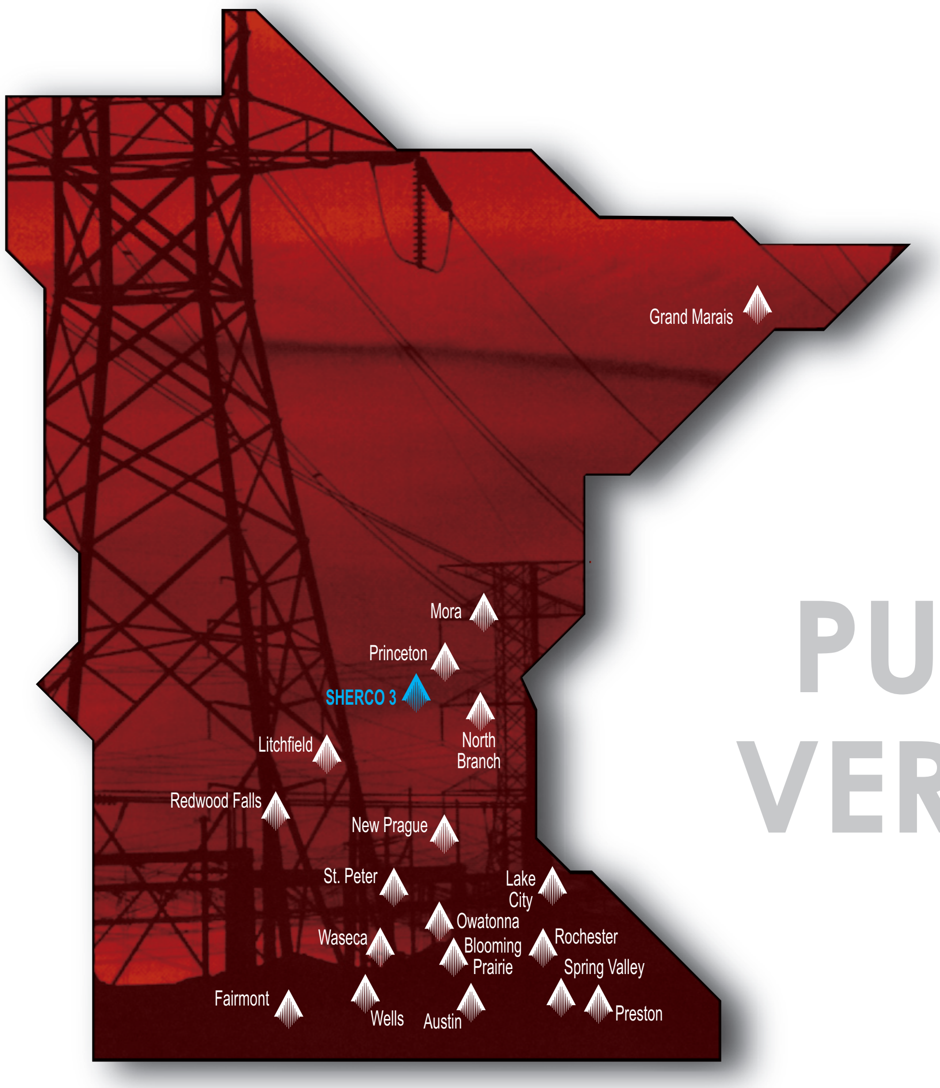
SOUTHERN MINNESOTA MUNICIPAL POWER AGENCY

Integrated Resource Plan 2014-2028

Submitted to Minnesota Public Utilities Commission

December 1, 2013

Docket No. ET9/RP-13-XXX



PUBLIC VERSION

SOUTHERN MINNESOTA
MUNICIPAL POWER AGENCY
Bringing power to your life.

November 27, 2013

Burl W. Haar
Executive Secretary
MN Public Utilities Commission
121 7th Place East
Suite 350
St. Paul, MN 55101-2147

SUBJECT: **IN THE MATTER OF SOUTHERN MINNESOTA MUNICIPAL POWER AGENCY'S SUBMITTAL OF ITS 2014 – 2028 INTEGRATED RESOURCE PLAN: DOCKET NO. ET9/RP-13-XXX**

Dear Mr. Haar:

Southern Minnesota Municipal Power Agency (SMMPA) has filed its 2013 Integrated Resource Plan by e-filing with the Minnesota Public Utilities Commission on November 27, 2013. This plan has been served upon all parties listed on the attached official service list.

This filing is SMMPA's seventh Integrated Resource Plan submitted pursuant to MN Statutes §216B.2422 and MN Rules Part 7843. Should you have any questions, please contact Larry Johnston at (507) 292-6440.

Sincerely,

Mark S. Mitchell

Mark S. Mitchell
Director of Operations and COO

Attachment
cc: Dave Geschwind

STATE OF MINNESOTA)
)
COUNTY OF OLMSTED)

AFFIDAVIT OF SERVICE

Re: In the Matter of Southern Minnesota Municipal Power Agency's Filing of its 2014 – 2028 Integrated Resource Plan to the Minnesota Public Utility Commission:

MPUC Docket No. ET9/RP-13-XXX

Larry W. Johnston, being first duly sworn, deposes and says that on the 27th day of November, 2013, he will serve the attached filing or summaries thereof in the above-referenced matter:

X	by depositing in the United States Mail at the City of Rochester, a true and correct copy thereof, properly enveloped with postage prepaid
______	by personal service
______	by facsimile transmission followed by first class mail
______	by overnight parcel delivery
X	by e-File

to all persons at the addresses indicated on the attached list.

Larry W Johnston

Larry W. Johnston
Director of Corporate Development
Agency Relations and Officer of
Legislative and Regulatory Affairs

Subscribed and sworn to before me this 27th day of November, 2013.

NAOMI A. GOLL
NOTARY PUBLIC - MINNESOTA
My Commission Expires Jan. 31, 2014

Naomi A. Goll

Naomi Goll
My commission expires: 1-31-2014

Official Service List
Southern Minnesota Municipal Power Agency
2013 Integrated Resource Plan
Docket No. ET/RP-13-XXX

Sharon Ferguson (5 Copies)
Department of Commerce
85 7th Place E Ste 500
Saint Paul MN 55101-2198

Burl W. Haar (5 Copies)
Public Utilities Commission
Suite 350
121 7th Place East
St. Paul MN 55101-2147

Julia Anderson
Office of the Attorney General-DOC
1800 BRM Tower
445 Minnesota St
St. Paul MN 55101-2134

Matt Kramer
DEED - 1st National Bank Bldg
332 Minnesota St Ste E200
Saint Paul MN 55101-1351

William Seuffert
75 Rev Martin Luther King Jr Blvd
130 State Capitol
St. Paul MN 55155

LARRY ANDERSON
SMMPA
500 1ST AVE. SW
ROCHESTER MN 55902-3303

James Alders
Xcel Energy
7th Floor
414 Nicollet Mall
Minneapolis MN 55401-1993

William A. Blazar
Minnesota Chamber Of Commerce
Suite 1500
400 Robert Street North
St. Paul MN 55101

Bruce Bomier
Environmental Resource Council
2829 Verndale Ave. #4
Anoka MN 55303-1624

Tammie Carino
Great River Energy
12300 Elm Creek Blvd.
Maple Grove MN 55369-4718

George Crocker
North American Water Office
PO Box 174
Lake Elmo MN 55042

Spencer Cronk
Department of Administration
200 Administration Bldg
St. Paul Minnesota 55155

Ledy Dunkle
Aldridge Electric
844 E Rockland Rd
Libertyville IL 60498-3358

Ed Ehlinger
Minnesota Department of Health
P.O. Box 64975
St. Paul MN 55164-0975

Benjamin Gerber
Minnesota Chamber of Commerce
400 Robert Street North
Suite 1500
St. Paul Minnesota 55101

Elizabeth Goodpaster
MN Center for Environmental Advocacy
Suite 206
26 East Exchange Street
St. Paul MN 55101-1667

Robert Harris
Western Area Power Administration
U.S. Dept. Of Energy
2900 4th Avenue North, PO Box 35800
Billings MT 59107-5800

James Hartson
59931 300th Street
Waltham MN 55982

Eric Jensen
Izaak Walton League of America
Suite 202
1619 Dayton Avenue
St. Paul MN 55104

Larry Johnston
SMMPA
500 1st Ave SW
Rochester MN 55902-3303

Mike Jones
Lignite Research Council
1016 E Owens Ave Ste 200
PO Box 2277
Bismarck ND 58502

John Knofczynski
Heartland Consumers Power District
PO Box 248
203 W. Center Street
Madison SD 57042-0248

Thomas Landwehr
Department of Natural Resources
Box 37, 500 Lafayette Rd
St. Paul Minnesota 55155

John Lindell
Office of the Attorney General-RUD
1400 BRM Tower
445 Minnesota St
St. Paul MN 55101-2130

Carl Nelson
Minnesota Project
1885 University Ave Ste 315
Saint Paul MN 55104

Clifford R. Porter
Lignite Research Council
Suite 200
1016 East Owens Avenue
Bismarck ND 58502

Mike Rothman
Department of Commerce
85 7th Pl E Ste 500
Saint Paul MN 55105

Official Service List
Southern Minnesota Municipal Power Agency
2013 Integrated Resource Plan
Docket No. ET/RP-13-XXX

Stan Selander
Great River Energy
12300 Elm Creek Boulevard
Maple Grove MN 55369-4718

Mrg Simon
Missouri River Energy Services
3724 W. Avera Drive
P.O. Box 88920
Sioux Falls SD 57109-8920

Beth H. Soholt
Wind on the Wires
570 Asbury Street Suite 201
St. Paul MN 55104

Duane Steenson
Montana Dakota Utilities
400 N 4th St
Bismarck ND 58501

Mr. Sullivan
Minnesota Planning
300 Centennial Building
St. Paul MN 55155

Eric Swanson
Winthrop Weinstine
225 S 6th St Ste 3500
Capella Tower
Minneapolis MN 55402-4629

Steve Thompson
Central Minnesota Municipal Power Agency
459 S Grove St
Blue Earth MN 56013-2629

Toni Volkmeier
MPCA
520 Lafayette Rd. N.
St. Paul MN 55155

Charles Zelle
Department of Transportation
MN Dept of Transportation
395 John Ireland Blvd
St. Paul MN 55155

Matthew J. Schuerger P.E.
Energy Systems Consulting Services, LLC
PO Box 16129
St. Paul MN 55116

Walter Schlink
Rochester Public Utilities
4000 East River Road NE
Rochester MN 55906-2813

Robert H. Schulte
Schulte Associates LLC
15347 Boulder Pointe Road
Eden Prairie MN 55347

John Linc Stine
MN Pollution Control Agency
520 Lafayette Rd
Saint Paul MN 55155

I Table of Contents

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II PREFACE

This document provides an overview of Southern Minnesota Municipal Power Agency's (SMMPA) seventh Integrated Resource Plan (IRP) filing to the Minnesota Public Utilities Commission under MN Statute §216B.2422, MN Rules Part 7843, and MN Statute § 216B.1691 Renewable Energy Objective. The plan identifies the anticipated power supply and delivery needs of SMMPA's eighteen member wholesale municipal electric customers for the 2014 through 2028 time period. This IRP details a base case least cost plan and specific actions to guide SMMPA within the first eight years of the planning period and outlines potential resources that might be used in years 9 through 15 of the planning horizon.

The electric utility industry in the Midwest region has changed and evolved significantly over the last several years. Previous planning and reliability functions of the Midcontinent Area Power Pool (MAPP) and bi-lateral market transactions have been replaced by the Midwest Reliability Organization (MRO) for reliability oversight and the Midcontinent Independent System Operator (MISO) for transmission planning and operations, and fully functioning energy and ancillary service markets. These industry changes have altered the way existing generating resources operate to serve load, and provide market alternatives to potentially meet future resource needs.

Significant transmission investments are being made in the upper-Midwest that will provide opportunities to access a variety of renewable and conventional resources. While this should create additional market alternatives that a utility may consider in developing its resource plan, construction of new generating resources must still be considered. MISO's evaluation of generating capacity in the region indicates a growing need for additional resources over the next several years. In this continually evolving environment, it is imperative that utilities engage in a planning process that both meets the regulatory requirements and allows the flexibility necessary to adjust to changes in the marketplace. This resource plan identifies SMMPA's likely courses of action, and is designed to minimize the cost of future supply, and to meet the service desires of our members and their customers while mitigating potential environmental or socioeconomic impacts.

To perform this resource planning analysis, a database of potential supply-side and demand-side alternatives was developed. As outlined in Section VII - Plan Development, a significant number of both supply-side and demand-side options were initially evaluated. To ensure that a thorough list of potential supply-side resources was considered, SMMPA hired an independent engineering consulting firm, SAIC (formerly R.W. Beck), to perform a comprehensive analysis to determine the technically viable resource options that should be considered in this study. Demand-Side alternatives considered in this study were based upon the results of a Demand-Side Management (DSM) technical potential screening study performed by Navigant Consulting for SMMPA. System optimization of supply and demand-side alternatives was accomplished through the use of the AURORA hourly production cost model.

SMMPA currently employs aggressive DSM programs that have proven effective at meeting a portion of the Agency's demand and energy needs. In developing the lowest cost integrated plan to meet the projected peak and energy forecasts, the Agency has assumed continuation of existing DSM programs, along with the addition of new DSM programs identified in the Navigant study. SMMPA's commitment to continued implementation of demand-side programs is demonstrated by using these programs to serve the first increment of growing needs. Following that, all supply-side resources including conventional peaking/cycling/baseload type resources, short-term purchased power options, and renewable technologies were made available for selection by AURORA. The least-cost plan development is driven by key data inputs and study assumptions, which are discussed in various sections of this report and summarized here as follows:
Energy and peak demand forecast
Operating costs and characteristics of existing resources
Capital, O&M costs, and operating characteristics for supply-side options
Capital, O&M costs, and operating characteristics for demand-side options
Fuel prices for various fuel types and future escalations
Market capacity and energy prices and future escalations
Externality and allowance costs for various pollutant emissions

The final step in the planning analysis is to test the robustness of the Base Case resource plan by performing various sensitivity analyses and varying key planning assumptions, including:
Base, high, and low natural gas prices
Base, high, and low locational marginal energy prices
Base, high, and low market capacity prices
Low and high externality costs
Base, high, and low capital costs
Base, high, and low load forecasts

The plan is consistent with the requirements of Minnesota statutes and rules and provides a clear, concise report to interested parties of what SMMPA intends to do to satisfy customer needs in the near term and what SMMPA is considering for options in the long term.

III Plan Cross-Reference

This resource plan is intended to satisfy requirements from four sources: 1) Provide the status of the short and long-range action plan included with SMMPA's 2009 Resource Plan Filing, 2) Requirements pertaining to the Commission's Order with respect to the 2009 Resource Plan Filing (Docket No. ET9/RP-09-536), 3) Requirements contained in MN Statute § 216B.2422, §216B.1612, §216B.1691, §216B.241, MN Rules Part 7843, and 4) Requirements contained in MPUC Letter issued August 5, 2013.

Table III-1 lists SMMPA's 2009 short and long-range action items and indicates where those items are addressed. Table III-2 lists items contained in the Commission's Order regarding SMMPA's 2009 filing and indicates where those items are discussed. Table III-3 lists the additional items relative to statutory and administrative rules governing resource plan filings and indicates where those items are addressed. Table III-4 lists the additional items addressed in the MPUC Letter issued August 5, 2013.

Table III-1
Cross-Reference to 2009 Resource Plan Short & Long Range Plan Items

Action Item	Status	Reference Section
Short Range – SMMPA will complete a turbine upgrade of approximately 7 MW at Sherco 3.	Completed	Section VI
Short Range – SMMPA will acquire 20 MW of quick start diesels and 20 MW of spark fired diesels.	Acquired 22 MW Quick Start. 25 MW spark ignited natural gas by end of 2013.	Section VI
Short Range – SMMPA will continue to implement existing and new DSM programs.	Ongoing	Section VII
Short Range – SMMPA will complete a 1.6 MW landfill gas generator.	Completed	Section VI
Short Range – SMMPA participate in CAPX activities.	Ongoing	Section VI
Short Range – SMMPA will continue bilateral purchase from OWEF and enXco to support the renewable energy standard.	Ongoing	Section VII
Short Range – SMMPA will make annual or seasonal bilateral or market purchases ranging from 20-40 MW.	Ongoing	Section VI

Table III-1 (continued)
Cross-Reference to 2009 Resource Plan Short & Long Range Plan Items

Action Item	Status	Reference Section
Long Range – SMMPA will continue expansion of SMMPA/Member DSM program.	Ongoing	Section VII
Long Range – SMMPA will acquire annual or seasonal peaking purchases as appropriate.	Ongoing	Section VI
Long Range – SMMPA will install 20 MW of spark fired diesels in 2017 and 2020.	Ongoing	Section VI
Long Range – SMMPA will install 100 MW of new wind resources in 2019 and 2024.	RES resource target dates have been updated	Section VII, IX, X

Table III-2
Cross-Reference to Commission's Order From 2009 Resource Plan (ET9/RP-09-536)

Action Item	Status	Reference Section
Next Resource Plan shall include: A discussion and modeling the impacts of Rochester Public Utility discontinuing its 216 MW contract rate of delivery.	Complete	Section VII
Next Resource Plan shall include: An update of the capacity accreditation reserve inputs to reflect the MISO Module E process.	Complete	Section VII
Next Resource Plan shall include: An update of its demand-side management analysis to account for the results of the DSM study on the potential of energy conservation.	Complete	Section VII, Appendix A
Next Resource Plan shall include sensitivity analysis of the cost effectiveness of achieving energy savings equal to 1.5% of retail sales.	Complete	Section VII
SMMPA shall file a compliance update July 2012, including the status of its demand-side management screening study and update of the short range plan.	Complete	
SMMPA shall file its next resource plan no later than July 1, 2013. Commission extended the filing date to December 1, 2013.	Complete	

Table III-3
Requirements for Resource Plan Filing Contents

Statute or Rule		Requirement	Reference Section
§216B.2422			
	Subd. 2	Include least cost plans for meeting 50% and 75% of all new and refurbished capacity needs with conservation and renewable energy resources.	Section XI
	Subd. 2a	Include applicable annual information required by section 216C.17, subdivision 2, and historically submitted as a part of the annual advanced forecast.	Section V, XIII
	Subd. 3	Utility must use the environmental cost values, along with other socioeconomic factors, in selecting resources.	Section VII, XII
	Subd. 4	Commission shall not approve a new or refurbished nonrenewable energy facility unless utility has demonstrated that a renewable energy facility is not in the public interest.	Section VIII, IX, X
	Subd. 6	Utility should state if it intends to site or construct a large energy facility.	Section VII, VIII
§216B.1612			
	Subd. 5(b)	Include a description of efforts to purchase energy from C-BED projects, including a list of the projects under contract and the amount of C-BED energy purchased.	Section VII
216B.1691			
	Subd. 3	Report on progress in meeting the Renewable Energy Standard (RES).	Section VII
216B.241			
	Subd. 1c(b)	Annual energy savings goal equivalent to 1.5% of gross annual retail energy sales.	Section VII

Table III-3 (continued)
Requirements for Resource Plan Filing Contents

Statute or Rule		Requirement	Reference Section
7843.0300			
	Subp. 5	Submit 15 copies of the plan to the Commission, and copies to the Department, RUD-OAG, MEQB members, and other interested parties.	See Official Service List Inside Front Cover
7843.0400			
	Subp. 1	Include a copy of the latest Advance Forecast to the MN Department of Commerce and MEQB.	Section XIII
	Subp. 2	Discuss any plans to reduce existing resources.	Section VI
	Subp. 3A	Include a list of resource options considered.	Section VI, VII, VIII
	Subp. 3B	Description of the process and analytical techniques used in developing the plan.	Section V, VII
	Subp. 3C	Include an 8 year action plan, with a schedule of key activities and regulatory filings.	Section IX
	Subp. 3D	Include a narrative and quantitative discussion of why the plan is in the public interest.	Section IV, X
	Subp. 4	Include a non-technical summary, not to exceed 25 pages in length, describing resource needs.	Section IV

Table III-4
Requirements for Resource Plan Filing Contents MPUC Letter Issued August 5, 2013

Statute or Rule		Requirement	Reference Section
§216B.2422			
	Subd. 4	Identify how the plan helps SMMPA achieve the greenhouse gas reduction goals under section 216H.02, the renewable energy standard under section 216B.1601, or the solar energy standard under section 216B.1691, subd. 2f.	Section X
Completeness items in Docket E015/RP-13-53			
		Address how SO2 allowance prices impact the plan, how unforced capacity impacts the plan, the use of Commission approved CO_2 values, cooling water impact on plant availability, DSM programs pros and cons of reduction in load vs. resource selection.	Section VII, XII

IV Resource Plan Summary

GENERAL DISCUSSION

This document is Southern Minnesota Municipal Power Agency's (SMMPA) seventh Integrated Resource Plan (IRP) filing to the Minnesota Public Utilities Commission under MN Statute §216B.2422 and MN Rules Part 7843. The plan details SMMPA's efforts under MN Statute §216B.1691, Minnesota's Renewable Energy Standard (RES). The plan identifies the anticipated power supply and delivery needs of SMMPA's eighteen member retail municipal electric customers for the 2014 through 2028 time period. This IRP also details action items implemented as a result of SMMPA's previous resource plan filings, details specific action items that SMMPA intends to complete within the first eight years of the planning period, and outlines potential resources that might be used for years 9 through 15 of the planning horizon. This section provides a summary of the major sections of this current filing.

PLAN OBJECTIVES

As stated in Minnesota Rules Part 7843, the factors to be considered by the Commission in their review of resource plans includes the following: (A) maintain or improve the adequacy and reliability of utility service; (B) keep the customers' bills and the utility's rates as low as practicable, given regulatory and other constraints; (C) minimize adverse socioeconomic effects and adverse effects upon the environment; (D) enhance the utility's ability to respond to changes in the financial, social, and technological factors affecting its operations; and (E) limit the risk of adverse effects on the utility and its customers from financial, social, and technological factors that the utility cannot control. SMMPA and the public power utilities it serves also share these objectives which have served as a guide as SMMPA evaluated various resource options in order to provide adequate, reliable and cost-effective electric power.

SMMPA continues to place emphasis on increasing the efficiencies of its facilities, providing through its members options for managing the energy needs of the members' retail customers as a critical component of a set of least-cost resources aimed at keeping costs low, now and into the future. These objectives are balanced with public power's long-standing commitment to the environment. This resource plan achieves those objectives.

LOAD FORECAST

The load forecasts are based upon SMMPA's 2013 Long Term Forecast. The forecast was developed using an econometric modeling approach. This is essentially the same methodological approach used in previous integrated resource plan filings. A brief description of the overall approach utilized in producing the load forecast is given below. The steps involved in the development of the forecast are described in more detail in Section V of this report.

Forecast Approach

The following steps define the process used to arrive at SMMPA's forecasted demand and energy requirements:

1. The annual retail load served across the Members is forecasted by combining econometric forecasts of residential customer counts and average energy use and adding the resulting estimate of residential sales to similar forecasts of total retail sales to commercial and industrial customers and other customers, such as lighting classes and government facilities. As described further in the Section V entitled, "Adjustments for Demand-side Management Conservation," the forecast of total retail sales are adjusted for the historical impact of DSM Conservation programs on the growth rates projected by the econometric models.
2. After adjusting for distribution losses, the resulting total represents the total delivered energy requirements across all of SMMPA's Members.
3. Total delivered energy requirements are then allocated to the Members based on a separate econometric forecast of total delivered energy requirements for each Member (referred to herein as the "Ratio Forecasts").
4. The contribution of each Member's load to SMMPA's peak demand (i.e., coincident peak, from the Member's perspective) is forecasted based on an econometric forecast of load factor, combined with the forecasted Member energy requirements.

These load determinants reflect the gross power requirements that would need to be served from supply- and/or demand-side resources.

LOAD AND CAPABILITY

SMMPA's Base Forecast Load and Capability Prior to the Resource Plan Information is shown in Table IV-1. This table is meant to be used as a starting point for the development of SMMPA's Resource Plan and to illustrate the capacity surpluses and deficits which exist prior to the plan development, based on SMMPA resources in place or planned for 2014. Under the scenario presented in Table IV-1, SMMPA first shows a deficit in the summer of 2015 however the first new conventional resource is not needed until 2020. The minor deficits from 2015 through 2019 will be filled with DSM activities and capacity purchases. The specific resources used to meet the identified capacity deficits are detailed in Section IX - Short Range Action Plan and Section X - Long Range Plan.

RESOURCE CAPABILITIES

SMMPA has a variety of existing resources available to both reliably and economically meet the energy needs of its members. These resources consist of peaking facilities, intermediate load facilities, base load facilities, demand-side management programs, SMMPA member curtailments, renewables, and power transactions from companies both inside and outside of the Midcontinent Independent Systems Operator (MISO) Pool.

Base Load Facilities

SMMPA's primary source of energy comes from a 41% share of the Sherburne County Generating Station Unit 3 (Sherco 3). Sherco 3 is jointly owned with Xcel Energy (Xcel) and features state-of-the-art air quality control system (AQCS). Approximately 75% to 85% of SMMPA's energy is produced at Sherco 3.

Intermediate Load Facilities

In 2013, SMMPA will complete the construction of 4 new generating units in Fairmont, Minnesota, totaling 25 MW. These new high-efficiency reciprocating engine units will replace the older, inefficient steam boilers and turbines at Fairmont. Although internal combustion generating plants are generally considered to be peaking resources, these new high efficiency units are 20% more efficient than other traditional internal combustion engines or turbines and are therefore expected to be dispatched as intermediate load units in MISO.

Peaking Facilities

The mix of peaking facilities within the SMMPA system consists of one combustion turbine and several reciprocating internal combustion engines (diesels) totaling approximately 140 MW of capacity.

The peaking facilities in the SMMPA system provide significant benefits beyond system capacity. Of the eighteen members in the SMMPA system, fourteen of them have generating capacity under contract with the Agency. Having this capacity located in the member communities substantially improves system reliability and improves the quality of service provided to the members of SMMPA.

Firm Power Purchases

SMMPA currently has between 40 MW and 70 MW of purchase capacity under contract for the period of 2014 through 2019.

Renewable Resources

The SMMPA power supply system currently consists of more than 110 MW of renewable resources. SMMPA owns six wind turbines located in and interconnected to member utility distribution systems. SMMPA also has an agreement in place to purchase the net electrical output of the Olmsted County Waste-to-Energy Facility (OWEF). In 2009, SMMPA entered into a Purchase Power Agreement (PPA) with enXco for 100.5 MW of wind generation located in Dexter, MN. The Agency also recently developed a 1.6 MW landfill gas generator project near Mora, Minnesota, which went into operation in 2012.

TABLE IV-1 (Part 1)
2014-2028 Base Forecast Load & Capability Prior to Resource Plan Information

		2014	2015	2016	2017	2018	2019	2020	2021
Total Member Requirements		751.8	773.1	793.0	814.6	836.2	858.1	878.1	900.1
	Above CROD	(85.8)	(97.3)	(108.5)	(120.7)	(132.8)	(144.7)	(155.6)	(167.6)
	Installed DSM-Conservation	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)
	Member Generation	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)
	Transmission Losses	11.1	11.3	11.5	11.7	11.9	12.1	12.3	12.5
	Total Adjustments	(162.3)	(173.6)	(184.6)	(196.5)	(208.5)	(220.2)	(230.9)	(242.7)
Total Agency Requirement		589.5	599.5	608.4	618.0	627.7	638.0	647.2	657.4
	Planning Reserve Requirements (9.3%)	54.8	55.8	56.6	57.5	58.4	59.3	60.2	61.1
Total Generation Level Requirements		644.3	655.3	665.0	675.5	686.1	697.3	707.4	718.5
	Supply Side Resources								
	Existing Generation Resources	560.0	560.0	560.0	560.0	560.0	560.0	560.0	560.0
	Existing Capacity Purchases	60.0	60.0	65.0	70.0	40.0	40.0		
	Existing EMP Program	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1
	Existing Direct Load Control	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4
	New DSM								
	New DSM Reserves & Losses Offset								
	New Conventional Generation								
	New Wind Generation								
	New Solar Generation								
	New Capacity Purchases								
	Total Supply Side Resources	647.5	647.5	652.5	657.5	627.5	627.5	587.5	587.5
Agency Resource Status (Positive = Excess MW)		3.1	(7.8)	(12.6)	(18.0)	(58.6)	(69.8)	(119.9)	(131.1)
	Actual Reserve Margin	9.8%	8.0%	7.2%	6.4%	0.0%	-1.6%	-9.2%	-10.6%

TABLE IV-1 (Part 2)
2014-2028 Base Forecast Load & Capability Prior to Resource Plan Information

		2022	2023	2024	2025	2026	2027	2028
Total Member Requirements		920.8	941.2	961.0	983.3	1,005.0	1,026.9	1,047.1
	Above CROD	(179.1)	(190.5)	(201.8)	(214.3)	(226.7)	(239.3)	(251.0)
	Installed DSM-Conservation	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)
	Member Generation	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)
	Transmission Losses	12.6	12.8	13.0	13.2	13.4	13.6	13.7
	Total Adjustments	(254.1)	(265.3)	(276.4)	(288.7)	(300.9)	(313.4)	(324.8)
Total Agency Requirement		666.7	675.9	684.6	694.5	704.1	713.6	722.2
	Planning Reserve Requirements (9.3%)	62.0	62.9	63.7	64.6	65.5	66.4	67.2
Total Generation Level Requirements		728.7	738.8	748.2	759.1	769.6	779.9	789.4
	Supply Side Resources							
	Existing Generation Resources	560.0	560.0	560.0	560.0	560.0	560.0	560.0
	Existing Capacity Purchases							
	Existing EMP Program	7.1	7.1	7.1	7.1	7.1	7.1	7.1
	Existing Direct Load Control	20.4	20.4	20.4	20.4	20.4	20.4	20.4
	New DSM							
	New DSM Reserves & Losses Offset							
	New Conventional Generation							
	New Wind Generation							
	New Solar Generation							
	New Capacity Purchases							
	Total Supply Side Resources	587.5	587.5	587.5	587.5	587.5	587.5	587.5
Agency Resource Status (Positive = Excess MW)		(141.3)	(151.3)	(160.8)	(171.7)	(182.1)	(192.5)	(202.0)
	Actual Reserve Margin	-11.9%	-13.1%	-14.2%	-15.4%	-16.6%	-17.7%	-18.7%

Demand-Side Management (DSM) Resources

DSM is a key strategic element in SMMPA's resource planning efforts. It is an overall cost-effective resource in our supply portfolio that serves an important role in meeting customer demand. DSM programs help to counter or minimize energy and demand growth thereby delaying the need to build more physical generation assets, they have minimal environmental impacts, and they are advantageous for economic development.

SMMPA and its members have a long standing commitment to DSM programs dating back to 1985 when members began installing direct load control (DLC) systems. Beginning in 1993, we started developing a range of conservation/high-efficiency initiatives for our members. SMMPA is committed to enhancing, developing, and implementing comprehensive, cost-effective, and innovative energy efficiency programs for which it has received national recognition.

As a whole, SMMPA members have a proven track record of strong DSM performance. The Next Generation Energy Act of 2007 established an aggressive energy savings goal of 1.5% of retail sales starting in 2010. For SMMPA members, that goal was more than double our historic energy saving achievements. But we approached that challenge head-on by refining our DSM program strategy and expanding upon our proven program platform. As a result, our 18 members have collectively exceeded that goal every year so far and we are on track to do so again in 2013.

Continuing to meet the (Conservation Improvement Program) CIP energy savings goal will be a challenge. Our goal is to continue to achieve at least 1.5% as we have to date, however we have no certainty that such an aggressive approach is sustainable. More aggressive residential and commercial lighting standards, building codes, and equipment standards will be phased in. Additionally, as we reach higher levels of market penetration, the available market potential, absent any significant advances in energy efficient technologies, shrinks. To help address some of these challenges, we participate in stakeholder workgroups created to try and address these issues. While some progress has been made, we think work remains to properly account for savings for behavioral programs and for changes to codes and standards.

SMMPA's strong commitment to DSM is based on our interest in developing a least-cost resource base, our commitment to sound environmental practices, and our knowledge of the role energy efficiency and the wise use of electricity can play in helping customers reduce their bills and control energy costs. In fact, SMMPA, in conjunction with our members, provides a comprehensive set of energy efficiency programs (currently over 20 programs) to our members' end-use customers. We view those programs as an integral part of our strategy in helping customers control their energy costs and meet the challenges of an increasingly competitive marketplace. Those programs will also continue to take a prominent and strategic planning role as SMMPA looks to the next 15 years and beyond. The following DSM programs are included as a part of the current filing:

- *Business Retrofit And New Construction Lighting Program*
- *Business High-Efficiency Cooling Program (including RTU's, PTAC's, PTHP's, Chillers, Air Source Heat Pumps, Ground Source Heat Pumps, and Water Source Heat Pumps)*
- *Business High-Efficiency Motor Program (including ECM Evaporator Fan Motors in Refrigerated Cases)*
- *Business Adjustable Speed Drive Program*
- *Business Compressed Air Leak Correction Program*
- *Lodging Guestroom Energy Management System Program*
- *Business Anti-Sweat Heater Controls Program*
- *Business VendingMiser Program*
- *Commercial Food Service Program (including 12 different qualifying equipment types)*
- *Business Custom Efficiency Program*
- *Load Profiling Services*
- *Residential Behavioral Program (Household Energy Use Comparisons)*
- *Residential ENERGY STAR® Appliance Program*
- *Residential ENERGY STAR Lighting Program*
- *Residential Cooling Program (including Central AC, Air Source Heat Pumps, and Ground Source Heat Pumps)*
- *Residential Central AC/Air Source Heat Pump Tune-Up Program*
- *Residential Efficient Furnace Fan Motor Program*
- *Residential LED Holiday Lighting Program*
- *Habitat for Humanity Program*
- *Low Income Program*

Section VI-Resource Capabilities details the DSM initiatives SMMPA and its members have undertaken, and the marketing and implementation assistance SMMPA provides to its members.

Member Direct Load Control (DLC)

SMMPA member utilities have developed extensive Direct Load Control (DLC) Programs. Members began installing DLC systems in 1985 predominantly as a means of managing the cost of their wholesale power supply. Today, SMMPA notifies its members during peak demand periods so they can operate their systems to lower their demand. Currently, fourteen of the eighteen SMMPA members have DLC systems. Member efforts are typically based upon central air conditioner cycling and to a lesser extent (given the technology saturation) electric hot water heater cycling.

Member utilities, with their close working relationships with their customer base, have achieved significant penetration into the DLC market with members estimating on average that 75% of available central air conditioners are under control. This significant penetration is based upon a mix of voluntary and incentive-based participation. It is the member municipal utility's strong direct contact efforts that have led to such significant participation. In an effort to extend the benefits of DLC initiatives, several members require the installation of load control switches in all new construction installations or service upgrades. Programs are mainly for residential customers, but persistent contact has resulted in significant participation among commercial accounts as well.

In addition to the technologies listed above, some members, based upon their system load shape and available fuel mix, have also incorporated off-peak heating and/or dual fuel technologies into their control strategy.

Several members have developed one or more interruptible rates, independent of SMMPA tariffs, which are employed to control load at the time of summer system peak. One member in particular, Austin Utilities, has a specific rate with Hormel which makes available up to 14 MW of standby generation located at their Austin processing facility. SMMPA has entered into an arrangement whereby if the units are not needed to serve Hormel, within the guidelines of the air permit, SMMPA has the right to schedule and dispatch the Plant not more than 12 times in any calendar year and each such call shall not exceed nine hours of operation.

Additionally, a number of members control municipal loads, such as municipal water and/or wastewater pumping loads during peak demand periods.

Energy Management Program

The Energy Management (EM) Program was designed as a commercial and industrial interruptible program in 1995. The program is similar in nature to the load-shed cooperatives found around the country such as those developed by Boston Edison, Commonwealth Edison, Southern California Energy Coalition, etc. Under the program, SMMPA purchases a specified amount of interruptible capacity during brief summer peak electric periods from interested member utility retail customers that can turn off at least 70 kW or operate at least 25 kW of load with their backup generator. Historically, the primary purpose of the program was to reduce demand during peak periods where SMMPA needs to reduce load to maintain its reserve requirement. We are currently evaluating the program to determine how this load reduction can be utilized within MISO.

Participation in the program is governed by an interruptible tariff and customer agreement between the member utility and the retail customer. The program, which had an availability of 7.1 MW of controllable load in 2013, is fully described in Chapter VI – Resource Capabilities.

Other Member Curtailments

There are some resources which SMMPA considers to be curtailments to load. In general, these are resources to which SMMPA does not have ownership rights, but the resource does reduce the power and energy SMMPA must provide to its members. SMMPA works with the members and their customers to try to ensure that these curtailments are being dispatched in a cost effective manner so that they lower cost to not only the owners, but also to SMMPA. SMMPA has three resources it considers curtailments -- Western Area Power Administration allocations to members, retail customer-owned distributed generation, and member-owned hydroelectric plants.

Midcontinent Independent System Operator

SMMPA is a Transmission Owning member of the Midcontinent Independent System Operator (MISO). All of the Agency's loads and generating assets reside within the MISO footprint, and the Agency's transmission assets are controlled by MISO. The Agency participates in the MISO Energy Market and the Ancillary Services Market. Reliability compliance oversight of the Agency's assets and operations is provided by the Midwest Reliability Organization (MRO) . The Agency also actively participates in the Minnesota Transmission Owners (MTO) group in order to comply with the Minnesota biennial transmission reporting requirements.

Wholesale Power Marketing

SMMPA's approach to wholesale power marketing has evolved over recent years. The Agency has recognized that increased participation in the wholesale power market will be a key to maximizing the utilization of the Agency's resources and lowering overall costs to its members. Accordingly, in early 2006, the Agency and The Energy Authority (TEA) formed an alliance whereby TEA would assist the Agency in wholesale power marketing activities. A key benefit from this marketing alliance is the enhanced capability TEA provides to SMMPA to successfully operate in MISO's locational marginal pricing (LMP) market and MISO's ancillary services market (ASM).

CAPX 2020

CapX 2020 represents an effort to ensure electric reliability for Minnesota and the surrounding region in the future. It began as an effort by the state's largest transmission owners (including cooperatives, municipals and investor-owned utilities) to assess the current transmission system and project the growth in customer demand for electricity through 2020. In 2006, the Agency joined CapX 2020.

CapX 2020 was established in 2004 in order to assist in the development of transmission resources needed to promote future electric reliability for Minnesota and the surrounding region.

The CapX 2020 projects provide needed transmission capacity to support new generation outlets, including renewable energy. The projects include four 345 kV transmission lines and one 230 kV line. The CapX 2020 lines are projected to cost more than $2 billion and cover nearly 800 miles. The Agency is investing approximately $70 million dollars in the CapX 2020 Hampton - Rochester - La Crosse 345 kV transmission project.

Transmission Facilities

The Agency's members are located in the control areas of the Agency, NSP, GRE and Alliant Energy. SMMPA members are connected to the electric transmission systems of NSP, Dairyland, GRE, and ITC Midwest, which purchased the transmission assets of Alliant Energy's Interstate Power and Light in December 2007. Sixteen of the Members have some generating capability located within their respective service areas. Additional information about SMMPA's transmission assets can be found in section VI – Resource Capabilities.

PLAN DEVELOPMENT

Resource planning tools available for this filing include the AURORAxmp Electric Market Model developed by EPIS, Inc. and the Energy Efficiency Resource Assessment Model (EERAM) developed by Navigant Consulting, Inc. The AURORA model was used to perform the supply-side/demand-side resources integration analysis.

A new DSM Technical Potential screening was completed by Navigant Consulting, Inc. The screening provided estimates of the technical, economic and market/achievable potential for the SMMPA system. The EERAM model evaluated a total of 65 residential, 81 commercial and 46 industrial DSM measures either currently being implemented by SMMPA members or offered by other utilities and may be of interest to SMMPA members. The model calculates all of the standard DSM program tests including the Participant Cost Test (PCT), Ratepayer Impact Test (RIM), Program Administrator Cost Test (PAC), and the Total Resource Cost Test (TRC). Program cost effectiveness is based upon the TRC test which includes all quantifiable costs and benefits of an energy efficient measure, regardless of who accrues them. For example, a measure passing the TRC test means that the measure is cost effective if the avoided costs are greater than the sum of the measure costs and SMMPA's administrative costs.

The screening also analyzed the savings impact to SMMPA from customer reparticipation at the end of the useful life of an installed energy-efficient measure and the impacts of increasingly rigorous efficiency codes and standards.

SMMPA has licensed the most recent Version 11.2 of AURORA from EPIS to perform all necessary analyses for developing the resource plan. AURORA is a fundamentals-based model that employs a multi-area, transmission-constrained dispatch logic to simulate real market conditions. Its true economic dispatch captures the dynamics and economics of electricity markets.

AURORA is designed to evaluate integrated resource plans, market sales and purchases, and plant life management programs. It also has modules developed to specifically accommodate demand-side management options and to facilitate the development of environmental compliance plans.

Planning Assumptions

For the 2013 IRP study, the objective function used for developing the least-cost resource plan is based on total present worth costs over the planning study period of 2014 – 2028 and a 22-year extension period.

AURORA calculates the annual costs of the generation system based on the fixed costs (carrying charges and fixed O&M costs) of new and existing generating resources, as well as the variable costs (fuel, emissions and variable O&M costs) associated with operating the generating system. Allowance for insurance and taxes are included in fixed O&M operating costs for future supply-side resources.

The least-cost plan development is driven by key data inputs and study assumptions, which are discussed in various sections of this report and summarized here as follows:

- Energy and peak demand forecast
- Operating costs and characteristics of existing resources
- Capital, O&M costs, and operating characteristics for supply-side options
- Capital, O&M costs, and operating characteristics for demand-side options
- Fuel prices for various fuel types and future escalations
- Externality and allowance costs for various pollutant emissions

The above mentioned data inputs and study assumptions are shown in Table VII-1 through VII-7. SMMPA used externality values developed by the State of Minnesota, adjusted to 2014 dollars. These Metropolitan Fringe values were used for all emission types.

The following key assumptions and study definitions are very important to understand the IRP results and conclusions developed in this study:

a. All AURORA cases are based on 9.3% minimum installed capacity reserves to meet the MISO planning criterion.
b. The study period is 2014 through 2028. A 22-year extension period is used for the AURORA optimization analysis to account for end-effects.
c. Total present worth costs are expressed in 2012 dollars, and are calculated by discounting annual costs with SMMPA’s cost of money of 5.68%.

d. Available future supply-side resources include: wind turbines, photovoltaic solar, peaking purchased power, combustion turbines, combined cycle, supercritical pulverized coal, integrated gas combined cycle (IGCC), nuclear, and spark fired natural gas engines.

e. Available future demand-side options include four program groups: commercial/industrial non-lighting (C/I-Other), commercial/industrial lighting (C/I-Lite), residential non-lighting (Res-Other), and residential lighting (Res-Lite). All existing DSM resources have been reflected in the load forecast (i.e. the demand and energy impacts have been included in the load forecast).

f. The costs of environmental externalities are taken into account in evaluating and developing the least-cost resource plans. These environmental externality values affect the economic dispatch of electric generating units, and they are also included in the total cost of each expansion plan based on the fuel burn of each generating unit.

g. SMMPA includes sufficient renewable resources in the plan to meet Renewable Energy Standard (RES) targets.

Supply-Side

SMMPA is continually evaluating its supply-side options to ensure that the lowest-cost alternatives are being pursued. To ensure that all potential resources were considered, SMMPA hired an independent engineering consulting firm, SAIC, (formerly R.W. Beck) to perform a comprehensive analysis to determine the technically viable resource options that should be considered in this study. For each identified option, the consulting firm provided the capital and operating costs and associated operating/performance characteristics. This information is discussed and summarized in Section VIII – Potential Resources.

In developing the new resource plan, SMMPA considered several different types of peaking, intermediate, and baseload resources. However, the implementation of the existing Rochester CROD, future Austin CROD, and aggressive marketing/implementation of demand-side resources has had a significant impact on SMMPA's system load shape resulting in much higher system load factors. SMMPA's system load factor for 2013 was 63% and is expected to increase to more than 76% by the year 2028.

Renewable Energy Standard (RES) ***MN Statute §216B.1691***

Parts of the plan development are SMMPA's strategies to meet targets established by the RES. In 2007, the Minnesota Legislature amended the renewable energy objectives statute. That amendment modified the remaining renewable energy objective to just one – the requirement that covered utilities make good faith efforts to ensure that by 2010 at least seven percent of total retail sales were generated using eligible renewable technologies. The statute also established benchmarks for the renewable energy standard of 12% by 2012, 17% by 2016, 20% by 2020, and 25% by 2025. To achieve these Renewable Energy Standards, SMMPA has acquired or anticipates acquiring the resources identified in Table IV-2. Included among those resources is a purchase power wind agreement of 100.5 MW with enXco which became commercially operational in February of 2009. Table IV-2 also anticipates an additional wind power purchase power agreement of 130 MW in 2021.

SMMPA continues to believe that the most cost-effective approach to meeting RES targets is a portfolio approach. That approach provides SMMPA members, and their customers, with the greatest flexibility and control over costs, while demonstrating the Agency's good faith in meeting these targets.

That strategy envisions multiple ownership structures for meeting RES targets. Those resources include the following:

- SMMPA-owned small renewable projects connected to member utility distribution systems, where feasible;
- SMMPA equity ownership (along with other owners) in larger projects when available;
- Power Purchase Agreements (PPA) for both the renewable energy and the green attribute;
- Community Based Energy Development (C-BED) projects; and,
- Renewable Energy Credits (REC).

That strategy also envisions a mix of technologies, including wind, bio-diesel/biogas, biomass, small hydroelectric facilities, and municipal solid waste to energy.

Table IV-2, on the following page, illustrates SMMPA's committed and planned RES resources for the period 2014-2028. More detailed descriptions of these RES resources can be found in Section VII – Plan Development.

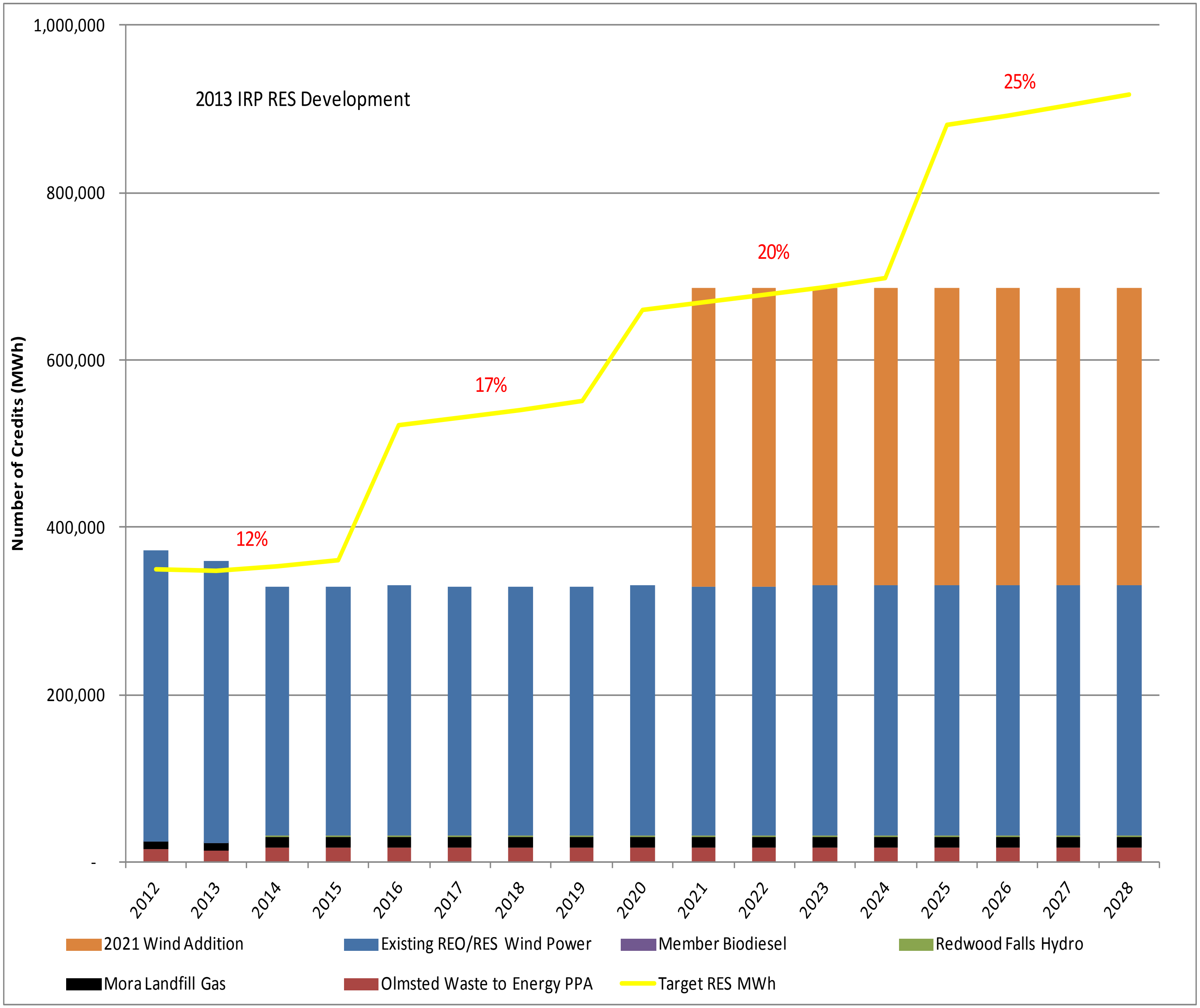
Consistent with the Commission's order, all current renewable resources SMMPA uses for meeting the RES are registered with the Midwest Renewable Energy Tracking System (M-RETS). SMMPA has been in compliance with all renewable energy certificates (RECs) retirements to date (currently 12% in 2012) and has filed all applicable compliance reports.

Table IV-2 SMMPA Renewable Energy Resources 2014-2018

Resources (in MWh)	EST 2014	EST 2015	EST 2016	EST 2017	EST 2018	EST 2019	EST 2020	EST 2021	EST 2022	EST 2023	EST 2024	EST 2025	EST 2026	EST 2027	EST 2028
REO/RES Resources															
Existing REO/RES Wind Power	297,867	297,867	298,381	297,867	297,867	297,867	298,381	297,867	297,867	297,867	298,381	297,867	297,867	297,867	298,381
Olmsted Waste to Energy PPA	17,689	17,689	17,741	17,689	17,689	17,689	17,741	17,689	17,689	17,689	17,741	17,689	17,689	17,689	17,741
Redwood Falls Hydro	1,677	1,677	1,677	1,677	1,677	1,677	1,677	1,677	1,677	1,677	1,677	1,677	1,677	1,677	1,677
Member Biodiesel	248	289	180	258	236	241	248	264	281	300	311	323	335	347	357
Mora Landfill Gas	12,483	12,483	12,517	12,483	12,483	12,483	12,517	12,483	12,483	12,483	12,517	12,483	12,483	12,483	12,517
2021 Wind Addition	-	-	-	-	-	-	-	355,254	355,255	355,255	355,867	355,255	355,255	355,255	355,867
SMMPA REO/RES MWh	329,963	330,005	330,496	329,974	329,952	329,956	330,564	685,234	685,251	685,271	686,494	685,293	685,306	685,318	686,540

2013 SMMPA Long Term Forecast Total Energy Required (TER)	2,953,005	3,012,656	3,074,172	3,120,673	3,176,742	3,238,535	3,301,890	3,346,595	3,391,207	3,434,266	3,485,219	3,521,843	3,568,619	3,614,668	3,666,114
TargetRES %	12%	12%	17%	17%	17%	17%	20%	20%	20%	20%	20%	25%	25%	25%	25%
Target RES MWh	354,361	361,519	522,609	530,514	540,046	550,551	660,378	669,319	678,241	686,853	697,044	880,461	892,155	903,667	916,529
Renewable Energy Credits Available	1,456,608	1,425,094	1,232,981	1,032,440	822,346	601,751	271,937	287,852	294,862	293,279	282,730	87,562	(119,287)	(337,637)	(567,625)
SMMPA Compliance %	12%	12%	17%	17%	17%	17%	20%	20%	20%	20%	20%	25%	25%	25%	25%

Chart IV-1 illustrates SMMPA's RES Development for the period of 2012-2028.



Demand-Side

As outlined at the beginning of Section VII – Plan Development, SMMPA conducted a new DSM screening for the 2014 filing. SMMPA selected Navigant Consulting, Inc. (Navigant) to conduct the current screening.

The objective of the study was to conduct an analysis of energy and peak demand savings potential for SMMPA. In previous screening studies, all of SMMPA's 18 member utilities have been combined in a single analysis group. In this study, we elected to use two study groups to better reflect actual SMMPA load obligations and how they may be affected by that DSM potential. Under certain limited conditions, and with sufficient notice (currently seven years), SMMPA's Power Sales Contract with its members allows for the establishment of a Contract Rate of Delivery (CROD). After a CROD level is established (based upon the member's peak in the preceding year), the CROD Member is responsible for supplying their load each and every hour in which it exceeds the established CROD level. SMMPA member Rochester Public Utilities (RPU) elected a CROD beginning in 2000, and Austin Utilities (AU) will establish a CROD in 2016.

The CROD has specific implications for DSM planning. When new efficient technology measures are installed in a CROD member system, essentially all the energy savings continue to accrue to SMMPA but the capacity savings will not. Those capacity savings are realized by the CROD member. It was for this reason that SMMPA separated the current analysis into two load groups - one CROD (representing AU and RPU) and the other Non-CROD (representing the other 16 SMMPA members). Separating the two groups makes it easier to assess the capacity impacts of DSM measures on SMMPA's overall capacity planning needs.

The technical potential analysis began with developing an estimate of the building stock for the SMMPA member service territories created by Navigant utilizing on-site data collected from over 198 commercial/industrial and 140 residential surveys conducted as part of previous work for the State of Minnesota. Where necessary, Navigant supplemented this dataset with data from other utility assessments to determine building information and estimate baseline and energy efficiency measure densities and fuel shares by end-use. The efficiency measures included in the study included the wide array of measures currently being offered by SMMPA members and measures offered by other utilities that could be of interest to SMMPA. Estimated savings, incremental costs, and measure lifetimes were drawn from the Minnesota Deemed Database. If unavailable, data was drawn from standard utility practice. The study evaluated a total of 65 residential measures, 81 commercial measures, and 46 industrial measures. The analysis is fully described in Chapter VII – Plan Development and a narrative summary of the technical potential study can be found in Appendix A.

The study utilized Navigant's Energy Efficiency Resource Assessment Model (EERAM) to assess technical, economic and market or achievable potential. The EERAM model calculates all of the standard DSM program tests including the Participant Cost Test (PCT), Ratepayer Impact Test (RIM), Program Administrator Cost Test (PAC), and the Total Resource Cost Test (TRC).

One of the important goals of integrated resource planning is to ensure the integration of cost-effective DSM resources. Such integration maximizes the DSM potential and defers the need to build supply-side alternatives. The EERAM model used in SMMPA's analysis includes a couple of unique features to assist in that process. In addition to estimating the achievable DSM potential of the building stock, the model also estimates the impacts of reparticipation at the end of the useful life of installed measures, and the impacts of higher codes and standards.

The analysis developed both a business as usual or Base Case DSM potential scenario as well as a Full (1.5%) DSM potential scenario. The energy savings for each of the two study groups (CROD and Non-CROD) were combined into four technology groups for integration with the AURORA model. Those groups consist of Residential Lighting, Residential Other (predominantly HVAC, appliances and behavioral programs), Commercial & Industrial Lighting, Commercial & Industrial Other (predominantly, motors, drives, HVAC, compressed air).

Base Case forecast cumulative energy savings over the planning horizon grow from 65,474 MWh in 2014 to an estimated 620,760 MWh in 2028. Savings as a percentage of forecast load averages approximately 1.3%. Because capacity savings in a CROD member will accrue to the member and not SMMPA, for the purposes of the integration, only Non-CROD capacity numbers were included. Base Case demand savings range from approximately 27 MW in 2014 to approximately 117 MW in 2028.

A Full (1.5%) DSM scenario was also developed. A number of assumptions were changed in the model to simulate higher adoptions (increased customer awareness and willingness factors and higher incentive levels). Theoretically, increased marketing could improve the awareness and willingness of customers, and increased incentives could improve paybacks. Whether or not that scenario can be realized is a question. SMMPA currently has an aggressive marketing program utilizing advanced approaches such as database marketing. Whether or not additional marketing and incentives can drive the market further remains to be seen. In the Full (1.5%) scenario, savings as a percentage of forecast load averages approximately 1.7% over the study period. Energy savings grow from 81,215 MWh in 2014 to 823,427 MWh in 2028. Non-CROD only demand savings grow from approximately 37 MW in 2014 to approximately 225 MW in 2028. This represents an over 30% increase in energy savings. If those savings could be realized, however, it would require an estimated 89% increase in DSM budget. SMMPA has been successful in meeting and exceeding the 1.5% savings target since its inception in 2010. We will continue to aggressively design and implement our programs as we have, but believe that the Base Case adoption rate is more realistic over the planning horizon.

Supply-Side and Demand-Side Integration

The AURORA optimization model was used to integrate the supply-side resources identified in Section VIII – Potential Resources with the results of the demand-side achievable potentials identified in this Section VII. All supply-side resources, including conventional peaking/cycling/baseload resources, advanced baseload technologies such as supercritical pulverized coal and newly emerging technologies like Integrated Gas Combined Cycle (IGCC), nuclear, renewable technologies, and short-term purchase power options were made available for selection by AURORA to develop the lowest cost plan to meet the projected peak and energy forecasts. In addition, all four bundled technology groups of demand-side resources were included in AURORA to develop the lowest cost “integrated” resource plan.

The final step in the planning analysis is to test the robustness of the lowest cost (base case) resource plan by performing various sensitivity analyses and varying key planning assumptions, including:

- Base and high natural gas prices
- Low and high externality costs
- Base and high LMP prices

- Base, high, and low load forecasts

High and low externality scenarios refer to the ranges of the environmental externality values referenced above and discussed further in Section XII - Environmental. The Base Case natural gas price of $4.68 per mmBtu was increased to $7.02 per mmBtu (50% increase) for the high gas price scenarios. The price of diesel fuel of $21.53 per mmBtu,with escalation increases as shown in Table VII-5, had very little impact due to very little diesel fuel being used in the various plans and therefore will show negligible sensitivity impacts. Scenarios also included high and low forecast assumptions. The results of the base integration analysis and sensitivity scenarios are shown in Table VII-26.

As shown in Tables VII-26, there are a variety of resource plan scenarios that consist of a mix of DSM programs, high, low, and base load forecasts, high and low externalities, base and high natural gas and LMP Prices, solar, no renewable resources, and no DSM resources. The Base Case consists of expected DSM, plus new supply-side additions of renewable resources, including future wind turbines installed in 2021 to meet RES requirements (130 MW), 25 MW increments of future wind in 2018, 2019, 2020 and 2021, twenty four peaking purchases (10 MW increments), and a simple-cycle combustion turbine (50MW increments) in 2020.

POTENTIAL RESOURCES

To perform this resource planning analysis, a database of potential supply-side and demand-side alternatives was developed. As outlined in Section VII - Plan Development, a significant number of both supply and demand-side options were initially evaluated. To ensure that all potential supply-side resources were considered, SMMPA hired an independent engineering consulting firm, SAIC (formerly R.W. Beck), to perform a comprehensive analysis to determine the technically viable resource options that should be considered in this study. For each identified option, the consulting firm provided the capital and operating costs and associated operating/performance characteristics.

The following provides a summary of the SAIC study with a discussion of those supply-side options that SMMPA used in developing the least-cost resource plan.

- Nuclear Power

- Pulverized Coal (supercritical boiler technology)
- Integrated Gasification Combined Cycle (IGCC)
- Natural Gas Combined Cycle
- Wind
- Solar Photovoltaic
- Biomass Technologies/Landfill Gas
- Reciprocating Engines
- Combustion Turbines
- Short Term Capacity-Only Purchases

The costs and operating characteristics of the supply-side potential resources considered in this IRP study are summarized in Section VIII – Potential Resources, Table VIII-1.

The DSM screening process, described in Section VII, identified the economic and achievable potential for DSM and identified the energy and demand impacts that can be anticipated. Chart VIII-1 shows the projected energy savings potential of the DSM programs, with a projected 620,760 MWh of new savings. Consistent with our existing DSM efforts, as the potential for new technologies present themselves, SMMPA will evaluate the potential, and include the technology in the resource mix if cost effective.

SHORT RANGE ACTION PLAN

The Short Range Action Plan details the expected specific activities of SMMPA with respect to resources in the eight years during the 2014-2021 time period. All of the activities included in SMMPA's Short Range Action Plan are discussed individually, and then all activities are combined in Table IX-2 to illustrate how all of the resources fit together. All known future resources that will be used to meet SMMPA's needs are included in the plan. In Section X - Long Range Plan, these resources are incorporated into a load and capability table that presents SMMPA's situation following implementation of the recommended plan.

The Short Range Action Plan includes a number of ongoing implementation activities identified in the last IRP as well as the development of new resources identified in the least-cost plan of this current filing.

Existing Resources

Sherco 3 - Over the eight years, SMMPA anticipates continuing to meet the vast majority of its capacity and energy requirements with its share of Sherburne County Unit 3 (Sherco 3).

Fairmont Energy Station – Construction of this new high efficiency natural gas fired facility is expected to be completed before the end of 2013. This new facility is expected to provide reliable intermediate load energy well into the future.

Member Generation - Additionally, SMMPA remains committed to maintaining its members' generating units to supplement the Agency's capacity and energy supply from Sherco 3. Total member generation is currently in excess of 140 MW.

Capacity Purchase – SMMPA currently has between 40 MW and 70 MW of purchased capacity under contract for the period of 2014 through 2019.

Mora Landfill Gas Generation – In 2012, SMMPA completed the installation of a 1.6 MW landfill gas generator near Mora, Minnesota.

OWEF, Renewable Purchase – SMMPA's purchase of energy from the Olmsted County Waste-to-Energy Facility (OWEF) is expected to continue to supply approximately 8,800 MWh of biomass energy annually.

enXco, Renewable Purchase – Throughout the Short Range Plan, SMMPA's purchase agreement with enXco from its 100.5 MW wind farm near Dexter Minnesota, will provide SMMPA members with over 330,000 MWh of renewable energy per year. This contract runs through the year 2029.

Member Direct Load Control Programs - The member Direct Load Control (DLC) Systems are used to cycle customer equipment (primarily central air-conditioners and electric water heaters) during potential Agency peaks to reduce member and system demand. The forecast of capability was developed from the end-use data supplied by member utilities and the planned capacity additions resulting from DLC are included in Table IV-3. While the members have achieved significant penetration of this technology (described further in Section VI), increased capability will result from a continuance of the existing programs including new initiatives in several member communities which require load control installation with any new construction or service upgrade.

Energy Management Program - The Energy Management (EM) Program operates as an interruptible program with member retail customer load. Participating customers designate equipment to be curtailed during interruptible periods and establish a firm service level that they will not exceed during those periods. The EM Program provides SMMPA with an additional capacity resource. In 2003, two members, Austin and Owatonna, elected to operate their own Energy Management Program for their respective utilities. In 2004, New Prague started running their program. Given our coincident peak billing, we would generally receive any capacity benefit of those member-operated programs. The forecast of capability was developed from data supplied by SMMPA and member utilities. The EM Program is expected to remain flat in the future.

Other Member Curtailments - Member utilities have several resources which SMMPA considers and treats as curtailment to load. These resources fall into three categories: 1) Western Area Power Administration (WAPA) allocations to members; 2) retail customer-owned distributed generation; and 3) member-owned hydroelectric plants. SMMPA works with the members to ensure that these curtailable resources are dispatched in a cost-effective manner to benefit both the member and the Agency. A complete description of these resources is included in Section VI - Resource Capabilities. Capacity available from other member curtailments is shown in Table IV-3.

A complete description of SMMPA's existing resources is included in Section VI - Resource Capabilities.

New Projected Resources

SMMPA's Short Range Action Plan (2014-2021) for this filing identifies peaking purchases, wind, simple cycle combustion turbine, as well as our four bundled demand-side programs.

During the period of the short term plan (2014-2021), the AURORA model projects the need for annual or seasonal peaking purchases of 30 MW in 2018, 30 MW in 2019, 50 MW in 2020 (a modeling limitation in Aurora identified 50 MW in 2020, but with the 50 MW combustion turbine addition, only 20 MW of peaking purchase is actually required in 2020), 10 MW in 2021. The modeling also show 130 MW of wind in 2021 and 25 MW of wind in 2018, 2019, 2020, 2021 and 50 MW of a simple cycle combustion turbine in 2020. These resources are needed due to the expired capacity contracts of 40 MW in 2019.

DSM remains a top priority for our short term plan. SMMPA will continue implementation of SMMPA/Member DSM initiatives. We will also continue to develop new programs that are beneficial for our members' customers. It should be noted that the DSM capacity savings reflect the Non-CROD modeling only as CROD member capacity savings do not accrue to SMMPA. The estimated summer peak demand impacts are included in Table IV-3. For the period of the Short Range Action Plan, the estimated cumulative energy savings from SMMPA's DSM Forecast is shown in Table IV-4.

TABLE IV-3
2014-2021 Short Range Action Plan Capacity Impacts (MW) For Base Load Forecast

		2014	2015	2016	2017	2018	2019	2020	2021
Total Member Requirements		751.8	773.1	793.0	814.6	836.2	858.1	878.1	900.1
	Above CROD	(85.8)	(97.3)	(108.5)	(120.7)	(132.8)	(144.7)	(155.6)	(167.6)
	Installed DSM-Conservation	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)
	Member Generation	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)
	Transmission Losses	11.1	11.3	11.5	11.7	11.9	12.1	12.3	12.5
	Total Adjustments	(162.3)	(173.6)	(184.6)	(196.5)	(208.5)	(220.2)	(230.9)	(242.7)
Total Agency Requirement		589.5	599.5	608.4	618.0	627.7	638.0	647.2	657.4
	Planning Reserve Requirements (9.3%)	54.8	55.8	56.6	57.5	58.4	59.3	60.2	61.1
Total Generation Level Requirements		644.3	655.3	665.0	675.5	686.1	697.3	707.4	718.5
	Supply Side Resources								
	Existing Generation Resources	560.0	560.0	560.0	560.0	560.0	560.0	560.0	560.0
	Existing Capacity Purchases	60.0	60.0	65.0	70.0	40.0	40.0		
	Existing EMP Program	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1
	Existing Direct Load Control	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4
	New DSM	6.9	12.0	16.8	21.5	26.2	31.3	37.4	44.2
	New DSM Reserves & Losses Offset	3.4	4.4	5.4	6.4	7.3	8.4	9.6	11.1
	New Conventional Generation							50.0	50.0
	New Wind Generation					2.5	5.0	7.5	23.0
	New Solar Generation								
	New Capacity Purchases					30.0	30.0	50.0	10.0
	Total Supply Side Resources	657.8	663.9	674.6	685.3	693.5	702.2	742.0	725.7
Agency Resource Status (Positive = Excess MW)		13.5	8.6	9.6	9.8	7.5	4.9	34.6	7.2
	Actual Reserve Margin	11.6%	10.7%	10.9%	10.9%	10.5%	10.1%	14.6%	10.4%

Table IV-4 Forecast DSM Energy Conservation Estimate (MWh)	
Year	**Cumulative DSM Savings**
2014	65,474
2015	98,533
2016	129,649
2017	159,322
2018	189,800
2019	222,578
2020	261,416
2021	305,116

Transmission Improvements

As described in Section VI – Resource Capabilities, the landscape has changed significantly with the development of the Midcontinent Independent System Operator (MISO). SMMPA is now a Transmission Owning member of MISO and transferred operational control of its transmission to MISO on April 1, 2006. SMMPA has been actively participating with CAPX 2020, (an effort of Minnesota's cooperative, municipal and investor-owned utility transmission owners) to strengthen Minnesota's transmission backbone. SMMPA has actively supported legislative changes to encourage additional investment in the transmission system, including the ability for municipal utilities to invest in the transmission system as owners. SMMPA is investing approximately $70 million in the CAPX line from Hampton to Rochester to La Crosse, currently under construction, which will improve deliverability in Southeastern Minnesota, including SMMPA'S balancing area.

LONG RANGE PLAN

This section of the filing is intended to identify the potential resources available to SMMPA to meet capacity and energy requirements for the rest of the 15-year planning period following the Short Range Action Plan. The basis for the analysis is the Base Case forecast scenario.

All supply-side resources discussed in Section VIII – Potential Resources were made available for selection by AURORA to develop the lowest cost plan to meet the projected peak and energy forecasts. Those resources included nuclear power, conventional base load, intermediate, and peaking resources, advanced base load technologies such as supercritical pulverized coal, emerging base load technologies like IGCC, and renewable technologies. In addition, all demand-side resources resulting from the DSM analysis in Section VIII – Potential Resources and Section VII – Plan Development were also provided to AURORA to develop the lowest cost "integrated" resource plan.

In addition to the resources identified in SMMPA's Short Range Action Plan, SMMPA's Long Range Plan, beyond 2021, includes the continuation of its DSM programs and peaking purchases of 10 MW in 2022-2026 and 20 MW in 2027-2028. These resource additions are shown in Table IV-5.

TABLE IV-5 (Part 1)
2014-2028 Base Forecast Load & Capability Including Resource Plan Information

	2014	2015	2016	2017	2018	2019	2020	2021
Total Member Requirements	751.8	773.1	793.0	814.6	836.2	858.1	878.1	900.1
Above CROD	(85.8)	(97.3)	(108.5)	(120.7)	(132.8)	(144.7)	(155.6)	(167.6)
Installed DSM-Conservation	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)
Member Generation	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)
Transmission Losses	11.1	11.3	11.5	11.7	11.9	12.1	12.3	12.5
Total Adjustments	(162.3)	(173.6)	(184.6)	(196.5)	(208.5)	(220.2)	(230.9)	(242.7)
Total Agency Requirement	589.5	599.5	608.4	618.0	627.7	638.0	647.2	657.4
Planning Reserve Requirements (9.3%)	54.8	55.8	56.6	57.5	58.4	59.3	60.2	61.1
Total Generation Level Requirements	644.3	655.3	665.0	675.5	686.1	697.3	707.4	718.5
Supply Side Resources								
Existing Generation Resources	560.0	560.0	560.0	560.0	560.0	560.0	560.0	560.0
Existing Capacity Purchases	60.0	60.0	65.0	70.0	40.0	40.0		
Existing EMP Program	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1
Existing Direct Load Control	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4
New DSM	6.9	12.0	16.8	21.5	26.2	31.3	37.4	44.2
New DSM Reserves & Losses Offset	3.4	4.4	5.4	6.4	7.3	8.4	9.6	11.1
New Conventional Generation							50.0	50.0
New Wind Generation					2.5	5.0	7.5	23.0
New Solar Generation								
New Capacity Purchases					30.0	30.0	50.0	10.0
Total Supply Side Resources	657.8	663.9	674.6	685.3	693.5	702.2	742.0	725.7
Agency Resource Status (Positive = Excess MW)	13.5	8.6	9.6	9.8	7.5	4.9	34.6	7.2
Actual Reserve Margin	11.6%	10.7%	10.9%	10.9%	10.5%	10.1%	14.6%	10.4%

TABLE IV-5 (Part 2)
2014-2028 Base Forecast Load & Capability Including Resource Plan Information

		2022	2023	2024	2025	2026	2027	2028
Total Member Requirements		920.8	941.2	961.0	983.3	1,005.0	1,026.9	1,047.1
	Above CROD	(179.1)	(190.5)	(201.8)	(214.3)	(226.7)	(239.3)	(251.0)
	Installed DSM-Conservation	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)
	Member Generation	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)
	Transmission Losses	12.6	12.8	13.0	13.2	13.4	13.6	13.7
	Total Adjustments	(254.1)	(265.3)	(276.4)	(288.7)	(300.9)	(313.4)	(324.8)
Total Agency Requirement		666.7	675.9	684.6	694.5	704.1	713.6	722.2
	Planning Reserve Requirements (9.3%)	62.0	62.9	63.7	64.6	65.5	66.4	67.2
Total Generation Level Requirements		728.7	738.8	748.2	759.1	769.6	779.9	789.4
	Supply Side Resources							
	Existing Generation Resources	560.0	560.0	560.0	560.0	560.0	560.0	560.0
	Existing Capacity Purchases							
	Existing EMP Program	7.1	7.1	7.1	7.1	7.1	7.1	7.1
	Existing Direct Load Control	20.4	20.4	20.4	20.4	20.4	20.4	20.4
	New DSM	51.4	58.9	66.6	74.1	81.5	88.9	96.2
	New DSM Reserves & Losses Offset	12.6	14.2	15.8	17.4	18.9	20.5	22.0
	New Conventional Generation	50.0	50.0	50.0	50.0	50.0	50.0	50.0
	New Wind Generation	23.0	23.0	23.0	23.0	23.0	23.0	23.0
	New Solar Generation							
	New Capacity Purchases	10.0	10.0	10.0	10.0	10.0	20.0	20.0
	Total Supply Side Resources	734.5	743.6	752.9	761.9	770.8	789.8	798.6
Agency Resource Status (Positive = Excess MW)		5.8	4.8	4.6	2.8	1.2	9.9	9.2
	Actual Reserve Margin	10.2%	10.0%	10.0%	9.7%	9.5%	10.7%	10.6%

CONTINGENCIES

SMMPA and its members have the potential to be impacted by sudden or unexpected events, changes in environmental regulations, changes in tax laws, industry restructuring, and other events over which it has little or no control. Section XI - Contingencies of the filing details those situations that SMMPA feels have the potential to cause noticeable effects to its members, member's customers and their respective electricity bills. The particular circumstances investigated or currently under investigation include:

- Low load growth and higher-than-expected load growth
- Expected and Full (1.5%) DSM attainment
- Sudden large load addition
- Failure or sudden retirement of existing generation
- 50% and 75% conservation and renewable plans
- Development of a large qualifying facility
- Non-availability of purchased power
- Increased competitive environment
- Greenhouse Gas Initiatives
- Solar Objective
- Additional Concerns

Each of these situations are highlighted and discussed in detail in Section XI.

ENVIRONMENTAL

Over the past several years, there has been significant debate over potential environmental legislation aimed at further reducing power plant emissions. Much of the debate focuses on the type of pollutants that should be regulated and the extent to which they should be regulated. The ongoing revisions to various regulations designed to further limit further emissions of SO_2, NOx, and mercury, are examples of this continually evolving landscape. Potential additional future environmental regulations could include provisions to limit future emissions of CO_2. The Agency has taken many steps over the years to reduce these specific emissions. The results are detailed in Section XII of this IRP.

SMMPA continues to actively monitor the development of proposed regulations and legislation to regularly estimate the impact on the Agency of future emissions restrictions. Future emissions restrictions are likely to alter the economics of operating certain types of generating units, with coal units likely to be the most affected. To protect the Agency's interests in Sherco 3, as well as to guide us in assessing the risks associated with constructing future units, SMMPA will continue to conduct the appropriate risk analyses as regulatory changes unfold.

In addition, SMMPA has utilized the Minnesota Public Utilities Commission (PUC) schedule of environmental costs for electric utilities in evaluating and selecting resource options. The PUC's environmental externality value ranges are designed for four specific regions: urban, metropolitan fringe, rural and within 200 miles of Minnesota. For the purposes of this resource selection study, the externality values chosen were metropolitan fringe.

RATE DESIGN

The on-going objective of the rate design efforts at SMMPA and its members is to encourage the wise use of electricity. To reach this objective, SMMPA has time-of-use Member rates in effect with on and off peak energy rates. In addition, the Agency has recommended to its members a rate structure with pass through credits/structures which allows members to move increasingly towards offering retail rates that send retail customers an appropriate price signal.

The SMMPA board of directors approved a number of rate increases between 2005 and 2010. The increases were mainly due to a changing electric power marketplace, and rapidly changing locational marginal prices (LMPs) due to the implementation new energy markets within regional transmission organizations (RTOs) such as the Midcontinent Independent System Operator (MISO). Another major factor was a volatile nature gas market due to super-storms such as Hurricane Katrina. These factors, along with increases in coal and oil costs and general inflation, contributed to increasing electric power costs.

Since January 1, 2010, the Agency has had no rate changes and recently the board approved no rate increase for 2014.

SMMPA completed a Ratemaking Policy and Analysis Study in 2010. A series of rate design alternatives were developed and presented to the Members. All of the alternatives were intended to align SMMPA's demand and energy charges with the Midcontinent Independent System Operator (MISO) capacity and energy market charges. The rates were neither market-based nor real-time, but did reflect the seasonal and time of use attributes of the MISO LMP price patterns.

Numerous board presentations and three member workshops were held to provide education and insights into the alternative rate schedules. After a full year of "shadow billing", essentially providing two monthly bills consisting of their official Schedule B bill and the new rate structure bill to each Member each month, the board decided to table the initiative at this time due primarily to a stable and moderate LMP market. The Agency will continue to monitor the energy market going forward. Having completed the Ratemaking Policy and Analysis Study, they are prepared to consider this again should market conditions warrant.

SMMPA offers rate design support to its members primarily in the form of recommending rate design consultants and assisting those consultants in working with our members. Working through its Energy Services Representative Team, SMMPA continues to encourage members to assess customer classifications and ensure that customers are classified properly under the appropriate customer class and billed accordingly under the appropriate rate schedules.

PLAN IS IN THE PUBLIC INTEREST

SMMPA believes that this plan is in the public interest, and meets the objectives established for Commission review of resource plans outlined below:

(A) Maintain or improve the adequacy and reliability of utility service.

Meeting SMMPA's future capacity and energy requirements is based upon primary components: 1) ensuring that the resource plan makes maximum use of our existing investment in resources by maintaining and extending the useful life of assets where economically viable, and 2) ensuring a least-cost combination of new supply and demand resources that at least maintains and hopefully enhances the reliability of utility service. SMMPA's existing resource base has a number of distributed units. The result is an extra degree of reliability in member communities that most utilities do not have. While these units generally employed as peaking units, their presence provides additional reliability and security for the customers in those communities. In the selection of new resources, SMMPA's DSM initiatives are designed to encourage persistence and ensure that the investment in high-efficiency alternatives will be in place when needed.

(B) Keep the customers' bills and the utility's rates as low as practicable, given regulatory and other constraints.

The resource planning process by its very nature is designed to identify the least-cost combination of resources. As mentioned above, SMMPA operates in a manner to obtain maximum utilization of the resources which its members and customers have invested in. Additionally, SMMPA members have a strong commitment to DSM programs that provide customers with energy management alternatives and methods for reducing their bills. DSM also allows SMMPA to add capacity to the system in smaller increments, which matches the increasing resource requirements more cost-effectively. SMMPA has employed a portfolio approach to meeting the targets of the RES in a manner which encourages renewable development, yet minimizes the cost of doing so (SMMPA's RES strategy is fully explained in Section VII). SMMPA's least-cost plans have also emphasized joint project participation, leveraging the potential for economies of scale and reducing costs while minimizing the future risk exposure by increasing the diversity of supply.

(C) ***Minimize adverse socio-economic effects and adverse effects upon the environment.***

With regard to the existing units in the plan, SMMPA's largest generating unit Sherco 3, employs state-of-the-art environmental control systems, making it one of the lowest emitting coal-fired plants in the country. The Sherco 3 unit burns sub-bituminous western coal with a sulfur content that is less than 1%. Sherco 3 is equipped with a state-of-the-art dry scrubber system which has enabled this generating unit to successfully meet the CAAA regulations on SO2 without any major modifications. It is anticipated that Sherco 3 will also be able to comply with the proposed CSAPR regulations on SO2 with only minor modifications.

Some members with new units are employing B20. Other members blend up to a B10 for summer months and then reduce blends during winter months to avoid problems with coagulation of the fuel in outside storage facilities.

SMMPA's existing DSM efforts reduce the amount of fossil fuel generation and associated emissions. Those DSM efforts were nationally recognized by the U.S. Department of Energy and the U.S. Environmental Protection Agency with receipt of National ENERGY STAR Awards in 2003, 2004, and 2010.

With regard to new resources, SMMPA remains committed to the development of renewable resources and has developed a cost effective approach for encouraging renewable resource development. The renewable resources included in the current filing provide for sufficient wind and biomass resources to meet the RES targets.

(D) Enhance the utility's ability to respond to changes in the financial, social, and technological factors affecting its operations.

SMMPA's current resource plan includes a mix of DSM, renewable resources, and reciprocating engines. SMMPA's renewable strategy is based on a portfolio approach whichutilizes a mix of resources and ownership structures. This strategy, fully outlined in Section VII, is based upon flexibility and recognizes the improving efficiencies of renewable technology.

(E) Limit the risk of adverse effects on the utility and its customers from financial, social, and technological factors that the utility cannot control.

There is significant risk in this electric utility landscape. As discussed above in (D), SMMPA's projected resource plan does not rely disproportionately on a particular unit. This portfolio approach to resource planning should provide a measure of risk mitigation through its variety. Also, the relatively small incremental additions identified in the plan will provide SMMPA with the flexibility to respond to unforeseen changes that impact the merits of a particular resource decision.

(F) The resource plan helps the utility achieve greenhouse gas reduction goals under section 216H.02

The 2013 Legislature made changes to §216B.242 asking utilities to discuss how the plan helps achieve the greenhouse gas (GHG) reduction goals under 216H.02. In the 2007 Legislative Session, sweeping changes were made in the way utilities would meet the energy needs of their consumers in the future. The Renewable Energy Standard (RES) mandated that increasing percentages of utility generation must be from qualifying renewable generation. Under the Conservation Improvement Program (CIP), energy efficiency was given an annual savings goal of 1.5% savings annually. These new requirements on utilities to reduce greenhouse gases were some of the most stringent in the nation. The Legislature recognized that electric utilities only contribute about one-third of the greenhouse gas emissions. To successfully reduce GHG emissions, Minnesota needed to ensure that all GHG emitters, not just utilities, would take action to reduce emissions. To further that reduction, the Legislature established a goal of reducing statewide GHG emissions across all sectors to a level of at least 15 percent below 2005 levels by 2015, to 30% below 2005 levels by 2025, and 80% below 2005 levels by 2050.

To develop the plan, the Commissioner of Commerce consulted with: the Pollution Control Agency, the Housing Finance Agency, the Departments of Natural Resources, Agriculture, Employment and Economic Development, and Transportation and the chair of the Metropolitan Council. To add to the prescriptive measures enacted for electric utilities, one of the main tasks given to this planning body was to "…identify, evaluate, and integrate a broad range of statewide greenhouse gas reduction options for all emission sectors in the state."

As outlined in other sections of this filing, SMMPA has met all the requirements of the RES, and will continue to meet the RES requirements with the additional resources contained in the short and long range plans. Likewise, SMMPA, to date, has exceeded the 1.5% goal established for the CIP savings requirement. As outlined in Chapter VI, SMMPA has a broad array of efficiency programs and continues to develop new cost-effective programs. While the "business as usual" CIP case shows slightly less than the 1.5% goal over the period, the bookends established by the 1.5% Scenario case suggest that we may be able to continue to meet that target with the continued strong efforts that SMMPA and its members have employed in the past. Unlike the RES target, SMMPA must rely upon its members' customers to continue to reach that goal. That performance will continue to be monitored in annual CIP filings and future resource plan submittals.

Additionally, as pointed out in Chapter XII - Environmental, SMMPA has retired several older steam units, and is replacing that capacity with higher efficiency natural gas units. SMMPA's performance in meeting the prescriptive goals established by the Legislature and upgrade the efficiency of its mix of resources is evidence of furthering the electric sector's contribution to the greenhouse reduction goals.

The plan is consistent with the requirements of Minnesota statutes and rules and provides a clear concise report to interested parties of what SMMPA intends to do to satisfy customer needs in the near term and what SMMPA is considering for options in the long term.

V Load Forecast

GENERAL DISCUSSION

The load forecast that underpins the IRP discussed herein is based on SMMPA's 2013 long-term Load Forecast. The following sections provide a brief overview of the forecast approach, data sources and assumptions, and results. For a more detailed description of the models, data, and methodologies used in developing the forecast, SMMPA's 2013 Load Forecast Report can be made available.

The forecast is primarily based on an econometric approach, wherein forecasting equations are developed that explain variations in load as a function of a series of explanatory variables, which are then simulated with future values of the explanatory variables to generate forecasts of load determinants. This is essentially the same methodology used in previous SMMPA IRP filings.

FORECAST APPROACH

The following steps define the process used to arrive at SMMPA's forecasted demand and energy requirements:

1. The annual retail load served across the members is forecasted by combining econometric forecasts of residential customer counts and average energy use and adding the resulting estimate of residential sales to similar forecasts of total retail sales to commercial and industrial customers and other customers, such as lighting classes and government facilities. As described further in the section below entitled, "Adjustments for Demand-Side Management Conservation," the forecast of total retail sales are adjusted for the historical impact of DSM Conservation programs on the growth rates projected by the econometric models.
2. After adjusting for distribution losses, the resulting total represents the total delivered energy requirements across all of SMMPA's members.
3. Total delivered energy requirements are then allocated to the members based on a separate econometric forecast of total delivered energy requirements for each member (referred to herein as the "Ratio Forecasts").
4. The contribution of each member's load to SMMPA's peak demand (i.e., coincident peak, from the member's perspective) is forecasted based on an econometric forecast of load factor, combined with the forecasted member energy requirements.

These load determinants reflect the gross power requirements that would need to be served from supply- and/or demand-side resources.

Adjustments for Demand-Side Management Conservation

SMMPA and its members have been operating demand-side management (DSM) programs aimed at improving the efficiency of appliances and other end-uses for its members' customers and attenuating peak demand for many years. This activity has resulted in reduced energy consumption and peak demands across SMMPA's members and, importantly, reduced growth in these measures of load. Accordingly, had it not been for this activity, the growth in SMMPA's load over the last several years would have been greater and the load level today, higher.

Table V-1below provides the estimated impacts of DSM programs over 2006-2012, based on data filed by SMMPA members related to the Minnesota Conservation Improvement Program (CIP). The energy and peak demand savings are segmented across several classes of measures.

Table V-1
Estimated Historical Demand-Side Management Program Impacts

	2006	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Energy Savings (MWh)							
Conservation							
Non-Behavioral	16,233	25,693	24,863	35,278	42,823	39,819	39,404
Behavioral	0	0	0	2,564	5,383	6,932	8,380
Total	16,233	25,693	24,863	37,842	48,206	46,751	47,784
Load Management	291	314	1,257	1,081	1,395	1,151	873
Renewables	0	0	0	0	73	67	91
Total	16,524	26,007	26,120	38,923	49,674	47,969	48,748
Demand Savings (kW)							
Conservation							
Non-Behavioral	6,832	10,489	10,123	12,268	12,829	12,269	11,568
Behavioral	0	0	0	878	1,733	2,256	2,666
Total	6,832	10,489	10,123	13,146	14,562	14,525	14,234
Load Management	27,447	27,042	37,286	46,860	39,992	42,136	49,256
Renewables	0	0	0	0	148	53	71
Total	34,279	37,531	47,409	60,006	54,702	56,714	63,561

In order to capture the impact of this history of demand-side management program activity on the load forecast, the baseline projected loads that result from the econometric forecast models have been adjusted upward in two ways.

First, the baseline projected loads have been adjusted upward by the cumulative impact of portions of historical incremental DSM that are viewed as producing DSM savings in years subsequent to their occurrence. For purposes of the adjusted load forecast shown herein, the cumulative amount of non-behavioral conservation DSM over 2006-2012, as shown in Table V-1 above, or 224,113 MWh and 76,378 kW for energy and peak demand, respectively, have been added to the baseline forecast.[1]

In this way, the results herein reflect a more accurate presentation of the mix of supply- and demand-side resources that meet SMMPA's peak demand and energy requirements. However, as this cumulative DSM Conservation impact is also represented as a demand reduction for purposes of this IRP, this adjustment does not impact SMMPA's power supply analyses described herein. It is merely a mechanism to provide a clear picture regarding SMMPA's DSM efforts. SMMPA has had active DSM Conservation programs for many years, reflecting a long-term commitment to improving energy efficiency across its member systems. Accordingly, the cumulative impacts calculated from the above impacts understate the load SMMPA has avoided through these programs, particularly as most of these programs affect end-uses with long useful lives.

Second, the growth in energy consumption resulting from the econometric forecasts of residential and non-residential sales was adjusted upward by the average impact of similar portions of historical DSM program impacts, as these accumulating DSM programs would have depressed load growth rates that inform the parameters of the econometric forecast models.

Table V-2 below provides historical DSM impacts based on the same CIP data filed by SMMPA members that formed the basis of this growth adjustment to the baseline forecasts. The values below were taken from CIP filing data maintained by SMMPA; however, as a result of a somewhat different segmentation of the total impacts and sourcing differences, the values are

[1] For the energy values, the historical energy impacts are split between residential and non-residential impacts for this purpose, and the average of these separate values over 2006-2012 are added, which yields a small difference from the average of the summed annual values.

slightly different from those above. Overall, the impact of these differences on the forecast results presented herein is negligible.

Table V-2
Estimated Incremental DSM Conservation Impacts[2]

	2006	2007	2008	2009	2010	2011	2012
Energy Savings (MWh)							
Residential	2,928	7,648	7,461	9,705	12,643	12,933	6,550
Non-residential	13,596	18,359	18,658	29,122	35,789	35,035	32,890
Total	16,524	26,008	26,119	38,827	48,431	47,969	39,441
Demand Savings (kW)	6,856	10,515	10,144	13,173	14,609	14,173	11,560

The growth *rate* in the baseline load forecast was adjusted upward by the average DSM program impacts over 2008-2012, or approximately 40,147 MWh.[3] This approach represents a shortcut of sorts to correct the dampening effect on the parameters of load forecast equations estimated over the historical period during which the DSM programs were active, but is consistent with the approach used by other MN utilities.[4] This adjustment was made to the retail energy forecasts. The demand forecasts were similarly adjusted through the downstream forecast process, which applies an estimate of distribution losses and forecast load factors to the energy sales forecast.[5]

SMMPA Wholesale Budget Forecast

SMMPA's members serve a portion of their load requirements from a variety of resources other than generation resources operated by SMMPA, including the following:

- Demand-side management (DSM) conservation measures
- Direct load control
- Interruptible load (mostly industrial customer arrangements)
- Western Area Power Administration (WAPA) capacity and energy allocations

[2] The values here reflect DSM conservation programs only and do not include behavioral programs, as these are assumed not to have impacts beyond the year of application. These incremental impacts are estimated to represent approximately 0.6 to 1.7 percent of total energy sales of SMMPA's members.
[3] Values for 2006-2007 were not immediately available when the adjustment was initially developed. As these historical values were segmented among retail customer classes and then averaged, the total adjustment across the classes is slightly different.
[4] This approach was discussed at a MN Division of Energy Resources (DER) meeting regarding methods to address embedded DSM in resource planning.
[5] In this way, a consistent adjustment to the baseline demand forecast was made, although it may be somewhat different than the demand impact values shown above.

- Generation resources located behind the wholesale meter (i.e., load-side generation), including hydro resources operated by the member or resources at large customer sites

In addition, one of SMMPA's members, Rochester Public Utilities (RPU), operates under a partial requirements arrangement under which SMMPA and RPU have agreed to a Contract Rate of Delivery (CROD) of 216 MW. Similarly, another of SMMPA's members, Austin Utilities (AU), has provided notice that it will set its CROD effective 2016 based on its 2015 non-coincident peak demand. Under the CROD arrangement, SMMPA serves loads only up to the CROD, resulting in load growth for the member in question gradually increasing the amount of demand and energy being subtracted from its gross requirements in computing the net requirements to be served by SMMPA.

In order to forecast the wholesale billing demands and charges of the members, the capacity and generation from these other resources is netted away from the gross IMS forecast, and CROD is assumed to gradually limit the demand and energy requirements of RPU over the forecast horizon and AU for 2016 and beyond.[6] This results in net IMS forecasts for energy and CP demand that form the basis for SMMPA's wholesale budget.

While the demand reductions above and some of the resources are only controlled by SMMPA to a limited extent, they are represented herein as supply- and demand-side resources of SMMPA.

DATA SOURCES AND ASSUMPTIONS

The forecast relies on historical utility system data provided to SMMPA by its member utilities and load data maintained by SMMPA. This data includes historical data regarding (i) retail billing data by major customer classification, (ii) system metered energy requirements, (iii) system metered peak demands, including both the peak of each member system and the contribution of each member system to SMMPA's peak, and (iv) the timing of the system peak demands mentioned in (iii). SMMPA also maintains or develops historical and projected data regarding curtailments, demand-side management impacts, load-side generation, and WAPA entitlements.

[6] Based on the assumed impacts of DSM Conservation measures and other load-side resources, over the forecast horizon, Austin's load is projected to flatten out and never reach its CROD set in 2015 based on its non-coincident peak.

Historical and projected economic and demographic data were provided by IHS Global Insight (Global Insight) and Woods & Poole Economics (Woods & Poole), both nationally recognized providers of such data. SAIC has developed consensus projections of economic and demographic data based on the data from these two providers. SAIC has also relied on information, provided by SMMPA staff and the members, regarding local economic developments and other issues specific to each member.

Historical weather data was provided by the National Oceanic and Atmospheric Administration (NOAA) for weather stations in Duluth, Rochester, and Saint Cloud, to which each member was assigned. For purposes of peak demand analyses, daily weather data was obtained from NOAA for Rochester only. Future monthly weather conditions were assumed to reflect normal data as reported by NOAA and representative of the 1971-2000 period. Future peak day weather conditions reflect averages over 1995-2012.

The forecast is based upon the following additional assumptions:

- The future influence on energy sales of the economic, demographic, and weather factors, on which the econometric models are based, was assumed to be similar to that estimated over the period 1980 through 2012.
- The future influence on load factors of weather variables, electricity prices, and seasonal factors was assumed to be similar to the estimated influence of such factors generally over the period 1995 through 2012.
- Although the econometric models implicitly account for the historical relationships between energy usage and the following factors to the extent they have occurred in the past, this Load Forecast does not explicitly reflect extraordinary potential future effects of: (a) increases in appliance design efficiency or building insulation standards; (b) development of substitute energy sources, or load-side generation; (c) consumers switching to traditional or new types of electrical end-uses from other alternatives (e.g., electric vehicles); (d) consumers switching from electrical appliances to other alternatives; or (e) variations in load that might result from legal, legislative, or regulatory actions.
- Recent hourly load patterns for the members were assumed to be reasonable representations of future load patterns, particularly for use in forecasting the energy

amounts that are below and above CROD for AU and RPU and the percent of on-peak versus off-peak energy.

FORECAST RESULTS

The sections below summarize the projections that form the basis for this IRP and the various adjustments discussed previously.

Retail Forecasts

As mentioned above, the load forecast begins with a forecast of retail energy sales by major customer classification across SMMPA's members. The following describes the forecast equations and resulting projections for the residential, commercial, and industrial classes.

For the residential class, the analysis of electric sales was separated into residential usage per customer and the number of customers, the product of which is total residential sales. This process is common for relatively homogenous customer groups. For other rate classifications, the total sales series is the primary forecasted variable.

The number of residential customers is projected on the basis of the estimated historical relationship between the number of residential customers of the members and the number of households in the surrounding counties. The econometric equation includes household counts and a binary variable to account for the recent housing downturn, which has tended to reduce customer counts across the members.

The forecast equation for residential average use reflects that usage is best explained by a combination of the following:

- Real personal income per household
- Real electricity prices (using a 3-year moving average)
- Natural gas prices (using a 4-year moving average)
- Heating and cooling degree-days
- Precipitation

Average residential consumption over the last few years has been impacted by several factors, most of which are anticipated to be temporary. The recent recession has had an impact on income and employment, but more importantly has destroyed a considerable amount of the net worth or perceived wealth of the average consumer in Minnesota. Not only were the stock market and the retirement accounts of many people impacted, but the market value of most people's homes, which represents many consumers' largest asset, also dropped between 10 and 20 percent. While the stock market has recovered a lot of lost ground, the housing market has remained depressed, and the expectation for a recovery to the prior peak in home prices is not anticipated to occur until 2019.[7]

The forecasts of the commercial and industrial classes are driven by the following variables:

- Real total personal income
- Total employment
- Real electricity prices (using a two-year moving average)
- Heating and cooling degree-days
- A binary variables to address class migration or simply the vagaries of class definitions across time and the impact over 2008-2009 of the recent recession that appears to be inadequately explained by the current economic data

Table V-3 on the next page contains historical and projected values of residential customer counts and sales across the customer classes modeled, as well as representative growth rates.

[7] Based on projections provided by IHS Global Insight, dated May 2013.

Table V-3

Historical and Projected Residential Customer Counts and Baseline Energy Sales

	Residential Customers	Energy Sales (MWh)[8] Residential	Commercial	Industrial	Other	Total	Residential Average Use
Historical							
1998	81,167	611,363	775,991	975,968	46,054	2,409,376	7,532
2003	90,379	728,023	1,023,004	925,050	46,487	2,722,564	8,055
2004	92,380	713,763	1,021,283	958,805	45,987	2,739,838	7,726
2005	93,941	773,569	1,036,916	1,006,155	54,105	2,870,745	8,235
2006	95,238	779,966	1,071,102	1,013,351	46,112	2,910,531	8,190
2007	96,116	795,035	1,105,306	1,042,560	42,592	2,985,493	8,272
2008	96,385	768,015	1,100,562	1,043,510	40,980	2,953,067	7,968
2009	96,756	752,497	1,074,349	911,689	39,611	2,778,146	7,777
2010	97,062	792,593	1,097,272	928,956	39,680	2,858,501	8,166
2011	98,321	791,268	1,093,258	942,685	54,064	2,881,275	8,048
2012	98,809	777,501	1,080,078	945,265	49,794	2,852,639	7,869
Projected							
2013	100,128	777,503	1,078,533	962,814	46,592	2,865,441	7,765
2014	101,506	787,651	1,090,805	984,538	45,413	2,908,407	7,760
2015	102,983	799,127	1,106,141	1,007,371	44,966	2,957,605	7,760
2016	104,442	810,709	1,119,132	1,032,952	44,795	3,007,588	7,762
2017	105,885	819,526	1,125,960	1,052,870	44,729	3,043,085	7,740
2018	107,185	830,269	1,140,759	1,072,393	44,704	3,088,126	7,746
2019	108,363	843,471	1,161,667	1,091,134	44,694	3,140,967	7,784
2020	109,511	859,796	1,184,843	1,111,348	44,691	3,200,678	7,851
2021	110,581	871,933	1,204,608	1,127,449	44,689	3,248,680	7,885
2022	111,603	885,571	1,225,465	1,145,551	44,689	3,301,275	7,935
2028	117,720	964,758	1,347,265	1,266,849	44,688	3,623,561	8,195
Cumulative Avg. Growth Rates:							
1998-2012	1.4%	1.7%	2.4%	-0.2%	0.6%	1.2%	0.3%
2003-2012	1.4%	0.7%	0.6%	0.2%	0.8%	0.5%	-0.3%
2013-2022	1.2%	1.5%	1.4%	1.9%	-0.5%	1.6%	0.2%
2013-2028	1.1%	1.4%	1.5%	1.8%	-0.3%	1.6%	0.4%

DSM Conservation Adjustment

As described previously, the growth in energy consumption exhibited by the baseline forecasts of residential and non-residential sales are adjusted upward by the average impact of non-behavioral DSM Conservation programs over the 2008-2012 period. This corrects the dampening effect on the forecast equation parameters of the DSM Conservation programs. In addition, in order to provide a representation of energy sales on a gross of DSM Conservation basis that is consistent with values reported elsewhere herein and provides a more complete picture of SMMPA's DSM

[8] There has been some migration of customers between the commercial and industrial classes shown, including a considerable reclassification of customers from industrial to commercial in 1999, which impacts the historical growth rates of these classes.

Conservation efforts, the Adjusted Forecast below also reflects an adjustment upward for the cumulative impact of DSM Conservation programs over 2006-2012.[9]

Table V-4 below shows the baseline and adjusted projection of residential and non-residential energy sales.

Table V-4
Baseline vs. Adjusted Retail Energy Sales (MWh)

	Baseline Forecast			Adjusted Forecast		
	Residential	Non-residential	Total	Residential	Non-residential	Total
2013	777,503	2,087,938	2,865,441	828,430	2,301,281	3,129,711
2014	787,651	2,120,755	2,908,407	848,437	2,364,397	3,212,834
2015	799,127	2,158,478	2,957,605	869,771	2,432,419	3,302,190
2016	810,709	2,196,879	3,007,588	891,212	2,501,118	3,392,330
2017	819,526	2,223,559	3,043,085	909,888	2,558,097	3,467,985
2018	830,269	2,257,857	3,088,126	930,489	2,622,693	3,553,182
2019	843,471	2,297,496	3,140,967	953,550	2,692,631	3,646,181
2020	859,796	2,340,882	3,200,678	979,733	2,766,316	3,746,049
2021	871,933	2,376,747	3,248,680	1,001,729	2,832,479	3,834,209
2022	885,571	2,415,704	3,301,275	1,025,226	2,901,735	3,926,961
2023	898,767	2,453,339	3,352,106	1,048,280	2,969,669	4,017,950
2024	913,747	2,496,350	3,410,097	1,073,119	3,042,980	4,116,098
2025	924,286	2,529,586	3,453,872	1,093,516	3,106,514	4,200,030
2026	936,816	2,570,505	3,507,322	1,115,905	3,177,732	4,293,637
2027	949,735	2,612,576	3,562,312	1,138,683	3,250,102	4,388,785
2028	964,758	2,658,803	3,623,561	1,163,564	3,326,627	4,490,191
Cumulative Avg. Growth Rates:						
2013-2022	1.5%	1.6%	1.6%	2.3%	2.6%	2.5%
2013-2028	1.4%	1.6%	1.6%	2.2%	2.5%	2.4%

IMS Energy and Peak Demand Forecast

The forecast of total retail sales above is translated into total IMS energy by adding an estimate of distribution losses, based on the average distribution loss percentage over the period 2002-2012. As mentioned previously, the total SMMPA IMS energy is allocated to the members based on the Ratio Forecasts developed based on separate econometric forecasts of monthly IMS energy,

[9] This latter adjustment is not made to the forecast determinants as an integral part of the development of forecast values, but is instead simply included as a discrete adjustment across all determinants shown herein. As mentioned previously, the 2006 and 2007 data was not available at the time the growth rate adjustment was made.

which rely on similar economic, demographic, and weather variables as the retail forecast equations.

The forecast of IMS energy is combined with an econometric forecast of monthly load factor to arrive at monthly IMS peak demands. The load factor forecast equations across the members include some combination of the following variables, with their influence or polarity noted in parentheses (note that, as these equations explain load factor, rather than actual peak demand, their polarity may be confusing—a negative polarity on the intensity of peak day weather conditions corresponds to higher peak loads):

- Average daily heating and cooling degree days (+)
- The amount by which peak day high temperature is greater than the base of 78 degrees Fahrenheit (dF) (-)
- The amount by which peak day low temperature is greater than the base of 50 dF (-)
- The amount by which peak day high temperatures are less than the base of 50 dF (-)
- One or more variables regarding weather conditions on the day prior to the peak, similar to the above peak day weather variables (-)
- Humidity (for summer months only) (-)
- Real electricity prices (-)
- Binary variable for peak demands occurring on a Friday (+)
- Several binary variables to capture residual seasonal variation and one-time deviations that are otherwise unexplained by the remaining variables

Table V-5 below contains projected values for the SMMPA IMS Energy and Peak Demand, which represents the summation of these values across the members.

Table V-5
Adjusted Base Case IMS Energy and Peak Demand

	Energy (MWh)	Summer Peak Demand (MW)
2013	3,280,744	732.5
2014	3,367,878	751.8
2015	3,461,546	773.1
2016	3,556,037	793.0
2017	3,635,342	814.6
2018	3,724,651	836.2
2019	3,822,137	858.1
2020	3,926,825	878.1
2021	4,019,239	900.1
2022	4,116,468	920.8
2023	4,211,847	941.2
2024	4,314,732	961.0
2025	4,402,714	983.3
2026	4,500,838	1,005.0
2027	4,600,577	1,026.9
2028	4,706,878	1,047.1
Cumulative Avg. Growth Rates:		
2013-2022	2.6%	2.6%
2013-2028	2.4%	2.4%

Alternative Forecast Scenarios

While a forecast that is derived from projections of the driving variables, obtained from reputable sources, provides a sound basis for planning, there is significant uncertainty in the future level of such variables. To the extent that economic, demographic, weather, or other conditions occur that are different from those assumed or provided, the actual member load can be expected to vary from the forecast. For various purposes, it is important to understand the amount by which the forecast can be in error and the sources of error.

The Base Case forecast relies on a set of assumptions, developed from projections provided by Global Insight and Woods & Poole, regarding future population and economic activity in the counties that comprise the service areas of the members. However, such projections are unlikely to exactly match the resulting data as future periods become history. While Global Insight does not publish information regarding the potential error of their projections, we have relied on such statistics published by Woods & Poole, which relies on a somewhat similar underlying data set and methodology. Woods & Poole publishes several statistics that define the average amount by which various projections they have prepared over 1984 through 2009 are different from actual results. We have utilized these statistics to develop ranges of the trends of economic activity and population representing approximately 90 percent of potential outcomes (i.e., 1.7 standard deviations).

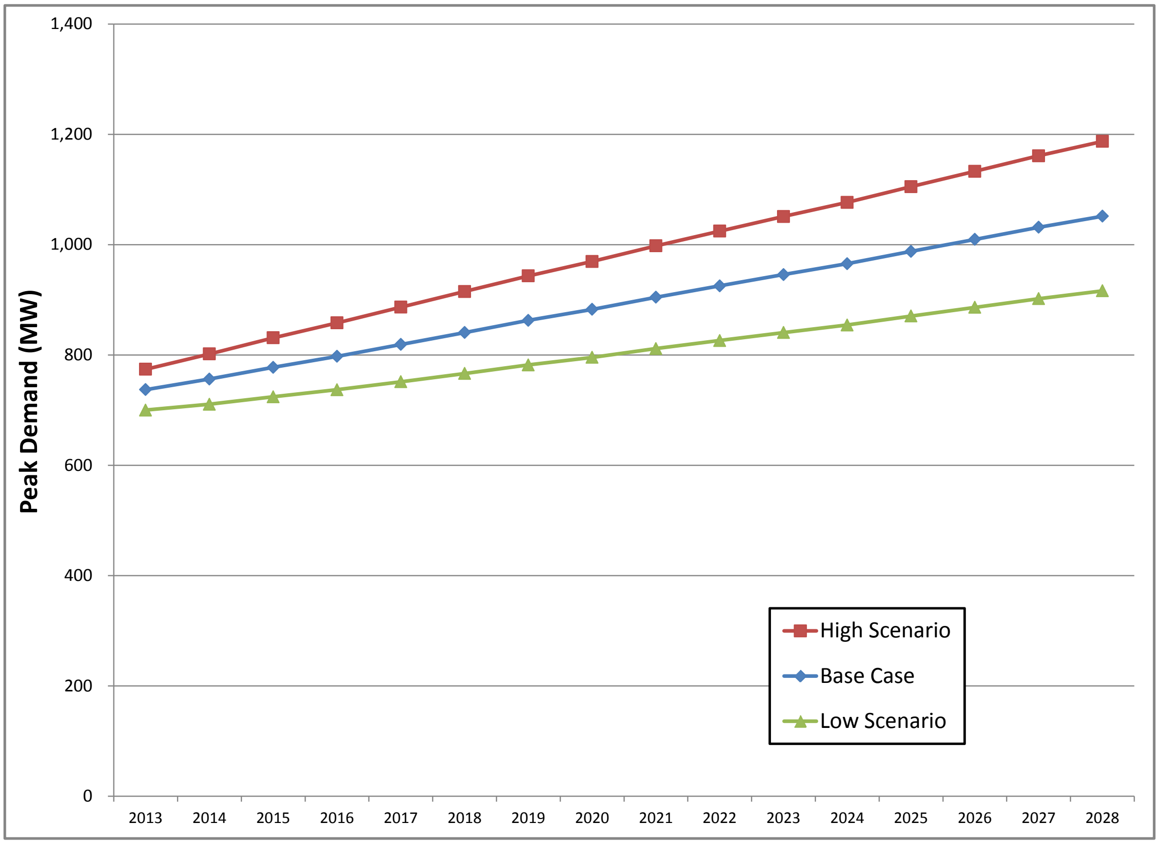
Table V-6 below provides the amount by which the economic and demographic projections were adjusted from the Base Case assumptions through 2028 to develop the High and Low Economic Cases. Other economic data, such as retail sales and gross domestic product, were assumed to vary by the same degree as income.

Table V-6
Assumed Variation in Selected Socioeconomic Variables

	Population	Employment	Income	Income Per Capita
2013	2.6%	4.6%	6.0%	6.0%
2014	3.9%	6.3%	7.3%	6.4%
2015	4.9%	7.5%	8.7%	6.8%
2016	5.9%	8.6%	10.0%	7.2%
2017	6.7%	9.5%	11.4%	7.7%
2018	7.5%	10.3%	12.8%	8.1%
2019	8.2%	11.0%	14.1%	8.5%
2020	8.9%	11.7%	15.0%	8.9%
2021	9.5%	12.3%	15.9%	9.4%
2022	10.2%	12.9%	16.8%	9.8%
2023	10.7%	13.5%	17.7%	10.2%
2024	11.3%	14.0%	18.6%	10.6%
2025	11.9%	14.6%	19.6%	11.1%
2026	12.4%	15.1%	20.5%	11.5%
2027	12.9%	15.5%	21.4%	11.9%
2028	13.5%	16.0%	22.3%	12.3%

Chart V-1 below depicts the forecast of SMMPA IMS Peak Demand from the High and Low Economic Scenarios as compared to the Base Case forecast.

Chart V-1
Range of Adjusted IMS Peak Demand Forecasts



While weather uncertainty is an important contributor to year-to-year variations in both energy and peak demand, the use of these scenarios herein was arrived at based on the long-term nature of the IRP and the expectation that the impact of the uncertainty in weather on the forecasts of load determinants would be negligible relative to the economic uncertainty more than a few years into the forecast horizon.

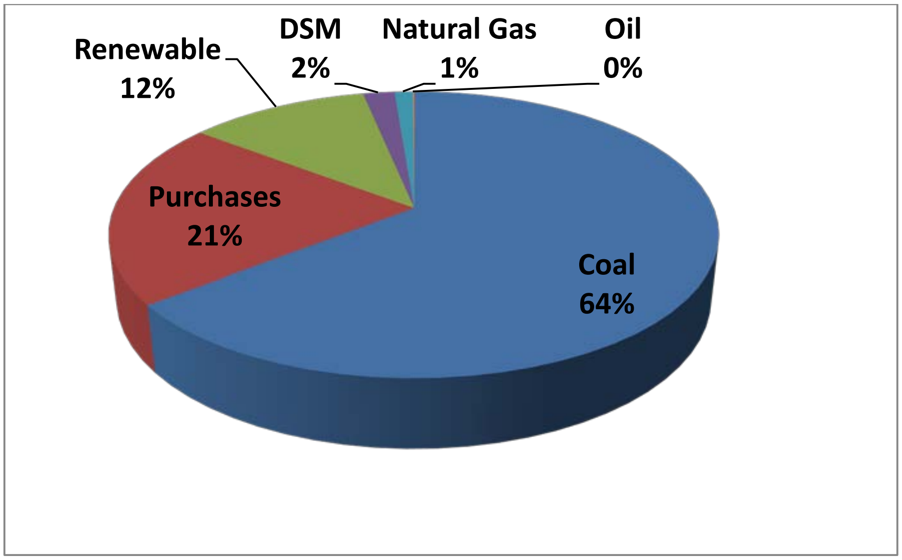
VI RESOURCE CAPABILITIES

GENERAL DISCUSSION

SMMPA has a variety of existing resources available to both reliably and economically meet the energy needs of its members. These resources consist of peaking facilities, intermediate load facilities, base load facilities, demand-side management programs, SMMPA member curtailments, renewables, and power transactions from other utilities. Chart VI-1 shows the breakdown of the energy resources projected to be available for 2014.

Chart VI-1

2014 SMMPA Energy Mix



BASE LOAD FACILITIES

Sherburne County Unit 3

On average, approximately 80% of SMMPA's energy is produced at the Sherburne County Generating Station Unit 3 (Sherco 3). Since 2014 is a planned outage year, the percentage of energy provided by Sherco is only 64%. The difference is usually provided via purchased energy. Sherco 3 is jointly owned with Xcel Energy (Xcel), and Xcel operates the plant. SMMPA owns 41% of Sherco 3 and Xcel owns the remaining 59%. The plant is a pulverized coal power plant with a state-of-the-art air quality control system (AQCS). The AQCS consists of eight dry scrubber modules and a downstream bag house. With this technology the AQCS is capable of removing over 70% of the sulfur dioxide, 90% of mercury emissions, and 98% of the particulate matter from the flue gas. In 2008, the boiler was also equipped with low-NOx burners for limiting the formation of nitrous oxides.

These capabilities, combined with the fact that the coal is low sulfur western coal, which has less than 1% sulfur, makes Sherco 3 one of the cleanest coal-fired plants in the country. This capability gives SMMPA flexibility to meet the requirements of the Clean Air Act Amendments of 1990 (CAAA) and manage SMMPA's SO_2 allowances in the future.

A $20 million high pressure and intermediate pressure turbine (HP/IP) upgrade project was completed during the planned outage in 2011. This upgrade was expected to improve overall efficiency of the unit by 1% to 2% and increase total output by 21 MW (Agency share 9 MW) without an increase in fuel consumption. This new HP/IP section was damaged during the November 2011 turbine failure which may negate some of this improvement. The insurance company has agreed to replace the HP/IP turbine section with new components which will not be available until the fall of 2015. This new equipment will most likely be installed during the scheduled 2017 outage.

INTERMEDIATE LOAD FACILITIES

In 2013, SMMPA will have completed the construction of 4 new generating units in Fairmont, Minnesota totaling 25 MW. These new high efficiency reciprocating engine units will replace the older, inefficient steam boilers and turbines at Fairmont. Although internal combustion generating plants are generally considered as peaking resources, these new high efficiency units are 20% more efficient than other traditional internal combustion engines or combustion turbines and are therefore expected to be dispatched as intermediate load units in MISO.

SMMPA purchased the old Fairmont power plant site from the City of Fairmont in 2011 and began the demolition of the steam boilers shortly thereafter. Construction of the new facilities began in 2012 and is expected to be completed by the end of 2013. This plant site also contains two older diesel generators which operate on either natural gas or fuel oil and are dispatched as peaking units.

Table VI-1 SMMPA Generating Capacity – Fairmont Energy Station					
			Year Installed	Unit Capacity (kW)	Plant Total (kW)
Fairmont	Unit	1	2013	6,500	
	Unit	2	2013	6,500	
	Unit	3	2013	6,500	
	Unit	4	2013	6,500	
	Unit	6	1975	6,540	
	Unit	7	1975	6,740	39,280

PEAKING FACILITIES

The mix of peaking facilities within the SMMPA system consists of one combustion turbine and several reciprocating internal combustion engines (diesels).

The peaking facilities in the SMMPA system provide significant benefits beyond system capacity. Of the eighteen members in the SMMPA system, fourteen of them have generating capacity under contract with the Agency. Having this capacity located in the member communities substantially improves system reliability and improves the quality of service provided to the members of SMMPA.

Most of the member-owned generating units that are committed to SMMPA are under "life-of-unit" Capacity Purchase Agreements. A "life-of-unit" Capacity Purchase Agreement does not have a termination date, but does have cancellation provisions. Under these agreements, SMMPA pays for all the direct costs of operating the plants. This includes fuel, labor, parts, materials, services, and necessary capital investments. With these agreements, the costs of owning generating capacity are shared by all that benefit from the capacity.

Combustion Turbine

The SMMPA system has one combustion turbine in its resource mix. The Owatonna Unit 7 was originally installed as a peaking unit and currently continues to provide the same service.

This combustion turbine was purchased by Owatonna Public Utilities in 1982 from Northern States Power Company (NSP). NSP originally installed the unit in 1966. The unit is a natural gas fired simple cycle combustion turbine.

Diesels

The diesel plants in SMMPA's system under the "life-of-unit" Capacity Purchase Agreements consist of approximately 68 MW of capacity located in 9 different communities with a total of 27 engines. Table VI-2 shows the location, year installed, and capacity in kW. These units provide valuable capacity to SMMPA and serve as a backup power supply for the communities in times of emergency.

Table VI-2
SMMPA Generating Capacity – Diesels

Station & Unit Number			Vintage	Unit Capacity (kW)	Plant Total (kW)
Blooming Prairie	Unit	1	1970	1,170	
	Unit	2	1957	1,340	2,510
Litchfield	Unit	5	1963	2,100	
	Unit	6	1963	2,100	4,200
Mora	Unit	2	1960	1,250	
	Unit	5	1972	5,550	
	Unit	6	1975	6,090	12,890
New Prague	Unit	2	1975	4,980	
	Unit	3	1963	2,690	
	Unit	4	1967	3,770	
	Unit	6	1981	6,520	17,960
Preston	Unit	4	1949	790	
	Unit	5	1954	1,080	
	Unit	6	1974	2,270	4,140
Princeton	Unit	3	1977	2,340	
	Unit	4	1967	1,270	
	Unit	5	1954	960	
	Unit	6	1962	2,720	7,290
Redwood Falls	Unit	1	1970	2,250	
	Unit	2	1974	6,080	8,330
Spring Valley	Unit	2	1952	1,160	
	Unit	3	1960	2,130	3,290

(continued)

Table VI-2 (continued) SMMPA Generating Capacity – Diesels					
Wells	Unit	1	1953	1,190	
	Unit	2	1957	1,180	
	Unit	3	1950	1,000	
	Unit	4	1966	1,830	
	Unit	5	1975	2,020	7,220
Diesel Capacity Total					**67,830**

SMMPA has full-time staff to address ongoing maintenance concerns and coordinate the O&M activities of the various member plants. SMMPA conducts on-going training sessions for all member plant personnel. In addition, regular exercise and maintenance procedures have been established to monitor and ensure that the units are in good operating condition.

During 2013, SMMPA retrofitted all 27 of these generators with new CO catalytic reduction systems in compliance with the new federal Maximum Available Control Technology (MACT) requirements for reciprocating engines. This project cost approximately $3.5 million.

Beginning in 2001, SMMPA entered into Quick-Start Capacity and Energy Purchase Agreements (Quick-Start Agreements) with eight of its members for new diesel units with 10-minute start capability. Under these agreements, members finance, build, and operate the units at their sole expense and provide the output of the units exclusively to the Agency. In exchange, the Agency pays the members a monthly capacity charge and reimburses all fuel costs. The Quick-Start Agreements have a minimum term of 20 years and can be renewed by SMMPA for successive five-year periods thereafter. Since the Agency's last IRP, an additional 22 MW of Quick Start generation has been installed at various member city locations. The existing Quick-Start Agreements currently provide SMMPA with approximately 56 MW of additional diesel peaking capacity.

Table VI-3
SMMPA Generating Capacity – Quick-Start Diesels

Station & Unit Number			Year Installed	Unit Capacity (kW)	Plant Total (kW)
Blooming Prairie	Unit	5	2003	2,000	
		6	2009	1,800	3,800
Grand Marais	Unit	1	2004	2,400	
	Unit	2	2004	1,800	
	Unit	3	2004	1,800	6,000
Litchfield	Unit	1	2010	2,000	
	Unit	2	2010	2,000	
	Unit	3	2010	2,000	
	Unit	4	2010	2,000	
	Unit	5	2010	2,000	10,000
North Branch	Unit	3	2003	2,000	
	Unit	4	2003	2,000	
	Unit	5	2011	2,000	
	Unit	6	2011	2,000	
	Unit	7	2011	2,000	10,000
Princeton	Unit	7	2003	4,840	4,840
Redwood Falls	Unit	3	2003	2,000	
	Unit	4	2003	2,000	
	Unit	5	2003	2,000	6,000
Saint Peter	Unit	1	2003	2,000	
	Unit	2	2003	2,000	
	Unit	3	2003	2,000	
	Unit	4	2003	2,000	
	Unit	5	2003	2,000	
	Unit	6	2003	2,000	12,000
Spring Valley	Unit	4	2009	2,000	
	Unit	5	2009	2,000	4,000
Quick-Start Diesel Capacity Total					**56,640**

Retired Units

Since SMMPA's last IRP, the Agency has retired approximately 100 MW of old generation. Most of these units were small steam powered peaking units. Steam units take several hours to start up thus making them impractical to operate as peaking units in the MISO market. Peaking units must be able to respond quickly to dispatch orders. SMMPA does not anticipate retiring any other generation over the next 15 year planning cycle. Listed in Table VI-4 are SMMPA's retired generating units, the year they were installed, and their capacity.

Table VI-4
SMMPA Generating Capacity – Retired Peaking Units

Station & Unit Number		Year Installed	Unit Capacity (kW)	Plant Total (kW)
Austin NE	Unit 1	1971	29,480	29,480
Austin Downtown	Unit 2	1940	3,700	
	Unit 3	1946	7,950	
	Unit 4	1954	12,350	
	Unit 5	1961	5,100	29,100
Fairmont	Unit 3	1945	5,000	
	Unit 4	1949	5,000	
	Unit 5	1958	12,400	22,400
Owatonna	Unit 6	1969	22,000	22,000
Retired Peaking Units Total				**102,980**

RENEWABLE RESOURCES

The SMMPA power supply system currently consists of more than 110 MW of renewable resources. SMMPA owns six wind turbines located in and interconnected to member utility distribution systems. Two 950 kW and two 1650 kW wind turbines are located in Fairmont and two 1650 kW wind turbines are located in Redwood Falls. SMMPA also has an agreement in place to purchase the net electrical output of the Olmsted County Waste-to-Energy Facility (OWEF) and receive biomass energy credits that can be applied toward the state renewable energy objective/renewable energy standard. In 2009, SMMPA entered into a Purchase Power Agreement (PPA) with enXco for 100,500 kW of wind generation located in Dexter, MN. The

Agency also recently developed a 1.6 MW landfill gas generator project near Mora, MN, which went into operation in 2012. Table VI-5 shows the generating capacity of each of these facilities and the year they were installed.

Table VI-5
SMMPA Generating Capacity – Renewable Resources

Station & Unit Number	Year Installed	Unit Capacity (kW)
Fairmont Wind Phase I	2003	1,900
Fairmont Wind Phase II	2004/2005	3,300
Redwood Falls Phase I	2004/2005	3,300
OWEF	2006	1,000
enXco Wind	2009	100,500
Mora Landfill Gas	2012	1,650
Total Renewable Units		**111,650**

POWER PURCHASES

SMMPA currently acquires a variety of resources through purchase power agreements including purchases of renewable generation. These purchase resources include a capacity-only purchase from the City of Hutchinson, Minnesota, and a capacity-only purchase from Nextera. These purchases are shown in Table VI-6 below.

Table VI-6
SMMPA Generating Capacity – Purchase Power Agreements

Year	Capacity (kW)
2014	60,000
2015	60,000
2016	65,000
2017	70,000
2018	40,000
2019	40,000

DEMAND-SIDE MANAGEMENT (DSM) RESOURCES

DSM is a key strategic element in SMMPA's resource planning efforts. It is an overall cost-effective resource in our supply portfolio that serves an important role in meeting customer demand. DSM programs help to counter or minimize energy and demand growth thereby delaying the need to build more physical generation assets, they have minimal environmental impacts, and they are advantageous for economic development.

SMMPA and its members have a long standing commitment to DSM programs dating back to 1985 when members began installing direct load control (DLC) systems. Beginning in 1993, we started developing a range of conservation/high-efficiency initiatives for our members. Members saw DSM as a way to keep their municipal consumption under control, deferring the need for obtaining additional power supply, and helping to manage their cost of power.

As the years have progressed, so has our commitment to DSM. Our energy efficiency programs have been ongoing for two decades and will continue to take a prominent and strategic resource planning role as SMMPA looks to the next 15 years and beyond. SMMPA is committed to enhancing, developing, and implementing comprehensive, cost-effective, and innovative energy efficiency programs. An indicator of this commitment is the fact that SMMPA and its member utilities were named recipients of the National ENERGY STAR® Award by the United States Environmental Protection Agency and Department of Energy for a third time in 2010.
SMMPA conducted its first DSM screening in 1991 and developed its initial Residential Home Efficiency and Commercial & Industrial Lighting Programs in 1993. Subsequently, SMMPA has conducted several additional screenings and conservation offerings with major program updates and expansions in 1995 and 2002. In between those major updates, SMMPA continues to add new high-efficiency initiatives as technologies have matured or customer interest provides opportunities.

As a whole, SMMPA members have a proven track record of strong DSM performance. The Next Generation Energy Act of 2007 established an aggressive energy savings goal of 1.5% of retail energy sales starting in 2010. For SMMPA members, that goal was more than double our historic energy saving achievements. But we approached that challenge head-on by refining our

DSM program strategy and expanding upon our proven program platform. As a result, our 18 members have collectively exceeded that goal every year so far and we are on track to do so again in 2013.

SMMPA's strong commitment to DSM is based on our interest in developing a least-cost resource base, our commitment to sound environmental practices, and our knowledge of the role energy efficiency and the wise use of electricity can play in helping customers reduce their bill and control energy costs. In fact, SMMPA provides a number of energy efficiency programs to our members' end-use customers. We view those programs as an integral part of our strategy in helping our members to help their customers control their energy costs and meet the challenges of an increasingly competitive international marketplace.

The following section describes the marketing and implementation assistance SMMPA provides to its members and outlines the DSM initiatives SMMPA and its members have undertaken.

DSM MARKETING AND IMPLEMENTATION ASSISTANCE

Historically, SMMPA's DSM programs, marketed under the banner of *Managing Tomorrow's Energy Today*, included programs for commercial and industrial lighting and two residential measures, which included water heater efficiency improvements and central air-conditioning tune-ups. In 1995, we began expanding our DSM programs and today SMMPA members offer a wide array of high-efficiency programs to promote the efficient use of energy to the commercial, industrial, residential, and low-income market segments.

SMMPA's three largest members, Austin Utilities (AU), Owatonna Public Utilities (OPU), and Rochester Public Utilities (RPU), promote DSM programs under their Conserve & Save® moniker. Our fifteen smaller SMMPA members market these high-efficiency programs under the banner of SaveEnergyInMyCommunity.com as a common theme that is then leveraged with their city name, such as www.SaveEnergyInNewPrague.com.

In the early 1990's, most of these energy efficiency programs were new to SMMPA member utilities. To make implementation as easy as possible for our members, we focused on turnkey program design. That turnkey effort included not only the DSM screening to identify potential technologies, but full program implementation including marketing and communication strategies and materials, rebate design, tracking mechanisms and all aspects of training. Today, that strategy of support continues with SMMPA staff providing DSM support to our three largest members where requested and three Energy Services Representatives in the field providing direct assistance to our fifteen smaller members and their customers.

Whether marketed under Conserve & Save or SaveEnergyInMyCommunity.com, SMMPA continues to actively evaluate and assess new DSM program opportunities that can cost effectively be bundled into existing program efforts including: program design, establishing incentive levels, developing collateral materials and implementation strategies, coordinating events, reimbursing rebates on energy-efficient technologies, reimbursing member marketing costs, and coordinating and educating vendors and retailers about high-efficiency equipment. These typical support activities are listed in Table VI-7 on the following page.

Over the years, SMMPA has also taken on a consistent role in enabling member participation in National ENERGY STAR Campaigns such as the "Change-A-Light, Change-The-World" compact fluorescent lighting promotion, appliance collaborative efforts, and Holiday Home Electronics Campaigns. These joint efforts have allowed SMMPA members to leverage the promotional advantages and market reach afforded by national campaigns. SMMPA staff has also supported region-wide DSM initiatives and has served on the Board of the Midwest Energy Efficiency Alliance (MEEA). MEEA is a collaborate network of nearly 50 Midwestern utilities, major corporations and state energy agencies whose purpose is to advance energy efficiency in the Midwest in order to support sustainable economic development and environmental preservation.

To assist with monitoring, evaluating, and reporting DSM efforts, SMMPA developed an Internet Rebate Tracking and Processing System. Members use this web-based system to manage and track customer rebates. The system is also used to process rebate reimbursements to members, and several customized reports have been incorporated for members. The system automatically calculates savings, manages status of customer projects, provides customized letters for accounts, and tracks program budgets and progress towards their 1.5% energy savings goal. The original system became available in 2005, and an upgraded version was released in early 2011.

The system is particularly helpful for completing Conservation Improvement Program (CIP) filings. Currently, SMMPA completes the CIP filings for all members with the exception of AU, OPU, and RPU, though SMMPA staff provides data and assistance to them as requested.

Table VI – 7
Typical DSM Marketing and Implementation Support

Evaluation and selection of DSM technologies using deemed savings levels.	Research and determination of incentive levels.
Development of customer contact strategies.	Detailed program descriptions, operational guidelines and implementation steps for member utilities.
Development/coordination of customer incentive payment and SMMPA reimbursement process.	Development of collateral materials including rebate forms and customer brochures.
Development of newspaper, newsletter, bill stuffer, and radio advertisements.	Coordination on National and Statewide ENERGY STAR campaigns.
Communications, coordination and education with high-efficiency equipment trade allies.	Development and management of web-based rebate tracking and reporting system.
Assistance to members in completing Conservation Improvement Program (CIP) filings and WAPA Minimum Investment Report filings.	Technical support to members regarding the use of high-efficiency technologies in specific customer applications.
Energy Service Representatives field staff in member communities to assist members with program implementation and technical assistance.	Program promotion via email blasts directly to member customers and trade allies.

SMMPA's DSM efforts have evolved over time given the unique wholesale relationship with its members. DSM presents SMMPA with a unique challenge. While DSM provides a cost-effective resource for meeting our future load requirements, DSM technologies are end-use customer-based. Simply stated, SMMPA doesn't directly provide electricity to any end-use customers. So gaining the necessary adoptions for successful programs requires that member utilities embrace and actively promote the programs to their retail customers. The acceptance and support of the SMMPA Board of Directors in adding Energy Services Representative positions to assist in those efforts shows the strong commitment of the SMMPA membership to actively promote these programs and meet Minnesota's aggressive 1.5% CIP energy savings goal.

In SMMPA's current DSM screening analysis, we evaluated 198 different technologies (see Section VII for a description of the DSM evaluation process). Cost-effective programs were then bundled into a manageable number of programs for integration purposes. For the most part even today, the programs are prescriptive in nature in an effort to ease administration for both the member and customer.

To help better support the members in promoting all program areas, and in recognition that DSM is on par with supply-side alternatives, SMMPA developed a reimbursement policy whereby member utilities are reimbursed for customer incentives and local marketing initiatives. Our current reimbursement limit is $100,000 per customer location, per technology, per year.

SMMPA continually assesses programs and technologies to ensure that DSM efforts address changing market dynamics. Some past examples of this are provided below.

- The most important issue for a company with a failed motor is to get their process back up and running. A customer will install a high-efficiency motor, but only if it is in stock. In the 1990's, SMMPA responded by being an industry leader and providing rebates for inventoried motors, ensuring a high-efficiency replacement was available when needed. Inventoried motors are rebated at one-half the replacement levels. Today, SMMPA continues to lead by not only providing a rebate for replacing working motors with National Electrical Manufacturers Association (NEMA) Premium motors, but also rebating for "enhanced" NEMA Premium motors that exceed the NEMA Premium efficiency standards by at least 1%.
- In the fall of 2001, SMMPA became an ENERGY STAR Partner and immediately began leveraging the opportunities provided by this national effort. SMMPA became an early supporter of ENERGY STAR National Campaigns such as Change-A-Light, Change the World. The success that SMMPA members experienced in promoting compact fluorescent lights in the campaign lead SMMPA to offer a series of year-round rebates on a wide array of ENERGY STAR qualified appliances. The partnership opened up opportunities for SMMPA members to collaborate with manufacturers and retailers in ways which would have otherwise been unavailable to SMMPA members and their customers. In collaboration with Sears, SMMPA and its members were the only electric utilities in Minnesota to participate with Sears in a special ENERGY STAR clothes washer promotion. In part for SMMPA's strong support and aggressive promotion of ENERGY STAR initiatives, SMMPA and its members received National ENERGY STAR Awards in 2003, 2004, and 2010. SMMPA continues to aggressively look to

develop and participate in new ENERGY STAR initiatives. As light-emitting-diode (LED) lighting technology has progressed and costs have come down, SMMPA has developed new programs to encourage member customers to save energy and money by installing LEDs in their homes and businesses. We currently offer rebates for residential ENERGY STAR LED bulbs and fixtures, and for a wide array of C&I LED lighting, including DesignLights Consortium®-qualified LEDs with proven quality, performance, and energy savings. In 2013, we also offered bonus rebates for replacing high-bay high-intensity discharge (HID) fixtures with LED luminaires.

- Effective July 14, 2012, production of most T12 florescent lamps was phased out, as mandated by the 2009 Department of Energy General Service Lamp legislation. Given those changes, we offered a bonus rebate to educate customers about this phase-out and to encourage them to replace their T12 fixtures with high-efficiency fluorescent T5 and T8 lighting.

- The Department of Energy estimates that average industrial customers waste 20% to 30% of their compressed air to air leaks. By routinely detecting and fixing air leaks, most companies can reduce leakage to 10% or less and achieve large cost savings and almost immediate payback. We saw this as a great energy-saving opportunity for our members' customers, so we developed a program to educate them and encourage them to survey their system for leaks. What makes our program unique is that we actually provide customers with the tools they need to perform their own air leak survey – including an ultrasonic leak detector and software to determine the leak size and the cost of the wasted compressed air. Ultrasonic leak detection equipment is loaned to customers for two weeks at no charge. Based on the savings customers have achieve through this program, some of them have purchased their own leak detector so they can locate and repair their leaks on a regular basis and optimize the efficiency of their system.

- After our three largest member utilities achieved results with their residential behavioral program (Opower's Home Energy Reports), we wanted to expand the program to the residential customers of our other members. But due to the complexities of gathering data and managing a program across 15 smaller utilities, Opower couldn't provide us with a cost-effective solution. We kept searching and in late 2011, we found another provider, Enerlyte, who was able to provide a more economical program for our smaller members. The program is similar to Opower but it provides energy usage comparison data right on monthly electric bills. So customers can track their usage more frequently to see how changes they are making impact their energy usage.

- SMMPA sees strong educational programs as a way to increase customer knowledge and adoption of efficient technologies. SMMPA has coordinated and administered Building Operator Certification (BOC) training for our members' customers since 2006. Since then, we have offered five level I sessions and one level II session. In November 2013, we started the second level II session. Each session includes seven full-day classes with topics ranging from HVAC Controls & Optimization to Enhanced Automation and Demand Reduction. To become certified, participants must pass an exam at the end of each class and complete assigned projects.

Over the past 20 years, SMMPA has continued to increase the number of programs offered to members' customers. Brief descriptions of our current DSM programs are on the following pages.

DSM RESOURCES

Conservation Programs

Business High-Efficiency Rebate Program Retrofit and New Construction Lighting Program

The Business High-Efficiency Rebate Program offers prescriptive rebates for new and retrofit applications with a wide array of commercial & industrial (C&I) technologies including: T8, Super T8 and T5 fixtures with electronic ballasts, pulse-start metal halide fixtures, ceramic metal halide, high-pressure sodium fixtures, compact fluorescent lighting, cold cathode lamps, induction lamps and fixtures, LED lamps and fixtures, LED/LEC exit signs, occupancy sensors, and photocells. Retrofit rebates are based on system conversions, that is, lamp and ballast combinations. It also provides rebates for some technologies, at a reduced level, for new construction installation.

Business High-Efficiency Motor Rebate Program

The Business High-Efficiency Motor Rebate Program provides prescriptive rebates for replacing working motors with Premium-efficiency National Electrical Manufacturers Association (NEMA) and for "enhanced" NEMA Premium motors that exceed the NEMA premium efficiency levels by at least 1%. Eligible motors must be NEMA design B or C, 3-phase, AC motors between 1 and 200 horsepower or DC-single phase or Electronically Commutated Motors (ECM) less than 1.5 HP. Rebates are available for replacement, new construction, and inventory. Rewound motors are not eligible. The program contains an innovative feature in that motors placed in inventory may receive a rebate. This policy helps encourage the stocking of high-efficiency motors. Motors placed in inventory are rebated at approximately ½ of the replacement rebate level value. In 2011, we also started offering prescriptive incentives for the installation of ECMs on evaporator fans in refrigerated cooler and freezer cases.

Business Variable Speed Drive Rebate Program

The Business Variable Speed Drive Rebate Program provides prescriptive rebates for the installation of Variable Speed Drives (VSD) for fan and pump applications from 1 to 200 horsepower. The program is for both new and replacement drives. Similar to the motors program, rebates at approximately ½ of the replacement rebate level are provided for new inventoried drives. VSD rebates for non-fan and pumping applications or over 200 horsepower may be covered under our Custom Rebate Program.

Business High-Efficiency Cooling Equipment Rebate Program

The Business High-Efficiency Cooling Equipment Rebate Program provides prescriptive rebates for the installation of new or replacement, rooftop and packaged air conditioning, air and water cooled chillers, ground source heat pumps, and air source heat pumps that meet or exceed minimum efficiency levels. The program provides base rebates plus bonus rebates that encourage customers to install higher efficiency units. For retrofit projects, new air-conditioning units must replace units of lesser efficiencies and of equivalent or greater capacity to qualify for a rebate.

Business Compressed Air Leak Correction Program

The Department of Energy estimates that average industrial customers waste 20% to 30% of their compressed air to air leaks. By routinely detecting and fixing air leaks, most companies can reduce leakage to 10% or less and achieve large cost savings and almost immediate payback.

This program not only provides incentives for repairing compressed air leaks, but it also loans the tools needed to customers to perform their own leak survey for free, if they choose, including an ultrasonic leak detector and software to determine the leak size and the cost of the wasted compressed air.

Lodging Guestroom Energy Management System Program

Hotel and motel rooms are typically vacant up to 12 hours per day. Without proper energy management equipment to control the operation, air-conditioning/heating units and lighting can operate all day long – whether rooms are occupied or not. This program provides rebates to customers that install an occupancy-based guestroom energy management system to automatically control the HVAC system to setback the room temperature when a guestroom is unoccupied and allow guests to adjust the room temperature when their room is occupied. An additional rebate is provided if the system also controls the operation of the room lighting when the guestroom is unoccupied.

Business Anti-Sweat Heater Controls Program

Glass doors on cooler and freezer cases can have anti-sweat or anti-condensate heaters in the frames and mullions of the case. Those heaters operate continuously in order to prevent condensation/frosting on the glass and frame that occurs when the surface temperature is below the dew point of the surrounding air. This program provides rebates for anti-sweat heater controls that automatically control the operation of these heaters, so they do not run continuously when not needed.

Business VendingMiser Program

This program provides a rebate for the installation of VendingMisers. The VendingMiser is a controller that automatically shuts down a refrigerated beverage machine (including lights, refrigeration, and electronics) whenever there is not foot traffic in front of the machine for 15 minutes. The controller periodically powers up the machine to maintain product temperature and provide compressor protection. It uses a motion sensor to also automatically power up the vending machine when people approach it.

Commercial Food Service Equipment Rebate Program

The Commercial Food Service Equipment Rebate Program provides prescriptive rebates for high-efficiency equipment for the food service industry meeting applicable efficiency levels as established by ENERGY STAR, the Food Service Technology Center, or the Consortium for Energy Efficiency. Estimates are as much as 80% of the $10 billion annual energy bill for the food service sector is expended by inefficient food cooking, holding, and storage equipment. Our program currently provides incentives for Combination Ovens, Convection Ovens, Fryers, Griddles, Insulated Holding Cabinets, Steam Cookers, Refrigerators, Freezers, Ice Makers, Dishwashers, Ventilation Hood Controllers, and Low-Flow Spray Valves. In addition to lowering electric and gas bills, qualifying equipment can also save significant amounts of water.

Business Custom Efficiency Program

The Business Custom Efficiency Program is a performance-based program to encourage the installation of high-efficiency process or building systems equipment. Typical applications cover systems such as: variable speed drives for non-fan and pump applications, air compressor system improvements, thermal storage, efficient refrigeration, energy management systems, heat recovery systems, and other process technologies. Equipment covered under a prescriptive rebate is not eligible for a custom rebate. Eligible measures must result in energy savings. The custom rebate is based on the first-year annual energy savings. Custom projects with estimated annual energy savings of 1,000,000 kWh or greater are reviewed and approved by the MN Division of Energy Resources as required by their Measurement and Verification Protocol.

Load Profiling Services

For most facilities, energy use information is limited to the data shown on their electric bill. But it is difficult to manage energy costs without knowing where, when, and how the energy is used. With that information, customers can make important decisions to improve their efficiency and reduce their energy costs.

In 1998, we developed an innovative program to give our members' key account customers tools to manage their utility costs. Our Performance Power System Program was a complete real-time power monitoring system, including high-end metering at their service entrances, a dedicated computer, and proprietary software, that gave customers the data needed for proactive energy management. It allowed them to monitor and control their electrical demand and log various parameters of their power system to help them manage their energy usage and costs.

SMMPA provided the base monitoring system to customers to use at no cost in exchange for the following commitments - a proactive interest in managing their energy usage, dedicated staff resources to take advantage of the capabilities of the system, and the materials/installation of the communication network. This base system allowed customers to expand it by purchasing additional meters that could be used to monitor specific loads or production areas. In addition to monitoring their electricity usage, the system could also be configured to monitor and log other utilities including natural gas, water, steam and compressed air. The system could also be interfaced with other energy management systems through ModbusTM RTU and TCP, Ethernet, and DDE.

The system could be utilized as an energy management system to control the operation of customer loads. The meters or software could trigger an alarm and send a signal to start up a backup generator or shed certain loads when user-defined demand thresholds were exceeded. The system also monitored the power quality delivered to and from facilities to ensure premium service and reliability.

Several of our members' large customers participated in this program and utilized it to monitor their loads and manage their energy usage. But with the change to a CIP energy savings goal, we stopped installing new systems after 2008. We believed this system was a great tool to help customers manage their energy usage, but we needed to focus our efforts on programs that achieved measureable energy savings and no longer had the time to dedicate to this program. It's difficult to quantify the energy savings from a program like this to justify its cost effectiveness.

With continued interest from customers to manage their energy usage, we partnered with Automated Energy, Inc. in 2011 to offer their load profiling service to our members' customers. Participating customers can view their daily load profiles for each of their meters/facilities to help find opportunities to manage their demand and energy usage. Utilizing the Internet and existing metering technologies, Automated Energy gives users access to their energy usage anywhere, anytime, by simply logging on to the web using an Internet browser. This service also allows customers to perform load analysis, bill estimation and forecasting, rate analysis, and measure the effectiveness of their energy efficiency efforts. In fact, one of our members is currently using the data from a participating customer to aggregate the demand at several of their meters in order to provide them with a better rate.

Residential Behavioral Program

Over the past few years, utilities have started offering residential behavioral programs. Most of these programs provide a comparison of their energy usage to homes of similar size and age. Customers are also provided with a “ranking” and studies have shown that this data influences customers with relatively higher energy usage to look for ways to reduce it. Our three largest members have contracted with Opower to provide that information to their customers, and fourteen of our smaller members use the service provided by Enerlyte. We are currently working with Enerlyte to implement this program at our last member utility.

Residential Appliance Program

The Residential Appliance Program provides educational information and rebates to encourage our members’ customers to purchase ENERGY STAR® qualified appliances. Rebates are available for the following appliances:

- ENERGY STAR labeled refrigerators receive a $25 rebate and are eligible for an additional rebate of up to $50 to cover the cost proper recycling of the old working refrigerator.
- ENERGY STAR labeled freezers receive a $25 rebate and are eligible for an additional rebate of up to $50 to cover the cost of proper recycling of the old working freezer.
- ENERGY STAR labeled dishwashers are eligible for a $25 rebate
- ENERGY STAR labeled clothes washers are eligible for a $50 rebate.
- ENERGY STAR labeled room air conditioners with both window and through the wall installation are eligible for a $25 rebate plus up to an additional $25 rebate for proof of proper recycling of the old working room air conditioner.
- ENERGY STAR labeled Dehumidifier Trade-Up Program. ENERGY STAR labeled dehumidifiers are eligible for a rebate of $65 with the turn in and proper recycling of an old working dehumidifier. Dehumidifiers use significant amounts of household energy, but the price differential between ENERGY STAR and non- ENERGY STAR qualified models is minimal. This program ensures significant savings on the system by encouraging customers to turn-in their old working unit and purchase energy-efficient

models. This is an innovative approach; only a handful of utilities nationwide have developed programs to address this market segment.

Residential Lighting Program

The Residential Lighting Program provides educational information and rebates to encourage our members' customers to install ENERGY STAR qualified lighting. Rebates are available for the following products:

- ENERGY STAR labeled compact fluorescent lamps (CFL) with a rebate of $2 or 50% of the CFL cost whichever is more. We designed this rebate structure to encourage the purchase of specialty lamps such as PAR, three-way, and dimmable lamps.
- ENERGY STAR labeled hardwired CFL fixtures, torchieres, ceiling fans with lighting, and compact fluorescent light kits for ceiling fans receive a rebate of $15 per fixture.
- ENERGY STAR labeled LED bulbs with a rebate of 50% of bulb cost up to a maximum of $15 per bulb.
- ENERGY STAR labeled LED fixtures with a rebate of 50% of fixture cost up to a maximum of $20 per fixture.

We also partner with the Wisconsin Energy Conservation Corporation (WECC) to offer point-of-purchase discounts on ENERGY STAR CFLs at select retailers from October through December. We have participated in this campaign since 2001 when it was known as "Change-A-Light, Change-the-World". The campaign has evolved over the years to include more specialty CFLs and it is now called the "Be Bright" campaign.

Residential Cooling Program

The Residential Cooling Program provides educational information and rebates to encourage our members' customers to purchase energy-efficient cooling equipment. Rebates are available for the following products:

- Central air conditioners and air source heat pumps with a cooling capacity of less than 20,000 Btuh receive a base rebate of $100 plus an efficiency bonus rebate of $25 for each 1 SEER above 14.0 SEER.
- Central air conditioners and air source heat pumps with a cooling capacity of 20,000 to 65,000 Btuh receive a base rebate of $200 plus an efficiency bonus rebate of $75 for

each 1 SEER above 14.0 SEER.

- Closed loop, open loop, and direct expansion ground source heat pumps that meet or exceed our minimum EER and coefficient of performance (COP) requirements receive a base rebate of $200 per ton and an efficiency bonus rebate of $25 per ton for each 1 EER above the minimum efficiency.

Central AC & Air Source Heat Pump Tune-Up Program

Air conditioners and air source heat pumps must be maintained to perform at optimum efficiency. Properly maintained cooling equipment provides improved comfort, runs more efficiently, lowers your energy costs, and lasts longer. A professional tune-up can improve unit efficiency by about 10 percent. A tune-up provides an opportunity for a licensed HVAC technician to professionally evaluate the cooling system. It includes cleaning the outdoor condenser, checking for refrigerant leaks, checking air flow, and checking refrigerant charge and pressure. This program provides a $35 rebate to residential and commercial customers who have a professional tune-up performed on their air conditioner or air source heat pump of 5.5 tons or less. Tune-ups must include the services listed in our Service Checklist.

Efficient Furnace Fan Motor Program

This is a new program we developed in 2013. This program offers a rebate of $125 for the installation of a new furnace with an Electronically Commutated Motor (ECM), Advanced Main Air Circulating Fan (AMACF), or equivalent. Qualifying new furnaces are identified on the Air Conditioning, Heating, and Refrigeration Institute's (AHRI) Certificate of Product Ratings (found at www.ahridirectory.org) as being equipped with an Electronically Commutated Motor or an Advanced Main Air Circulating Fan, or being an "e" Electronically Efficient Furnace. This is primarily a residential program, but rebates are also paid to commercial customers who install qualifying furnaces. We will be considering offering rebates starting in 2014 for retrofit installations that meet the following conditions:

- ECM must be multispeed,
- ECM must be controlled to vary speed by season, and
- ECM must replace an existing permanent split capacitor (PSC) furnace fan motor.

LED Holiday Lighting Program

In 2007, we developed our LED Holiday Lighting Rebate Program to educate members' customers about the benefits of LED holiday lighting, to increase the quantity of LED lights and decorations available at retailers, and to capture the energy savings of LED holiday lights purchased and installed by customers. We continue to offer rebates for LED strings and decorations since a large number of incandescent holiday lights continue to be available at much cheaper prices than LEDs. Our current rebates per LED string or decoration are as follows:

- Up to 99 LED lamps = $3 rebate
- 100-199 lamps = $6 rebate
- 200-299 lamps = $9 rebate
- 300 or more = $12 rebate

Habitat for Humanity Program

In 2010, we partnered with Habitat for Humanity to help increase the efficiency of those homes for low-income customers served by our member utilities. We work with our members offer rebates for CFL and LED bulbs and fixtures, efficient furnace fan motors, ENERGY STAR dishwashers, ENERGY STAR clothes washers, microwave ovens, room air conditioners, central air conditioners, air source heat pumps, and ground source heat pumps.

Low Income Program

SMMPA has developed partnerships to deliver DSM services to low-income households. SMMPA contracts with Community Action Agencies (CAA) to couple the assessment and installation of DSM measures in conjunction with their weatherization visits. SMMPA has worked with the CAA's to develop a process for identifying efficiency improvement opportunities for low-income homeowners. The end uses include lighting and the potential for CFL's, refrigerators, the presence of microwave ovens, room air-conditioning, and clothes washers. Member utilities provide up to ten compact fluorescent lamps with a total cost not to exceed $70, can replace working refrigerators, clothes washers, room air conditioners, and can provide microwave ovens to reduce the consumption of electric ranges. Low-income households are prioritized in the following manner: 1) Consumers with highest electrical usage, 2) Senior citizens over the age of 60, 3) Handicapped consumers, and 4) Families with children under the age of six.

Demand Response Programs

Member Direct Load Control

SMMPA member utilities have developed extensive Direct Load Control (DLC) Programs. Members began installing DLC systems in 1985 predominantly as a means of managing the cost of their power supply. Today, SMMPA notifies its members during peak demand periods so they can operate their systems to lower their demand. Currently fourteen of the eighteen SMMPA members have DLC systems. Member systems are predominantly based upon Cannon Technologies' EMETCON system utilizing power-line carrier signals. Member efforts are typically based upon central air conditioner cycling and to a lesser extent (given the technology saturation) electric hot water heater cycling.

Member utilities, with their close working relationships with their customer base, have achieved significant penetration into the DLC market with members estimating on average that 75% of available central air conditioners are under control. This significant penetration has been based upon a mix of voluntary and incentive-based participation. It is the member municipal utility's strong direct contact efforts that have led to such significant participation. In an effort to extend the benefits of DLC initiatives, several members require the installation of load control switches in all new construction installations or service upgrades. Programs are mainly for residential customers, but persistent contact has resulted in significant participation among commercial accounts as well. DLC efforts currently represent about 20 MW of capability.

In addition to the technologies listed above, some members, based upon their system load shape and available fuel mix, have also incorporated off-peak heating and/or dual fuel technologies into their control strategy.

Several members have developed one or more interruptible rates, independent of SMMPA tariffs, which are employed to control load at the time of summer system peak. One member in particular, Austin Utilities, has a specific rate with Hormel which makes available up to 14 MW of standby generation located at their Austin processing facility. SMMPA has entered into an arrangement whereby if the units are not needed to serve Hormel, within the guidelines of the air permit, SMMPA has the right to schedule and dispatch the Plant not more than 12 times in any calendar year and each such call shall not exceed 9 hours of operation.

Additionally, a number of members control municipal loads, such as municipal water and/or wastewater pumping loads during peak demand periods.

Energy Management Program

The Energy Management (EM) Program was designed as a commercial and industrial interruptible program in 1995. The program is similar in nature to the load-shed cooperatives found around the country such as those developed by Boston Edison, Commonwealth Edison, Southern California Energy Coalition, etc. Under the program, SMMPA purchases a specified amount of interruptible capacity during brief summer peak electric periods from interested member utility retail customers that can turn off at least 70 kW or operate at least 25 kW of load with their backup generator. Historically, the primary purpose of the program was to reduce demand during peak periods where SMMPA needs to reduce load to maintain its reserve requirement. We are currently evaluating the program to determine how this load reduction can be utilized within MISO.

Participation in the program is governed by an interruptible tariff and customer agreement between the member utility and the retail customer. The terms and conditions of the tariff are listed below.

Energy Management Program Terms and Conditions

• Maximum Total Hours of Curtailment Per Year	54
• Maximum Hours of Curtailment in Any Day	6
• Maximum Number of Curtailments Per Year	9
• Curtailment Season	June – September
• Maximum Consecutive Days of Interruption	3
• Advance Notification	1 Hour Minimum
• Curtailment Window	12:00 P.M. – 6:00 P.M. (fixed)

An average baseline usage is calculated annually for each of the participants for their respective curtailment window. Firm service levels (FSL) are established based upon the equipment the customer elects to place in the program. Participants receive $5/kW per summer month for the capacity they commit to the program. Monthly payments are made to the customer regardless of whether or not the program is called during the month. Demand alert monitors are installed at the customer site to allow the customer to monitor their load and ensure that they do not exceed their FSL during the interruption. Customers are expected to be 100% compliant and there are deductions for non-compliance; however, deductions cannot exceed the amount the participant would have received in monthly credits. The program serves as an excellent way to encourage customers to try interruptible options as a strategy for managing their energy costs. The program provides SMMPA with an additional line of defense to keep the Agency from eating into its reserve margin in the event of extreme weather. Program participation has ranged from small manufacturers and commercial establishments with less than 100 kW to large manufacturers with as much as 2,500 kW committed to the program. In 2013, seven SMMPA members had a total of 18 customers participating in the program with a potential of 7.1 MW of controllable load.

In 2003, two members, Austin and Owatonna, elected to operate their own Energy Management Program for their respective utilities. In 2004, New Prague started running their own program. Given SMMPA's coincident peak billing system, there should be a very high probability of reducing the SMMPA system load as these members seek to lower their own summer peak. Rochester Public Utilities (RPU) operates their own curtailment programs given the fact that RPU has established a Contract Rate of Delivery (CROD) at 216 MW. RPU is responsible for providing their own requirements in any hour in which their load is at 216 MW or higher.

INSTALLED DEMAND-SIDE MANAGEMENT (DSM) CAPABILITY

The 2009 IRP Action Plan stressed a continuation of Member Direct Load Control (DLC), the Energy Management (EM) Program, and many of the conservation programs described above. Table VI-8 below provides the estimated impacts of DSM programs over 2006-2012, based on data filed by SMMPA related to the Minnesota Conservation Improvement Program (CIP). These estimates place installed non-behavioral DSM conservation capacity at approximately 76.4 MW. Load Management installed capacity is approximately 49 MW. How much of that capacity SMMPA can utilize as a future resource due to impacts of the Contract Rate of Delivery (CROD) for two members is detailed in Chapter VII - Plan Development.

Table VI-8
Estimated Historical Demand-Side Management Program Impacts

	2006	2007	2008	2009	2010	2011	2012
Energy Savings (MWh)							
Conservation							
Non-Behavioral	16,233	25,693	24,863	35,278	42,823	39,819	39,404
Behavioral	0	0	0	2,564	5,383	6,932	8,380
Total	16,233	25,693	24,863	37,842	48,206	46,751	47,784
Load Management	291	314	1,257	1,081	1,395	1,151	873
Renewables	0	0	0	0	73	67	91
Total	16,524	26,007	26,120	38,923	49,674	47,969	48,748
Demand Savings (kW)							
Conservation							
Non-Behavioral	6,832	10,489	10,123	12,268	12,829	12,269	11,568
Behavioral	0	0	0	878	1,733	2,256	2,666
Total	6,832	10,489	10,123	13,146	14,562	14,525	14,234
Load Management	27,447	27,042	37,286	46,860	39,992	42,136	49,256
Renewables	0	0	0	0	148	53	71
Total	34,279	37,531	47,409	60,006	54,702	56,714	63,561

OTHER MEMBER CURTAILMENTS

There are some resources which SMMPA considers to be curtailments to load. In general these are resources to which SMMPA does not have ownership rights, but the resource does reduce the power and energy SMMPA must provide to its members. SMMPA works with the members and their customers to try to ensure that these curtailments are being dispatched in a cost effective manner so that they lower cost to not only the owners, but also to SMMPA. SMMPA has three resources it considers curtailments -- Western Area Power Administration allocations to members, retail customer-owned distributed generation, and member-owned hydroelectric plants.

Western Area Power Administration

Three of SMMPA's members, Fairmont, Redwood Falls, and Litchfield, currently have allocations of power from the Western Area Power Administration (WAPA). The Fairmont allocation totals 578 kW of summer capacity and 885 kW of winter capacity. The Litchfield allocation consists of a maximum of 12,745 kW of summer capacity and a maximum of 10,730 kW of winter capacity with total annual energy of 69,948 MWh. The Redwood Falls allocation consists of a maximum of 8,923 kW of summer capacity and a maximum of 7,731 kW of winter capacity with total annual energy of 44,340 MWh.

Although these members are credited with their full WAPA allocations, the energy is dispatched by SMMPA. In this manner, the WAPA power helps SMMPA control its power cost to all the members.

Retail Customer-Owned Distributed Generation

Rochester Public Utilities has commercial/industrial customers which own generators that operate during peak demand periods that provide 4.0 MW of summer peak reduction and an annual energy production of 33,696 MWh. Austin Utilities has an industrial customer that owns generation and operates under an interruptible tariff and operates during peak demand periods, providing up to 14.0 MW of summer peak reduction and an annual energy production of 4,200 MWh.

It should also be noted that Austin Utilities has elected to establish a Contract Rate of Delivery (CROD) that will become effective in 2016. It is anticipated that Austin's CROD level will be set at approximately 65.8 MW, which is the forecasted value of Austin's NCP peak demand that SMMPA must serve in 2015. The establishment of the CROD means that when Austin's load is above 65.8 MW, during any hour, SMMPA is required to serve 65.8 MW and Austin Utilities is responsible for serving the load above that amount.

Member-Owned Hydroelectric Plants

Redwood Falls has a small hydroelectric power plant that reduces the amount of load that SMMPA must serve. Redwood Falls' hydroelectric plant provides approximately 325 kW of summertime peak demand reduction and an annual energy production of approximately 1,000 MWh. SMMPA purchases the renewable energy certificates (RECs) associated with the generation. (For additional detail see Section VII). Rochester Public Utilities also has a hydroelectric power plant that provides approximately 2 MW of power during summer peak demand periods and approximately 12,500 MWh of annual energy.

MIDCONTINENT INDEPENDENT SYSTEM OPERATOR

SMMPA is a Transmission Owning member of the Midcontinent Independent System Operator (MISO). All of the Agency's loads and generating assets reside within the MISO footprint, and the Agency's transmission assets are controlled by MISO. The Agency participates in the MISO Energy Market and the Ancillary Services Market. Reliability compliance oversight of the Agency's assets and operations is provided by the Midwest Reliability Organization (MRO).

Joint planning is fostered through all MISO activities, while at the same time providing valuable analysis and information to the MISO members. The Agency is actively participating with the Minnesota Transmission Owners ("MTO") group in order to comply with the Minnesota biennial transmission reporting requirements. The MTO group consists of Alliant Energy, American Transmission Company, Dairyland Power Cooperative, East River Electric Power Cooperative, Great River Energy, Hutchinson Utilities Commission, ITC Midwest, L&O Power Cooperative, Marshall Municipal Utilities, Minnesota Power, Minnkota Power Cooperative, Missouri River Energy Services, Otter Tail Power Company, Rochester Public Utilities, Willmar Municipal Utilities, and Xcel Energy.

WHOLESALE POWER MARKETING

SMMPA's approach to wholesale power marketing has evolved over recent years. The Agency has recognized that increased participation in the wholesale power market will be a key to maximizing the utilization of the Agency's resources and lowering overall costs to its members. Accordingly, in early 2006, the Agency and The Energy Authority (TEA) formed an alliance whereby TEA would assist the Agency in wholesale power marketing activities. A key benefit from this marketing alliance is the enhanced capability TEA provides to SMMPA to successfully operate in MISO's locational marginal pricing (LMP) market. On April 1, 2005, MISO's LMP market became operational. MISO's ancillary services market (ASM) became operational in January 2009, and TEA and the Agency worked together to enable the Agency to participate in the new market.

TRANSMISSION DEVELOPMENTS

Several key regional MAPP members have become Transmission Owners (TOs) under MISO. These members have transferred the operational control of their transmission systems to MISO and are under the MISO Open Access Transmission, Energy and Operating Reserve Markets Tariff ("Tariff"). SMMPA transferred operational control of its transmission to MISO on April 1, 2006 when SMMPA became a MISO Transmission Owning member.

CAPX 2020

CapX 2020 represents an effort to ensure electric reliability for Minnesota and the surrounding region in the future. It began as an effort by the state's largest transmission owners (including cooperatives, municipals and investor-owned utilities) to assess the current transmission system and project the growth in customer demand for electricity through 2020. In 2006, the Agency joined CapX 2020. Other members include Central Minnesota Municipal Power Agency, Dairyland Power Cooperative, Great River Energy, Minnesota Power, Minnkota Power Cooperative, Missouri River Energy Services, Otter Tail Power Company, Rochester Public Utilities, Wisconsin Public Power Inc. Energy, and Xcel Energy (NSP). CapX 2020 was established in 2004 in order to assist in the development of transmission resources needed to promote future electric reliability for Minnesota and the surrounding region.

The CapX 2020 projects provide needed transmission capacity to support new generation outlet, including renewable energy. The projects include four 345 kV transmission lines and one 230 kV line. The CapX 2020 lines are projected to cost more than $2 billion and cover nearly 800 miles. The Agency is investing approximately $70 million dollars in the CapX 2020 Hampton – Rochester – La Crosse 345 kV transmission project.

TRANSMISSION FACILITIES

The Agency's Members are located in the control areas of the Agency, NSP, GRE and Alliant Energy. The Members are connected to the electric transmission systems of NSP, Dairyland, GRE, and ITC Midwest, which purchased the transmission assets of Alliant Energy's Interstate Power and Light in December 2007. Sixteen of the Members have some generating capability located within their respective service areas.

Various transmission lines and associated substation additions have been constructed by the Agency at a cost of over $110,000,000. In the cases of the terminated GRE, NSP and Alliant Energy agreements described below, the Agency received or is receiving credit for the investment in transmission facilities integrated within the network of GRE, NSP and ITC Midwest.
In recognition of the formation of SMMPA years ago, the probable requirements for transmission facilities of SMMPA, and the deficiencies for the then-existing systems in southern Minnesota, Dairyland entered into a long-term Shared Transmission System (STS) Agreement with SMMPA for the planning, construction, ownership, use, operation and maintenance of transmission facilities.

The STS Agreement generally included provisions for (i) providing sufficient transmission capacity to deliver the firm power and energy requirements of the utility's customers and SMMPA Members; (ii) formation of the coordinating committee to jointly plan facilities in the geographic areas where SMMPA and the utility's service areas overlap; (iii) each utility to construct and own transmission facilities required to be added to the system in proportion to the respective load growth of each system; (iv) certain requirements and remedies for maintaining balance of ownership of the transmission facilities included in the shared transmission system; (v) annual adjustments to be applied to the investment responsibility of a party which is under-invested to recognize escalation in the costs of construction and transmission carrying charges for the use of the over-invested party's system by the under-invested party; (vi) a term of 30 or 50 years with automatic five year extensions; and (vii) operating the shared transmission system and metering of the electricity delivered by the shared transmission system.

SMMPA also had an STS Agreement with NSP, which was converted to a network customer arrangement with NSP in November, 1996. On April 1, 2006, that network service arrangement was converted to MISO network services. SMMPA also had an STS Agreement with Alliant Energy (Interstate Power), which was converted to a network customer arrangement with Alliant Energy on January 1, 1998. In 2003, that Alliant Energy network service arrangement was converted to MISO network services. SMMPA also had an Integrated Transmission Agreement (ITA) with GRE that was terminated on January 1, 2012 and was converted to MISO network services on that date. SMMPA's STS Agreements with Dairyland remains in effect.

Table VI-9 lists the mileage of the various classes of SMMPA transmission lines, which total 291.01 miles. All of these lines are overhead lines except for 6.9 miles of underground cable in the 69 kV class.

Table VI-9

Circuit Miles of Transmission by Voltage

Voltage (kilovolts)	Circuit length
230 kV	17.09 miles
161 kV	123.58 miles
115 kV	11.80 miles
69 kV	138.54 miles

VII Plan Development

GENERAL DISCUSSION

This is SMMPA's seventh resource plan filing to the Minnesota Public Utilities Commission under MN Statute §216B.2422 and MN Rules Part 7843.

PLAN OBJECTIVES

As stated in Minnesota Rules 7843, the factors to be considered by the Commission in their review of resource plans includes the following: (1) maintain or improve the adequacy and reliability of utility service; (2) keep the customers' bills and the utility's rates as low as practicable, given regulatory and other constraints; (3) minimize adverse socio-economic effects and adverse effects upon the environment; (4) enhance the utility's ability to respond to changes in the financial, social, and technological factors affecting its operations; and (5) limit the risk of adverse effects on the utility and its customers from financial, social, and technological factors that the utility cannot control. SMMPA and the public power utilities it serves also share these objectives which have served as a guide as SMMPA evaluated various resource options in order to provide adequate, reliable and cost-effective electric power.

PLANNING TOOLS

Resource planning tools available for this filing include the AURORAxmp Electric Market Model developed by EPIS, Inc. and the Energy Efficiency Resource Assessment Model (EERAM) developed by Navigant Consulting, Inc. The AURORA model was used to perform the supply-side/demand-side resources integration analysis.

DEMAND-SIDE MANAGEMENT MODEL

In the initial years of SMMPA's DSM program, screenings were conducted using the Compass® model, a DSM screening tool developed by Synergic Resources Corporation (SRC). Navigant Consulting, Inc. ultimately acquired SRC, and today, Navigant Consulting uses the EERAM model to conduct DSM Technical Potential Screenings. SMMPA indicated in its last filing (2009) that it would conduct a new Technical Potential Screening in its next resource plan filing. A narrative summary of SMMPA's current screening can be found in Appendix A.

PLANNING ASSUMPTIONS

For the 2013 IRP study, the objective function used for developing the least-cost resource plan is based on total present worth costs over the planning study period of 2014 - 2028 and a 22 year extension period.

AURORA calculates the annual costs of the generation system based on the fixed costs (carrying charges and fixed O&M costs) of new and existing generating resources, as well as the variable costs (fuel, emissions and variable O&M costs) associated with operating the generating system. Carrying charges include interest, principal payments, property taxes, mechanical and property insurance.

The capacity accreditation for all generation resources in the AURORA model has been updated to reflect current MISO UCAP process as opposed to the previous MAPP URGE process. This process derates the capability of each generator based on their historic forced outage rate.

The capacity reserve requirement percentage is updated annually by MISO. The MISO reserve requirement for planning year 2013 was 6.4%. This value is increasing to 7.3% for planning year 2014. The AURORA model assumes a reserve requirement of 9.3% to allow for unforeseen changes in the MISO reserve requirements or individual generator forced outage rates over time.

The least-cost plan development is driven by key data inputs and study assumptions, which are discussed in various sections of this report and summarized here as follows:

- Energy and peak demand forecast
- Operating costs and characteristics of existing resources
- Capital, O&M costs, and operating characteristics for supply-side options
- Capital, O&M costs, and operating characteristics for demand-side options
- Fuel prices for various fuel types and future escalations
- Externality and allowance costs for various pollutant emissions

The above mentioned data inputs and study assumptions are shown in Table VII-1 through VII-7 on the following pages. SMMPA used externality values developed by the State of Minnesota, adjusted to 2014 dollars. The Metropolitan Fringe values were used for all emission types.

TABLE VII-1

Energy and Peak Demand Forecast (TER)

Year	Annual Energy (GWh)	Peak Demand (MW)	Load Factor %
2013	2,900	518	63.9%
2014	2,953	523	64.4%
2015	3,013	527	65.2%
2016	3,074	530	66.2%
2017	3,121	534	66.7%
2018	3,177	538	67.4%
2019	3,239	542	68.2%
2020	3,302	544	69.3%
2021	3,347	546	70.0%
2022	3,391	546	70.9%
2023	3,434	546	71.8%
2024	3,485	545	73.0%
2025	3,522	546	73.6%
2026	3,569	547	74.5%
2027	3,615	547	75.4%
2028	3,666	547	76.6%

Total Energy Requirement (TER) equals SMMPA system IMS, minus member adjustments (non-dedicated hydro dam units in Rochester and Redwood Falls, power supplied by the Mayo Foundation generator which came on line in 6/96, and any curtailment load in Rochester), minus power supplied by Western Area Power Administration (WAPA) to Litchfield, Redwood Falls, and Fairmont, minus Rochester load that exceeds the 216 MW Contract Rate of Delivery (CROD) cap, plus transmission line losses.

Table VII-2
Existing Generating Resource Data

TRADE SECRET

Table VII-3
Future Supply-Side Resource Data

Generating Resources	Years Available	Rated Capacity (MW)	2014 Capital Cost ($/kW)	Full Load Heat Rate (Btu/kWh)	2014 Fuel Price ($/MMBtu)	2014 Variable O&M Cost ($/MWh)	2014 Fixed O&M Cost ($/kW/Yr)	Maintenance Rate (%)	Forced Outage Rate (%)
Wind Turbines	2014-2028	25.00	N/A	N/A	N/A	35.87	N/A	0.00	0.00
Solar- Photovoltaic	2014-2028	1.00	3,500	N/A	N/A	N/A	56.38	0.00	0.00
Peaking Purchase	2014-2028	10.00	N/A	10,000	0.00	0.00	33.94	0.00	0.00
LM6000	2014-2028	50.00	1,200	9,766	4.68	4.62	24.60	2.00	3.00
Siemens SGT6F	2014-2028	50.00	800	10,525	4.68	10.61	15.38	4.00	3.00
Wartsila Recip. Engine	2014-2028	37.00	800	8,650	4.68	20.50	33.83	3.00	3.00
CC w/GE 7FA	2014-2028	50.00	1,100	8,040	4.68	3.69	26.75	3.00	3.00
Ultra Super Critical PC	2014-2028	50.00	4,000	8,600	2.12	5.13	79.95	5.00	4.00
IGCC w/GE 7FA	2014-2028	50.00	4,700	9,600	4.68	7.43	112.04	5.00	3.00
Nuclear AP-1000	2014-2028	50.00	6,700	10,434	0.55	2.19	164.31	4.00	2.00

Table VII-4
Demand-Side Potential Resource Characteristics

DSM Resource Name	Years Available	2014 Rated Capacity (1) (MW)	2028 Rated Capacity (1) (MW)	2014 Annual Energy (2) (GWh)	2028 Annual Energy (2) (GWh)	2014 Variable (3) O&M Cost ($/Yr)	2028 Variable (3) O&M Cost ($/Yr)
Expected DSM:							
C/I - Other	2014-2028	7.818	36.067	25.129	258.361	$61,508	$1,548,435
C/I - Lite	2014-2028	2.283	15.427	24.549	172.296	$128,578	$1,446,605
Res - Other	2014-2028	16.844	60.502	8.097	81.869	$530,572	$2,562,826
Res - Lite	2014-2028	0.380	4.567	7.699	108.233	$63,349	$336,279

Notes:

1. The rated capacity of each DSM program varies from year to year. This table only shows the starting and ending values.
2. The annual energy of each DSM program varies from year to year. This table only shows the starting and ending values.
3. The annual DSM costs modeled as Variable O&M costs in AURORA.

   These DSM costs also vary from year to year, and this table only shows the starting values in year 2014 and 2028.

Table VII-5

Fuel and Price Escalation Rates

TRADE SECRET

Table VII-6
Cost of Money and Fixed Charge Rates

	Solar Photovoltaic	Combustion Turbines	Combined Cycles	Coal PC & IGCC	Nuclear AP-1000
Book Life	30	30	30	30	30
Operating Life	30	30	30	60	60
Cost of Money	5.68%	5.68%	5.68%	5.68%	5.68%
Capital Carrying Rate (%)	7.02%	7.02%	7.02%	7.02%	7.02%

Table VII-7 Minnesota Environmental Externality Range Values in 2014 Dollars		
	Metropolitan Fringe	
	Low Values	High Values
SO_2 $/ton	$0.50	$150
PM_{10} $/ton	$2,944	$4,275
CO $/ton	$1.12	$1.99
NO_x $/ton	$207	$394
Pb $/ton	$2,447	$2,955
CO_2 $/ton	$9	$34

*Low Range Value from 2014-2028 with 2.5% Escalation.
**High Range Value from 2014-2028 with 2.5% Escalation.

The following key assumptions and study definitions are very important to understand the IRP results and conclusions developed in this study:

a. All AURORA cases are based on 9.3% minimum installed capacity reserves to meet the MISO planning criterion.

b. The study period is 15 years, from 2014 through 2028. A 22-year extension period is used for the AURORA optimization analysis to account for end-effects.

c. Total present worth costs are expressed in 2012 dollars, and are calculated by discounting annual costs with SMMPA's cost of money of 5.68%.

d. Available future supply-side resources include: wind turbines, photovoltaic solar, landfill gas plants, peaking purchased power, combustion turbines, combined cycle, supercritical pulverized coal, integrated gas combined cycle (IGCC), nuclear, and spark fired natural gas engines.

e. Available future demand-side options include four program groups: commercial/industrial non-lighting (C/I-Other), commercial/industrial lighting (C/I-Lite), residential non-lighting (Res-Other), and residential lighting (Res-Lite). All existing DSM resources have been reflected in the load forecast (i.e. the demand and energy impacts have been included in the load forecast).

f. The costs of environmental externalities are taken into account in evaluating and developing the least-cost resource plans.

g. SMMPA includes sufficient renewable resources in the plan to meet Renewable Energy

Standard (RES) targets.

PLAN DEVELOPMENT

Supply-Side

SMMPA is continually evaluating its supply-side options to ensure that the lowest-cost alternatives are being pursued. To ensure that all potential resources were considered, SMMPA hired an independent engineering consulting firm, SAIC, (formerly R.W. Beck) to perform a comprehensive analysis to determine the technically viable resource options that should be considered in this study. For each identified option, the consulting firm provided the capital and operating costs and associated operating/performance characteristics. This information will be discussed and summarized in Section VIII – Potential Resources.

The anticipated capacity factor of a resource plays a critical role in determining the least-cost resource for a given system. If capacity factors are fairly low (less than 10%), a peaking facility will generally be the lowest cost alternative. If capacity factors increase to the 10% to 30% range, an intermediate resource tends to become the lower cost option. As a resource's capacity factor increases above the 30% range, baseload facilities will most likely yield the lowest overall cost. The capacity factor of a unit economically dispatched on one system may not be the same capacity factor of that same unit economically dispatched on a different system. The system load shape (and therefore, load factor) of a system, as well as the other resources on that system, impact the determination of a least-cost alternative. As a result, a resource which is determined to be the lowest cost alternative for one system may not be the lowest cost option for another system.

In developing the new resource plan, SMMPA considered several different types of peaking, intermediate, and baseload resources. However, the implementation of the existing Rochester CROD, future Austin CROD, and aggressive marketing/implementation of demand-side resources has had a significant impact on SMMPA's system load shape resulting in much higher system load factors. SMMPA's system load factor for 2012 was 64% and is expected to increase to more than 76% by the year 2028. This increasing system load factor will tend to require more baseload type additions in the future.

Renewable Energy Standard (RES) ***MN Statute §216B.1691***

Parts of the plan development are SMMPA's strategies to meet targets established by the RES. In 2007, the Minnesota Legislature amended the renewable energy objectives statute. That amendment modified the remaining renewable energy objective to just one – the requirement that covered utilities make good faith efforts to ensure that by 2010 at least seven percent of total retail sales were generated using eligible renewable technologies. The statute also established benchmarks for the renewable energy standard of 12% by 2012, 17% by 2016, 20% by 2020, and 25% by 2025 (for non-nuclear utilities). To achieve these Renewable Energy Standards, SMMPA has acquired or anticipates acquiring the resources identified in Table VII-8.

SMMPA continues to believe that the most cost effective approach to meeting RES targets is a portfolio approach. That approach provides SMMPA members, and their customers, with the greatest flexibility and control over costs, while meeting the RES targets. That strategy envisions multiple ownership structures for meeting RES targets. Those potential resources include the following:

- SMMPA-owned small renewable projects connected to member utility distribution systems, where feasible;
- SMMPA equity ownership (along with other owners) in larger projects when available;
- Power Purchase Agreements (PPA's) for both the renewable energy and the green attribute;
- Community Based Energy Development (C-BED) projects; and,
- Renewable Energy Certificates (RECs).

That strategy also envisions a mix of technologies, including wind, bio-diesel/biogas, biomass, small hydroelectric facilities, solar, and municipal solid waste to energy. Table VII-8, on the following page, illustrates SMMPA's committed and planned REO/RES resources for the period 2014-2018.

Table VII-8 SMMPA Renewable Energy Resources

Resources (in MWh)	EST 2014	EST 2015	EST 2016	EST 2017	EST 2018	EST 2019	EST 2020	EST 2021	EST 2022	EST 2023	EST 2024	EST 2025	EST 2026	EST 2027	EST 2028
REO/RES Resources															
Existing REO/RES Wind Power	297,867	297,867	298,381	297,867	297,867	297,867	298,381	297,867	297,867	297,867	298,381	297,867	297,867	297,867	298,381
Olmsted Waste to Energy PPA	17,689	17,689	17,741	17,689	17,689	17,689	17,741	17,689	17,689	17,689	17,741	17,689	17,689	17,689	17,741
Redwood Falls Hydro	1,677	1,677	1,677	1,677	1,677	1,677	1,677	1,677	1,677	1,677	1,677	1,677	1,677	1,677	1,677
Member Biodiesel	248	289	180	258	236	241	248	264	281	300	311	323	335	347	357
Mora Landfill Gas	12,483	12,483	12,517	12,483	12,483	12,483	12,517	12,483	12,483	12,483	12,517	12,483	12,483	12,483	12,517
2021 Wind Addition	-	-	-	-	-	-	-	355,254	355,255	355,255	355,867	355,255	355,255	355,255	355,867
SMMPA REO/RES MWh	329,963	330,005	330,496	329,974	329,952	329,956	330,564	685,234	685,251	685,271	686,494	685,293	685,306	685,318	686,540

2013 SMMPA Long Term Forecast Total Energy Required (TER)	2,953,005	3,012,656	3,074,172	3,120,673	3,176,742	3,238,535	3,301,890	3,346,595	3,391,207	3,434,266	3,485,219	3,521,843	3,568,619	3,614,668	3,666,114
TargetRES %	12%	12%	17%	17%	17%	17%	20%	20%	20%	20%	20%	25%	25%	25%	25%
Target RES MWh	354,361	361,519	522,609	530,514	540,046	550,551	660,378	669,319	678,241	686,853	697,044	880,461	892,155	903,667	916,529
Renewable Energy Credits Available	1,456,608	1,425,094	1,232,981	1,032,440	822,346	601,751	271,937	287,852	294,862	293,279	282,730	87,562	(119,287)	(337,637)	(567,625)
SMMPA Compliance %	12%	12%	17%	17%	17%	17%	20%	20%	20%	20%	20%	25%	25%	25%	25%

Below is a brief description of the status of the RES resources shown in Table VII-8. All of SMMPA's existing renewable resources are registered with the Midwest Renewable Tracking System (M-RETS) consistent with Minnesota Public Utility Commission orders.

<u>SMMPA Current RES wind power</u> – Currently this resource consist of SMMPA-owned wind turbines interconnected to member communities. Two 950 KW units and two 1.65 MW turbines located in Fairmont and two 1.65 MW turbines located in Redwood Falls. Additional wind resources include a 100.5 MW power purchase agreement with EDF Renewable Energy Inc. (formally known as enXco). That twenty-year power purchase agreement is supplied from the 100.5 MW Wapsipinicon wind farm located near Dexter in southeastern Minnesota.

<u>C-BED Wind Resources</u> - SMMPA does not currently have any existing Community Based Energy Development (C-BED) resources. When SMMPA began securing resources to meet the Renewable Energy Objective (REO) and Renewable Energy Standard (RES), SMMPA solicited C-BED proposals. Developing C-BED projects proved challenging with inability to obtain financing and/or significant concerns with deliverability due to the unavailability of transmission. As a result of our request for proposals (RFP) process, we entered into negotiations with a developer for a 30 MW project. After many months of negotiation, that developer was unable to secure turbines and negotiations ceased. We entered into negotiations with a second successful bidder for a 36 MW project. After many months, the bidder requested that SMMPA proceed with the project in a non-C-BED structure. SMMPA was becoming increasingly concerned about having sufficient resources to meet the 2010 RES target and elected to proceed with that project in the requested non-C-BED structure. Ultimately the developer informed SMMPA that they could not complete the project in accordance with the contract and the project is in default.

In addition to the formal RFPs issued by SMMPA, we were approached by numerous individuals near member communities regarding potential C-BED projects. We requested term sheets or project proposals but none led to proposals, negotiations or projects. With concern over the ultimate development of the 36MW project described above, we entered into parallel negotiations with the EDF project described above to ensure that we had sufficient resources to meet the 2010 target. SMMPA remains committed to the C-BED concept and when we begin to look for additional wind projects in the later part of this decade, we fully anticipate looking for C-BED proposers again.

Olmsted County Waste to Energy Facility - In 2003, the Minnesota Legislature amended the eligible renewable technologies for meeting the REO to include Municipal Solid Waste. In early 2006, SMMPA, RPU, and Olmsted County completed negotiations on amended terms under which SMMPA will purchase renewable energy from the existing Olmsted County facility.

Mora Landfill Gas Facility – In April of 2012, SMMPA completed the development of a landfill gas project near SMMPA member Mora. SMMPA entered into a gas purchase agreement with the East Central Solid Waste Commission and installed a 1.6 MW generator at the site to utilize the methane previously being flared. The project not only provides an additional renewable resource, but it will result in the destruction of methane - a greenhouse gas 20 times more potent than CO_2.

Member Hydro Renewable Energy Certificates (RECs) – Since 2008, SMMPA, under an agreement with Member utility Redwood Falls, has been obtaining and registering the Redwood Falls hydro electric generation unit with M-RETS. Under the agreement, SMMPA reports the renewable generation and purchases the RECs for use in meeting the RES.

Member Bio-diesel – SMMPA was testing and promoting bio-diesel in Member generating units well before Minnesota passed legislation promoting the use of bio-diesel. Member utilities have embraced the use of bio-diesel in their locally based generation. Members strive to blend up to a B20 mixture in warm months blending downward in colder months to avoid congealing of the fuel.

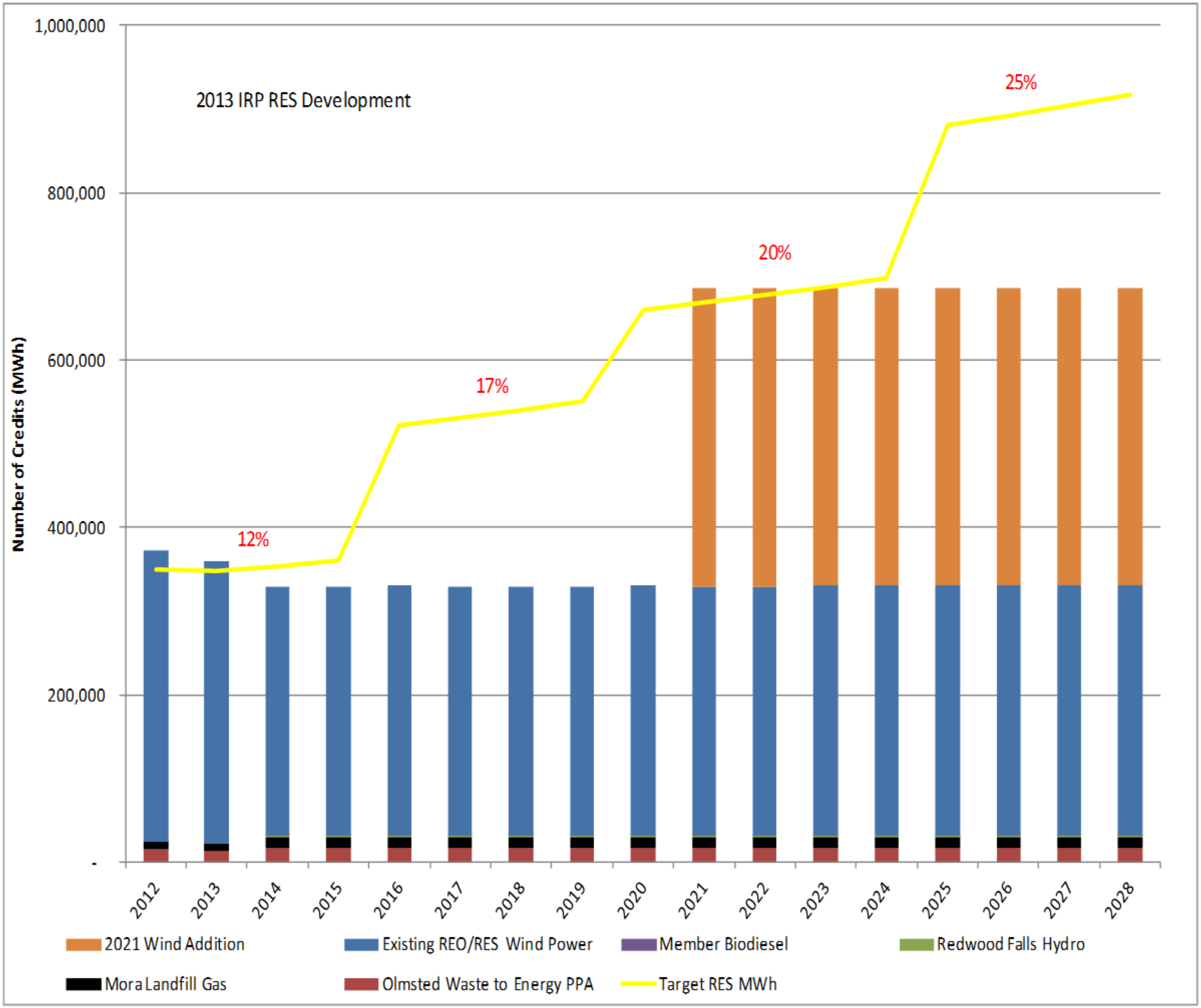
Future RES Resources – The SMMPA model contains various future RES resources. Some of these resources are fixed in the model and some are allowed to be chosen by the model. The fixed resources consists of a single block of 130 MW of wind generation installed in the 2021 timeframe. This was done in order to establish as base case which insured that the model contained at least enough renewable resources to meet the Agency's RES requirements.

The model also includes an option for choosing any number of additional wind resources in blocks of 25 MW as part of the optimization routine. In addition, the model contains a 1.0 MW solar option as an alternative in the optimization routine. These alternatives are discussed in more detail in Section VIII- Potential Resources.

Consistent with the Commission's order, all current renewable resources SMMPA uses for meeting the RES are registered with the Midwest Renewable Energy Tracking System (M-RETS). SMMPA annually files its RES Compliance Report with the Minnesota Public Utilities Commission (MPUC). Those Reports have been accepted by the MPUC through the 2012 program year and are listed in Table VII-8.

Chart VII-1 on the following page illustrates SMMPA's RES Development for the period of 2014-2028.

Chart VII-1



2013 IRP RES Development
Number of Credits (MWh)
1,000,000
800,000
600,000
400,000
200,000
-
12%
17%
20%
25%
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2021 Wind Addition
Existing REO/RES Wind Power
Member Biodiesel
Redwood Falls Hydro
Mora Landfill Gas
Olmsted Waste to Energy PPA
Target RES MWh

Demand-Side

As outlined at the beginning of Section VII, SMMPA conducted a new DSM screening for this filing. SMMPA selected Navigant Consulting, Inc. (Navigant) to conduct the current screening. Navigant was selected to conduct the DSM screening for three reasons: 1) A historic knowledge of SMMPA and our programs. 2) Navigant (Summit Blue, whom Navigant owns) conducted the Statewide Technical Potential Study for the State of Minnesota, and 3) Navigant's experience in assisting Minnesota Electric Utilities in similar efforts. The first reason provided a sense of continuity with our historic efforts which used the Compass® screening tool model. Navigant's Energy Efficiency Resource Assessment Model (EERAM) incorporates a similar methodological approach. The final two reasons provided SMMPA an opportunity to take advantage of Navigant's specific Minnesota experience and knowledge in "filling-in", where necessary, SMMPA's DSM dataset.

Study Objectives, Methodology and Results

This section provides a brief overview of the study objectives, methodology and results. Additional detail can be found in the Southern Minnesota Municipal Power Agency 2014 – 2028 Energy Efficiency Potential Study contained in Appendix A.

The objective of the study was to conduct an analysis of energy and peak demand savings potential for Southern Minnesota Municipal Power Agency (SMMPA). In previous screening studies, all of SMMPA's 18 member utilities have been combined in a single analysis group. In this study, we elected to use two study groups to better reflect actual SMMPA load obligations and how they may be affected by that DSM potential. Under certain limited conditions, and with sufficient notice (currently seven years), SMMPA's Power Sales Contract with its members allows for the establishment of a Contract Rate of Delivery (CROD). After a CROD level is established, (based upon the member's peak in the preceding year) the CROD Member is responsible for supplying their load requirement each and every hour in which the member's load exceeds the established CROD level. For example, if a member wished to establish a CROD in 2025, they would give SMMPA notice in 2018. In that case, their CROD would be established based upon the member's peak in 2024. For illustration, if we assume that the member peak is 40 MW in 2024, beginning in 2025 the CROD would be set at 40 MW and in each and every hour in which the member's load exceeded 40 MW, the member would be responsible for supplying that additional load. In this example, if in any hour the member's load reached 45 MW, the member would be responsible for supplying that additional 5 MW needed to meet the load rather than SMMPA.

In the Minnesota Public Utility Commission (MPUC) Order accepting SMMPA's 2009 Integrated Resource Plan, the MPUC requested that SMMPA conduct a sensitivity related to the discontinuance of the Rochester CROD. We have not conducted such a sensitivity in the current filing. Rochester Public Utilities established a CROD in large part to increase their autonomy in conducting their own planning for their future power supply. Between the 2009 filling and this current filing, SMMPA sought to have its members extend their power sales agreements from 2030 to 2050. Fifteen Members extended their power sales agreements to 2050. Three members, Austin, Rochester and Waseca did not extend those agreements. SMMPA continues to discuss the potential for future relationships with those members that chose not to extend, but any continuation a full-requirements is unlikely. Under these conditions it would be highly unlikely that Rochester would choose to discontinue the CROD and such a sensitivity was not performed.

Two SMMPA members have elected to establish a CROD. Rochester Public Utilities (RPU) established a CROD beginning in 2000 at 216 MW, and Austin Utilities (AU) intends to establish a CROD beginning in 2016 at an estimated 65.8 MW. The CROD has specific implications for DSM planning. If new efficient technology measures are installed in a CROD member system, essentially all the energy savings would continue to accrue to SMMPA but any capacity savings would not. Those capacity savings would be realized by the CROD member. It was for this reason that SMMPA separated the current analysis into two load groups - one CROD (representing AU and RPU) and the other Non-CROD (representing the other 16 SMMPA members). Separating the two groups makes it a little easier to assess the capacity impacts of DSM measures on SMMPA's overall capacity planning needs.

Navigant conducted a potential analysis of energy efficiency over a fifteen year period, 2014 – 2028. The modeling begins in 2008 using detailed historical DSM achievements from SMMPA's online tracking database[1] 2008 through 2011 to calibrate the model. The study addressed technical, economic and achievable potential for SMMPA using Navigant's EERAM Model.

[1] SMMPA maintains a measure by measure tracking database of efficiency improvements.

Chart VII-2 Diagram of Types of Energy Efficiency Potential

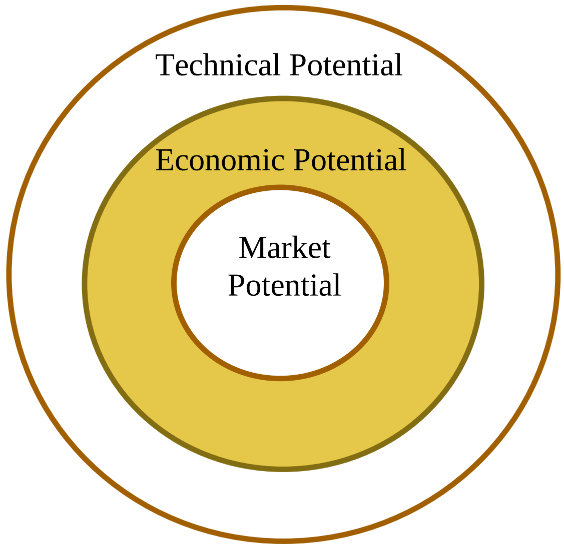


Chart VII-2 provides a visual portrayal of efficiency potential. The Technical Potential is the amount of energy efficiency available through the installation of all efficiency technologies included in the dataset of measures considered. The Economic Potential is the amount of energy efficiency available that is cost effective from the dataset of measures considered. The Market or Achievable potential is the amount of energy efficiency available under current market conditions and available investments from the dataset of measures considered – that is, what customers are actually anticipated to install.

The technical potential effort began with developing an estimate of the building stock for the SMMPA member service territories created by Navigant utilizing on-site data collected from over 198 commercial/industrial and 140 residential surveys conducted as part of previous work for the State of Minnesota.[2] Where necessary, Navigant supplemented this dataset with data from other utility assessments to determine building information and estimate baseline and energy efficiency measure densities and fuel shares by end-use.

The efficiency measures included in the study included the wide array of measures currently being offered by SMMPA members (see existing programs outlined in Section VI - Resource

[2] Minnesota Statewide Electricity Efficiency Potentials Report, Summit Blue Consulting, April 2010

Capabilities) and measures offered by other utilities that could be of interest to SMMPA. Estimated savings, incremental costs, and measure lifetimes were drawn from the Minnesota Deemed Database. If unavailable, data was drawn from standard utility practice. The study evaluated a total of 65 residential measures, 81 commercial measures, and 46 industrial measures. Measure data can be found in Tables C-1through C-4 of the study summary found in Appendix A.

As mentioned, the study data was separated into two SMMPA analysis groups, CROD (AU and RPU) and Non-CROD (the remaining 16 SMMPA members). The Navigant EERAM model was used to provide a forecast of energy savings and demand reduction potential by sector (residential, commercial and industrial) over the forecast period 2014-2028. Measure types addressed include replacement on burn out, early retirement, retrofit, emerging or new technologies, behavioral programs, and new construction. The model integrates energy efficiency measure impacts and costs, customer characteristics, utility load forecasts, avoided costs, rate schedules, administrative costs, and metropolitan fringe environmental values issued by the Minnesota Public Utilities Commission. The model utilizes a bottom–up approach using the starting points of the building stocks and equipment saturation estimates, forecast of building stock decay and new construction, energy efficiency technology data, past energy efficiency program accomplishments, and decision-maker variables that help drive the market adoptions. For established energy efficiency measures, the model calculates market/achievable potential based on a decision-maker adoption rate algorithm. The algorithm is primarily a measure by measure elasticity response to measure payback. For emerging technologies, a diffusion curve methodology is utilized rather than a measure payback methodology. A full discussion of the EERAM model features can be found in Section 2.2 of the study summary found in Appendix A.

The EERAM model calculates all of the standard DSM program tests including the Participant Cost Test (PCT), Ratepayer Impact Test (RIM), Program Administrator Cost Test (PAC), and the Total Resource Cost Test (TRC). The TRC test includes all quantifiable costs and benefits of an energy efficient measure, regardless of who accrues them. For example, a measure passing the TRC test means that the measure is cost effective if the avoided costs are greater than the sum of the measure costs and SMMPA's administrative costs. Measure by measure TRC values can be found in Tables E-1 through E-4 of the study summary found in Appendix A.

In addition to providing sector estimates of energy and demand savings for the forecast period, the EERAM model provides a savings forecast resulting from measure reparticipation and codes and standards impacts. If resource plans are to optimize the integration of cost-effective demand side alternatives, it is imperative that all of the effects of DSM measures are accounted for. For example, if a customer adopts an efficiency measure with a useful life of five years, what happens to the cumulative savings at the end of that useful life? Do they go away? Such an assumption and result would be highly unlikely. What is more likely is that the utility continues to run a program addressing the end use technology or a subsequent standard mandates a level of performance. An illustration might be a customer who replaced a 40 watt incandescent light bulb with a compact fluorescent lamp (CFL) several years ago. When that lamp burns out, will the savings go away as the customer opts to replace the CFL? More likely, the utility is offering a lighting program with CFL measure options, light emitting diode (LED) measure options, or efficiency standards will have made the return to the 40 watt incandescent lamp impossible. In our example, if the savings were assumed to be lost, that additional load requirement would need to be met with additional electric generation. A more reasonable approach is to assess what percentage of measure installations continue to provide efficiency benefits at least equal to the initial DSM measure installed, and what percentage may return to the available stock for program participation.

The EERAM model uses a two-step function to first estimate the share of initial participants which will continue saving energy by installing a new measure similar to the original measure, and the share which will return to the baseline population. In the SMMPA modeling, 85% of the measure installations are considered to re-engage at the end of their useful life (continue to provide savings similar to the original measure) and 15% are considered to go back to the baseline population and are eligible for any program that affects the baseline. There are no incremental energy and demand savings accruing from this re-engaging population, but there must be some adjustments to cumulative savings. First, the 15% of the population that return to the baseline have their savings removed from the cumulative savings. Secondly, if the savings of the technology of the 85% re-engaging population is different from what was achieved at the time of the original participation, the cumulative savings are adjusted by that delta difference.

Codes and Standards also have an impact on the savings forecast. Utilities, including SMMPA, typically advocate for and participate in codes and standards development. They do so because codes and standards can push up the efficiency of the baseline. As appliances, equipment and structures become more efficient, the less generation the utility has to put in place to meet future load. So like re-participation at the end of measure life, we also want to estimate the anticipated savings during the planning horizon so that we can optimize the actual new generation which needs to be added by the utility. From a measurement and evaluation standpoint however, utility efforts to advance codes and standards can have an unintended consequence. The new higher equipment standard to be enacted tomorrow or next year may negate the impact of a high-efficiency rebate program you currently offer. The result is a problem where savings once attributed to the utility might now be attributed to a code or standard. As an example, if a specific code or standard effectively reduces savings by 50% starting in 2015, the incremental measure impact for the utility would be 100% of the estimated program impact up to the year 2015, but there after 50% of the impact might be attributed to the utility and, if tracked at all, 50% attributed to codes and standards. In reality, to optimize a plan we would hope to account for estimates of all savings - those induced by utility rebates and those induced through codes and standards. The EERAM model also provides estimates of energy and demand impacts from known code and standard changes and implementation timelines. Such anticipated changes include lighting technologies covered by the Energy Independence and Security Act of 2007, and planned changes in cooling and refrigeration equipment as well as motors.

Using the EERAM model, Navigant conducted a technical potential analysis for the two separate groups, CROD (2 members) and Non-CROD (16 members). The EERAM model forecasted energy and demand savings for the 192 residential, commercial and industrial measures. These energy savings were then mapped against a set of load shapes by sector and end-use to build a savings production shape which could be integrated with the AURORAxmp® model. Residential end-use shapes included: interior lighting, HVAC-cooling, HVAC-year long, refrigeration, clothes washers, and other. Commercial and Industrial load shapes included: cooling, cooking, air compressor, process, motors, refrigeration, ventilation, lights-interior, lights-exterior, and whole building. The load shapes were derived by Navigant from secondary sources and reviewed for reasonableness. For the purpose of minimizing the modeling time in AURORA, the load shape results were combined into four groups similar to what SMMPA has done in the past. Those groups are Residential lighting, Residential other, C&I lighting and C&I other. Additional information on the load shape model can be found in Section 3.0 of the study summary found in Appendix A.

Table VII-9 on the following page shows the anticipated Technical and Economic potential for all of the SMMPA members (combined CROD and Non-CROD). As mentioned previously, the Technical Potential represents the forecasted energy efficiency if high efficiency equipment could replace all existing base equipment contained in the dataset of measures. The Technical Potential establishes a theoretical upper bound of potential savings. The Economic Potential on the other hand represents the amount of energy efficiency forecast to be available from the dataset of measures considered to be cost effective.

Two observations can be drawn from assessing the data. First, the total technical potential energy savings for all sectors at the beginning of the study period is 938,407 MWh and decreases somewhat throughout the study period to 744,926 MWh by 2028. That decline is due to the impacts of increasing codes and standards (eliminating potential), and some decay in the building stock over the study period. A second observation is that the economic potential forecast is actually quite close to the technical potential forecast. There are several reasons for this. The first is that the measure dataset used for the study includes a large number of technologies included in the Minnesota Deemed Database. Effectively they are measures which some utilities are already implementing or considering implementing and are a set of measures which you would expect to be economically feasible. Secondly, the economic potential numbers are impacted by how the Total Resource Cost (TRC) test is used to screen the technologies. The goal of the economic screening is to have a group of measures which provide a benefit-cost ratio of 1.0 or greater. In screening individual measures, as SMMPA has done in the past, to proxy a program value of 1.0 we used a slightly lower screening value of 0.75. This would tend to push up the economic potential savings forecast somewhat. TRC values for program measures can be found in Tables E-1 through E-4 of the study summary in Appendix A.

Table VII-9 Technical and Economic Potential by Sector for All SMMPA Members

Technical Potential

Energy Potential (MWh)

Sector	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Residential	302,293	300,398	302,513	303,782	305,417	307,240	245,341	246,098	246,917	247,887	248,804	224,860	224,530	224,193	223,821
Commercial	225,250	221,001	218,919	215,108	214,695	214,297	185,512	185,372	185,215	185,044	184,853	178,126	176,261	174,420	172,596
Industrial & Agriculture	410,864	404,673	400,658	396,683	392,749	388,858	378,114	374,368	370,659	366,986	363,350	359,765	355,973	352,221	348,509
Total All Buildings	**938,407**	**926,072**	**922,090**	**915,573**	**912,861**	**910,394**	**808,966**	**805,838**	**802,791**	**799,918**	**797,007**	**762,751**	**756,764**	**750,834**	**744,926**
% of Forecast Sales	30.79%	29.83%	29.15%	28.47%	27.95%	27.46%	24.04%	23.59%	23.16%	22.72%	22.29%	21.00%	20.50%	20.02%	19.56%

Demand Potential (kW)

Sector	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Residential	271,222	257,531	260,522	262,969	265,614	268,383	262,624	263,638	264,462	265,631	266,653	266,182	265,562	264,922	264,248
Commercial	38,975	37,956	37,819	37,373	37,886	38,393	32,244	32,787	33,314	33,828	34,326	33,646	33,294	32,946	32,601
Industrial & Agricultural	91,429	88,228	87,549	86,875	86,205	85,540	84,263	83,613	82,967	82,326	81,689	81,055	80,201	79,356	78,519
Total All Buildings	**401,627**	**383,715**	**385,890**	**387,217**	**389,705**	**392,316**	**379,131**	**380,037**	**380,743**	**381,785**	**382,669**	**380,884**	**379,057**	**377,223**	**375,369**
% of Forecast Sales	59.60%	55.74%	55.04%	54.11%	53.53%	52.94%	50.43%	49.55%	48.78%	48.06%	47.46%	46.29%	45.25%	44.27%	43.45%

Economic Potential

Energy Potential (MWh)

Sector	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Residential	279,845	279,720	280,959	285,194	291,179	295,305	233,710	234,596	235,426	238,011	238,937	215,003	214,684	214,356	213,994
Commercial	163,794	152,783	164,140	167,686	167,801	168,434	140,134	140,471	140,789	141,084	141,359	170,007	168,229	166,470	164,728
Industrial & Agriculture	410,468	404,473	400,441	396,448	392,497	388,858	378,114	374,368	370,659	366,986	363,350	359,765	355,973	352,221	348,509
Total All Buildings	**854,107**	**836,976**	**845,540**	**849,328**	**851,477**	**852,596**	**751,957**	**749,435**	**746,874**	**746,082**	**743,646**	**744,776**	**738,886**	**733,047**	**727,231**
% of Forecast Sales	28.03%	26.96%	26.73%	26.41%	26.07%	25.71%	22.34%	21.94%	21.54%	21.19%	20.79%	20.51%	20.02%	19.55%	19.10%

Demand Potential (kW)

Sector	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Residential	267,232	239,393	240,836	242,595	257,066	266,228	261,306	262,652	263,477	264,831	265,854	265,383	264,764	264,124	263,452
Commercial	35,178	33,113	34,235	34,737	35,334	36,406	30,278	30,842	31,390	31,924	32,442	32,187	31,850	31,516	31,187
Industrial & Agriculture	90,987	88,004	87,306	86,612	85,923	85,540	84,263	83,613	82,967	82,326	81,689	81,055	80,201	79,356	78,519
Total All Buildings	**393,396**	**360,510**	**362,376**	**363,944**	**378,323**	**388,174**	**375,847**	**377,107**	**377,834**	**379,080**	**379,985**	**378,625**	**376,815**	**374,996**	**373,157**
% of Forecast Sales	58.37%	52.37%	51.69%	50.86%	51.97%	52.38%	49.99%	49.17%	48.40%	47.72%	47.13%	46.02%	44.98%	44.01%	43.19%

Base Case Scenario

Based upon Navigant's characterization of the building stock, growth, and dataset measure characteristics, they developed the most probable savings case, which we refer to as the Base Case Scenario. Table VII-10 below provides the SMMPA system cumulative market/achievable potential savings, by sector, for the forecast period. At the start of the planning horizon (2014), SMMPA's cumulative energy savings potential is approximately 220,893 MWh or about 7.2% of forecast sales. By the end of the period (2028) that number nearly doubles, growing to 430,102 MWh or roughly 11.3% of forecast sales. Capacity forecasts start out at 57.014 MW (8.46% of forecast demand) and grow over the study horizon to 137.984 MW, or approximately 16% of forecast demand.

Table VII-10 Base Case Scenario Cumulative Market Potential by Sector for All SMMPA Members

Cumulative Market Potential

Energy Potential (MWh)

Sector	2014	2015	2016	2017	2018	2019	2020	2021
Residential	38,553	39,501	41,859	44,394	47,263	50,568	43,198	47,046
Commercial	82,252	83,878	85,736	87,848	92,777	98,457	90,885	99,157
Industrial & Agriculture	98,578	105,164	112,770	120,560	128,355	136,706	141,991	152,633
Load Management	1,510	1,543	1,571	1,604	1,631	1,661	1,685	1,719
Total All Buildings	**220,893**	**230,085**	**241,937**	**254,407**	**270,026**	**287,391**	**277,760**	**300,555**
% of Forecast Sales	7.25%	7.41%	7.65%	7.91%	8.27%	8.67%	8.25%	8.80%

Demand Potential (kW)

Sector	2014	2015	2016	2017	2018	2019	2020	2021
Residential	16,707	15,106	16,711	18,485	20,511	22,908	24,760	28,268
Commercial	20,754	21,008	21,345	21,748	22,924	24,266	22,865	24,765
Industrial & Agriculture	19,553	20,117	21,605	23,137	24,689	26,366	27,949	30,140
Load Management	35,782	36,540	37,209	37,984	38,638	39,333	39,900	40,700
Total All Buildings*	**57,014**	**56,232**	**59,660**	**63,369**	**68,124**	**73,539**	**75,575**	**83,173**
% of Forecast Sales*	8.46%	8.17%	8.51%	8.85%	9.36%	9.92%	10.05%	10.84%

Energy Potential (MWh)

Sector	2022	2023	2024	2025	2026	2027	2028	
Residential	51,277	55,767	60,319	54,674	58,750	62,706	66,570	
Commercial	107,991	117,034	126,063	128,685	138,083	147,475	156,914	
Industrial & Agriculture	162,939	172,649	181,187	184,814	192,041	198,596	204,681	
Load Management	1,749	1,780	1,807	1,844	1,877	1,910	1,936	
Total All Buildings	**323,955**	**347,231**	**369,376**	**370,017**	**390,751**	**410,687**	**430,102**	
% of Forecast Sales	9.34%	9.86%	10.33%	10.19%	10.59%	10.95%	11.30%	

Demand Potential (kW)

Sector	2022	2023	2024	2025	2026	2027	2028	
Residential	32,269	36,610	41,154	44,818	49,633	54,359	58,970	
Commercial	26,761	28,787	30,791	31,561	33,475	35,343	37,191	
Industrial & Agriculture	32,279	34,321	36,140	37,451	39,026	40,464	41,823	
Load Management	41,416	42,143	42,771	43,651	44,452	45,212	45,832	
Total All Buildings*	**91,308**	**99,719**	**108,084**	**113,830**	**122,134**	**130,166**	**137,984**	
% of Forecast Sales*	11.70%	12.55%	13.41%	13.84%	14.58%	15.27%	15.97%	

*** The totals and percentages do not include Load Management**

Table VII-11 on the following page provides the base case scenario incremental savings for all SMMPA members over the study horizon. As mentioned previously, total forecasted savings comes from not only installed measures throughout the planning horizon, but also from customer re-participation and from code and standard improvement impacts. Table VII-11 shows how much each of these components contributes. As discussed above, if we are to fully optimize future resources we need not only to estimate the impacts of efficiency measures installed during the planning horizon, but to also recognize the savings implications as measures reach the end their useful life. These energy and capacity savings are estimated in Table VII-11 in the row labeled Utility Re-Participation. For example in 2014, 5,510 MWh of potential energy savings result from Re-participation. Potential exists from measures installed in our current program as well as throughout the planning horizon. Over the 15-year study, re-participation contributes approximately 5,700 MWh annually.

Table VII-11 Base Case Scenario Incremental Achievable/Market Potential by Sector for All SMMPA Members

Incremental Market Potential

Energy Potential (MWh)

Sector	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Residential	6,351	6,411	6,429	6,564	6,738	7,128	7,024	7,656	8,098	8,364	8,498	7,942	7,945	7,903	7,812
Commercial	5,224	4,642	4,709	4,856	5,211	6,062	7,220	8,734	9,744	9,874	9,859	10,310	10,350	10,381	10,404
Industrial & Agriculture	8,928	8,605	8,185	7,999	8,119	8,780	9,964	11,140	11,226	10,535	9,794	9,036	8,407	7,835	7,311
Load Management	1,510	1,543	1,571	1,604	1,631	1,661	1,685	1,719	1,749	1,780	1,807	1,844	1,877	1,910	1,936
Total All Buildings	**22,013**	**21,201**	**20,894**	**21,022**	**21,700**	**23,631**	**25,893**	**29,249**	**30,816**	**30,552**	**29,958**	**29,132**	**28,579**	**28,028**	**27,462**
% of Forecast Sales	0.72%	0.68%	0.66%	0.65%	0.66%	0.71%	0.77%	0.86%	0.89%	0.87%	0.84%	0.80%	0.77%	0.75%	0.72%
Utility Re-Participation	5,510	5,735	4,151	2,915	3,238	3,703	3,109	3,789	6,863	6,361	8,003	7,584	7,816	8,496	8,774
Program Goal (includes Re-participation)	**27,523**	**26,935**	**25,045**	**23,937**	**24,938**	**27,334**	**29,002**	**33,038**	**37,679**	**36,913**	**37,961**	**36,715**	**36,395**	**36,524**	**36,237**
% of Forecast Sales (incremental & re-participation)	**0.90%**	**0.87%**	**0.79%**	**0.74%**	**0.76%**	**0.82%**	**0.86%**	**0.97%**	**1.09%**	**1.05%**	**1.06%**	**1.01%**	**0.99%**	**0.97%**	**0.95%**
Codes & Standards	9,915	11,124	11,099	10,797	10,629	10,563	14,979	15,838	15,554	15,134	13,253	12,786	12,730	12,524	12,342
Program Goal (includes Re-participation and C&S)	**37,438**	**38,060**	**36,144**	**34,734**	**35,566**	**37,897**	**43,980**	**48,876**	**53,234**	**52,047**	**51,214**	**49,501**	**49,125**	**49,049**	**48,579**
Incremental & Re-participation & Codes and Standard Effects as % of Forecast	**1.23%**	**1.23%**	**1.14%**	**1.08%**	**1.09%**	**1.14%**	**1.31%**	**1.43%**	**1.54%**	**1.48%**	**1.43%**	**1.36%**	**1.33%**	**1.31%**	**1.28%**

Demand Potential (kW)

Sector	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Residential	1,975	1,638	1,728	1,853	2,079	2,543	3,033	3,704	4,249	4,626	4,902	5,040	5,154	5,185	5,128
Commercial	1,244	1,115	1,107	1,135	1,212	1,401	1,650	1,971	2,181	2,191	2,170	2,131	2,106	2,080	2,053
Industrial & Agriculture	1,716	1,649	1,590	1,561	1,600	1,753	2,022	2,286	2,332	2,215	2,083	1,943	1,824	1,714	1,613
Load Management	35,782	36,540	37,209	37,984	38,638	39,333	39,900	40,700	41,416	42,143	42,771	43,651	44,452	45,212	45,832
Total All Buildings*	**4,935**	**4,402**	**4,425**	**4,549**	**4,892**	**5,697**	**6,705**	**7,960**	**8,762**	**9,033**	**9,155**	**9,114**	**9,084**	**8,979**	**8,794**
% of Forecast Sales*	**0.73%**	**0.64%**	**0.63%**	**0.64%**	**0.67%**	**0.77%**	**0.89%**	**1.04%**	**1.12%**	**1.14%**	**1.14%**	**1.11%**	**1.08%**	**1.05%**	**1.02%**
Utility Re-Participation	1,019	1,093	846	579	513	620	878	1,152	2,043	2,036	2,571	2,801	2,432	2,946	3,232
Program Goal (includes Re-participation)	**5,954**	**5,495**	**5,270**	**5,128**	**5,405**	**6,317**	**7,583**	**9,113**	**10,806**	**11,069**	**11,726**	**11,915**	**11,516**	**11,925**	**12,026**
% of Forecast Sales (incremental & re-participation)*	**0.88%**	**0.80%**	**0.75%**	**0.72%**	**0.74%**	**0.85%**	**1.01%**	**1.19%**	**1.38%**	**1.39%**	**1.45%**	**1.45%**	**1.37%**	**1.40%**	**1.39%**
Codes & Standards	1,823	4,204	4,199	4,146	4,100	4,090	4,970	5,146	5,096	5,046	4,517	4,257	4,242	4,213	4,183
Program Goal (includes Re-participation and C&S)	**7,777**	**9,699**	**9,469**	**9,273**	**9,505**	**10,407**	**12,553**	**14,259**	**15,902**	**16,115**	**16,243**	**16,172**	**15,758**	**16,138**	**16,210**
Incremental & Re-participation & Codes and Standard Effects as % of Forecast*	**1.15%**	**1.41%**	**1.35%**	**1.30%**	**1.31%**	**1.40%**	**1.67%**	**1.86%**	**2.04%**	**2.03%**	**2.01%**	**1.97%**	**1.88%**	**1.89%**	**1.88%**

* The totals and percentages do not include Load Management

Table VII-11 also provides estimates of savings resulting from the implementation of enhanced Codes and Standards. The EERAM model accounts for known code and standard changes planned at the time of the study and reflects those changes as a percent change to the savings for those measures in future years. For example, if a code change reduced the savings of a measure by 50% in 2017, the DSM program measure would reflect 100% of the savings in years 2014 – 2016, but in years 2017 and beyond 50% of the savings would be attributed to the DSM measure and the other 50% to codes and standards. Known changes for the current study included such items as lighting impacts due to lamp discontinuation and efficiency requirements under the Energy Independence and Security Act of 2007, heating, ventilation and air-conditioning (HVAC) efficiency improvements, new motor efficiency standards, and increases in appliance efficiency standards. Utilities, including SMMPA, participate in working groups to educate and promote more stringent codes and standards. It is important to try and estimate the impact this has upon existing DSM measure offerings and similar to re-participation savings, understand and capture the impacts of these changes on system optimization. The forecast of Code and Standard energy and capacity savings potential is shown in Table VII-11 in the rows labeled "Codes & Standards".

The combination of these forecasts from the building sectors, re-participation, and Codes and Standards provides the incremental market or achievable potential for the study horizon base case. Table VII-12 lists the achievable/market potential energy and demand forecasts, by year, for the planning horizon. As a benchmark, Table VII-12 also lists the incremental energy and demand as a percent of SMMPA's forecast load. For example, the forecasted incremental energy savings for 2014 is 37,438 MWh. This savings represents 1.23% of SMMPA's forecasted energy requirement for 2014. Incremental energy savings over the planning horizon ranges from an estimated low of 34,734 MWh in 2017 to an estimated high of 53,234 MWh in 2022. The percent of forecasted energy sales ranges from an estimated low of just over 1% of sales (1.08%) in 2017, to an estimated high of 1.54% in 2022. Across the planning horizon, cumulative forecasted energy saved is 665,445 MWh. The average of forecasted savings as a percent of forecasted energy sales is 1.29% over the 15-year planning horizon.

Table VII-12 Base Case Achievable Potential for All SMMPA Members

Year	Forecast Annual Incremental Energy Potential MWh	Incremental Energy Potential As A % of Forecast Load	Forecast Incremental Demand Potential kW[1]	Incremental Demand Potential As A % of Forecast Load[1]
2014	37,438	1.23%	7,777	1.15%
2015	38,060	1.23%	9,699	1.41%
2016	36,144	1.14%	9,469	1.35%
2017	34,734	1.08%	9,273	1.30%
2018	35,566	1.09%	9,505	1.31%
2019	37,897	1.14%	10,407	1.40%
2020	43,980	1.31%	12,553	1.67%
2021	48,876	1.43%	14,259	1.86%
2022	53,234	1.54%	15,902	2.04%
2023	52,047	1.48%	16,115	2.03%
2024	51,214	1.43%	16,243	2.01%
2025	49,501	1.36%	16,172	1.97%
2026	49,125	1.33%	15,758	1.88%
2027	49,049	1.31%	16,138	1.89%
2028	48,579	1.28%	16,210	1.88%

[1] The totals and percentages do not include load management

Table VII-12 includes demand savings potential from both CROD and Non-CROD members. Forecasted incremental demand for the combined SMMPA members ranges from a low of 7,777 kW in 2014 to a high of 16,243 in 2024. In integrating technical potential study savings into the IRP modeling, only potential energy savings from the CROD members was included since the demand savings potential from investments in DSM measures in CROD members is realized by the CROD member, not SMMPA (as previously described).

Tables VII-13 through VII-16 provide Base Case forecast savings for the top 20 highest energy producing measures for the initial (2014) and final (2028) program years for both CROD and Non-CROD member analysis. Additional information on individual measures can be found in the summary narrative describing the current technical potential screening found in Appendix A. The following tables also identify the market segment in addition to the specific efficiency measure. For example, the acronym SFE stands for single family existing, MFE stands for multifamily existing, Com stands for commercial, and IND stands for industrial market segments.

Table VII-13 Top 20 Measures in 2014: CROD Base Case

Rank	Top Twenty Measures - 2014	2014 - Energy Savings (MWh)	2014 - Demand Savings (KW)	Energy % of Total	Demand % of Total
1	SFE - Home Energy Report	1,924	0	19.0%	0.0%
2	Com - VSD - For HVAC Fans	1,815	437	18.0%	16.5%
3	IND - VSD - For HVAC Fans	1,317	317	13.0%	12.0%
4	SFE - Recycle Refrigerator	482	55	4.8%	2.1%
5	Com - T12-T8 4ft	412	118	4.1%	4.5%
6	IND - T12-T8 8ft	292	29	2.9%	1.1%
7	IND - T12-T8 4ft	274	53	2.7%	2.0%
8	IND - Low Wattage T8 - 4ft	253	49	2.5%	1.9%
9	IND - T8 Linear fluorescent delamping 4 ft	230	45	2.3%	1.7%
10	IND - High bay fluorescent	206	40	2.0%	1.5%
11	SFE - Hardwired CFL Fixtures	196	19	1.9%	0.7%
12	Com - Compressed Air Leak Correction	181	38	1.8%	1.4%
13	IND - Occupancy Sensor - Motion	180	35	1.8%	1.3%
14	Com - Low Wattage T8 - 4ft	168	48	1.7%	1.8%
15	Com - Occupancy Sensor - Motion (for Premium T8s only)	133	38	1.3%	1.4%
16	SFE - CFL 13W-18W - Replacing 60W Incandescent	126	12	1.2%	0.5%
17	SFE - ECM Furnace Fan Motor	121	323	1.2%	12.2%
18	SFE - HVAC Quality Installation	107	285	1.1%	10.8%
19	IND - Time Clock Lighting Controls	82	0	0.8%	0.0%
20	IND - Compressed Air Leak Correction	77	11	0.8%	0.4%
	Top 20 Total	**8,577**	**1,950**	**84.9%**	**73.8%**

Table VII-14 Top 20 Measures in 2014: Non-CROD Base Case

Rank	Top Twenty Measures - 2014	2014 - Energy Savings (MWh)	2014 - Demand Savings (KW)	Energy % of Total	Demand % of Total
1	IND - VSD - For HVAC Fans	2,108	507	20.3%	22.1%
2	SFE - Home Energy Report	1,533	0	14.7%	0.0%
3	Com - VSD - For HVAC Fans	860	207	8.3%	9.0%
4	IND - T12-T8 8ft	524	51	5.0%	2.2%
5	IND - T12-T8 4ft	491	96	4.7%	4.2%
6	IND - Low Wattage T8 - 4ft	475	92	4.6%	4.0%
7	Com - Compressed Air Leak Correction	434	91	4.2%	4.0%
8	IND - T8 Linear fluorescent delamping 4 ft	402	78	3.9%	3.4%
9	IND - High bay fluorescent	355	69	3.4%	3.0%
10	SFE - Recycle Refrigerator	355	41	3.4%	1.8%
11	IND - Occupancy Sensor - Motion	321	62	3.1%	2.7%
12	Com - T12-T8 4ft	219	62	2.1%	2.7%
13	SFE - Hardwired CFL Fixtures	205	20	2.0%	0.9%
14	IND - Time Clock Lighting Controls	145	0	1.4%	0.0%
15	SFE - CFL 13W-18W - Replacing 60W Incandescent	134	13	1.3%	0.6%
16	IND - Compressed Air Leak Correction	131	18	1.3%	0.8%
17	IND - CFL Fixture 16 to 24W	123	11	1.2%	0.5%
18	SFE - HVAC Quality Installation	96	255	0.9%	11.1%
19	IND - CFL: >25W Screw-In Indoor	94	11	0.9%	0.5%
20	Com - Low Wattage T8 - 4ft	91	26	0.9%	1.1%
	Top 20 Total	**9,098**	**1,711**	**87.5%**	**74.5%**

Table VII-15 Top 20 Measures in 2028: CROD Base Case

Rank	Top Twenty Measures - 2028	2028 - Energy Savings (MWh)	2028 - Demand Savings (KW)	Energy % of Total	Demand % of Total
1	Com - VSD - For HVAC Fans	3,300	794	22.7%	15.8%
2	SFE - Home Energy Report	1,924	0	13.2%	0.0%
3	IND - VSD - For HVAC Fans	1,839	442	12.7%	8.8%
4	SFE - Hardwired LED Fixtures	738	70	5.1%	1.4%
5	Com - Parallel Rack	577	0	4.0%	0.0%
6	SFE - Recycle Refrigerator	564	64	3.9%	1.3%
7	SFE - HVAC Quality Installation	550	1,464	3.8%	29.1%
8	IND - Low Wattage T8 - 4ft	442	86	3.0%	1.7%
9	Com - High Evaporator Temp Cases	377	0	2.6%	0.0%
10	Com - Compressed Air Leak Correction	372	78	2.6%	1.6%
11	Com - High Eff Glass Door	328	0	2.3%	0.0%
12	Com - Occupancy Sensor - Motion (for Premium T8s only)	294	84	2.0%	1.7%
13	Com - Low Wattage T8 - 4ft	271	77	1.9%	1.5%
14	Com - LED Luminaire: 16-24 Watt Interior	250	44	1.7%	0.9%
15	SFE - ECM Furnace Fan Motor	240	638	1.7%	12.7%
16	Com - 320W Pulse Start Metal Halide	168	48	1.2%	1.0%
17	MFE - HVAC Quality Installation	146	389	1.0%	7.7%
18	SFE - Recycle Freezer	140	16	1.0%	0.3%
19	IND - Occupancy Sensor - Motion	132	26	0.9%	0.5%
20	Com - Daylighting - Continuous Dimming	96	28	0.7%	0.5%
	Top 20 Total	**12,749**	**4,347**	**87.8%**	**86.5%**

Table VII-16 Top 20 Measures in 2028: Non-CROD Base Case

Rank	Top Twenty Measures - 2028	2028 - Energy Savings (MWh)	2028 - Demand Savings (KW)	Energy % of Total	Demand % of Total
1	IND - VSD - For HVAC Fans	2,763	665	25.1%	17.6%
2	Com - VSD - For HVAC Fans	1,572	378	14.3%	10.0%
3	SFE - Home Energy Report	1,533	0	13.9%	0.0%
4	Com - Compressed Air Leak Correction	921	193	8.4%	5.1%
5	IND - Low Wattage T8 - 4ft	813	158	7.4%	4.2%
6	SFE - HVAC Quality Installation	430	1,144	3.9%	30.3%
7	SFE - Recycle Refrigerator	402	46	3.7%	1.2%
8	Com - Parallel Rack	243	0	2.2%	0.0%
9	Com - High Evaporator Temp Cases	164	0	1.5%	0.0%
10	Com - Low Wattage T8 - 4ft	146	42	1.3%	1.1%
11	Com - Occupancy Sensor - Motion (for Premium T8s only)	144	41	1.3%	1.1%
12	Com - High Eff Glass Door	138	0	1.3%	0.0%
13	IND - Occupancy Sensor - Motion	131	25	1.2%	0.7%
14	MFE - HVAC Quality Installation	114	304	1.0%	8.1%
15	IND - LED Luminaire: 16-24 Watt Interior	102	9	0.9%	0.2%
16	SFE - ECM Furnace Fan Motor	102	271	0.9%	7.2%
17	SFE - Recycle Freezer	94	11	0.9%	0.3%
18	Com - 320W Pulse Start Metal Halide	90	26	0.8%	0.7%
19	IND - T12-T8 8ft	76	7	0.7%	0.2%
20	IND - T12-T8 4ft	71	14	0.6%	0.4%
	Top 20 Total	**10,049**	**3,334**	**91.3%**	**88.4%**

In Chapter VI – Resource Capabilities, our extensive suite of DSM programs is described. Included in that suite is a set of behavioral initiatives being conducted in the residential sector – Home Energy Reports. Three SMMPA member utilities, Austin Utilities, Owatonna Public Utilities, and Rochester Public Utilities have been participating with OPower to provide home energy reports. Beginning in 2012, SMMPA began working with Enerlyte to develop a home energy reporting program for the remaining 15 SMMPA member utilities. Actual member implementation with the 15 utilities began in late 2012 and all but one member is currently operating the program. That remaining member is planning that integration in the spring of 2014. Subsequent to initiating an agreement with Enerlyte, the State of Minnesota altered the way it allows utilities to claim behavioral program savings in the Minnesota Conservation Improvement Program (CIP) program. Currently, only one-third of the savings identified via measurement and verification (M&V) are allowed to be counted in CIP program compliance filings. All of the forecasted savings in the Base Scenario only count 1/3 of the anticipated behavioral program savings. Navigant modified the EERAM model used for the SMMPA analysis to assess the impact of counting 100% of the program savings.

Table VII-17, on the following page, provides the same incremental achievable/market potential as shown in Table VII-12 above except that 100% of the behavioral savings were counted. Energy savings range from a low of 41,754 MWh in 2017 to a high of 60,254 MWh in 2022. Forecasted annual energy savings as a percentage of forecast annual sales ranged from a low of 1.30% in 2017 and 2018 to a high of 1.74% in 2022. The average percentage energy savings across the study period was 1.5%. Table VII-17 does not present any changes in forecast demand because the behavioral program does not assume any capacity savings. We recognize that behavioral programs are relatively new to Minnesota and there is much to be learned. However, even though we consider them to only have a one year measure life, we believe that they play an important role in the mix of longer lived resources and in fact, can be a cost effective means of encouraging those longer lived investments if full savings are allowed. To obtain those savings, we are required to make the full annual investment in the program. When only one-third of the program saving are allowed to be counted, effectively the total resource cost tests are impacted, falling below the 0.75 value that we typically use to determine whether or not to proceed with program design and implementation (TRC values can be found in Table E-1 in the summary narrative found in Appendix A). SMMPA recognizes that the Division of Energy Resources (DER) is interested in further long term evaluation. However, since M&V is required to substantiate our energy savings, we would hope that the DER and the Minnesota Public Utilities Commission (MPUC) would reconsider claiming 100% of the energy savings.

Table VII-17 Base Case Achievable Potential for All SMMPA Members

(Includes Forecast for 100% of Behavioral Savings)

Year	Forecast Annual Incremental Energy Potential MWh	Incremental Energy Potential As A % of Forecast Load	Forecast Incremental Demand Potential kW[1]	Incremental Demand Potential As A % of Forecast Load[1]
2014	44,458	1.46%	7,777	1.15%
2015	45,080	1.45%	9,699	1.41%
2016	43,164	1.36%	9,469	1.35%
2017	41,754	1.30%	9,273	1.30%
2018	42,586	1.30%	9,505	1.31%
2019	44,917	1.35%	10,407	1.40%
2020	51,000	1.52%	12,553	1.67%
2021	55,896	1.64%	14,259	1.86%
2022	60,254	1.74%	15,902	2.04%
2023	59,067	1.68%	16,115	2.03%
2024	58,234	1.63%	16,243	2.01%
2025	56,521	1.56%	16,172	1.97%
2026	56,145	1.52%	15,758	1.88%
2027	56,068	1.50%	16,138	1.89%
2028	55,599	1.46%	16,210	1.88%

[1] The totals and percentages do not include load management

Full (1.5%) DSM Scenario

As described above, the Base Case Scenario (which assumes only counting one-third of behavioral program savings) while always above 1.0% of forecast savings to forecast load, it only hits the 1.5% target in one year of the planning horizon (2022). In the Order accepting SMMPA's 2009 Integrated Resource Plan, the MPUC required that SMMPA's next resource plan include a sensitivity evaluating the cost effectiveness of including energy savings equal to 1.5% of retail sales.

While the EERAM model is designed to take known program inputs and produce a business as usual forecast, SMMPA worked with Navigant to modify several characteristics in the model to produce an estimate to achieve 1.5% program savings. The model changes affected two areas; 1) program adoptions and 2) measure incentives.

There were two significant changes made in the area of predicting customer program adoption. First, the "willingness and awareness" upper bound coefficients in the EERAM model were increased from 0.85 to 0.9. In effect this change makes more base technologies available for program participation/adoption. The second change was to alter the EERAM model calibration. To calibrate the model for the base – business as usual case – we used an average percent of sales for residential and commercial and industrial from 2011 and 2012. That average was 1.9% and 1.46% of sales for residential and commercial/industrial, respectively. For the Full (1.5%) DSM Scenario modification, that calibration was set to 2% for each sector. This change means that the scenario assumption starts with assuming we can achieve a higher savings level than in the most two recent years, and that customers will be more knowledgeable regarding efficient technologies and therefore more willing to adopt and implement those technologies. For this to occur, SMMPA would need to engage in very aggressive marketing. Additional marketing efforts may or may not be able to drive such additional customer adoptions or savings. SMMPA members already have a very aggressive and innovative marketing program. As described in Chapter VI, SMMPA has adopted a very innovative database marketing strategy using Constant Contact to tailor and deliver specific measure content to members' commercial and industrial customers. Whether or not this effort can be made more effective is unknown. Additionally, SMMPA members have not restricted annual program participation based upon reaching goals or budgets. Efficiency purchases are rarely spontaneous – especially for expensive products and equipment. We recognize that customer adoption is a lengthy process of educating, building awareness, incenting with the successful culmination in the customer budgeting and making high-efficiency purchases. This cycle, particularly in the commercial/industrial segment, is likely to require more than one budget cycle. Consequently, our program seeks to ensure that when the customer is ready to make that investment, we are there with incentives to encourage the purchase of efficient equipment. This has worked well for SMMPA members. As illustrated in Table VII-18 below, SMMPA has been very successful in achieving program savings, exceeding CIP targets since 2010, the first year with an energy savings goal. Given these strong results, it is difficult to determine if marketing can be enhanced sufficiently to continually achieve the Full (1.5%) DSM

Table VII-18

2009 - 2012 CIP Program Results for All SMMPA Members

CIP Year	Aggregated kWh Saved/ kWh Sales
2009	1.33%
2010	1.70%
2011	1.64%
2012	1.70%

Scenario.

The second change to produce the Full (1.5%) DSM Scenario was to increase incentives. While there are exceptions where SMMPA pays a higher incentive to promote a specific technology, in general our average incentives are about 50% of the incremental cost of the high-efficient technology. For the Full (1.5%) DSM Scenario, the incentives were increased beginning in 2017 from 50% of incremental cost to 75% of incremental cost. Table VII-19, below, provides the incremental Market/Achievable Potential for all SMMPA members. Forecasted annual incremental energy savings ranges from a low of 44,795 MWh in 2015, to a high of 68,104 MWh in 2022. Forecasted energy savings as a percent of forecasted load ranges from a low of 1.44% of forecasted sales in 2015 to a high of 1.96% of forecasted sales in 2022. The average throughout the forecast period is 1.68%.

Tables VII-20 through VII-23 provide the Full (1.5%) DSM Scenario forecast savings for the top 20 highest energy producing measures for the initial (2014) and final (2028) program years for both CROD and Non-CROD member analysis. Additional information on individual measures can be found in the summary narrative describing the current technical potential screening found in Appendix A. The following tables also identify the market segment in addition to the specific efficiency measure. For example, the acronym SFE stands for single family existing, MFE stands for multifamily existing, Com stands for commercial, and IND stands for industrial market segments.

Table VII-19 Full (1.5%) Scenario Achievable Potential for All SMMPA Members

Year	Forecast Annual Incremental Energy Potential MWh	Incremental Energy Potential As A % of Forecast Load	Forecast Incremental Demand Potential kW[1]	Incremental Demand Potential As A % of Forecast Load[1]
2014	45,547	1.49%	17,019	2.53%
2015	44,795	1.44%	18,577	2.70%
2016	47,877	1.51%	21,145	3.02%
2017	46,655	1.45%	21,233	2.97%
2018	49,181	1.51%	22,602	3.10%
2019	54,591	1.65%	25,482	3.44%
2020	62,013	1.84%	29,404	3.91%
2021	65,775	1.93%	31,426	4.10%
2022	68,104	1.96%	32,467	4.16%
2023	65,537	1.86%	32,079	4.04%
2024	62,986	1.76%	31,441	3.90%
2025	63,561	1.75%	31,409	3.82%
2026	61,393	1.66%	29,982	3.58%
2027	61,893	1.65%	33,609	3.94%
2028	60,572	1.59%	32,751	3.79%

[1] The totals and percentages do not include load management

Table VII-20 Top 20 Measures in 2014: CROD Full (1.5%) Scenario

Rank	Top Twenty Measures - 2014	2014 - Energy Savings (MWh)	2014 - Demand Savings (KW)	Energy % of Total	Demand % of Total
1	IND - VSD - For HVAC Fans	2,623	631	18.9%	8.7%
2	SFE - Home Energy Report	1,924	0	13.8%	0.0%
3	Com - VSD - For HVAC Fans	1,816	437	13.1%	6.0%
4	SFE - ECM Furnace Fan Motor	1,334	3,549	9.6%	48.9%
5	SFE - Hardwired CFL Fixtures	708	67	5.1%	0.9%
6	SFE - Recycle Refrigerator	571	65	4.1%	0.9%
7	SFE - CFL 13W-18W - Replacing 60W Incandescent	420	40	3.0%	0.5%
8	Com - T12-T8 4ft	412	118	3.0%	1.6%
9	MFE - ECM Furnace Fan Motor	378	1,004	2.7%	13.8%
10	IND - T12-T8 8ft	209	20	1.5%	0.3%
11	IND - T12-T8 4ft	195	38	1.4%	0.5%
12	Com - Compressed Air Leak Correction	181	38	1.3%	0.5%
13	IND - Low Wattage T8 - 4ft	173	34	1.2%	0.5%
14	Com - Low Wattage T8 - 4ft	168	48	1.2%	0.7%
15	IND - T8 Linear fluorescent delamping 4 ft	168	33	1.2%	0.4%
16	IND - High bay fluorescent	151	29	1.1%	0.4%
17	Com - Occupancy Sensor - Motion (for Premium T8s only)	133	38	1.0%	0.5%
18	IND - Occupancy Sensor - Motion	129	25	0.9%	0.3%
19	SFE - CFL 18W-25W - Replacing 75W Incandescent	122	12	0.9%	0.2%
20	SFE - HVAC Quality Installation	112	297	0.8%	4.1%
	Top 20 Total	**11,926**	**6,523**	**85.7%**	**89.9%**

Table VII-21 Top 20 Measures in 2014: Non-CROD Full (1.5%) Scenario

Rank	Top Twenty Measures - 2014	2014 - Energy Savings (MWh)	2014 - Demand Savings (KW)	Energy % of Total	Demand % of Total
1	IND - VSD - For HVAC Fans	5,239	1,260	35.6%	18.2%
2	SFE - Home Energy Report	1,533	0	10.4%	0.0%
3	SFE - ECM Furnace Fan Motor	1,169	3,110	8.0%	44.9%
4	Com - VSD - For HVAC Fans	860	207	5.9%	3.0%
5	SFE - Hardwired CFL Fixtures	528	50	3.6%	0.7%
6	SFE - Recycle Refrigerator	501	57	3.4%	0.8%
7	Com - Compressed Air Leak Correction	434	91	3.0%	1.3%
8	MFE - ECM Furnace Fan Motor	332	882	2.3%	12.7%
9	SFE - CFL 13W-18W - Replacing 60W Incandescent	321	30	2.2%	0.4%
10	IND - T12-T8 8ft	300	29	2.0%	0.4%
11	IND - T12-T8 4ft	281	55	1.9%	0.8%
12	IND - Low Wattage T8 - 4ft	249	48	1.7%	0.7%
13	IND - T8 Linear fluorescent delamping 4 ft	241	47	1.6%	0.7%
14	Com - T12-T8 4ft	219	62	1.5%	0.9%
15	IND - High bay fluorescent	217	42	1.5%	0.6%
16	IND - Occupancy Sensor - Motion	185	36	1.3%	0.5%
17	IND - Compressed Air Leak Correction	158	22	1.1%	0.3%
18	IND - Premium Efficiency Motor 1800 RPM ODP	118	34	0.8%	0.5%
19	SFE - HVAC Quality Installation	101	269	0.7%	3.9%
20	SFE - CFL 18W-25W - Replacing 75W Incandescent	96	9	0.7%	0.1%
	Top 20 Total	**13,083**	**6,341**	**89.0%**	**91.6%**

Table VII-22 Top 20 Measures in 2028: CROD Full (1.5%) Scenario

Rank	Top Twenty Measures - 2028	2028 - Energy Savings (MWh)	2028 - Demand Savings (KW)	Energy % of Total	Demand % of Total
1	Com - VSD - For HVAC Fans	3,725	896	19.8%	7.9%
2	IND - VSD - For HVAC Fans	2,546	612	13.5%	5.4%
3	SFE - Home Energy Report	1,924	0	10.2%	0.0%
4	SFE - ECM Furnace Fan Motor	1,530	4,071	8.1%	36.1%
5	MFE - ECM Furnace Fan Motor	860	2,288	4.6%	20.3%
6	SFE - Hardwired LED Fixtures	839	80	4.5%	0.7%
7	Com - Parallel Rack	732	0	3.9%	0.0%
8	SFE - Recycle Refrigerator	670	76	3.6%	0.7%
9	SFE - HVAC Quality Installation	606	1,612	3.2%	14.3%
10	Com - High Evaporator Temp Cases	447	0	2.4%	0.0%
11	Com - Compressed Air Leak Correction	400	84	2.1%	0.7%
12	Com - High Eff Glass Door	398	0	2.1%	0.0%
13	IND - Low Wattage T8 - 4ft	343	67	1.8%	0.6%
14	Com - Occupancy Sensor - Motion (for Premium T8s only)	335	96	1.8%	0.8%
15	Com - Low Wattage T8 - 4ft	328	93	1.7%	0.8%
16	Com - LED Luminaire: 16-24 Watt Interior	299	52	1.6%	0.5%
17	Com - 320W Pulse Start Metal Halide	204	58	1.1%	0.5%
18	MFE - HVAC Quality Installation	161	428	0.9%	3.8%
19	SFE - Recycle Freezer	144	16	0.8%	0.1%
20	IND - Occupancy Sensor - Motion	139	27	0.7%	0.2%
	Top 20 Total	**16,633**	**10,558**	**88.5%**	**93.6%**

Table VII-23 Top 20 Measures in 2028: Non-CROD Full (1.5%) Scenario

Rank	Top Twenty Measures - 2028	2028 - Energy Savings (MWh)	2028 - Demand Savings (KW)	Energy % of Total	Demand % of Total
1	IND - VSD - For HVAC Fans	3,434	826	23.6%	8.9%
2	Com - VSD - For HVAC Fans	1,775	427	12.2%	4.6%
3	SFE - Home Energy Report	1,533	0	10.5%	0.0%
4	SFE - ECM Furnace Fan Motor	1,204	3,202	8.3%	34.7%
5	Com - Compressed Air Leak Correction	991	208	6.8%	2.3%
6	MFE - ECM Furnace Fan Motor	759	2,018	5.2%	21.9%
7	SFE - Recycle Refrigerator	574	65	3.9%	0.7%
8	IND - Low Wattage T8 - 4ft	493	96	3.4%	1.0%
9	SFE - HVAC Quality Installation	466	1,239	3.2%	13.4%
10	Com - Parallel Rack	278	0	1.9%	0.0%
11	IND - Occupancy Sensor - Motion	194	38	1.3%	0.4%
12	Com - High Evaporator Temp Cases	192	0	1.3%	0.0%
13	Com - Low Wattage T8 - 4ft	177	50	1.2%	0.5%
14	Com - High Eff Glass Door	165	0	1.1%	0.0%
15	Com - Occupancy Sensor - Motion (for Premium T8s only)	161	46	1.1%	0.5%
16	IND - T12-T8 8ft	145	14	1.0%	0.2%
17	IND - T12-T8 4ft	135	26	0.9%	0.3%
18	MFE - HVAC Quality Installation	124	329	0.8%	3.6%
19	IND - LED Luminaire: 16-24 Watt Interior	119	11	0.8%	0.1%
20	Com - 320W Pulse Start Metal Halide	109	31	0.8%	0.3%
	Top 20 Total	**13,028**	**8,628**	**89.5%**	**93.4%**

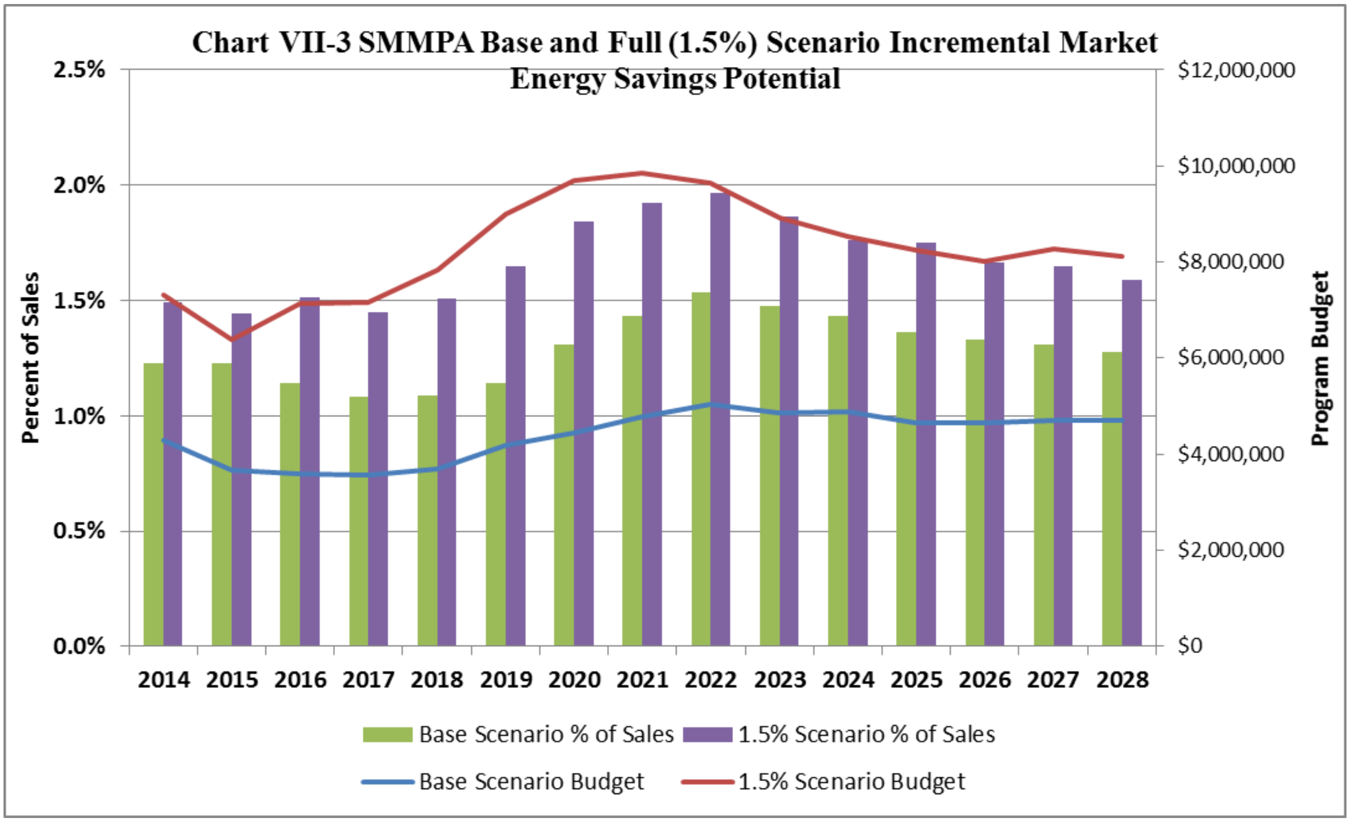


Chart VII-3 above shows the forecast percent of savings from both the Base Case and the Full (1.5%) DSM Scenario case, as well as the projected budgets for the two scenarios. The left axis shows the forecast energy savings as a percent of forecast energy sales. The right axis shows the annual budget anticipated to reach the forecast level of savings. The Base Case forecast has a beginning budget in 2014 of approximately $4.3 million and an ending budget in 2028 of approximately $4.7 million (total budget of approximately $65.8 million over the study period). On average, the Base Case energy savings forecast averaged approximately 1.29% of forecast energy sales. The Full (1.5%) DSM Scenario case forecast has a beginning budget of approximately $7.3 million and an ending budget in 2028 of approximately $8.1 million (total budget of approximately $124 million over the study period). On average, the Full (1.5%) DSM Scenario energy savings forecast averaged approximately 1.68% of forecast energy sales. That is, if SMMPA was able to achieve the Full (1.5%) DSM Scenario forecast energy sales by significantly increasing its marketing/adoption performance and incentives, on average the result would be approximately a 30% increase in energy savings, yet the budget would need to increase by approximately 89%. As discussed earlier, SMMPA already has a very aggressive marketing program that has yielded actual energy savings in excess of the CIP goal. Whether or not we could realistically push those market adoptions even harder, particularly 15 years into the future, is highly speculative. What the Full (1.5%) DSM Scenario tells us is something that SMMPA already recognizes, if we can continue to achieve additional savings we can spend additional resources and accomplish that cost effectively. Given the significant increases in budget required by the Full (1.5%) DSM Scenario, SMMPA recommends that we continue with our successful past practice. That is, to continue aggressively marketing our efficiency measures, many of which have been nationally recognized, with the goal of reaching and exceeding, if possible, the 1.5% target. We will continue to monitor our performance and adjust our programs as necessary.

Demand-Side Measure Integration

As mentioned previously, for integration purposes, forecast energy savings for both the CROD and Non-CROD Study groups were incorporated. However, only demand savings from the Non-CROD study group was incorporated into the integration, reflecting that SMMPA receives no capacity benefit from measures installed in a CROD member utility[3]. Table VII-24 below shows the cumulative Achievable/Market potential inputs to that integration for the Base Case. Table

Table VII-24 SMMPA Base Case Achievable Potential for Aurora® Model Integration
Includes Energy Savings for All Members & Demand Savings for Non-CROD Members

Year	Residential Lighting		Residential Other		C&I Lighting		C&I Other		All DSM Programs	
	Energy Savings (MWh)	Demand Savings (kW)	Energy Savings (MWh)	Demand Savings (kW)	Energy Savings (MWh)	Demand Savings (kW)	Energy Savings (MWh)	Demand Savings (kW)	Energy Savings (MWh)	Demand Savings (kW)
2014	7,699	380	8,097	16,844	24,549	2,283	25,129	7,818	65,474	27,325
2015	11,982	566	11,640	18,985	35,239	3,297	39,673	9,523	98,533	32,371
2016	17,147	804	15,312	21,166	45,125	4,266	52,065	10,941	129,649	37,176
2017	22,556	1,071	19,314	23,467	52,919	4,961	64,533	12,383	159,322	41,882
2018	27,593	1,301	23,671	25,793	61,158	5,679	77,378	13,853	189,800	46,626
2019	32,639	1,530	28,200	28,275	69,953	6,440	91,787	15,501	222,578	51,747
2020	41,824	1,943	33,358	31,116	80,898	7,455	105,337	17,255	261,416	57,769
2021	51,371	2,347	39,033	34,336	93,530	8,599	121,181	19,310	305,116	64,593
2022	60,857	2,748	45,051	37,769	106,314	9,733	140,920	21,591	353,143	71,840
2023	70,082	3,137	51,345	41,434	118,338	10,805	160,187	23,894	399,952	79,270
2024	78,301	3,484	57,765	45,147	130,111	11,868	179,726	26,492	445,903	86,990
2025	85,801	3,758	63,944	48,975	140,606	12,767	199,752	28,978	490,103	94,478
2026	93,341	4,032	69,835	52,747	151,313	13,661	219,404	31,412	533,892	101,853
2027	100,765	4,300	75,836	56,602	161,937	14,554	239,035	33,825	577,574	109,282
2028	108,233	4,567	81,869	60,502	172,296	15,427	258,361	36,067	620,760	116,563

[3] Additional demand savings result from these energy efficiency investments, however those benefits accrue to the CROD member and are not available as a resource to meet SMMPA load.

VII-25 shows the Achievable/Market potential inputs to the integration for the Full (1.5%) DSM Scenario. The AURORA model was used to show the integration and optimization of the supply-side resources identified in Section VIII – potential resources with the results of the demand-side achievable potential identified in this section.

Table VII-25 SMMPA 1.5% Scenario Case Achievable Potential for Aurora® Model Integration
Includes Energy Savings for All Members & Demand Savings for Non-CROD Members

Year	Residential Lighting		Residential Other		C&I Lighting		C&I Other		All DSM Programs	
	Energy Savings (MWh)	Demand Savings (kW)	Energy Savings (MWh)	Demand Savings (kW)	Energy Savings (MWh)	Demand Savings (kW)	Energy Savings (MWh)	Demand Savings (kW)	Energy Savings (MWh)	Demand Savings (kW)
2014	11,163	506	14,769	24,797	20,654	1,835	34,630	9,454	81,215	36,592
2015	17,235	756	21,622	30,799	29,918	2,677	52,236	11,706	121,010	45,938
2016	24,953	1,092	29,449	37,837	39,225	3,556	70,232	14,027	163,859	56,512
2017	32,589	1,443	37,741	45,093	46,513	4,166	88,610	16,403	205,452	67,104
2018	39,642	1,748	46,806	52,767	54,755	4,843	108,341	18,927	249,544	78,286
2019	46,593	2,047	56,760	61,262	64,214	5,621	131,450	21,868	299,017	90,798
2020	57,077	2,506	68,185	70,851	75,822	6,660	154,803	25,040	355,887	105,057
2021	67,807	2,951	80,315	81,101	88,747	7,796	179,616	28,390	416,486	120,238
2022	78,390	3,389	92,628	91,482	101,513	8,900	206,853	31,741	479,384	135,512
2023	88,540	3,810	105,049	101,945	113,583	9,953	232,510	34,937	539,683	150,644
2024	97,533	4,182	117,421	112,245	124,923	10,919	257,528	38,281	597,405	165,627
2025	105,461	4,459	129,326	122,377	135,428	11,783	285,450	41,911	655,665	180,530
2026	113,328	4,735	140,688	132,135	146,186	12,648	311,521	45,234	711,723	194,752
2027	121,035	5,005	153,484	143,629	156,890	13,515	336,840	48,410	768,249	210,559
2028	128,751	5,275	166,029	154,778	167,463	14,378	361,185	51,302	823,427	225,733

Table VII-26 shows the integration/optimization cases developed for the current filing. Three of those cases deal specifically with DSM. The Base Case has the expected DSM from our base case analysis and is used for all other production comparisons. Case 5 is a No DSM case which was developed to illustrate the significant value that DSM provides to SMMPA, and Case 7 includes the results of the DSM Full (1.5%) DSM Scenario case.

The Base Case (including the business as usual DSM forecast energy savings averaging 1.29% of forecast sales for the study period) has a present worth value of $1,329M in 2012 dollars. Case 5 (no DSM) has a present worth value of $1,437M in 2012 dollars. That is, SMMPA costs are approximately 8% higher in the absence of the forecast base case DSM affirming the significant value to SMMPA of its DSM initiatives.

Case 7 shows the potential benefits of the Full (1.5%) DSM Scenario case if that level of savings could be realized. Case 7 is approximately 2.8% less expensive than the Base Case. This confirms what SMMPA already knows, that DSM is typically a cost-effective resource. Case 7 helps SMMPA understand some bookends for DSM planning. That is, if we could achieve the level of savings identified in the Full (1.5%) DSM Scenario case, we could expand our budget by a sizable amount and still remain cost effective. However, as we pointed out in table VII-18, very aggressive design and implementation has driven results above the 1.5% target – even in a program which has been operating since the early 1990's. The ability to continue to drive enhanced customer willingness and acceptance sufficient to actually motivate increased adoptions and achieve the Full (1.5%) DSM Scenario savings level is highly uncertain. With only a 2.8% cost advantage over a 15-year horizon, increasing our DSM budget with the assumption that the savings will materialize carries a fair degree of risk. We believe that given SMMPA's commitment to DSM and the high savings levels experienced to date, the most appropriate course is the base case approach, while continuing to aggressively pursue annual savings and targets with the objective of continuing to meet or exceed the 1.5% goal. This scenario gives us some degree of certainty that we have room to increase our DSM budget cost effectively, if we need to.

SUPPLY-SIDE AND DEMAND-SIDE INTEGRATION

The AURORA optimization model was used to integrate the supply-side resources identified in Section VIII – Potential Resources with the results of the demand-side achievable potentials identified in this Section VII. The results of the base integration analysis and sensitivity scenarios are shown in Table VII-26.

The lowest cost plan, or Base Case, produced by this integration consists of expected DSM, plus new supply-side additions including future wind turbines installed in 2021 (130 MW) and 25 MW increments of future wind in 2018, 2019, 2020, 2021, twenty-four peaking purchases (10 MW increments), and a simple-cycle combustion turbine (50 MW increments) in 2020.

Table VII-26 also shows a variety of resource plan scenarios that consist of a mix of DSM programs, high, low and base load forecasts, high and low externalities, base and high natural gas and LMP Prices, solar, no renewable resources, and no DSM resources. High and low externality scenarios refer to the ranges of the environmental externality values referenced above and discussed further in Section XII - Environmental.

The MPUC requested that SMMPA discuss the pros and cons of DSM savings impact adjustments being made to load or made available to the planning model for selection. Given that the DSM Technical Potential Screening utilizes a benefit-cost screening employing externality values, avoided costs, and escalation rates similar to the planning model, SMMPA believes both approaches to be equivalent. In historic filings, SMMPA's DSM screening output was made available as a resource for selection. All of the DSM resources given to the model were selected, and yielded the least cost case. While SMMPA new DSM screening was completely updated, it used a similar approach and generated similar types of results. With the advent of the MISO hourly market, planning with a production cost model has become central to all Agency ongoing budgeting and planning. For the current filing, that planning model was used to produce modeling runs with and without the DSM resources. The results illustrated what we would expect (as outlined earlier in Chapter VII) plans including all of the DSM resources provided to the model yielded the lowest net present value (NPV), or least-cost case.

TABLE VII-26 (Part 1)

Supply and Demand-Side Integration Sensitivity Analysis Results

AURORA Case Number	Case Description	W/O EXT PW Costs in 2012 Dollars (Million $)	WITH EXT PW Costs in 2012 Dollars (Million $)	DSM Programs Expected/Full CIP [E/F]				Renewable Resources			Peaking Purchases (10 MW)	Simple Cycle Combustion Turbine (50 MW)	Natural Gas Firing Reciprocating Engines (37 MW)
				Res Lite	Res Other	CI Lite	CI Other	Future Wind (130 MW)	Future Wind (25 MW)	SOLAR (1MW)			
Base	Base Load Forecast Low Externality Costs Base LMP Prices Base Gas Price	$1,329	$1,670	E	E	E	E	2021	2018 2019 2020 2021		24	2020	
Case 1	Base Load Forecast High Externality Costs High LMP Prices High Gas Price	$1,899	$2,368	E	E	E	E	2021	2018 2019 2020 2021		24	2020	
Case 2	High Load Forecast High Externality Costs High LMP Prices High Gas Price	$2,072	$2,725	E	E	E	E	2021	2014 2015 2016 2017		49	2018 2020 2029	
Case 3	Low Load Forecast Low Externality Costs Base LMP Prices Base Gas Price	$1,189	$1,417	E	E	E	E	2021	2020 2021 2022		3		
Case 4	Base Load Forecast Low Externality Costs High LMP Prices High Gas Price	$1,435	$1,624	E	E	E	E	2021	2018 2019 2020 2021		24	2020	
Case 5	NO DSM Base Load Forecast Low Externality Costs Base LMP Prices Base Gas Price	$1,437	$1,964					2021	2014 2015 2016 2017		61	2018 2020 2024	2029 2050
Case 6	NO RENEWABLES Base Load Forecast Low Externality Costs Base LMP Prices Base Gas Price	$1,234	$1,597	E	E	E	E				60	2020 2029	

TABLE VII-26 (Part 2)

Supply and Demand-Side Integration Sensitivity Analysis Results

AURORA Case Number	Case Description	W/O EXT PW Costs in 2012 Dollars (Million $)	WITH EXT PW Costs in 2012 Dollars (Million $)	DSM Programs Expected/Full CIP [E/F] Res Lite	Res Other	CI Lite	CI Other	Renewable Resources Future Wind (130 MW)	Future Wind (25 MW)	SOLAR (1MW)	Peaking Purchases (10 MW)	Simple Cycle Combustion Turbine (50 MW)	Natural Gas Firing Reciprocating Engines (37 MW)
Case 7	Base Load Forecast Low Externality Costs Base LMP Prices Base Gas Price	$1,292	$1,587	F	F	F	F	2021	2020		2		
Case 8	SOLAR- 1MW Base Load Forecast Low Externality Costs Base LMP Prices Base Gas Price	$1,331	$1,673	E	E	E	E	2021	2018 2019 2020 2021	2014	23	2020	
Case 9	SOLAR- 35MW-2014 Base Load Forecast Low Externality Costs Base LMP Prices Base Gas Price	$1,391	$1,746	E	E	E	E	2021	2020 2021 2022 2023		33		
Case 10	HIGH PEAKING PURCHASES Base Load Forecast Low Externality Costs Base LMP Prices Base Gas Price	$1,337	$1,678	E	E	E	E	2021	2018 2019 2020 2021		24	2020	

VIII Potential Resources

GENERAL DISCUSSION

To perform this resource planning analysis, a database of potential supply-side and demand-side alternatives was developed. As outlined in Section VII - Plan Development, a significant number of both supply and demand-side options were initially evaluated. To ensure that all potential supply-side resources were considered, SMMPA hired an independent engineering consulting firm, SAIC (formerly R.W. Beck), to perform a comprehensive analysis to determine the technically viable resource options that should be considered in this study. For each identified option, the consulting firm provided the capital and operating costs and associated operating/performance characteristics.

SUPPLY-SIDE POTENTIAL RESOURCES

The following provides a summary of the SAIC study with a discussion of those supply-side options that SMMPA used in developing the least-cost resource plan.

Nuclear Power

Nuclear power plants provide approximately 20% of the electrical energy needs of utilities throughout the United States and conventional nuclear generation is a mature and proven technology. Until recently, there have not been any new nuclear power plants ordered in the United States since the 1970's. Several new projects are now being proposed to meet the increased demand for electrical energy and the increasing demand for resources that do not emit carbon dioxide.

Typically, nuclear generating units have very high capital costs and lengthy construction periods relative to other generation options and are best suited for base load duty. Cycling and load following operations are typically detrimental to the economics of large nuclear units and such service increases maintenance requirements and costs considerably.

Based on SAIC's screening analysis, the following nuclear generator was considered in developing the least-cost resource plan:

- A nuclear reactor plant with a site rating of 2,236 MW (For study purposes, a 50 MW joint-ownership is assumed to be consistent with the ownership size of the nuclear plant option.)

Supercritical Pulverized Coal

Coal-fired power plants are the mainstay of most utilities throughout the United States, and conventional coal-fired generation is a mature and proven technology. Typically, coal-fired generating units have high capital costs and lengthy construction periods relative to other generation options, and are best suited for baseload duty.

Pulverized coal (PC) boilers were originally designed to accommodate larger boiler sizes with increased steam pressure and temperature, and are the most advanced type of solid-fuel boiler in use today. PC-fired boiler benefits include higher boiler efficiencies and lower NO_X emissions as compared to the older stoker and cyclone-fired boilers of the past. The PC combustion process includes grinding the coal to a talcum powder consistency, mixing the coal powder with heated combustion air, and discharging the mixture into the boiler firebox through burners similar to conventional gas burners. Air emissions regulations require new coal-fired units to incorporate flue gas desulfurization (FGD) systems to control SO_2 emissions, selective or non-selective catalytic (SCR/SNCR) reduction to control NOx emissions, and either electrostatic precipitators (ESPs) or fabric filters to control particulate emissions. Additional controls for mercury and other emissions may be required in the future as a result of the state and federal rules.

The PC-fired boiler can be either operated under sub-critical (typically 2600 psi, 1000 degrees F and lower) or supercritical (above 3200 psi and 1000 degrees F) steam conditions. Sub-critical designs have been used extensively in the United States for decades, and are most predominant. Supercritical boilers are designed to operate above steam's critical pressure. The capital costs of supercritical boilers are slightly higher than sub-critical ones, but they offer improved efficiencies and certain environmental advantages. In Europe and Asia, such technology has been aggressively pursued and high temperature supercritical boilers have dominated new capacity projects.

Based on SAIC's screening analysis, a supercritical pulverized coal plant was considered for further analysis in developing the least-cost resource plan:

- A supercritical PC plant with a site rating of 600 MW (For study purposes, a 50 MW joint-ownership is assumed to be consistent with the ownership size of the large coal plant option.)

Integrated Gasification Combined Cycle (IGCC) Coal

Integrated Gasification Combined Cycle (IGCC) is a relatively new technology. The process begins by converting the combustible components of coal from a solid to a gaseous form and then utilizing this gas to fuel a traditional combined cycle generating plant. IGCC has both advantages and disadvantages compared to traditional pulverized coal generation. Since IGCC is still an emerging technology, the amount of operational and financial information is somewhat limited. Depending on the information source, it does appear that IGCC operational performance in the areas of heat rate and availability are better than that of pulverized coal. Although the environmental emissions are fairly similar with both technologies, the IGCC is better equipped to capture the various emission components such as sulfur and CO_2, which can then be sold for various industrial uses, including injection for enhanced oil recovery (EOR) and potentially long term sequestration. The primary disadvantages with IGCC are its lack of operational experience resulting in lower availability (and potentially lower reliability) and its higher capital and operating cost, although this price differential could decrease as this new technology advances.

Based on SAIC's screening analysis, one type of IGCC coal plant was considered for further analysis in developing the least-cost resource plan:

- A generic IGCC plant utilizing coal with a site rating of 610 MW.

Natural Gas Combined Cycle

Combined cycle combustion turbine (CCCT) units utilize both simple cycle combustion turbine (SCCT) and conventional steam production technologies. A combined cycle unit uses the exhaust gases from the combustion turbine to produce steam with a heat recovery steam generator (HRSG). This steam from the HRSG is used to drive a steam turbine generator.

Combined cycle units are more efficient than simple cycle units because they make use of the heat in the exhaust gases. However, they do not have the operational flexibility of a simple cycle unit. Simple cycle combustion turbines can generally start with only a few minutes' notice, run for short periods of time, and then be shut down again, making them ideal for covering peak load periods or backing up wind generation resources. Combined cycle units require a much longer startup time due to the physical constraints associated with operating a HRSG/steam turbine combination. CCCT must also be dispatched for longer periods of time than conventional SCCT. As a result, CCCT units are generally dispatched as an intermediate-type resource. CCCT generally do not operate during off-peak evenings and weekends hours since the lower loads tend to keep the market cost of energy well below the cost of natural gas-fired generation, even accounting for combined-cycle unit efficiencies.

An advantage of combined cycle units is that they can be installed in stages, if necessary. The simple cycle combustion turbine can be installed first, with the HRSG and steam turbine generator installed at a later time. The construction time for a large combined cycle plant is shorter than for a coal-fired plant (about 24 – 30 months, excluding permitting). The emission characteristics of combined cycle combustion turbines are similar to those of a simple cycle combustion turbine. In addition to water or steam injection and dry low NOx combustors, selective catalytic reduction systems can be used to control NOx.

Based on SAIC's screening analysis, one model of combined cycle plants was chosen for further analysis in developing the least-cost resource plan:

- The GE Frame 7FA CC with a site rating of 550 MW.

Wind

To ensure SMMPA remains in compliance with the RES as percent requirements increase over time, the AURORA model used committed wind resources of 130 MW in the year 2021. This wind may be SMMPA-owned turbines or a purchased power contract(s) with either a traditional or a Community Based Energy Development (C-BED) wind provider. The model also includes a planning option which will allow it to choose additional wind, in smaller blocks of 25 MW each, beyond that necessary for RES compliance, if economically justified.

Solar Photovoltaic

Photovoltaic power modules (PV) have been used in commercial operation since the mid 1980's and is a proven technology. There is currently approximately 6,400 MW PV capacity installed in the US according to the Solar Energy Industries Association. The crystalline silicon modules being manufactured today have undergone a number of performance enhancements over the years to improve power output and reliability. A more recent development is the use of thin film PV which can be a very cost effective solutions for future applications.

Reciprocating Engines

SMMPA has extensive experience with reciprocating engine generation and currently has approximately 120 MW in operation. Reciprocating engines have several advantages over a combustion turbine when used for peaking purposes. Reciprocating engines are generally more efficient than combustion turbines and they maintain their higher efficiencies throughout their entire load range; whereas combustion turbines lose their efficiency when they are not operating at full output. Combustion turbines also lose about 10% of their generating capacity during hot weather; whereas reciprocating engines can retain full output at higher temperatures. Like combustion turbines, reciprocating engines can be start quickly, run for short periods, and follow changes in load which makes them a valuable asset in the MISO market. In addition, reciprocating engines plants can be constructed in smaller increments and can therefore be distributed throughout the system to areas that need voltage support.

SMMPA currently operates two general types of reciprocating engines, “oil only units” and “dual fuel units”. Oil only units have a much lower capital costs, but are more expensive to operate due primarily to the high cost of oil as compared to natural gas. Dual fuel units have higher capital costs, but lower operating costs since they can take advantage of running on lower-cost natural gas.

A relatively new development in reciprocating engine technology is the Spark Ignited Gas engine. These engines operate using the principal of the Otto Cycle instead of the traditional Diesel Cycle. This results in significantly better efficiencies. SMMPA is currently in the process of installing four such engines at its Fairmont plant totaling 25 MW.

Based on SAIC’s screening analysis, one type of Spark Ignited Gas plant was considered for further analysis in developing the least-cost resource plan:

- A generic four Wartsila engines with a total site rating of 37 MW.

Combustion Turbines

Two different sizes of simple cycle combustion turbine options were used in the planning process. The small option, rated at 50 MW, could be owned solely by the Agency. The large options assumes that the Agency would partner with another utility on a larger, 200 MW unit. The simple cycle combustion turbine operates on the Brayton Cycle and is less efficient than Spark Ignited Gas engines; however, combustion turbines are attractive because they have relatively low capital costs. The technology is mature and reliable. The major emission concern associated with simple cycle units is nitrogen oxides (NOx). Water or steam injection or dry low NOx combustors are available to control NOx emission levels.

Based on SAIC's screening analysis, two models of combustion turbines were considered for further analysis in developing the least-cost resource plan:

- A GE LM6000 simple cycle combustion turbine rated at 50 MW.
- A Siemens SGT6F simple cycle combustion turbines rated at 208 MW.

Short Term Capacity-Only Purchases

A short term capacity-only purchase option was included in the AURORA model to serve as a short term bridge between long-term capacity additions. This purchase option is essentially a capacity-only purchase with a low capacity charge and minimal energy supply associated with it. AURORA fills in the energy requirements using spot market energy purchases at MISO LMP prices. Since long-term capacity additions can generally not be built in increments smaller than 50-100 MW, the capacity-only purchase allows the AURORA model to cover the smaller increments of load growth until a more long-term resource is available. For study purposes, we have assumed blocks of 10 MW purchases are available if needed, which will be sufficient to meet about one year's load growth and the associated capacity reserve requirements.

The costs and operating characteristics of the supply-side potential resources considered in this IRP study are summarized in Table VIII-1.

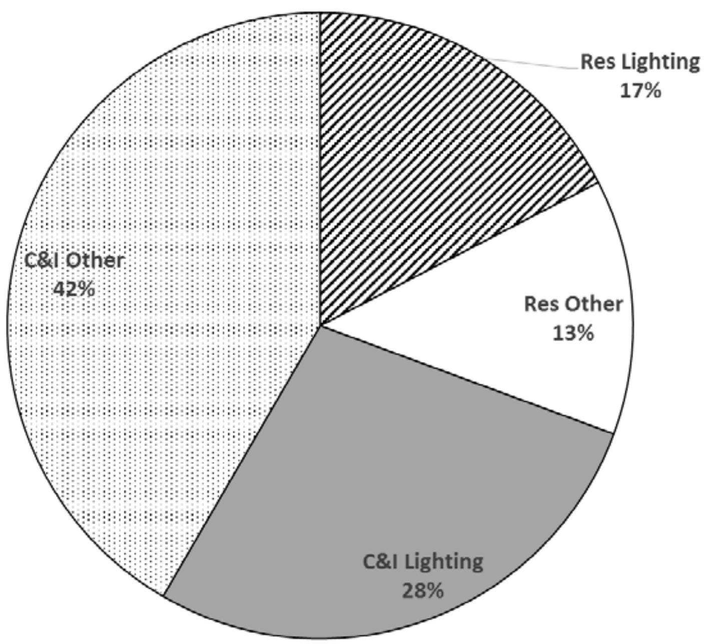
Table VIII-1
Supply-Side Potential Resource Characteristics

Generating Resources	Years Available	Rated Capacity (MW)	2014 Capital Cost ($/kW)	Full Load Heat Rate (Btu/kWh)	2014 Fuel Price ($/MMBtu)	2014 Variable O&M Cost ($/MWh)	2014 Fixed O&M Cost ($/kW/Yr)	Maintenance Rate (%)	Forced Outage Rate (%)
Wind Turbines	2014-2028	25.00	N/A	N/A	N/A	35.87	N/A	0.00	0.00
Solar- Photovoltaic	2014-2028	1.00	3,500	N/A	N/A	N/A	56.38	0.00	0.00
Peaking Purchase	2014-2028	10.00	N/A	10,000	0.00	0.00	33.94	0.00	0.00
LM6000	2014-2028	50.00	1,200	9,766	4.68	4.62	24.60	2.00	3.00
Siemens SGT6F	2014-2028	50.00	800	10,525	4.68	10.61	15.38	4.00	3.00
Wartsila Recip. Engine	2014-2028	37.00	800	8,650	4.68	20.50	33.83	3.00	3.00
CC w/GE 7FA	2014-2028	50.00	1,100	8,040	4.68	3.69	26.75	3.00	3.00
Ultra Super Critical PC	2014-2028	50.00	4,000	8,600	2.12	5.13	79.95	5.00	4.00
IGCC w/GE 7FA	2014-2028	50.00	4,700	9,600	4.68	7.43	112.04	5.00	3.00
Nuclear AP-1000	2014-2028	50.00	6,700	10,434	0.55	2.19	164.31	4.00	2.00

DSM POTENTIAL

Since 1991, SMMPA and its members have been focusing increased attention on DSM as an important component of its resource base. The DSM screening process, described in Section VII, identified the technical, economic and achievable/market potential for DSM and identified the energy and demand impacts that can be anticipated. Chart VIII-1 shows the estimated energy savings forecast for the DSM programs, with a projected 620,760 MWh of new savings.

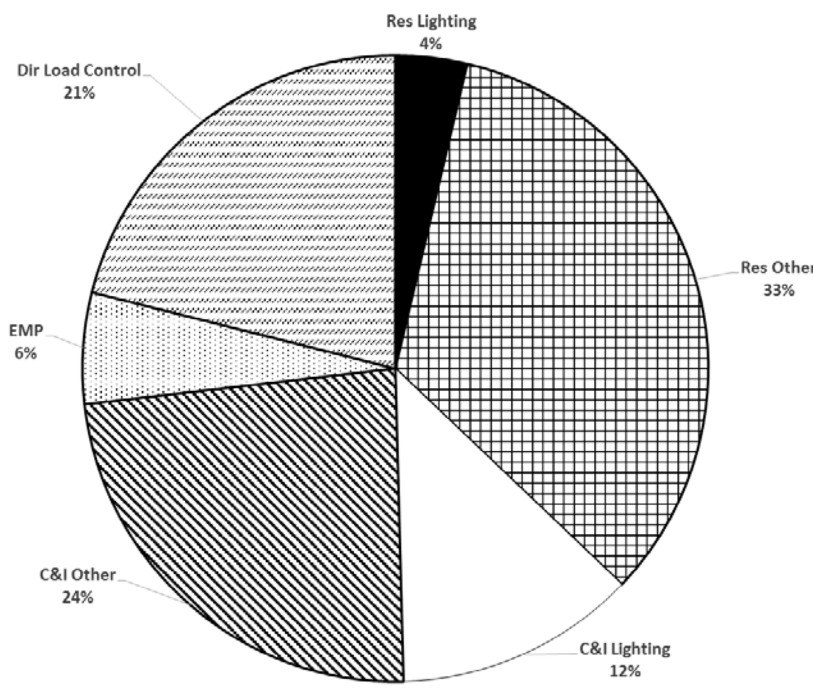
Chart VIII-1
Cumulative Market Potential Energy Savings Base Case
By Technology in 2028 - 620,760 MWh



Commercial and Industrial Other – essentially high-efficiency motors and drives, heating ventilating and air-conditioning (HVAC), compressed air and high efficiency process improvements - make up 42% of the savings. Commercial and Industrial Lighting, Residential Lighting and Residential Other – essentially air-conditioning and appliances - make up the remaining savings. Consistent with our existing DSM efforts, as the potential for new technologies present themselves, SMMPA will evaluate the potential, and include the technology in the resource mix, if cost effective.

Chart VIII-2 portrays an estimate of the potential total summer peak reduction for the Base Case at the end of the planning horizon in 2028, a total of 123.7 MW. As discussed in Chapter VII - Plan Development, only the capacity impact of measures installed in Non-CROD

Chart VIII-2
Cumulative DSM Potential Summer Peak Savings Base Case
By Technology in 2028 123.7 MW



communities were included in the analysis. While there were capacity benefits associated with the installation of DSM measures in CROD members, that benefit accrued to the member, not to SMMPA. The largest segment is in the category of Residential Other (49%). Included in that category are capacity savings from such measures as heating, ventilation and air conditioning (HVAC) quality installation, furnace fan motor installation, and load management (direct load control cycling of central air conditioners and electric water heating). The category contributes 60.5 MW of capacity savings of which approximately 19 MW is attributable to load management. The second largest segment is Commercial and Industrial Other with approximately 23% of the total. Included in that category are measures such as variable frequency drives for HVAC, compressed air leak correction, and commercial and industrial load management. The category contributes approximately 36.1 MW of capacity savings of which approximately 6.9 MW is attributable to load management. The Energy Management Program (commercial and industrial load shedding) contributes about 20% percent of the total or 7.1 MW. Commercial and Industrial lighting and residential lighting contribute 7% (15.4 MW) and approximately 1% (4.6 MW) of the capacity savings total, respectively.

The costs and operating characteristics of the demand-side potential resources considered in this IRP study are summarized in Table VIII-2.

Table VIII-2
Demand-Side Potential Resource Characteristics

DSM Resource Name	Years Available	2014 Rated Capacity (1) (MW)	2028 Rated Capacity (1) (MW)	2014 Annual Energy (2) (GWh)	2028 Annual Energy (2) (GWh)	2014 Variable (3) O&M Cost ($/Yr)	2028 Variable (3) O&M Cost ($/Yr)
Expected DSM:							
C/I - Other	2014-2028	7.818	36.067	25.129	258.361	$61,508	$1,548,435
C/I - Lite	2014-2028	2.283	15.427	24.549	172.296	$128,578	$1,446,605
Res - Other	2014-2028	16.844	60.502	8.097	81.869	$530,572	$2,562,826
Res - Lite	2014-2028	0.380	4.567	7.699	108.233	$63,349	$336,279

Notes:
1. The rated capacity of each DSM program varies from year to year. This table only shows the starting and ending values.
2. The annual energy of each DSM program varies from year to year. This table only shows the starting and ending values.
3. The annual DSM costs modeled as Variable O&M costs in AURORA.
These DSM costs also vary from year to year, and this table only shows the starting values in year 2014 and 2028.

IX Short Range Action Plan

GENERAL DISCUSSION

The Short Range Action Plan details the expected specific activities of SMMPA with respect to resources in the eight years during the 2014-2021 time period. All of the activities included in SMMPA's Short Range Action Plan are discussed individually, and then all activities are combined in Table IX-2 to illustrate how all of the resources fit together. All known future resources that will be used to meet SMMPA's needs are included in the plan. In Section X - Long Range Plan, these resources are incorporated into a load and capability table that presents SMMPA's situation following implementation of the recommended plan.

The Short Range Action Plan includes a number of ongoing implementation activities identified in the last IRP as well as the development of new resources identified in the least-cost plan of this current filing.

EXISTING RESOURCES

Generating Units

Sherco 3 - Over the next eight years, SMMPA anticipates continuing to meet the vast majority of its capacity and energy requirements with its Sherburne County Unit 3 (Sherco 3). SMMPA's share of the capacity of Sherco 3 is approximately 372 MW, which represents about 60% of SMMPA's current total capacity and provides over 80% of the Agency's energy requirements. The annual energy produced by Sherco 3 is about 2,500 GWh, which represents about 82% of SMMPA's current energy requirements.

Fairmont Energy Station – Construction of this new high efficiency natural gas fired facility is expected to be completed before the end of 2013. This new facility is expected to provide reliable intermediate load energy well into the future.

Renewable Generation – The Agency's existing fleet of renewable generation resources is all relatively new facilities and is expected to continue to provide reliable renewable power throughout the entire IRP planning period.

Diesel Generation - Additionally, SMMPA remains committed to maintaining its members' diesel units to supplement the Agency's capacity and energy supply from Sherco 3. Approximately $3.5 million was spent on installing new emission controls on these units in 2013 and they are expected to provide the Agency with reliable capacity through the entire IRP planning period. No additional units are currently planned during for the short range action plan.

DEMAND-SIDE MANAGEMENT (DSM)

Member Direct Load Control Programs - SMMPA members' Direct Load Control (DLC) Systems are used to cycle customer equipment (primarily central air-conditioners and electric water heaters) during potential Agency peaks to reduce member and system demand. The forecast of capability was developed from the end-use data supplied by member utilities and the planned capacity additions resulting from DLC are included in Table IX-2 (New DSM). While the members have achieved significant penetration of this technology (described further in Section VI), increased capability will result from a continuance of the existing programs including new initiatives in several member communities which require load control installation with any new construction or service upgrade.

Energy Management Program - The Energy Management (EM) Program operates as an interruptible program with member retail customer load. Participating customers designate equipment to be curtailed during interruptible periods and establish a firm service level that they will not exceed during curtailments. Program participants employ a mixture of curtailing loads and/or using backup or emergency generation to remain below their firm service level during curtailments. Curtailment periods are dispatched by the Agency. The EM Program provides SMMPA with an additional capacity resource.

In 2003, two members, Austin and Owatonna, elected to operate their own Energy Management Program for their respective utilities. In 2004, New Prague started running their program. Given our coincident peak billing, we would generally receive any capacity benefit of those member-operated programs (with the exception of Austin once a CROD is established). The forecast of capability was developed from data supplied by SMMPA and member utilities. The planned capacity additions for the EM Program are included in Table IX-2 under the category EMP Program.

Other Member Curtailments - Member utilities have several resources which SMMPA considers and treats as curtailment to load. These resources fall into three categories: 1) Western Area Power Administration (WAPA) allocations to members; 2) retail customer-owned distributed generation; and 3) member-owned hydroelectric plants. SMMPA works with the members to ensure that these curtailable resources are dispatched in a cost-effective manner to benefit both the member and the Agency. A complete description of these resources is included in Section VI - Resource Capabilities. Capacity available from other member curtailments is shown in Table IX-2.

A complete description of SMMPA's existing resources is included in Section VI - Resource Capabilities.

NEW PROJECTED RESOURCES

SMMPA's Short Range Action Plan (2014-2021) for the current filing identifies peaking purchases, wind, simple cycle combustion turbine, as well as our four bundled demand-side programs.

During the period of the short term plan (2014-2021), the AURORA model anticipates the need for annual or seasonal peaking purchases of 30 MW in 2018, 30 MW in 2019, 50 MW in 2020 (a modeling limitation in AURORA identified 50 MW in 2020, but with the 50 MW combustion turbine addition, only 20 MW of peaking purchase is actually required in 2020), and 10 MW in 2021. SMMPA also anticipates purchasing 130 MW of wind in 2021 to meet RES requirements. In addition, SMMPA anticipates purchasing 25 MW of wind in 2018, 2019, 2020, 2021, as well as 50 MW of a simple cycle combustion turbine in 2020. These resources are needed due to the expired capacity contracts of 40MW in 2019.

SMMPA will also continue implementation of SMMPA/Member DSM initiatives as a part of the short term plan. As outlined in Section VII, DSM programs were bundled into four groups for the AURORA optimization modeling. The four groups consisted of Commercial & Industrial Lighting, Commercial and Industrial Other (non-lighting technologies such as HVAC, motors, variable speed drives, and refrigeration), Residential Lighting, and Residential Other (basically HVAC and efficient appliances). The Base Case plan included all four of the bundled DSM programs for the AURORA optimization model. These four DSM programs represent new program savings above and beyond those that are already implemented by SMMPA and its members. It should be noted that the DSM capacity savings have been reduced to reflect the fact that SMMPA does not receive any summer capacity savings benefit from DSM program investment in Rochester (and Austin beginning in 2016) due to the Contract Rate of Delivery (CROD). The estimated summer peak demand impacts are included in Table IX-2.

For the period of the Short Range Action Plan, the estimated cumulative achievable energy savings from SMMPA's Base Case are shown in Table IX-1. Energy savings reflect the savings from all four bundled programs in all SMMPA members. Under the CROD, SMMPA provides all energy up to the CROD limit. (In Rochester's case, in any hour, up to 216 MW). As most of the DSM initiatives screened have year-round savings, and the CROD affects a very limited number of hours during the summer season, all energy savings have been included.

Table IX-1

Forecast DSM Energy Conservation Estimate (MWh)

Year	Cumulative DSM Savings
2014	65,474
2015	98,533
2016	129,649
2017	159,322
2018	189,800
2019	222,578
2020	261,416
2021	305,116

TRANSMISSION IMPROVEMENTS

As described in Section VI – Resource Capabilities, the landscape has changed significantly with the development of the Midcontinent Independent System Operator (MISO). SMMPA is now a Transmission Owning member of MISO and transferred operational control of its transmission to MISO on April 1, 2006. SMMPA has been actively participating with CapX 2020, (an effort of Minnesota's cooperative, municipal and investor-owned utility transmission owners) to strengthen Minnesota's transmission backbone. SMMPA has actively supported legislative changes to encourage additional investment in the transmission system, including the ability for municipal utilities to invest in the transmission system as owners. SMMPA is investing approximately $70 million in the construction of the Hampton – Rochester – La Crosse 345 kV transmission project. This project will improve deliverability and reliability in Southeastern Minnesota, including SMMPA's balancing area.

TABLE IX-2
2014-2021 Short Range Action Plan Capacity Impacts (MW) For Base Load Forecast

		2014	2015	2016	2017	2018	2019	2020	2021
Total Member Requirements		751.8	773.1	793.0	814.6	836.2	858.1	878.1	900.1
	Above CROD	(85.8)	(97.3)	(108.5)	(120.7)	(132.8)	(144.7)	(155.6)	(167.6)
	Installed DSM-Conservation	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)
	Member Generation	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)
	Transmission Losses	11.1	11.3	11.5	11.7	11.9	12.1	12.3	12.5
	Total Adjustments	(162.3)	(173.6)	(184.6)	(196.5)	(208.5)	(220.2)	(230.9)	(242.7)
Total Agency Requirement		589.5	599.5	608.4	618.0	627.7	638.0	647.2	657.4
	Planning Reserve Requirements (9.3%)	54.8	55.8	56.6	57.5	58.4	59.3	60.2	61.1
Total Generation Level Requirements		644.3	655.3	665.0	675.5	686.1	697.3	707.4	718.5
	Supply Side Resources								
	Existing Generation Resources	560.0	560.0	560.0	560.0	560.0	560.0	560.0	560.0
	Existing Capacity Purchases	60.0	60.0	65.0	70.0	40.0	40.0		
	Existing EMP Program	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1
	Existing Direct Load Control	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4
	New DSM	6.9	12.0	16.8	21.5	26.2	31.3	37.4	44.2
	New DSM Reserves & Losses Offset	3.4	4.4	5.4	6.4	7.3	8.4	9.6	11.1
	New Conventional Generation							50.0	50.0
	New Wind Generation					2.5	5.0	7.5	23.0
	New Solar Generation								
	New Capacity Purchases					30.0	30.0	50.0	10.0
	Total Supply Side Resources	657.8	663.9	674.6	685.3	693.5	702.2	742.0	725.7
Agency Resource Status (Positive = Excess MW)		13.5	8.6	9.6	9.8	7.5	4.9	34.6	7.2
	Actual Reserve Margin	11.6%	10.7%	10.9%	10.9%	10.5%	10.1%	14.6%	10.4%

X Long Range Plan

GENERAL DISCUSSION

This section of the filing is intended to identify the potential resources available to SMMPA to meet capacity and energy requirements for the rest of the 15-year planning period following the Short Range Action Plan. The basis for the analysis is the base case forecast scenario. Discussions regarding high and low forecast scenarios are discussed as a part of Section XI - Contingencies.

In developing the new resource plan, SMMPA has considered a full range of baseload, intermediate/cycling and peaking resources, including fossil fuel, nuclear power and renewable alternatives. The implementation of the Rochester CROD, the expected implementation of the Austin CROD in 2016, and aggressive implementation of member load control initiatives continue to have a significant impact on SMMPA's system load shape, resulting in a much higher system load factor in the future. Renewable resources were assessed not only to meet these increasing energy needs, but also to meet targets contained in the Renewable Energy Standard, Minnesota Statute §216B.1691.

All supply-side resources discussed in Section VIII – Potential Resources were made available for selection by AURORA to develop the lowest cost plan to meet the projected peak and energy forecasts. Those resources included nuclear power, conventional baseload, intermediate, and peaking resources, advanced baseload technologies such as supercritical pulverized coal, emerging baseload technologies like IGCC, and renewable technologies. In addition, all demand-side resources resulting from the DSM analysis in Section VIII – Potential Resources and Section VII - Plan Development were provided to AURORA to develop the lowest cost "integrated" resource plan.

BASE LONG RANGE PLAN

As outlined in Section VII - Plan Development, based upon the supply and demand-side integration analysis, SMMPA intends to meet future capacity and energy requirements through aggressively pursuing DSM opportunities, market purchases, as well as installing new capacity.

Table X-1 SMMPA Base Case Achievable Potential for Aurora® Model Integration
Includes Energy Savings for All Members & Demand Savings for Non-CROD Members

Year	Residential Lighting		Residential Other		C&I Lighting		C&I Other		All DSM Programs	
	Energy Savings (MWh)	Demand Savings (kW)	Energy Savings (MWh)	Demand Savings (kW)	Energy Savings (MWh)	Demand Savings (kW)	Energy Savings (MWh)	Demand Savings (kW)	Energy Savings (MWh)	Demand Savings (kW)
2014	7,699	380	8,097	16,844	24,549	2,283	25,129	7,818	65,474	27,325
2015	11,982	566	11,640	18,985	35,239	3,297	39,673	9,523	98,533	32,371
2016	17,147	804	15,312	21,166	45,125	4,266	52,065	10,941	129,649	37,176
2017	22,556	1,071	19,314	23,467	52,919	4,961	64,533	12,383	159,322	41,882
2018	27,593	1,301	23,671	25,793	61,158	5,679	77,378	13,853	189,800	46,626
2019	32,639	1,530	28,200	28,275	69,953	6,440	91,787	15,501	222,578	51,747
2020	41,824	1,943	33,358	31,116	80,898	7,455	105,337	17,255	261,416	57,769
2021	51,371	2,347	39,033	34,336	93,530	8,599	121,181	19,310	305,116	64,593
2022	60,857	2,748	45,051	37,769	106,314	9,733	140,920	21,591	353,143	71,840
2023	70,082	3,137	51,345	41,434	118,338	10,805	160,187	23,894	399,952	79,270
2024	78,301	3,484	57,765	45,147	130,111	11,868	179,726	26,492	445,903	86,990
2025	85,801	3,758	63,944	48,975	140,606	12,767	199,752	28,978	490,103	94,478
2026	93,341	4,032	69,835	52,747	151,313	13,661	219,404	31,412	533,892	101,853
2027	100,765	4,300	75,836	56,602	161,937	14,554	239,035	33,825	577,574	109,282
2028	108,233	4,567	81,869	60,502	172,296	15,427	258,361	36,067	620,760	116,563

The AURORA model was used to evaluate the bundled DSM combinations: Commercial & Industrial Lighting, Commercial Other, Residential Lighting and Residential Other. Table X-1 provides the cumulative estimated achievable potential base case savings from Commercial/Industrial Other, Commercial/Industrial Lighting, Residential Other, and Residential Lighting. For example, in the first program year of the current filing (2014), it is estimated that SMMPA will be able to achieve another incremental 25,129 MWh from the group of C&I non-lighting technologies (C/I Other), another 24,549 MWh from the C&I lighting technologies, another 8,097 MWh from Residential non-lighting technologies (Residential Other), and another 7,699 MWh from Residential Lighting technologies for an incremental total addition of 65,474 MWh savings. Over the long range plan horizon (through 2028), cumulative total savings for all programs would grow to an estimated 620,760 MWh. The demand savings shown include only those projected capacity savings which occur in Non-Contract Rate of Delivery (CROD) members. As described in previous sections, any capacity savings from measure installation in a CROD member community (Rochester currently and Austin after 2016) accrue to the CROD member and do not contribute to SMMPA's resources to serve future load.

NEW RESOURCES

In addition to the resources identified in SMMPA's Short Range Action Plan, SMMPA's Long Range Plan, beyond 2021, includes the continuation of its DSM programs, and peaking purchases of 10 MW in 2022-2026 and 20 MW in 2027-2028. These resource additions are shown in Table X-2.

ENVIRONMENTAL EXTERNALITIES

As part of the supply-side and demand-side integration analysis, the high and low values of the externality cost values shown in Section XII were used. The low externality values were used in the base case scenario analysis, and the high values were used in some of the sensitivity cases.

PLAN IS IN THE PUBLIC INTEREST

SMMPA believes that this plan is in the public interest, and meets the objectives established for Commission review of resource plans outlined below:

(A) Maintain or improve the adequacy and reliability of utility service.

Meeting SMMPA's future capacity and energy requirements is based upon the following primary components: 1) ensuring that the resource plan makes maximum use of our existing investment in resources by maintaining and extending the useful life of assets where economically viable, and 2) ensuring a least-cost combination of new supply and demand resources that at least maintains and hopefully enhances the reliability of utility service. SMMPA's existing resource base has a number of distributed units. The result is an extra degree of reliability in member communities that most utilities do not have. While these units are generally employed as peaking units, their presence provides additional reliability and security for the customers in those communities. In the selection of new resources, SMMPA's DSM initiatives are designed to encourage persistence and ensure that the investment in high-efficiency alternatives will be in place when needed.

(B) Keep the customers' bills and the utility's rates as low as practicable, given regulatory and other constraints.

The resource planning process by its very nature is designed to identify the least-cost combination of resources. As mentioned above, SMMPA operates in a manner to obtain maximum utilization of the resources which its members and customers have invested in. Additionally, SMMPA members have a strong commitment to DSM programs with options which provide customers with energy management alternatives and methods for reducing their bills. DSM also allows SMMPA to add capacity to the system in smaller increments, which matches the increasing resource requirements more cost effectively. SMMPA has employed a portfolio approach to meeting the targets of the RES in a manner which encourages renewable development, yet minimizes the cost of doing so (SMMPA's RES strategy is fully explained in Section VII). SMMPA's least-cost plans have also emphasized joint project participation, leveraging the potential for economies of scale and reducing costs while minimizing future risk exposure by increasing the diversity of supply.

(C) *Minimize adverse socio-economic effects and adverse effects upon the environment.*

With regard to the existing units in the plan, SMMPA's largest generating unit Sherco 3, employs state-of-the-art environmental control systems, making it one of the lowest emitting coal-fired plants in the region. In late 2008, additional control technologies were added at Sherco to reduce NOx emissions by another 66%. In 2010, mercury control equipment was installed on Sherco 3 to reduce mercury emissions as much as 90%. In 2011, a major efficiency improvement was made at Sherco 3 by replacing the Intermediate Pressure and High Pressure (HP/IP) sections of the steam turbine with a more modern, higher efficiency design. SMMPA was also an early adopter of bio-diesel in electric generating units, testing bio-diesel blends years before Minnesota passed a requirement for diesel fuel to be blended with 2% bio-fuel. SMMPA continues that effort with some member units utilizing B20, and others blending to B10 in summer months and then reducing to B2 levels to prevent fuel in outside storage from congealing. SMMPA's existing DSM efforts reduce the amount of fossil fuel generation and associated emissions. Those DSM efforts have been nationally recognized by the U.S. Department of Energy and the U.S. Environmental Protection Agency with receipt of three National ENERGY STAR Awards.

With regard to new resources, SMMPA remains committed to the development of renewable resources and has developed a cost minimization approach for encouraging renewable resource development. The renewable resources included in the current filing provide for sufficient resources to meet the RES targets.

(D) Enhance the utility's ability to respond to changes in the financial, social, and technological factors affecting its operations.

SMMPA's current resource plan includes a mix of DSM, renewable resources, peaking purchases, and spark fired diesels. SMMPA's renewable strategy is based on a portfolio approach which not only utilizes a mix of resources, but ownership structures where possible. This strategy, fully outlined in Section VII, is based upon flexibility and recognizes the improving efficiencies of renewable technology. This strategy extends to the other technologies identified as well. SMMPA's current plan anticipates relatively small resource additions. This strategy diversifies the projects that SMMPA relies upon to serve its load while also minimizing the likelihood that costly transmission upgrades will be necessary to allow the projects to interconnect to the regional transmission system.

(E) Limit the risk of adverse effects on the utility and its customers from financial, social, and technological factors that the utility cannot control.

There is significant risk in this electric utility landscape. As discussed above in (D), SMMPA's projected resource plan does not rely disproportionately on a particular unit or technology type. This portfolio approach to resource planning should provide a measure of risk mitigation through its variety. Also, the relatively small incremental additions identified in the plan will provide SMMPA with the flexibility to respond to unforeseen changes that impact the merits of a particular resource decision.

(F) ***The resource plan helps the utility achieve greenhouse gas reduction goals under section 216H.02***

The 2013 Legislature made changes to §216B.242 asking utilities to discuss how the plan helps achieve the greenhouse gas (GHG) reduction goals under 216H.02. In the 2007 Legislative Session, sweeping changes were made in the way utilities would meet the energy needs of their consumers in the future. The Renewable Energy Standard (RES) mandated that increasing percentages of utility generation must be from qualifying renewable generation. Under the Conservation Improvement Program (CIP), energy efficiency was given a savings goal of 1.5% savings annually. These new requirements on utilities to reduce greenhouse gases were some of the most stringent in the nation. The Legislature recognized that electric utilities only contribute about one-third of the greenhouse gas emissions. To successfully reduce GHG emissions, Minnesota needed to ensure that all GHG emitters, not just utilities, would take action to reduce emissions. To further that reduction, the Legislature established a goal of reducing statewide GHG emissions across all sectors to a level of at least 15 percent below 2005 levels by 2015, to 30% below 2005 levels by 2025, and 80% below 2005 levels by 2050.

To develop the plan, the Commissioner of Commerce consulted with: the Pollution Control Agency, the Housing Finance Agency, the Departments of Natural Resources, Agriculture, Employment and Economic Development, and Transportation and the chair of the Metropolitan Council. To add to the prescriptive measures enacted for electric utilities, one of the main tasks given to this planning body was to "…identify, evaluate, and integrate a broad range of statewide greenhouse gas reduction options for all emission sectors in the state."

As outlined in other sections of the current filing, SMMPA has met all the requirements of the RES, and will continue to meet the RES requirements with the additional resources contained in the short and long range plans. Likewise, SMMPA, to date, has exceeded the 1.5% goal established for the CIP savings requirement. As outlined in Chapter VI, SMMPA has a broad array of efficiency programs and continues to develop new cost-effective programs. While the "business as usual" CIP case shows slightly less than the 1.5% goal over the period, the bookends established by the 1.5% Scenario case suggest that with the continued strong efforts that SMMPA has employed in the past we may be able to continue to meet that target. Unlike the RES target, SMMPA must rely upon its members' customers to continue to reach that goal. That performance will continue to be monitored in annual CIP filings as well as future resource plan submittals.

Additionally, as pointed out in Chapter XII - Environmental, SMMPA has retired several older steam units, and is replacing that capacity with higher efficiency natural gas units. SMMPA's performance in meeting the prescriptive goals established by the Legislature and upgrade the efficiency of its mix of resources is evidence of furthering the electric sectors contribution to the greenhouse reduction goals.

The plan is consistent with the requirements of Minnesota statutes and rules and provides a clear concise report to interested parties of what SMMPA intends to do to satisfy customer needs in the near term and what SMMPA is considering for options in the long term.

TABLE X-2 (Part 1)
2014-2028 Base Forecast Load & Capability Including Resource Plan Information

		2014	2015	2016	2017	2018	2019	2020	2021
Total Member Requirements		751.8	773.1	793.0	814.6	836.2	858.1	878.1	900.1
	Above CROD	(85.8)	(97.3)	(108.5)	(120.7)	(132.8)	(144.7)	(155.6)	(167.6)
	Installed DSM-Conservation	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)
	Member Generation	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)
	Transmission Losses	11.1	11.3	11.5	11.7	11.9	12.1	12.3	12.5
	Total Adjustments	(162.3)	(173.6)	(184.6)	(196.5)	(208.5)	(220.2)	(230.9)	(242.7)
Total Agency Requirement		589.5	599.5	608.4	618.0	627.7	638.0	647.2	657.4
	Planning Reserve Requirements (9.3%)	54.8	55.8	56.6	57.5	58.4	59.3	60.2	61.1
Total Generation Level Requirements		644.3	655.3	665.0	675.5	686.1	697.3	707.4	718.5
	Supply Side Resources								
	Existing Generation Resources	560.0	560.0	560.0	560.0	560.0	560.0	560.0	560.0
	Existing Capacity Purchases	60.0	60.0	65.0	70.0	40.0	40.0		
	Existing EMP Program	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1
	Existing Direct Load Control	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4
	New DSM	6.9	12.0	16.8	21.5	26.2	31.3	37.4	44.2
	New DSM Reserves & Losses Offset	3.4	4.4	5.4	6.4	7.3	8.4	9.6	11.1
	New Conventional Generation							50.0	50.0
	New Wind Generation					2.5	5.0	7.5	23.0
	New Solar Generation								
	New Capacity Purchases					30.0	30.0	50.0	10.0
	Total Supply Side Resources	657.8	663.9	674.6	685.3	693.5	702.2	742.0	725.7
Agency Resource Status (Positive = Excess MW)		13.5	8.6	9.6	9.8	7.5	4.9	34.6	7.2
	Actual Reserve Margin	11.6%	10.7%	10.9%	10.9%	10.5%	10.1%	14.6%	10.4%

TABLE X-2 (Part 2)
2014-2028 Base Forecast Load & Capability Including Resource Plan Information

		2022	2023	2024	2025	2026	2027	2028
Total Member Requirements		920.8	941.2	961.0	983.3	1,005.0	1,026.9	1,047.1
	Above CROD	(179.1)	(190.5)	(201.8)	(214.3)	(226.7)	(239.3)	(251.0)
	Installed DSM-Conservation	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)
	Member Generation	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)
	Transmission Losses	12.6	12.8	13.0	13.2	13.4	13.6	13.7
	Total Adjustments	(254.1)	(265.3)	(276.4)	(288.7)	(300.9)	(313.4)	(324.8)
Total Agency Requirement		666.7	675.9	684.6	694.5	704.1	713.6	722.2
	Planning Reserve Requirements (9.3%)	62.0	62.9	63.7	64.6	65.5	66.4	67.2
Total Generation Level Requirements		728.7	738.8	748.2	759.1	769.6	779.9	789.4
	Supply Side Resources							
	Existing Generation Resources	560.0	560.0	560.0	560.0	560.0	560.0	560.0
	Existing Capacity Purchases							
	Existing EMP Program	7.1	7.1	7.1	7.1	7.1	7.1	7.1
	Existing Direct Load Control	20.4	20.4	20.4	20.4	20.4	20.4	20.4
	New DSM	51.4	58.9	66.6	74.1	81.5	88.9	96.2
	New DSM Reserves & Losses Offset	12.6	14.2	15.8	17.4	18.9	20.5	22.0
	New Conventional Generation	50.0	50.0	50.0	50.0	50.0	50.0	50.0
	New Wind Generation	23.0	23.0	23.0	23.0	23.0	23.0	23.0
	New Solar Generation							
	New Capacity Purchases	10.0	10.0	10.0	10.0	10.0	20.0	20.0
	Total Supply Side Resources	734.5	743.6	752.9	761.9	770.8	789.8	798.6
Agency Resource Status (Positive = Excess MW)		5.8	4.8	4.6	2.8	1.2	9.9	9.2
	Actual Reserve Margin	10.2%	10.0%	10.0%	9.7%	9.5%	10.7%	10.6%

XI Contingencies

GENERAL DISCUSSION

SMMPA and its members have the potential to be impacted by sudden or unexpected events, changes in environmental regulations, changes in tax laws, and other events over which it has little or no control. This section of the filing details those situations that SMMPA feels have the potential to cause noticeable effects to its members, member's customers, and their respective electricity bills. The particular circumstances investigated or currently under investigation include:

- Low load growth and higher-than-expected load growth
- Expected and Full (1.5%) DSM attainment
- Sudden large load addition
- Failure or sudden retirement of existing generation
- 50% and 75% conservation and renewable plans
- Development of a large qualifying facility
- Non-availability of purchased power
- Increased competitive environment
- Greenhouse Gas Initiatives
- Solar Objective
- Additional Concerns

Each of these situations is highlighted and discussed in detail in this section.

LOW LOAD GROWTH & HIGH LOAD GROWTH SCENARIOS

In developing the scenario forecast bands for both SMMPA system energy and peak demand, the following methodology was used:

While a forecast that is derived from projections of the driving variables, obtained from reputable sources, provides a sound basis for planning, there is significant uncertainty in the future level of such variables. To the extent that economic, demographic, weather, or other conditions occur that are different from those assumed or provided, the actual member load can be expected to vary from the forecast. For various purposes, it is important to understand the amount by which the forecast can be in error and the sources of error.

Accordingly, SMMPA produces alternative load forecasts, referred to as the High and Low Economic Cases, or simply High and Low, that are intended to capture specific ranges of uncertainty in the major economic and demographic driving variables. These scenarios are produced by simulating the forecast equations with alternative assumptions about the driving variables that are consistent with a particular uncertainty range.

The Base Case forecast relies on a set of assumptions, developed from projections provided by Global Insight and Woods & Poole regarding future population and economic activity in the counties that comprise the service areas of the SMMPA members. However, such projections are unlikely to exactly match the resulting data as future periods become history. While Global Insight does not publish information regarding the potential error of their projections, we have relied on such statistics published by Woods & Poole, which relies on a somewhat similar underlying data set and methodology. Woods & Poole publishes several statistics that define the average amount by which various projections they have prepared over 1984 through 2010 are different from actual results. We have utilized these statistics to develop ranges of the trends of economic activity and population representing approximately 90 percent of potential outcomes (i.e., 1.7 standard deviations). Occurrences outside the range encompassing these scenarios can be expected with only 10 percent probability.

Table XI-1 below provides the amount by which the economic and demographic projections were adjusted from the Base Case assumptions through 2032 to develop the High and Low Economic Cases. Other economic data, such as retail sales and gross domestic product, were assumed to vary by the same degree as income. Adjustments to projections beyond 2032 are based on the linear trend in this data.

Table XI-1
Assumed Variation in Selected Socioeconomic Variables

	Population	Employment	Income	Income Per Capita
2013	2.6%	4.6%	6.0%	6.0%
2014	3.9%	6.3%	7.3%	6.4%
2015	4.9%	7.5%	8.7%	6.8%
2016	5.9%	8.6%	10.0%	7.2%
2017	6.7%	9.5%	11.4%	7.7%
2018	7.5%	10.3%	12.8%	8.1%
2019	8.2%	11.0%	14.1%	8.5%
2020	8.9%	11.7%	15.0%	8.9%
2021	9.5%	12.3%	15.9%	9.4%
2022	10.2%	12.9%	16.8%	9.8%
2023	10.7%	13.5%	17.7%	10.2%
2024	11.3%	14.0%	18.6%	10.6%
2025	11.9%	14.6%	19.6%	11.1%
2026	12.4%	15.1%	20.5%	11.5%
2027	12.9%	15.5%	21.4%	11.9%
2028	13.5%	16.0%	22.3%	12.3%
2029	14.0%	16.4%	23.2%	12.8%
2030	14.4%	16.9%	24.1%	13.2%
2031	14.9%	17.3%	25.0%	13.6%
2032	15.4%	17.7%	25.9%	14.0%

Table XI-2 shows the plan changes given the low and high load forecast scenarios. AURORA Case 2 shows the results of the high load forecast scenario. Under the high load forecast scenario, AURORA selected 25 MW wind in 2014, 2015, 2016, 2017, peaking purchases of 20 MW in 2014, 20 MW in 2015, 30 MW in 2016, 30 MW in 2017, 50 MW in 2018, 20 MW in 2019, 50 MW in 2020, 10 MW in 2021, 20 MW in 2022, 20 MW in 2023, 30 MW in 2024, 30 MW in 2025, 30 MW in 2026, 40 MW in 2027, 40 MW in 2028, 50 MW in 2029, and 50 MW of simple cycle combustion turbine in 2018, 2020, 2029. The Base Case selected 25 MW of wind in 2018, 2019, 2020, 2021, peaking purchases of 30 MW in 2018, 30 MW in 2019, 50 MW in 2020, 10 MW in 2021, 10 MW in 2022, 10 MW in 2023, 10 MW in 2024-2026, 20 MW in 2027-2028, 30 MW in 2029, and 50 MW of simple cycle combustion turbine in 2020. Case 2 scenario fully utilizes all DSM, similar to the Base Case. The high load growth scenario requires 100 MW of additional resources and the present worth (W/O EXT) is approximately $743 million more than the Base Case.

AURORA Case 3 illustrates the changes resulting from the low load forecast scenario. Under the low load forecast scenario, peaking purchases of 20 MW in 2020, 10 MW in 2021, and 25 MW of wind in 2020-2022. Case 3 scenario fully utilizes all DSM, similar to the Base Case. The Case 3 low load growth scenario, which requires 75 MW less resource additions, has a present worth cost (W/O EXT) that is approximately $140 million less than the Base Case.

TABLE XI-2

Supply and Demand-Side Integration Sensitivity Analysis Results

AURORA Case Number	Case Description	W/O EXT PW Costs in 2012 Dollars (Million $)	WITH EXT PW Costs in 2012 Dollars (Million $)	DSM Programs Expected/Full CIP [E/F]				Renewable Resources			Peaking Purchases (10 MW)	Simple Cycle Combustion Turbine (50 MW)	Natural Gas Firing Reciprocating Engines (37 MW)
				Res Lite	Res Other	CI Lite	CI Other	Future Wind (130 MW)	Future Wind (25 MW)	SOLAR (1MW)			
Base	Base Load Forecast Low Externality Costs Base LMP Prices Base Gas Price	$1,329	$1,670	E	E	E	E	2021	2018 2019 2020 2021		24	2020	
Case 2	High Load Forecast High Externality Costs High LMP Prices High Gas Price	$2,072	$2,725	E	E	E	E	2021	2014 2015 2016 2017		49	2018 2020 2029	
Case 3	Low Load Forecast Low Externality Costs Base LMP Prices Base Gas Price	$1,189	$1,417	E	E	E	E	2021	2020 2021 2022		3		

EXPECTED AND FULL (1.5%) DSM ATTAINMENT

SMMPA has evaluated its load and capability situation in the event that SMMPA were only to achieve expected and Full (1.5%) DSM savings. Table XI-3 lists the annual planned capacity additions due to DSM for the two contingent attainment amounts. Tables XI-4 and XI-5 show the load and capability impacts that result from the expected and Full (1.5%) DSM levels. Table XI-6 shows the Base Case for expected DSM and Case 7 for the Full (1.5%) DSM attained levels. A full explanation of the Base and 1.5% Scenario cases is contained in Chapter VII - Plan Development.

The establishment of the CROD for Rochester Public Utilities, effective on January 1, 2000, means that they are responsible for serving that portion of load during any hour in which Rochester's total load is above 216 MW. This means that DSM installed in the Rochester service territory will not reduce SMMPA's summer capacity requirements. The same will be true for Austin Utilities in 2016 when they begin their CROD from the Agency. SMMPA continues to encourage DSM with all of its members. SMMPA will experience virtually all of the energy savings from DSM installed anywhere in its service territory but only experience summer capacity savings from DSM installed in the service territories of members other than Rochester and Austin. Consequently, only the DSM demand savings in the Non-CROD analysis was included in the AURORA optimizations, as outlined in Chapter VII .

The resultant DSM demand savings at the expected and Full (1.5%) DSM levels are shown in Table XI-3. Table XI-3 shows the cumulative effects of the various attainment scenarios. Table XI-4 shows the effect of Base Case (expected) DSM attainment. Table XI-5 shows the effect of Full (1.5%) of DSM attainment.

Table XI- 3

Expected and Full (1.5%) of Potential DSM Summer DSM Capacity Additions

Year	Expected Planned Addition (MW)	Full (1.5%) Planned Addition (MW
2014	27.325	36.592
2015	32.371	45.938
2016	31.176	56.512
2017	41.882	67.104
2018	46.626	78.286
2019	51.747	90.798
2020	57.769	105.057
2021	64.593	120.238
2022	71.840	135.512
2023	79.270	150.644
2024	86.990	165.627
2025	94.478	180.530
2026	101.853	194.752
2027	109.282	210.559
2028	116.563	225.733

Table XI-6, shows the AURORA results for the two DSM attainment levels. The DSM levels resulted in the model choosing different resources than those selected to meet future needs in the Base Case. The financial implications are however, exactly as would be expected. If the expected DSM was to be obtained, then Case 7 provides approximately $37 million in savings over the Base Case. The results show that expected levels of DSM will result in higher costs and full (1.5%) levels of DSM will result in lower costs. The results are consistent with and support SMMPA’s continual approach of evaluating and adding new cost-effective DSM strategies as outlined in Sections VI and VII.

TABLE XI-4 (Part 1)
Expected DSM Attainment
2014-2028 Base Forecast Load & Capability Including Resource Plan Information

		2014	2015	2016	2017	2018	2019	2020	2021
Total Member Requirements		751.8	773.1	793.0	814.6	836.2	858.1	878.1	900.1
	Above CROD	(85.8)	(97.3)	(108.5)	(120.7)	(132.8)	(144.7)	(155.6)	(167.6)
	Installed DSM-Conservation	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)
	Member Generation	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)
	Transmission Losses	11.1	11.3	11.5	11.7	11.9	12.1	12.3	12.5
	Total Adjustments	(162.3)	(173.6)	(184.6)	(196.5)	(208.5)	(220.2)	(230.9)	(242.7)
Total Agency Requirement		589.5	599.5	608.4	618.0	627.7	638.0	647.2	657.4
	Planning Reserve Requirements (9.3%)	54.8	55.8	56.6	57.5	58.4	59.3	60.2	61.1
Total Generation Level Requirements		644.3	655.3	665.0	675.5	686.1	697.3	707.4	718.5
	Supply Side Resources								
	Existing Generation Resources	560.0	560.0	560.0	560.0	560.0	560.0	560.0	560.0
	Existing Capacity Purchases	60.0	60.0	65.0	70.0	40.0	40.0		
	Existing EMP Program	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1
	Existing Direct Load Control	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4
	New DSM	6.9	12.0	16.8	21.5	26.2	31.3	37.4	44.2
	New DSM Reserves & Losses Offset	3.4	4.4	5.4	6.4	7.3	8.4	9.6	11.1
	New Conventional Generation							50.0	50.0
	New Wind Generation					2.5	5.0	7.5	23.0
	New Solar Generation								
	New Capacity Purchases					30.0	30.0	50.0	10.0
	Total Supply Side Resources	657.8	663.9	674.6	685.3	693.5	702.2	742.0	725.7
Agency Resource Status (Positive = Excess MW)		13.5	8.6	9.6	9.8	7.5	4.9	34.6	7.2
	Actual Reserve Margin	11.6%	10.7%	10.9%	10.9%	10.5%	10.1%	14.6%	10.4%

TABLE XI-4 (Part 2)
Expected DSM Attainment
2014-2028 Base Forecast Load & Capability Including Resource Plan Information

		2022	2023	2024	2025	2026	2027	2028
Total Member Requirements		920.8	941.2	961.0	983.3	1,005.0	1,026.9	1,047.1
	Above CROD	(179.1)	(190.5)	(201.8)	(214.3)	(226.7)	(239.3)	(251.0)
	Installed DSM-Conservation	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)
	Member Generation	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)
	Transmission Losses	12.6	12.8	13.0	13.2	13.4	13.6	13.7
	Total Adjustments	(254.1)	(265.3)	(276.4)	(288.7)	(300.9)	(313.4)	(324.8)
Total Agency Requirement		666.7	675.9	684.6	694.5	704.1	713.6	722.2
	Planning Reserve Requirements (9.3%)	62.0	62.9	63.7	64.6	65.5	66.4	67.2
Total Generation Level Requirements		728.7	738.8	748.2	759.1	769.6	779.9	789.4
	Supply Side Resources							
	Existing Generation Resources	560.0	560.0	560.0	560.0	560.0	560.0	560.0
	Existing Capacity Purchases							
	Existing EMP Program	7.1	7.1	7.1	7.1	7.1	7.1	7.1
	Existing Direct Load Control	20.4	20.4	20.4	20.4	20.4	20.4	20.4
	New DSM	51.4	58.9	66.6	74.1	81.5	88.9	96.2
	New DSM Reserves & Losses Offset	12.6	14.2	15.8	17.4	18.9	20.5	22.0
	New Conventional Generation	50.0	50.0	50.0	50.0	50.0	50.0	50.0
	New Wind Generation	23.0	23.0	23.0	23.0	23.0	23.0	23.0
	New Solar Generation							
	New Capacity Purchases	10.0	10.0	10.0	10.0	10.0	20.0	20.0
	Total Supply Side Resources	734.5	743.6	752.9	761.9	770.8	789.8	798.6
Agency Resource Status (Positive = Excess MW)		5.8	4.8	4.6	2.8	1.2	9.9	9.2
	Actual Reserve Margin	10.2%	10.0%	10.0%	9.7%	9.5%	10.7%	10.6%

TABLE XI-5 (Part 1)
Full (1.5%) DSM Attainment
2014-2028 Base Forecast Load & Capability Including Resource Plan Information

		2014	2015	2016	2017	2018	2019	2020	2021
Total Member Requirements		751.8	773.1	793.0	814.6	836.2	858.1	878.1	900.1
	Above CROD	(85.8)	(97.3)	(108.5)	(120.7)	(132.8)	(144.7)	(155.6)	(167.6)
	Installed DSM-Conservation	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)
	Member Generation	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)
	Transmission Losses	11.1	11.3	11.5	11.7	11.9	12.1	12.3	12.5
	Total Adjustments	(162.3)	(173.6)	(184.6)	(196.5)	(208.5)	(220.2)	(230.9)	(242.7)
Total Agency Requirement		589.5	599.5	608.4	618.0	627.7	638.0	647.2	657.4
	Planning Reserve Requirements (9.3%)	54.8	55.8	56.6	57.5	58.4	59.3	60.2	61.1
Total Generation Level Requirements		644.3	655.3	665.0	675.5	686.1	697.3	707.4	718.5
	Supply Side Resources								
	Existing Generation Resources	560.0	560.0	560.0	560.0	560.0	560.0	560.0	560.0
	Existing Capacity Purchases	60.0	60.0	65.0	70.0	40.0	40.0		
	Existing EMP Program	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1
	Existing Direct Load Control	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4
	New DSM	16.2	25.5	36.1	46.7	57.9	70.4	84.7	99.8
	New DSM Reserves & Losses Offset	4.2	5.6	7.1	8.6	10.1	11.9	13.9	16.0
	New Conventional Generation								
	New Wind Generation							2.5	15.5
	New Solar Generation								
	New Capacity Purchases							20.0	
	Total Supply Side Resources	667.9	678.6	695.7	712.8	695.5	709.8	708.6	718.8
Agency Resource Status (Positive = Excess MW)		23.5	23.3	30.6	37.3	9.4	12.5	1.2	0.2
	Actual Reserve Margin	13.3%	13.2%	14.3%	15.3%	10.8%	11.3%	9.5%	9.3%

TABLE XI-5 (Part 2)
Full (1.5%) DSM Attainment
2014-2028 Base Forecast Load & Capability Including Resource Plan Information

		2022	2023	2024	2025	2026	2027	2028
Total Member Requirements		920.8	941.2	961.0	983.3	1,005.0	1,026.9	1,047.1
	Above CROD	(179.1)	(190.5)	(201.8)	(214.3)	(226.7)	(239.3)	(251.0)
	Installed DSM-Conservation	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)	(76.4)
	Member Generation	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)	(11.2)
	Transmission Losses	12.6	12.8	13.0	13.2	13.4	13.6	13.7
	Total Adjustments	(254.1)	(265.3)	(276.4)	(288.7)	(300.9)	(313.4)	(324.8)
Total Agency Requirement		666.7	675.9	684.6	694.5	704.1	713.6	722.2
	Planning Reserve Requirements (9.3%)	62.0	62.9	63.7	64.6	65.5	66.4	67.2
Total Generation Level Requirements		728.7	738.8	748.2	759.1	769.6	779.9	789.4
	Supply Side Resources							
	Existing Generation Resources	560.0	560.0	560.0	560.0	560.0	560.0	560.0
	Existing Capacity Purchases							
	Existing EMP Program	7.1	7.1	7.1	7.1	7.1	7.1	7.1
	Existing Direct Load Control	20.4	20.4	20.4	20.4	20.4	20.4	20.4
	New DSM	115.1	130.2	145.2	160.1	174.4	190.2	205.3
	New DSM Reserves & Losses Offset	18.3	20.6	22.8	25.1	27.1	29.5	31.7
	New Conventional Generation							
	New Wind Generation	15.5	15.5	15.5	15.5	15.5	15.5	15.5
	New Solar Generation							
	New Capacity Purchases							
	Total Supply Side Resources	736.4	753.8	771.0	788.2	804.5	822.7	840.0
Agency Resource Status (Positive = Excess MW)		7.6	15.0	22.7	29.0	34.9	42.7	50.5
	Actual Reserve Margin	10.4%	11.5%	12.6%	13.5%	14.3%	15.3%	16.3%

TABLE XI-6

Supply and Demand-Side Integration Sensitivity Analysis Results

AURORA Case Number	Case Description	W/O EXT PW Costs in 2012 Dollars (Million $)	WITH EXT PW Costs in 2012 Dollars (Million $)	DSM Programs Expected/Full CIP [E/F]				Renewable Resources			Peaking Purchases (10 MW)	Simple Cycle Combustion Turbine (50 MW)	Natural Gas Firing Reciprocating Engines (37 MW)
				Res Lite	Res Other	CI Lite	CI Other	Future Wind (130 MW)	Future Wind (25 MW)	SOLAR (1MW)			
Base	Base Load Forecast Low Externality Costs Base LMP Prices Base Gas Price	$1,329	$1,670	E	E	E	E	2021	2018 2019 2020 2021		24	2020	
Case 7	Base Load Forecast Low Externality Costs Base LMP Prices Base Gas Price	$1,292	$1,587	F	F	F	F	2021	2020		2		

SUDDEN LARGE LOAD ADDITION

If SMMPA is faced with a sudden large load addition, it can call on capacity and energy from a variety of resources. It is likely that additional energy requirements could be met in the short term from the surplus energy that exists on the SMMPA system as a result of planning reserve requirements and from the MISO market. In particular, the relative decoupling of generation and loads that has occurred with the implementation of the MISO LMP market makes it easier to serve the energy needs of unexpected load additions.

To meet MISO's capacity requirements as a result of a sudden large load addition, SMMPA would likely have to turn to the capacity market to purchase adequate capacity to avoid a deficiency and its associated penalties. SMMPA has successfully used this approach in the past to respond to short-term capacity needs.

Longer term responses to a sudden large load addition would require planning on SMMPA's part to determine the most appropriate and economical means of serving the load. SMMPA has formed a partnership with The Energy Authority (TEA), a wholesale power marketing firm that focuses on providing marketing services for public power entities such as joint action agencies and municipalities. This partnership provides SMMPA access to markets not only in MISO, but also throughout the entire Eastern Interconnection. SMMPA would plan on taking advantage of this partnership to address any sudden large load addition.

FAILURE OR SUDDEN RETIREMENT OF EXISTING FACILITIES

SMMPA has several options available to react to a failure or sudden retirement of an existing generation resource. The choice of option employed would depend on several factors, such as the type of resource lost, the time required to replace or repair the unit, and the price and availability of capacity and energy within the MISO pools.

If another major failure were to occur at Sherco 3, repairing the facility would tend to be much less expensive than a full replacement as we have seen with the failure in 2011. A failure such as this could take anywhere from six months to two years to repair. In either case, SMMPA would most likely replace the lost capacity using the MISO Capacity Market. SMMPA would replace the lost energy from this facility through a portfolio approach in order to minimize the risk and exposure from any one source. This portfolio would include short term energy contracts and spot market energy purchase.

If the failure were to occur at a peaking facility such as one of our member city contracted generators, a decision would have to be made as to whether or not it would be economical to repair. If the decision were made to repair the unit, the work would most likely be completed in less than 1 year. If the decision were made not to repair the unit, an AURORA case scenario would be run to help determine the best type of replacement resource for this lost facility. If AURORA modeling determines that the replacement should be another peaking unit, one option would be to replace it with a new Quick-Start Agreement with one of SMMPA's member cities. Preference would most likely be given to the member city which lost the unit in order to help maintain their previous capabilities. This new quick-start facility could most likely be completed within 24 months. On the other hand, if AURORA modeling identified a baseload resource as the most economical replacement alternative, SMMPA would most likely handle this through the normal resource planning process to help determine the best baseload option. In the meantime, SMMPA would have to purchase spot market capacity from the MISO pool until the new baseload facility became operational. In either case, SMMPA would use the same portfolio approach as discussed above, in order to replace the energy from this unit until such replacement can be put into operation. Historically, short term replacement energy and capacity has been readily available from the MISO markets.

50% AND 75% CONSERVATION AND RENEWABLE PLANS

Minnesota Statutes §216B.2422, Sub2 states that "a utility shall include the least cost plan for meeting 50 and 75 percent of all new and refurbished capacity needs through a combination of conservation and renewable energy resources."

SMMPA's Base Case resource plan involves the installation of 397 MW of name plate or rated capacity consisting of a simple cycle combustion turbine (CT), renewable resources, and Demand-Side Management (DSM). The name plate capacity translates into an accredited reserve capacity of 190 MW of new capacity consisting of 50 MW of simple cycle CT, 140 MW of DSM, and wind resources over the 15-year planning period (2014-2028). Table XI-7 shows the amounts and percentages of the various types of resources added to the system for the Base Case resource plan and the resulting capacity values.

TABLE XI-7
Resource Additions for Base Case Plan

	Installation Years	Rated Capacity (MW)	Reserve Capacity (MW)	Percent of Total Reserve Capacity Add. (%)
Simple Cycle CT	2020	50	50	26.32%
New Additions		50	50	26.32%
DSM Additions	2014-2028	117	117	61.58%
Future Wind I	2018-2021	100	10	5.26%
Future Wind II	2021	130	13	6.84%
Total DSM & Renewables	2014-2028	347	140	73.68%
Total New Additions	2014-2028	397	190	100.00%

As shown in the above table, the additional new capacity in the Base Case resource plan for the current filing includes 73.68% of DSM and renewables. For this IRP study, we have assumed that the reserve capacity of wind resources is 10% of the rated capacity, which is consistent with standard utility planning and operating practices.

An AURORA case was not developed for each of the 50% and 75% conservation and renewable scenarios, because SMMPA has such a small requirement for additional capacity through the end of the study period and the Base Case has already provided 73.68% renewable and DSM resources for future needs.

DEVELOPMENT OF A LARGE QUALIFYING FACILITY

SMMPA does not have concerns about large qualifying facilities being connected to the system as long as SMMPA is only required to pay avoided costs, taking into consideration the need for capacity and any associated increased expenses. As long as the Agency's financial obligations to future unforeseen qualifying facility projects are based upon paying avoided costs, our members and their customers would not be negatively impacted.

NON-AVAILABLE OR UNECONOMIC PURCHASED POWER

Significant changes have taken place in recent years with the arrival of the new MISO energy market. This new market provides SMMPA access to a much larger group of generation resources. The design of this new market, in theory, guarantees that energy will always be available on a minute-to-minute basis via MISO's vast generation pool. With this wider reach, the Agency expects the risk of non-available or uneconomic purchased power will be significantly reduced.

The competitive wholesale market environment, if it functions as designed, should keep capacity and energy available at competitive rates. A number of wholesale brokers, marketers, and independent power producers have become established throughout the region. These entities also make available capacity and energy from outside of the region. SMMPA is continually looking to establish relationships with these types of organizations to diversify its purchased power options.

INCREASED COMPETITIVE ENVIRONMENT

The utility landscape has changed significantly in the years since the Federal Energy Regulatory Commission (FERC) issued Order 888, in an effort to spur competition in the wholesale electric market. Since that time there has been a flurry of activity at the wholesale level, followed by a strong push by many states towards some form of retail competition. A whole new world of independent power producers (IPP's) has for the most part come and gone. What remains is a system of new Regional Transmission Organizations (RTO) serving a mix of regulated and deregulated state utility markets. Nevertheless, the industry is still looking for ways to promote and even ensure that there is true wholesale competition.

Throughout this period SMMPA has worked to increase its capabilities in understanding these rapidly changing and complex markets. SMMPA has increased the capacity of its wholesale marketing staff and supplemented that staff capability with strategic partnerships such as the one with The Energy Authority. The Energy Authority (TEA) is a wholesale power marketing firm that focuses on providing marketing services for public power entities such as joint action agencies and municipalities. Not only does our TEA relationship provide SMMPA access to markets throughout the entire Eastern Interconnection, but TEA's extensive MISO experience helps SMMPA operate as cost effectively as possible in MISO.

SMMPA's strategic partnership with other regional utilities continues as well. The CapX 2020 transmission efforts described previously provide an opportunity for SMMPA to ensure development, access, and a right to invest and own additional transmission in a framework that minimizes individual utility risk.

GREENHOUSE GAS INITIATIVES

SMMPA continues to monitor greenhouse gas developments. Agency staff has served on the Midwest Governor's Association – Renewable Electricity & Advanced Coal with Carbon Capture and Storage Advisory Group and currently serves on the American Public Power Associations (APPA) CEO Climate Change and Generation Policy Task Force.

SMMPA staff is currently monitoring the Environmental Protection Agency's (EPA) efforts to develop new source performance standards (NSPS) or existing plants by participating in listening sessions conducted by Resources for the Future, and the EPA. We will continue to monitor these efforts with an eye towards assessing potential consumer impacts and partnering with other similar organizations in assessing those impacts and developing appropriate strategies to mitigate impacts.

SMMPA has aggressively pursued the development of readily available technologies which reduce the Agency's carbon footprint, specifically renewables and DSM. SMMPA has been recognized for its efforts in both areas having received several awards for its DSM initiatives from the U.S Department of Energy and the U.S. Environmental Protection Agency. More information about SMMPA's approach to reducing carbon-based generation is described in Section XII.

SOLAR OBJECTIVE

In 2013, the Minnesota Legislature passed amendments to Statutes 216B.2422, under section 216B.1691, subdivision 2f, concerning the solar energy standard.

In Table XI-8, Case 8 shows what impact one MW of solar can have on planning. Case 8 has a financial impact of being approximately $2 million dollars more expensive without the extension (W/O EXT) compared to the Base Case.

In Table XI-8, Case 9 shows the impact of a 35 MW solar project on the SMMPA system. Compared to the Base Case, Case 9 is approximately $62 million dollars more expensive without the extension (W/O EXT) than the Base Case.

ADDITIONAL CONCERNS

In order to cover additional concerns, in Table XI-8, the following cases were completed to compare plans and financial impacts to the Base Case.

- Case 5 has NO DSM and reflects a large change in future resources along with a financial impact of being $108 million dollars without the extension (W/O EXT) more expensive than the Base Case. Further description is found in Chapter VII
- Case 6 has NO RENEWABLES and reflects a change in future resources along with a financial impact of being $95 million dollars without the extension (W/O EXT) less expensive than the Base Case.
- Case 7 has FULL (1.5%) DSM and reflects a change in future resources along with a financial impact of being $37 million dollars without the extension (W/O EXT) less expensive than the Base Case. Further description is found in Chapter VII.

- Cases 8 and 9 were discussed in the Solar Objective above.
- Case 10 has HIGH PEAKING PURCHASES and reflects no change in future resources but has a financial impact of being $8 million dollars without the extension (W/O EXT) more expensive than the Base Case.

This concludes the cases in Table XI-8.

TABLE XI-8

Supply and Demand-Side Integration Sensitivity Analysis Results

AURORA Case Number	Case Description	W/O EXT PW Costs in 2012 Dollars (Million $)	WITH EXT PW Costs in 2012 Dollars (Million $)	DSM Programs Expected/Full CIP [E/F] Res Lite	Res Other	CI Lite	CI Other	Renewable Resources Future Wind (130 MW)	Future Wind (25 MW)	SOLAR (1MW)	Peaking Purchases (10 MW)	Simple Cycle Combustion Turbine (50 MW)	Natural Gas Firing Reciprocating Engines (37 MW)
Base	Base Load Forecast Low Externality Costs Base LMP Prices Base Gas Price	$1,329	$1,670	E	E	E	E	2021	2018 2019 2020 2021		24	2020	
Case 5	NO DSM Base Load Forecast Low Externality Costs Base LMP Prices Base Gas Price	$1,437	$1,964					2021	2014 2015 2016 2017		61	2018 2020 2024	2029 2050
Case 6	NO RENEWABLES Base Load Forecast Low Externality Costs Base LMP Prices Base Gas Price	$1,234	$1,597	E	E	E	E				60	2020 2029	
Case 7	Base Load Forecast Low Externality Costs Base LMP Prices Base Gas Price	$1,292	$1,587	F	F	F	F	2021	2020		2		
Case 8	SOLAR- 1MW Base Load Forecast Low Externality Costs Base LMP Prices Base Gas Price	$1,331	$1,673	E	E	E	E	2021	2018 2019 2020 2021	2014	23	2020	
Case 9	SOLAR- 35MW-2014 Base Load Forecast Low Externality Costs Base LMP Prices Base Gas Price	$1,391	$1,746	E	E	E	E	2021	2020 2021 2022 2023		33		
Case 10	HIGH PEAKING PURCHASES Base Load Forecast Low Externality Costs Base LMP Prices Base Gas Price	$1,337	$1,678	E	E	E	E	2021	2018 2019 2020 2021		24	2020	

XII Environmental

GENERAL DISCUSSION

There are a number of federal and state initiatives and regulations that affect the cost and/or ability of SMMPA to provide power to its members. Among the most significant pieces of federal legislation to impact the electric utility industry was the Clean Air Act Amendments (CAAA) of 1990. The subsequent regulations from the CAAA such as the Cross State Air Pollution Rule (CSAPR) and the Mercury and Air Toxics Standards (MATS), affect the operation of nearly every fossil-fired power plant in the country.

Current Environmental Protection Agency (EPA) discussions relative to new source performance standards (NSPS) for both new and existing fossil fuel plants will provide additional information and directives. Initiatives in Minnesota including the Renewable Energy Standard (RES), conservation improvement program (CIP), and greenhouse gas programs also impact on the cost and/or ability of SMMPA to provide power to its members.

SULFUR DIOXIDE REDUCTIONS REQUIRED BY CAAA AND CSAPR

Part of the Title IV requirements placed on utilities in the CAAA of 1990 includes the requirement to have allowances for the emission of SO_2. An allowance of SO_2 is equivalent to one ton of SO_2. Nationally, the total number of annual allowances is fixed at 10 million tons below the 1980 SO_2 emissions level. The reductions were to be achieved through a two-phase tightening of the restrictions placed on fossil-fuel-fired power plants. In 1995, all Phase I generating units were allocated allowances and were allowed to emit tons of SO_2 equal to the number of allowances they held. Since 2000, all Phase II units must have allowances equal to or greater than the number of tons of SO_2 they emit.

SMMPA had no Phase I generating units. Sherco 3, which is jointly owned with Xcel, is SMMPA’s only Phase II unit. Sherco 3 burns sub-bituminous western coal with a sulfur content that is less than 1%. Sherco 3 is equipped with a state-of-the-art dry scrubber system which has enabled this generating unit to successfully meet the CAAA regulations on SO_2 without any major modifications. Likewise, it is anticipated that Sherco 3 would also be able to comply with the new CSAPR regulations on SO_2 with only minor modifications to increase scrubber capability. Although SO_2 allowance prices are currently at an all time low, possible future increases in SO_2 allowance prices would have little or no affect on this existing resource plan.

NO_X REDUCTIONS REQUIRED BY CAAA AND CSAPR

Title IV of the CAAA also contains NOx emission limitations. The NOx provisions limit NOx emission rates for different combustion technologies. To comply with the CAAA NOx provisions, SMMPA studied its alternatives and made investments at Sherco 3. In order to comply with the CAIR standards (now CSAPR), new low-NOx burners were installed in 2008, resulting in a decrease in NOx emission of approximately 70%.

MERCURY REDUCTIONS REQUIRED BY THE MINNESOTA MERCURY EMISSION REDUCTION ACT OF 2006

During the 2006 Minnesota Legislative session, several bills were introduced to help reduce mercury emissions around the State. Approximately 50% of the mercury emission in Minnesota for the year 2005 came from coal-fired boilers. There are currently more than 60 such boilers located throughout Minnesota operated by more than 20 different companies. Bringing all stakeholders together would have been an insurmountable task requiring years of dialog. In order to obtain a quick and easy solution to mercury reduction, a negotiated settlement was made between the MPCA and Minnesota's two largest public utilities. This new law, the Minnesota Mercury Emissions Reduction Act (MMERA), requires Xcel Energy and Minnesota Power to reduce mercury emissions at their largest generating facilities by 90% by the year 2010 for dry scrubber units and 2014 for wet scrubbed units. This law accelerates the then existing Federal program by up to eight years and increases required removal rates from 70% to 90%. In return for agreeing to this expansion of the Federal program, Xcel Energy and Minnesota Power were granted an extension of their emission rate rider which allows them to seek full cost recovery of any cost associated with mercury removal, plus provides for special bonuses based on performance.

The 2006 MMERA was specifically written to target generating assets owned by Xcel Energy and Minnesota Power. The law purposely excluded generating assets owned by other companies in order to simplify and expedite the lawmaking process. The MPUC in its recent ruling agreed that the MMERA did not apply to SMMPA. Nonetheless, SMMPA did volunteer to work with

Xcel Energy to submit a joint mercury reduction plan that would encompass both Xcel's and SMMPA's share of the generating unit. This plan seeks to achieve a mercury removal rate nearing 90% removal. The equipment was installed during 2010 and appeared to be working well before the unit failure in 2011.

GREENHOUSE GAS REQUIREMENTS

As a portion of the Next Generation Energy Act of 2007, Minnesota made sweeping changes in how Minnesota utilities would meet the needs of their electric consumers in the future. Those changes included the 25% by 2020 Renewable Energy Standard (RES) for most utilities, including SMMPA and the annual 1.5% energy savings goal under the Conservation Improvement Program (CIP) required of all retail electrical providers in Minnesota. In previous sections of the current filing, SMMPA has identified how it is successfully meeting, or exceeding the targets of these initiatives.

SMMPA has taken additional steps to aide in the reduction on CO_2 emissions since its last IRP filing in 2009. SMMPA entered into a purchase power agreement for a 100 MW wind project in southeastern Minnesota which reduces the carbon emission from serving SMMPA's load by approximately 12%. The turbine efficiency upgrade at Sherco 3 which was completed in the fall of 2011 is expected to reduce CO_2 emissions by another 1%. The Agency also retired approximately 100 MW of older inefficient coal and natural gas fired steam plants reducing CO_2 emissions by another 3% to 4%. In 2012, SMMPA commissioned a 1.6 MW landfill gas engine near Mora, Minnesota. Finally, SMMPA is in the process of installing 25 MW of higher efficiency natural gas fired engines at its plant in Fairmont.

SMMPA, at present, has enough qualifying RES resources, with renewable energy certificate (REC) banking requirements, to meet its RES requirements through 2020.

This filing also identifies the "above target" success which SMMPA has experienced to-date in our CIP program. SMMPA's DSM Programs play a vital role in helping Minnesota achieve its climate change goals. As a result of the electric savings, SMMPA and its members, through CIP in 2009-2012, avoided nearly 169,000 tons of CO_2 emissions. Table XII-1 below provides an estimate of the CO_2 impact of those efficiency programs. On average, each megawatt-hour

(MWh) of electricity saved in Minnesota avoids 1,823 pounds of CO_2 emitted to the atmosphere.[1]

Table XII-1 SMMPA CIP Program Results 2009-2012

CIP Year	Aggregated MWh Saved/MWh Sales	Aggregated Incremental MWh Savings	Estimated Incremental CO_2 Reduction (Tons)[1]
2009	1.33%	38,923	35,478
2010	1.70%	49,674	45,278
2011	1.64%	47,969	43,724
2012	1.70%	48,748	44,434

[1] Regional average emission rate from Docket No. E,G999/CI-00-1343. The CO_2 emission rate was last updated on March 17, 2009.

SMMPA continues its commitment to taking action to reduce carbon emissions. This plan cost effectively serves our load requirements while reducing carbon intensity per unit of energy delivered through an optimum mix of effective DSM programs, reduced reliance on coal, generating facility efficiency improvements, expansion of our already substantial renewable energy sources, and the addition of carbon-minimizing resources in the long term.

Since Sherco was out of service since 2011 for two years, it is not possible to calculate representative carbon intensity because of the large amounts of energy purchased through the MISO market during this outage. However, the Agency estimates that its overall carbon intensity will be well under 1.0 tons/MWh in the future and continue to decrease over time as more renewable resources are added.

MACT 40, CFR 63 FOR RECIPROCATING ENGINES

The EPA established new standards for stationary reciprocating internal combustion engines (RICE). Many municipal utilities have chosen to retire their RICE generation resources rather than incur the costs of implementing these new standards. SMMPA relies very heavily on its fleet of RICE resources and chose to implement these new standards at all of our Member "life-of-unit" contracted RICE generators. In general, this implementation included three primary components. The largest expense was to install oxidation catalysts on each engine which removed in excess of 70% of CO emissions. Because these oxidation catalysts are generally integral to the engine's exhaust silencer, adding this new catalyst also facilitated the need to replace the silencer and exhaust stacks. The second change was to add crankcase ventilation systems to all units which filters and returns any oil fumes back into the engines rather than venting to atmosphere. Third was to implement formal operating and maintenance procedures designed to optimize the operation of the energy thereby minimizing any emissions. SMMPA has always had a very strong operation and maintenance program for its fleet of RICE generators, so this last phase of implementation was relatively painless. The entire cost of this upgrade was approximately $3.5 million dollars.

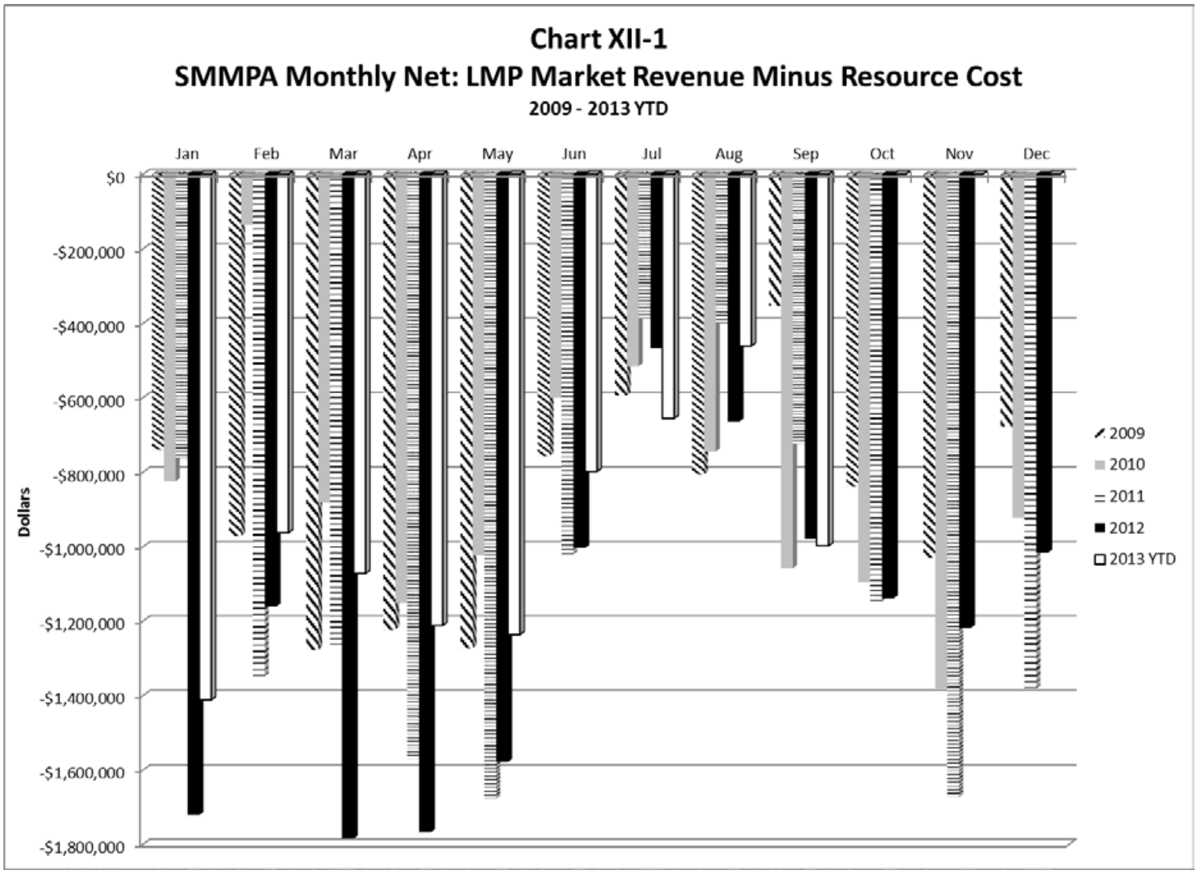
RENEWABLE ENERGY STANDARD (RES) COST ANALYSIS

During the 2011 Legislative session, Minnesota Laws 2011, Chapter 97, Section 15, amended Minn. Stat. §216B.1691 [Renewable Energy Objectives] by adding a Subdivision 2e. This subdivision required each electric utility subject to the RES to submit a report to the MPUC estimating the rate impact of compliance with the RES statute. The report was to be submitted within 150 days of the effective date of the Legislation. Additionally, subsequent analysis was to be included in future resource plan filings.

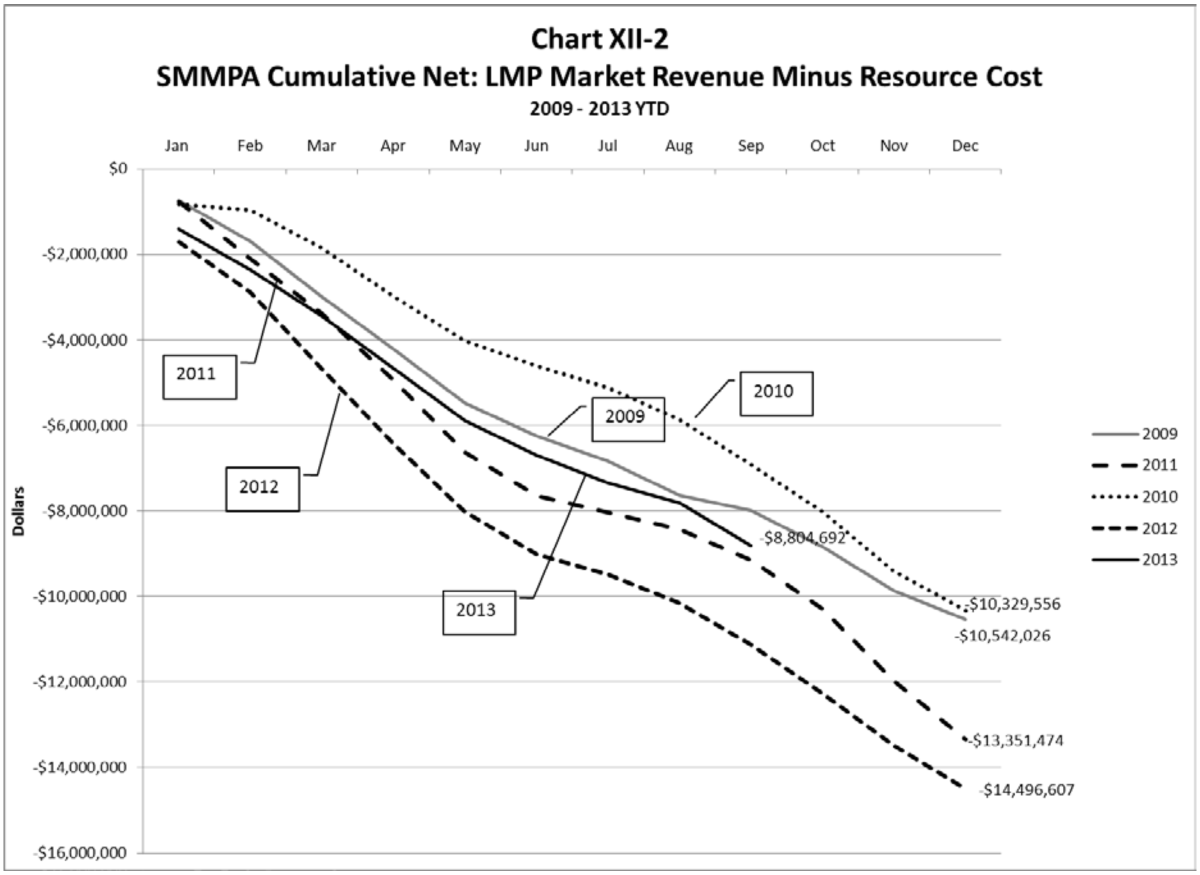
In its initial filing in October of 2011, SMMPA used a two-pronged approach for estimating economic impact: 1) A market-based assessment – comparing the costs associated with acquiring the RES resource relative to the Locational Marginal Price (LMP) received from the Midcontinent Independent System Operator (MISO) for the injection of that renewable generation, and 2) An assessment of the current resource plan with and without our portfolio of renewable resources to meet the RES.

Market-Based Assessment

Over 90% of SMMPA's current renewable generation is attributable to a single wind purchase power agreement (PPA). That resource, located in southeastern Minnesota and described in Chapter VI, went commercial in February of 2009 ensuring that SMMPA would have sufficient



resources to meet the step-up in RES requirement in 2010. Chart XII-1 above shows the net difference between the aggregate costs under the PPA and the aggregate injection revenues received from MISO based upon locational marginal prices (LMP) for 2009 – 2013 year-to-date. Since the project came on line in 2009, there has not been a month in which SMMPA received more in revenues from MISO injection than it pays in generation costs for the project. Monthly losses have ranged from a low of approximately $136,000 in February of 2010 (a month in which there was an outage from a transformer issue for part of the month), to nearly $1.8 million in March of 2012. Chart XII-2 below provides the same information in a cumulative chart for 2009 through September of 2013.



Annual losses range from a low of $10.3 million in 2010, to a high of nearly $15 million in 2012. It appears that loses for 2013 will fall between those values. The values contained in the charts above show the net of project costs and revenues from hourly injections into MISO. However, there are some additional costs to be considered. There continue to be significant periods of transmission congestion which causes MISO to issue negative LMPs to encourage generators to go off-line. Wind generation in locations of transmission congestion (significant generation and low load) presents some unique challenges in that wind developers typically see these units as must-run units regardless of LMP prices. That means that during periods of negative LMPs, a utility with a PPA would typically be expected to incur all of the production costs of the developer plus additionally have to pay MISO the negative LMP to deliver the power – a particularly uneconomical event. SMMPA has structured its agreement with our developer to allow SMMPA to make economic curtailments during periods of negative LMP's to mitigate costs. However, SMMPA is still responsible for making up the loss of the Production Tax Credit (PTC), which is based upon unit production, to the developer. Since 2009, the negative LMP hours range from about 450 to over 600 hours annual and add an average expense of $355,000 annually.

Offsetting the costs described above is a small capacity benefit and the renewable energy credit benefit. Beginning in 2010, MISO began allowing a capacity credit based upon the availability of the wind power project at the time of the prior year's peak. While the peak value will vary from year to year, over the past several years that average value for this 100.5 MW project is 12 MW. If capacity was valued at $2.50/kW month, this would provide a value to SMMPA of approximately $360,000. An additional benefit to SMMPA is the renewable energy certificate (REC) value. RECs values vary by vintage, but if we consider a current wind REC purchase price of $1.10 per REC and our project produces 300,000 MWh annually, RECs provide another $330,000 of value that is not reflected in the LMP price.

When the costs and the benefits are averaged, the project has an annual cost to SMMPA members of approximately $10-$11M. This cost represents approximately 5% of SMMPA's annual revenues from its members.

There are strengths and weaknesses to the real-time market analysis. The biggest weakness is that it is not forward looking and assumes that near term costs and prices are constant. The biggest strength is that these are not hypothetical but real costs that the Agency and its members must cover. To provide a longer term assessment, we also conduct an IRP modeling assessment to benchmark RES costs.

IRP Modeling Assessment

Another approach to assessing the financial impacts of the RES is to utilize the AURORA model to run a case which does not have any of the RES resources included and then compare that case to the Base Case and look at the net present value (NPV) difference. All of the AURORA cases run for this filing can be found at the end of Chapter VII – Plan Development. Case 6 is a "No Renewables" Case which does not allow the model to select any RES resources. The NPV of the No Renewables case is $1,234 million. The NPV of the Base Case, which includes RES resources, is $1,329 million or approximately 7.7% higher over the planning horizon than the No Renewable case.

POTENTIAL REGULATIONS

Over the past several years, there has been significant debate over potential environmental legislation aimed at further reducing power plant emissions. Much of the debate focuses on the type of pollutants that should be regulated and the extent to which they should be regulated. The ongoing revisions to CAIR and CSAPR regulations, designed to further limit further emissions of SO_2, NOx, and mercury, are examples of this continually evolving landscape.

SMMPA actively monitors the development of proposed regulations and legislation to regularly estimate the impact of future emissions restrictions. As discussed above, SMMPA expects little to no impact on Sherco 3 as a result of the proposed Cross State Air Pollution Rule (CSAPR) since Sherco 3 already utilizes modern control technologies for SO_2 and NOx. Likewise, there should be no impact to Sherco 3 resulting from the new Mercury and Air Toxic Standards (MATS) since mercury control equipment has already been installed. Sherco is also not impacted by the new Clean Water Act (CWA) Cooling Water Intake Structure (CWIS) rule since Sherco does not use once through cooling. To protect our interests in Sherco 3, as well as to guide us in assessing the risks associated with constructing future units, SMMPA will continue to conduct the appropriate risk analyses as regulatory changes unfold.

The Midcontinent Independent System Operator (MISO) has also been concerned about the potential impact of new environmental regulations. MISO conducted a study in 2011 to help quantify the impact which these regulations may have on the energy market. This study identified nearly 13,000 MW of coal-fired generation that was in risk of retirement due to these regulations. As a result, even though Sherco 3 is not directly impacted by these regulations, SMMPA may experience higher costs of purchase power in the future due to retirement of low cost generation within MISO.

Recently the EPA has issued New Source Performance Standards (NSPS) for new fossil fueled plants, and is currently promulgating NSPS standards for existing plants which are scheduled to be released for review and comment in the summer of 2014. The primary focus of these regulations is carbon reduction. The U.S. Environmental Protection Agency (EPA) is currently conducting a series of “listening sessions” around the country to help determine the scope and timing of any new NSPS standard for existing plants. Of concern in determining final rules is the necessity of certain plant locations for grid stability and the recognition that some utilities may face single unit contingencies depending upon how standards are implemented.

ENVIRONMENTAL EXTERNALITIES

SMMPA has utilized the Minnesota Public Utilities Commission (PUC) schedule of environmental costs for electric utilities, adjusted for inflation, in evaluating and selecting resource options. The PUC's environmental externality value ranges are designed for four specific regions: urban, metropolitan fringe, rural and within 200 miles of Minnesota. For the purposes of this resource selection study, the externality values chosen were metropolitan fringe. The inflation adjusted ranges used are shown in Table XII-1 expressed in 2014 dollars.

Table XII-2
Minnesota Environmental Externality Range Values in 2014 Dollars

	Metropolitan Fringe	
	Low Values	High Values
SO_2 $/ton	$0.50	$150
PM_{10} $/ton	$2,944	$4,275
CO $/ton	$1.12	$1.99
NO_x $/ton	$207	$394
Pb $/ton	$2,447	$2,955
CO_2 $/ton	$9	$34

*Low Range Value from 2014-2028 with 2.5% Escalation.
**High Range Value from 2014-2028 with 2.5% Escalation.

These environmental externality values affect the economic dispatch of electric generating units in the planning model and are included in the total cost of each expansion plan based on the fuel burn of each generating unit. The externality values in Table XII-2 were used to identify the least-cost plan and all sensitivity analysis in this filing.

XIII Rate Design

GENERAL DISCUSSION

The on-going objective of the rate design efforts at SMMPA and its members is to encourage the efficient consumption of electricity. To reach this objective, SMMPA provides a rate structure with a number of pass through credits/structures which allow members to move increasingly towards offering retail rates that send retail customers useful price signals. What follows is a summary of the Agency's Power Sales Contract Schedule B Base Rate followed by a review of the three large power rates currently in effect.

BASE RATE

The Agency's Power Sales Contract includes Schedule B, which consists of the Base Rate charged to all members ("Schedule B Base Rate" or "base rate"). The base rate consists of three main components and four individual rates. They are discussed below. The Agency's rates have been unchanged since January 1, 2010 and will remain unchanged in 2014 as approved by the Agency's board of directors at its meeting on October 18, 2013.

Demand Charges

Demand charges include a Power Supply Demand Charge and a Transmission Demand Charge.

The Power Supply Demand Charge is billed each month to Members based on the greater of (i) the Member's metered demand measured during the monthly period or (ii) 74% of the Member's metered demand, coincident to the Agency's highest 60 minute integrated demand measured during the most recent full summer season, defined as the period June through September. The Member's metered demand is based on the 60 minute integrated demand coincident to the Agency's highest 60 minute integrated demand measured during the billing month. The demand measurement is reduced by any hydro-electric facilities of the Member, if any. The power supply demand charge rate is $10.66/kW/Month. Application of the power supply demand charge to Member billing determinants results in the recovery of about 27% of the Agency's Member revenue requirements.

The Transmission Demand Charge is billed each month to Members based on 100% of the Members metered demand coincident to the Agency's highest 60 minute integrated demand measured during the most recent full summer season. The transmission demand charge rate is \$2.66/kW/Month. Application of the transmission demand charge to the Member billing determinants described above results in the recovery of about 8% of the Agency's Member revenue requirements.

Energy Charges

The Agency has in place both on and off-peak energy charges. The on-peak energy charge is applied to metered Member usage between 10:00 a.m. and 10:00 p.m. Monday through Friday, excluding seven major holidays if they fall on a weekday. If the holiday falls on a weekend, the Friday or Monday is designated as an off-peak day depending upon whether the holiday falls on a Saturday or Sunday. The on-peak energy rate is \$0.05413/kWh.

For purposes of the energy charges, all hours and days not considered as on-peak per the paragraph above are off-peak. The off-peak energy charge is \$0.04046/kWh.

When the on and off-peak energy charges are applied to their respective kWh usage amounts for each Member they result in recovery of about 65% of the Agency's Member revenue requirements.

Energy Cost Adjustment (ECA)

On a monthly basis for each year the Agency assures that the Members will pay the Schedule B rates as included in budgeted revenues with a mechanism that compares the actual cost per kWh to the budgeted cost per kWh. To the extent there is a difference the Agency adds or subtracts an incremental cost/kWh so that the amount actually paid by each Member is the same as was included in the board-approved budget for the year, which is based on the approved Schedule B rates. The ECA is typically a relatively small adjustment to Member bills. It does, however, assure that the Agency's Members may budget their power sales cost each year with confidence that there will be no purchased power variance from their budget due to rates.

Tax Adjustment Clause and Late Payment Charge

Schedule B Base Rate also includes a pass through mechanism in the event of the imposition of any tax, or payment in lieu thereof, by any lawful authority on the Agency. The Agency may pass to each Member their share of such tax or payment in lieu thereof.

The Agency may also impose a late payment charge on the unpaid balance based on an annual rate equal to the prime rate of the Morgan Guaranty Trust Company.

Neither the Tax Adjustment Clause nor the Late Payment Charge has been utilized in recent years.

LARGE POWER RATES

Large Power Load Factor Rate

The Large Power Load Factor Rate provides an energy charge credit of $0.00370/kWh for all energy in excess of 547 times the billing demand. This credit provides an incentive for qualifying retail customers to improve their load factors and more efficiently utilize existing Agency resources. Attachment 1 to Schedule B consists of an available rate for qualifying retail customers of participating Members.

The retail customer must have an aggregated metered demand of 1,000 kW for twelve consecutive months. Power and energy consumption meters will be installed and maintained by the Agency at the retail customer's site. The participating Member utility will read the meter each month.

All other aspects and rates for this rate schedule are the same as the Base Rate. As of October 2013, there were 16 retail customers on the Large Power Load Factor Rate.

Large Power Seasonal Rate

The Large Power Seasonal Rate provides incentives for qualifying retail customers to shift summer season electrical usage to the winter season and more efficiently utilize existing Agency resources. The rate schedule provides a split demand charge with a higher demand charge during the summer month of June through September. The winter season is from October through May. The summer demand charge is $13.24/kW/month. The winter demand charge is $9.27/kW/month.

The retail customer must have an aggregated metered demand of 1,000 kW for twelve consecutive months. Power and energy consumption meters will be installed and maintained by the Agency at the retail customer's site. The participating Member utility will read the meter each month.

All other aspects and rates for this rate schedule are the same as the Base Rate. As of October 2013, there was one retail customer on the Large Power Seasonal Rate.

Large Power Time-Of-Use Rate

The Large Power Time-of-Use Rate is available to qualifying retail customers of participating Members. The rate provides incentives to shift on-peak period electrical usage to the off-peak period thus more efficiently utilizing Agency resources. The rate schedule provides a larger separation between on-peak and off-peak rates. The on-peak rate is $0.05835/kWh and the off-peak rate is $0.03705/kWh.

To participate on this rate, retail customers must meet one of three criteria. First, the retail customer must have at least an aggregated demand of 1,000 kW and above for twelve consecutive months immediately preceding the application date. Second, a retail customer may qualify if they experience a change in operations insuring at least an aggregated metered demand of 1,000 kW and above. Third, the two retail customers which have the largest metered demand of each participating Member at any given time. The Agency will place and maintain meters at the retail customer's site. The participating Member will read the meter monthly on the day that the Agency records the power and energy consumption of the participating Members total system.

All other aspects of the Large Power Time-of-Use Rate are the same as the Agency's Schedule B Base Rate. As of October 2013, there were no retail customers on the Large Power Time-of-Use Rate.

LARGE AND SMALL LOAD INTERRUPTIBLE RATES

Large Load Interruptible Rate (Large Load Energy Management Program)

The Large Load Interruptible Rates (Attachment 7 to Schedule B of the Power Sale Contract) provides a demand-side management (DSM) credit to participating Members for each retail customer with a per site load of 70 kW that is willing to provide interruptible power consistent with the Large Load Energy Management Agreement. The DSM credit provides an incentive for customers to allow their load to be curtailed during high load periods resulting in better utilization of Agency's resources. The DSM credit is $5.00/kW of contracted curtailable load per summer month (maximum of $20/kW/year). The credit applies each month to contracted load regardless of whether a curtailment is called. A deduction from the credit is applied for non-performance. The deduction is $0.14/kW x 4 intervals per hour times the curtailment hours times the kW shortfall and applies to each and every curtailment in which the customer's average kW during the curtailment period exceeds its firm service level.

The participating Member owns and maintains the necessary electronic demand meter with dial-in data access capabilities compatible with the Agency's billing software. The participating Member also owns the phone line. The Agency and the participating Member share equally in the installation and operating costs of the equipment. The Agency is responsible for data integrity.

In addition, the following criteria apply:

- Curtailment calls take place during the months of June through September.
- Hours of curtailment are 12:00 p.m. to 6:00 p.m.
- Curtailment days are Monday through Friday excluding holidays (Independence Day and Labor Day), or the day upon which they are celebrated.
- Maximum number of hours curtailed cannot exceed six hours in each 24 hour period.
- Curtailment notification occurs at least one and one-half hours prior to the curtailment.
- SMMPA is responsible for installation and/or modification of RTUs and/or Participating Member's SCADA systems.
- SMMPA is responsible for installation of a Demand Alert Monitor to enable the retail customer to monitor loads during curtailment periods.

As of October 2013, there are 15 retail customers on the Large Power Interruptible Rate. There were no curtailments in 2013.

Small Load Interruptible Rate (Small Load Energy Management Program)

The Small Load Interruptible Rate, while similar to the Large Load Interruptible Rate, is available for retail customers with curtailable load per site of at least 25 kW but less than 70 kW. Like the Large Load Interruptible Rate, the Small Load Interruptible Rate provides an incentive for retail customers to allow their load to be curtailed during periods of high load in accordance with the

Small Load Energy Management Agreement. The amount of the credit is the same as the Large Load Interruptible Rate at $5.00/kW/summer month for a total of $20/kW/year.

The terms and conditions are similar to the Large Power Interruptible Rate. The credit applies each month to the curtailable load the retail customer's on-site generation provides whether a curtailment is called or not. If a retail customer is called to provide curtailable power and the actual load of the on-site generation does not average at least 25 kW over the curtailment period, the participating customer does not receive a credit for that month.

As of October 2013, there are three retail customers on the Small Load Interruptible Rate. There were no curtailments in 2013.

RATEMAKING POLICY AND ANALYSIS STUDY

The Agency completed a Ratemaking Policy and Analysis Study in 2010. A series of rate design alternatives were developed and presented to the Members. All of the alternatives were intended to align SMMPA's demand and energy charges with the Midcontinent Independent System Operator (MISO) capacity and energy market charges. The rates were neither market-based nor real-time but did reflect the seasonal and time-of-use attributes of the MISO LMP price patterns.

Numerous board presentations and three Member workshops were held to provide education and insights into the alternative rate schedules. After a full year of "shadow billing", essentially providing two monthly bills consisting of their official Schedule B bill and the new rate structure bill to each Member each month, the board decided to table the initiative. Their decision was largely based on three factors. First, the cost and complexity of new metering and metering information systems to fully implement the new rates at the retail level is significant and for many Members prohibitive. Second, LMP prices in the MISO energy market have softened in recent years and are not expected to increase significantly in the foreseeable future. The large LMP spikes experienced in the mid-2000s have become less frequent. While there are still price fluctuations, the amplitude and duration of significantly higher prices has diminished. Lower prices overall and reduced fluctuations have caused the potential economic benefits of an innovative rate structure to be reduced. Third, in spite of a number of wholesale public power providers studying new and innovative pricing approaches, few, if any, have adopted any significant changes. SMMPA's Members will continue to monitor the energy market going forward. Having completed the Ratemaking Policy and Analysis Study, they are prepared to consider this again should market conditions warrant.

MEMBER UTILITY RATE DESIGN ASSISTANCE

SMMPA offers rate design support to its members primarily in the form of recommending rate study and rate design consultants and assisting those consultants in working with our members. Working through its Energy Services Representative Team, SMMPA continues to encourage members to assess customer classifications and ensure that customers are classified properly under the appropriate customer class and billed accordingly under the appropriate rate schedules.

Appendix A

Southern Minnesota Public Power Agency

2014-2028 Energy Efficiency Potential Study

SOUTHERN MINNESOTA
MUNICIPAL POWER AGENCY

Navigant Consulting, Inc.
1001 and 1003 Officers Row
Vancouver, WA 98660

360-808-4008
www.navigant.com

September 8, 2013

NAVIGANT

Table of Contents

List of Figures and Tables

1. Introduction

1.1 *Study Objectives*

The purpose of this study was to conduct a potential analysis of energy and peak demand savings for the 18 member utilities of Southern Minnesota Municipal Power Agency (SMMPA). In previous Demand Side Management (DSM) potential studies SMMPA members were combined as a single analysis group. For this study, we separated the SMMPA members into two groups, one group consisted of the two Contract Rate of Delivery (CROD) members, Rochester Public Utilities (RPU) and Austin Utilities (AU), and the other group the remaining balance of member utilities (Non-CROD). The CROD is a unique supply arrangement between SMMPA and its members under the Power Sales Contract. Under certain conditions, members can fix the capacity they receive from SMMPA at a contractually determined CROD amount. If a CROD is established the member would self supply in any hour where the members load exceeded that CROD amount. RPU's CROD took effect in 2000 and AU will establish a CROD which will take effect in 2016. The CROD has specific implications for Integrated Resource Planning (IRP) in that if a member elects to establish a CROD the Agency is no longer responsible for supplying capacity to the member when they exceed the CROD. The implications for a technical potential study are that while SMMPA will accrue essentially all the energy savings associated with a CROD member, SMMPA will not accrue the capacity savings associated with technologies installed in a CROD member. Separating the two groups makes it a little easier to assess the capacity impacts of DSM measures on SMMPA's overall capacity planning needs.

Two scenarios were developed for each analysis group, and load shapes were estimated representing the impact of the Demand Side Management (DSM) potential across each hour of the year. The base scenario estimated the achievable potential based on decision making response to measure payback using the current incentive levels provided by the SMMPA member utilities. The current incentive levels, as expressed as a percent of incremental technology cost, vary, but on average are close to 50% of incremental cost. In the Minnesota Public Utility Commission (MPUC) Order accepting SMMPA's 2009 IRP, the MPUC stipulated that SMMPA analyze energy savings equal to 1.5% of electric sales in its next filing. That 1.5% scenario was based on more aggressive marketing activities starting in 2014 (designed to increase knowledge and willingness factors) and increasing the incentive levels to 75% of incremental cost beginning in the year 2016.

Navigant conducted a potential analysis of energy efficiency over fifteen years, for 2014 to 2028. Although the potential analysis timeframe is 2014 to 2028, the modeling begins in 2008, using historical SMMPA achievements for 2008 through 2011.

The study addressed the technical, economic and achievable potential for SMMPA using Navigant's Energy Efficiency Resource Assessment Model (EERAM). This report includes the following sections:

- Section 1 Introduction
- Section 2 Energy Efficiency Potential Methodology
- Section 3 Hourly Load Model

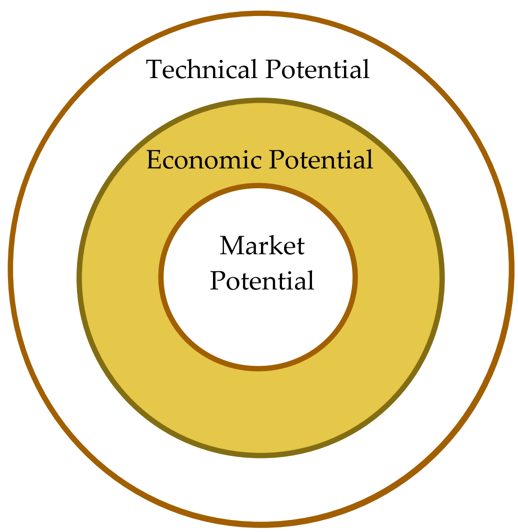
- Section 4 Efficiency Measure Characterization
- Section 5 Forecast Results
- Appendix A Glossary of Terms
- Appendix B EERAM Economic Tests
- Appendix C DSM Measure Data
- Appendix D Measure Savings: CROD/Non-CROD Base and 1.5% Scenarios
- Appendix E TRC Values by Measure – CROD and Non CROD
- Appendix F Measures Within Competition Groups
- Appendix G Measures Using Diffusion Curve Decision Method

1.2 *Approach to Estimating Energy Efficiency Potential*

Figure 1 illustrates there are three major types of energy efficiency potential:

1. **Technical potential** – The amount of energy efficiency available through the installation of all efficiency technologies included in the dataset of measures considered.
2. **Economic potential** – The amount of energy efficiency available that is cost effective from this dataset of measures considered.
3. **Market/Achievable potential** – The amount of energy efficiency available under current market conditions and available investments from this dataset of measures considered.

Figure 1. Diagram of Types of Energy Efficiency Potential



Navigant undertook the energy efficiency potential study with the following key tasks (each of these tasks is summarized below):

- Develop baseline building characteristics.
- Characterize the energy efficiency measures.

- Conduct benefit-cost analysis of energy efficiency measures.
- Estimate energy efficiency potentials.

1.2.1 Develop Baseline Building Characteristics

In previous work for the State of Minnesota[1], Navigant had conducted on-site surveys on a number of residential and non-residential buildings in Minnesota to identify building characteristics. Additionally, Navigant supplemented this dataset with data from other utility assessments. Navigant combined these two datasets of building information and estimated baseline and energy efficiency measure densities and fuel shares by end-use. This data was utilized as a proxy for the building stocks of SMMPA given that equivalent data is unavailable specifically for the SMMPA member service territories. There were a total of 198 Commercial/Industrial and 140 Residential on-site surveys included in our analysis.

1.2.2 Characterize the Energy Efficiency Measures

Navigant characterized the energy efficiency measures as follows:

1. Identified the energy efficiency measures to be included in the study. In consultation with SMMPA staff, Navigant identified and selected measures currently offered by SMMPA members, measures included in the Minnesota Deemed Database, and measures offered by other utilities that could be of interest to SMMPA members.
2. Estimated the incremental savings, costs, and lifetimes using the same sources as were used to identify the measures included in the study.
3. Obtained from SMMPA the incentive levels currently offered by its member utilities by measure. For those measures not currently offered, incentive levels were set to be 50% of incremental measure cost (for the base scenario).

1.2.3 Conduct Benefit-Cost Analysis of Energy Efficiency Measures

The energy efficiency measures were evaluated with respect to each of the four main standard cost tests, with the total resource benefit-cost tests used to determine cost-effectiveness.

- **Total Resource Cost (TRC) test:** Measures are cost effective from this perspective if their avoided costs are greater than the sum of the measure costs and the program administrators' administrative costs.
- **Program Administrator Cost (PAC) test:** Measures are cost effective from this perspective if the costs avoided by the measure's energy and demand savings are greater than the program administrators' costs to promote the measure, including customer incentives.
- **Participant Cost Test (PCT):** Measures are cost effective from this perspective if the reduced electric costs to the participating customer from the measure exceed the after-incentive cost of the measure to the customer.
- **Ratepayer Impact Measure (RIM) test:** Measures are cost effective from this perspective if their avoided costs are greater than the sum of the program administrators' costs and the "lost revenues" caused by the measure.

[1] Minnesota Statewide Electricity Efficiency Potentials Report, Summit Blue Consulting, April 2010

1.2.4 Estimate Energy Efficiency Potential

Navigant developed estimates of energy efficiency measure potentials in terms of technical, economic, and achievable potential (the results that are realistic for SMMPA member utilities to achieve through cost-effective demand-side management programs). Economic potential was estimated using the TRC test as the economic "screen" to apply to technical potential estimates in order to determine whether the measures are "cost-effective" or not.

Two sets of energy efficiency potential were separately modeled. The first for the two CROD members (Austin Utilities and Rochester Public Utilities) and the second for the remaining Non-CROD members. The Non-CROD utilities include:

- Blooming Prairie Public Utilities
- Fairmont Public Utilities
- Grand Marais Public Utilities
- Lake City Utilities
- Litchfield Public Utilities
- Mora Municipal Utilities
- New Prague Utilities Commission
- North Branch Municipal Water & Light
- Owatonna Public Utilities
- Preston Public Utilities
- Princeton Public Utilities
- Redwood Falls Public Utilities
- Saint Peter Municipal Utilities
- Spring Valley Public Utilities
- Waseca Utilities
- Wells Public Utilities

To identify achievable potential, the EERAM model was used to estimate conversion rates from inefficient products to more efficient products for retrofit and replacement and dual baseline measures, as well as installation rates in new buildings for new construction markets. New construction was assessed by starting with current building stock counts and estimating future year building stocks by adjusting each previous year's stocks by the percentage change each year in forecasted energy use. The delta value between a forecast year and the previous year is the estimate of new construction.

2. Energy Efficiency Potential Methodology

2.1 *Overview of the Energy Efficiency Resource Assessment Model (EERAM)*

The Energy Efficiency Resource Assessment Model (EERAM) is an energy efficiency potential model designed to estimate technical, economic, and achievable energy efficiency potential for SMMPA member utility service areas. Developed by Navigant, the model forecasts energy savings and demand reduction potential within the residential, commercial, and industrial sectors over a forecast period. For SMMPA, the forecast is through 2028.

EERAM is an Excel spreadsheet model based on the integration of energy efficiency measure impacts and costs, customer characteristics, utility load forecasts, and utility avoided costs and rate schedules. Excel is used as the modeling platform to provide transparency to the estimation process. Using Excel also allows the model to be customized and to accommodate either detailed or more general model input data.

The model utilizes a bottom-up approach, using the starting points of study area building stocks and equipment saturation estimates, forecasts of building stock decay and new construction, energy efficiency technology data, past energy efficiency program accomplishments, and decision-maker variables that help drive the market scenarios. Appendix C provides information on measure impacts and costs, base and efficient technology densities, measure life, and incentive levels for each measure included within EERAM.

For established energy efficiency measures, EERAM calculates achievable potential based on a decision-maker adoption rate algorithm. This algorithm is primarily a measure by measure elasticity response to measure payback. However, a diffusion curve methodology is used for emerging technologies. Emerging technologies are considered to follow a Bass diffusion curve methodology rather than a measure payback methodology. The Bass diffusion model was developed by Dr. Frank Bass and describes the process of how new products are adopted as an interaction between users and potential users.

2.2 *EERAM Model Features*

The EERAM model incorporates a number of innovative features, including:

- Utilization to the extent possible of the Minnesota Deemed Savings database for deemed savings and costs.
- Utilization of utility-specific or, if not available, Minnesota-specific building characteristics information.
- Utilization of decision-maker awareness of measures and if aware, the willingness to purchase the energy efficiency measure variables. These variables are utilized in the consumer choice algorithm. This data is based on responses to decision maker surveys conducted by Navigant

(Summit Blue) when performing on-site surveys for the State of Minnesota during development of the Minnesota Statewide Electricity Efficiency Potentials Report[2].

- Utilization of 2008-2011 historical SMMPA specific energy efficiency achievements to calibrate model results.
- The ability to create forecasts utilizing either the historical achievement data for calibration or utilizing percent of sales by sector as the first year calibration method.
- The ability to quickly create scenarios based on different measure incentive levels. Other scenarios can also be developed using alternative input data, such as differing avoided costs, energy forecasts, building stock forecasts, and others that may be of interest to SMMPA.
- Calculation of the basic economic tests (described later), but also calculates the Total Resource Cost (TRC) values for the base year and for each year in the forecast. The TRC values are used to screen what is included in the achievable potential estimates, and as technology costs and impacts change over time, so do the TRC values.
    - ❖ The TRC screening value was set by SMMPA at 0.75 and is a variable that can be set by the user.
    - ❖ For emerging technologies, the TRC screening value is allowed to be lower. This value was set at 0.50 in the study.
- In addition to the TRC values changing over time, the model incorporates time vectors for other key variables as well including:
    - ❖ Technology cost
    - ❖ Administrative cost
    - ❖ Technology impact
    - ❖ Consumer awareness and willingness
    - ❖ Avoided costs
- Impacts of known codes and standards and the timing of those impacts are included in the EERAM modeling structure. These impacts are estimated at the measure level.
- Recognition that at the end of measure life, actions may take place that affects both cumulative potential and program participation.
    - ❖ The model has a variable called measure re-engagement, which is a percentage estimate of those who continue with the same or more-efficient version of the initially-implemented measure. The remainder (or non-re-engagers) is assumed to fall back to the baseline efficiency. The model adjusts cumulative potential to account for those who fall back to the baseline efficiency.
    - ❖ The model has another variable called re-participants. This is an estimated percentage of the measure re-engagers who also again participate in SMMPA's utility-specific programs and receive an incentive. For these customers, their energy savings is assumed to continue, but is not counted as new incremental savings. Although there is no new incremental savings, there is a cost associated with maintaining these savings. The additional incentive and administrative costs are added to the program costs.
- Mutually-exclusive measures are placed into competition groups. Within the competition groups, the mutually-exclusive measures share the same base population but each measure uses its own unique decision-maker adoption rate algorithm to estimate year by year achievable potential. The base population is reduced each year by the sum of the mutually-exclusive

[2] Minnesota Statewide Electricity Efficiency Potentials Report, Summit Blue Consulting, April 2010

measures participation. LED and CFL lamps of the same lumens are an example of mutually exclusive measures. A list of mutually exclusive measures is provided in Appendix F.
- The EERAM Models utilize the Metropolitan Fringe Environmental Externality Values issued by the Minnesota Public Utilities Commission in June of 2012. The EERAM models allow for externality values to be set at the low value or high value for scenario modeling purposes. The Base and 1.5% scenario model data shown in this narrative were conducted using the high values.

2.3 *Calculating Energy Efficiency Potential*

The model partitions its evaluation of each measure into technical, economic and achievable potential. Each assessment includes building stock estimates, technology densities, and measure impacts; each using a different algorithm.

Technical potential is calculated using the product of a measure's savings per unit, the quantity of applicable units in each facility, and the number of facilities in SMMPA's member service areas. The assessment includes measures that might not be cost-effective or have the backing of a strong consumer market. By disregarding these factors, the technical potential assessment provides an upper bound of savings potential regardless of cost or market penetration. For measures considered to be replace on burnout (ROB), the quantity of applicable units per year is limited to the number that need to be replaced, which is determined by measure life. As time passes, this potential population grows until meeting the full measure life. For other, non-replace-on-burnout measures, the full populations of baseline units are considered available. No net-to-gross adjustments occur with technical potential.

Economic potential estimates the amount of technical potential that is cost-effective, as defined by the results of the Total Resource Cost (TRC) test. The TRC test is a cost-benefit analysis of relevant energy efficiency measures, excluding market barriers, such as lack of consumer knowledge. Benefits include avoided costs of generation, transmission and distribution investments, as well as avoided fuel costs due to energy conserved by energy efficiency programs. Costs include incremental measure costs and program administration costs. The TRC screening value for emerging technologies can be set lower than other technologies if the user wishes it to be (this value was set at 0.50 in the study). Replace on burnout measures are treated the same as with technical potential and there are no net-to-gross adjustments.

Achievable potential is the third of EERAM's energy efficiency algorithms, calculating the amount of economic energy efficiency potential that could be captured by SMMPA member programs over the forecast period. This calculation varies with the program's parameters, such as the program design or magnitude of incentives or rebates for customer installations.

2.4 *Measure Types Addressed*

EERAM recognizes six types of measure types, including:

- **Replacement on Burnout (ROB):** An energy efficiency measure is implemented after the existing equipment fails.
- **Early Retirement:** An energy efficiency measure normally regarded as ROB is installed before its effective measure life is reached.

- **Retrofit:** An energy efficiency measure that can be implemented immediately. The lifetime of the base technology is not a factor as retrofit measures generally do not replace existing technologies, but rather improves the efficiency of existing technologies. The energy impact is therefore the amount of that improvement.
- **Emerging Technology/New Technologies:** An energy efficiency measure is just entering or about to enter the marketplace. Achievable potential is calculated differently for emerging/new technologies and uses a Bass diffusion model rather than the traditional measure payback. Appendix G provides a list of the measures that utilized the Bass diffusion curve.
- **Behavioral Programs:** These are programs that are designed to influence consumer behavior through the provision of training and/or information. Technical potential for SMMPA's behavioral program was conservatively estimated based upon data from similar programs being operated in Minnesota. Actual program design incorporates a control and treatment group, measurement and evaluation, and annual investment to drive annual savings. The model allows for selecting between 1/3 and 100% of projected savings (based upon recent MN CIP requirements) and allows for scenario analysis in the IRP.
- **New Construction:** A measure or package of measures installed at the time of construction.

2.5 *Financial Tests Calculated*

EERAM also calculates several financial tests[3], including:

- **Total Resource Cost (TRC):** This test includes all quantifiable costs and benefits of an energy efficiency measure, regardless of who accrues them. For example, a measure passing the TRC test means that the measure is cost-effective from this perspective if its avoided costs are greater than the sum of the measure costs and SMMPA's administrative costs.
- **Program Administrator Cost Test (PAC):** This test measures the net costs **o**f an energy efficiency program based on the costs incurred by the SMMPA member utilities (including incentive costs) and excluding any net costs incurred by the participant. For example, a measure passing the PAC test means that the measures is cost-effective from this perspective if the costs avoided by the measure's energy and demand savings are greater than SMMPA's costs to promote the measure, including customer incentives.
- **Ratepayer Impact Test (RIM):** This test measures what happens to customer bills or rates due to changes in utility revenue and operating costs caused by the program. For example, a measure passing the RIM test means that the measures is cost-effective from this perspective if its avoided costs are greater than the sum of SMMPA's costs and the "lost revenues" caused by the measure.
- **Participant Cost Test (PCT):** This test measures the quantifiable benefits and costs to the customer due to participation in the program. For example, a measure passing the PCT test means that the measures is cost-effective from this perspective if the reduced electric costs to the participating customer from the measure exceed the after-incentive cost of the measure to the customer.
- **Simple Customer Payback:** This measurement calculates the program payback by taking the measure cost less the incentive received and divides it by first year energy bill savings.

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[3] Appendix B provides further details of each economic test.

- **Levelized Measure Cost/kWh:** This measure multiplies the energy efficiency measure costs by the Capital Recovery Factor, and divides by the first year kWh savings.

Outputs from the model are designed to accomplish multiple objectives, including:

- Determining the total cost-effective energy savings available over the forecast period, both annually and cumulatively. This is determined for 100% of retail energy use in a service territory. These estimates are provided at the sector, program type, and end-use classification levels.
- Providing guidance for SMMPA's energy efficiency goals at an aggregate level, as well as at the measure category level, where appropriate. As discussed, the EERAM calculations are calibrated to past SMMPA achievement levels to ensure continuity with historical program achievements.

2.6 *Approach to Multi-Life Benefits and Costs*

2.6.1 Multi-Life Benefits

The EERAM model is built to recognize that the impacts of most DSM measures extend beyond the initial estimate of measure life. Taking this reality into account can affect certain benefit/cost ratios that include incentive costs, such as the PCT, PAC, and RIM, as well as changes in measure costs and impacts, utility program budgets, and cumulative energy and demand impact estimates. The estimation of multi-life effects begins with two variables:

- **Measure Re-Engagement.** A variable that estimates the share of measure installations that continue to provide efficiency benefits at least equal to the initial DSM measure installed. The complimentary share of installations not part of re-engagement is returned to the population totals of available stock for program participation.
- **Portion of Re-Engagement Receiving an Incentive (Re-Participants)**. A variable that represents the percent of re-engagers that also re-participate in the DSM program, if it is still offered. This recognizes that SMMPA's members will incur some amount of incentive and administrative cost from re-participants. With re-participants, the SMMPA members continue to maintain the original savings but do not accrue additional incremental savings.

Estimating measure re-engagement and re-participation is a two-step function used both to identify what share of initial participants continue saving energy by installing a new measure similar to the original measure, and second, what portion of these re-engagers again partake in a DSM program. For example, if the re-engaging share is 85% (which is the current default value), then 15% are thought of as returning to the baseline population. As this 15% are once again members of the baseline population, they can now participate in any program that affects this baseline.

There are no incremental energy/demand savings accruing from this re-engaging population. However, cumulative savings must be adjusted in two ways. First, the 15% that go back to the baseline population needs to have their savings removed from cumulative savings. Second, for the 85%, the adjustment to cumulative potential is dependent upon whether the savings are different from what was achieved at the time of the original participation. If unchanged, no changes are made to cumulative potential. If savings are different, then the cumulative potential is adjusted by this delta difference.

At the time of re-engagement, factors may exist that affect the estimate of continuing DSM measure saving and costs.

- A code or standard (C&S) may have come into effect since the initial point of participation. The effects of the C&S become an attribution issue. Since C&S are mandatory, savings affected by C&S are attributed to the C&S. The share of savings may be 100% or may be a share lower than 100%. If 100%, then no further savings or costs are attributed to the DSM program measure. If the attribution is less than 100%, then the attribution share still applicable to SMMPA is accounted.
- A measure's estimated energy savings may increase or decrease in the future. For example, LED lighting is still improving in efficacy and, as it does, savings per measure increase. In contrast, appliance recycling programs, such as refrigerator recycling, are expected to have lower savings per unit over time as the population of refrigerators becomes a more recent (more efficient) vintage each passing year.
- A measure's estimated cost may increase or decrease in the future. For example, LEDs and other newer technologies are expected to decline in cost as these become more popular in the marketplace. The declining cost of CFLs over the past decade is an example of such an effect.

Any changes in energy savings at the point of re-engagement are calculated. These changes in energy savings are applied to the Cumulative Potential and do not affect the Achievable Incremental Potential.

2.7 *Codes and Standards Modified Baseline Effects on Cumulative Potential*

The effects of codes and standards within the EERAM model are viewed as an attribution issue between what is credited to codes and standards and what is credited to the DSM program. The "Code Based Impact Change" identifies the specific codes and standards expected to affect measure savings over the forecast period. The effects to measure savings are in the form of time vectors where a specific code and standard is associated with the measures it is expected to affect. The measure effect is in the form of a percent change in savings starting at the point when the code and standard goes into force. As an example, if a specific code and standard effectively reduces savings by 50% starting in the year 2015, the DSM program's first year incremental measure impact would be 100% of the estimated program impact up to the year 2015. Starting in 2015 and thereafter, SMMPA's share of the measure savings is reduced by 50% with the other 50% being attributed to the code and standard.

Treating the savings achieved by the DSM program after a code and standard goes into force is done in two parts. First addressed, at the moment the code and standard going into force, is whether there are any adjustment to the first measure lifetime savings, costs, and benefits. The EERAM model treats these already exiting program achievements, benefits, and costs as unchanged (maintained) over the remaining first life of the measure.

However, at the time of re-engagement, adjustments do occur. For those measures assumed to re-engage after the first lifetime is complete, the measure impacts, benefits, and costs are calculated based on the code and standard adjusted savings level. It is assumed that attribution of the savings transfers to the code and standard at this point forward. To accommodate this, the Cumulative Potential is adjusted downward to reflect the lowered savings resulting from the impact of the code and standard at the time of re-engagement. Additionally, post first lifetime benefits and costs are calculated to reflect the lower savings.

2.8 *Appliance Recycling*

Appliance recycling measures need special treatment because of the unique characteristics of the base population. Unlike other base technologies, the used appliance stock available for recycling is constantly being refreshed with new populations of appliances. Due to past improvements to appliance efficiencies (primarily codes and standards), the constantly refreshing population of available appliances for recycling is more efficient (and thus saves less energy) from year to year. Available populations of appliances for recycling do not change significantly from year to year, but the time vector of savings per unit does decline. The analysis recognizes that future decline in per unit savings.

2.9 *Behavior Based Energy Savings Potential*

Savings potential from behavior-based initiatives is included in the EERAM model. For the purposes of this study, Navigant defines behavior-based initiatives as those providing information about energy use and efficiency actions, rather than financial incentives, equipment, or services. These initiatives use a variety of implementation strategies including mass media marketing, community-based social marketing, competitions, training, and feedback.[4]

Outcomes from behavior-based initiatives that result in energy savings can be broadly characterized as equipment-based and usage-based:

- **Equipment-based behavior** – Savings from the purchase and installation of higher efficiency equipment, relative to baseline conditions.[5] Examples of equipment-based behavior include the replacement of lights with higher efficiency lights, purchasing Energy Star®-qualified appliances, and purchasing premium efficiency motors to replace working motors. In the EERAM Model, these savings are modeled at the equipment level as contributions to the percentages of the population that are aware of the measure and that are willing to adopt this measure. Equipment-based behavior can be sub-categorized as:
  - ❖ Non-incented equipment-based behavior – The purchase of higher efficiency equipment for which no incentives are provided.
  - ❖ Incented equipment-based behavior– The purchase of higher efficiency equipment for which incentives are provided. In the SMMPA models, equipment installation induced by the program is accounted for not in the behavioral program but rather in the measure specific data.
- **Usage-based behavior** – Savings from changes in usage and maintenance of existing equipment. Examples of usage-based behavior include turning off lights, unplugging electronics and chargers, programming thermostats, and improving the efficiency of equipment through

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[4] *Evaluation of Consumer Behavioral Research*, Navigant (Summit Blue Consulting) for the Northwest Energy Efficiency Alliance, April 6, 2010, Page 4.

[5] This could be either the early retirement of older equipment or the installation of high-efficiency equipment at the natural time of installation or replacement.

modified maintenance practices. In the EERAM model, these savings are modeled as an equipment-independent module with savings unassociated with equipment improvement.

The behavior measure savings used within EERAM reflect estimates of usage-based and non-incented based behavior. The incented equipment-based behavior is assumed to be addressed by SMMPA's' other incentive-based DSM programs. The behavior program measure life is assumed to be one year, reflecting the need to continually reinforce the behavior program's message to conserve and use energy efficiently.

The Minnesota Division of Energy Resources (DER) has recently changed how it treats saving from behavior programs. The DER requires a control and treatment group, and measurement and verification procedures to establish the annual savings from the program but then discounts those savings by two-thirds. To assess the impact of that decision, the SMMPA EERAM models have incorporated a switch which allows a discount of the savings by 66.6% or no discount. A number of states apply a small discount, for example 20%, to ensure that asset-based savings induced by the program which may be separately incented (customer decisions to install high efficiency equipment) are not double counted.

2.10 *Calibration*

For existing measures, the calibration function is used to identify program participation year by year. The initial calibration factor is determined by using SMMPA's actual historical DSM accomplishments and the payback associated with each measure in the calibration year of 2011. This initial calibration factor is used each forecast year to estimate program participation; as available stocks and payback changes, participation changes.

Key calibration variables include measure payback by year and the market factor. Payback is simple payback with the basic calculation for year "n" taking the form:

Payback (n) = (Incremental technology cost – incentive cost (n)) / electric bill reduction (n)

The "market factor" is a calibration constant that is computed in the calibration year using the following form:

Market factor = calibration target / (total available base technology measures available) * EXP (0.0 - Beta Constant * Measure Payback)

Where:

- The calibration targets for each measure are determined from historical SMMPA data
- The total available base technology measures available is the measure economic potential * Awareness * Willingness
- The Beta constant represents the average influence of excluded (non-payback) factors
- EXP represents the exponential function of Excel

The market factors by measure are used in the decision adoption calculation. For each measure by year, the algorithm estimates the number of units implemented. The algorithm has the following form:

Number of measures implemented = total available measure units * binary logit function * market factor * decision maker measure awareness and willingness to install the measure.

The "total available measure units" is a variable that changes with each forecast year and differs depending on whether the measure is a replace on burnout or a retrofit. For retrofit measures, the calculation has the form:

Total available measure units = Available building stock * (maximum density for the competing technologies – base year efficient technology density) – running sum of previous years of efficient technology units installed.

For replace on burnout measures, the calculation has the form:

Total available measure units = Available building stock / measure life * (maximum density for the competing technologies – base year efficient technology density) – running sum of previous years of efficient technology units installed.

The "binary logit" function is similar to the "market factor" function described above. The difference between the two is that the "market factor" function uses the calibration year measure payback value while the "binary logit" function utilizes the measure payback in each forecast year. The logit function has the form:

Share of Efficiency Measures Implemented = Exp (0.0 – Beta Constant * Measure Payback)

Where:

- The Beta constant represents the average influence of all excluded (non-payback) factors.
- The Beta constant is allowed to be modified with values between 0.0 and 1.0. A lower number creates slower implementation and a larger higher implementation. A neutral value of 0.5 is utilized.
- Measure payback is simple measure payback and is calculated for each measure, each forecast year.

For new and emerging measures, the calibration function is based on Bass Diffusion Curves. The diffusion formula includes a starting and a maximum value. The starting value is a percentage share of the technical potential. The maximum value is represented as the technical potential for the measure multiplied by the willingness and awareness variables. The shape of the diffusion curves are determined by coefficients estimated by Dr. Bass in his research. It takes the form:

Measure Adoptions (t) = (p + q * (X(t-1) / m)) * (m - X(t-1))

Where:

- t = time
- p = the coefficient of innovation, external influence or advertising effect.
- q = the coefficient of imitation, internal influence or word-of-mouth effect.
- X(t-1) = cumulative adoptions up to time "t"'

- m = the number of potential adopters

For newer technologies regardless of type, the average value of "p" has been found to be 0.03, and is often less than 0.01. The average value of "q" has been found to be 0.38, with a typical range between 0.3 and 0.5. The value for "m" is the measure's technical potential. The initial value for "X(t-1)" is a share of the measure's technical potential. This value is set as a variable by measure.

2.11 *Creating Scenarios Based on Modifying the Incentive Level*

A fundamental element of EERAM is the decision maker algorithm. The function of calibration is to establish by measure the baseline "Market Factor", which is estimated based on simple measure payback and the achieved savings in the base year. This value is essentially an elasticity used in the forecast period to estimate measure adoption. These incentive levels by measure are generally the actual incentives provided by the utility or they default to an input value such as 50% of incremental cost. Once the baseline Market Factor is established, the incentive during the forecast period can be modified up or down. Changing the incentive changes the simple measure payback with corresponding changes in measure adoption rates. These changes in adoption rates are based on using the baseline Market Factor, which is unchanged, and the modified simple measure payback.

The estimates of future decision-maker measure awareness and willingness to install the measure are also affected by changes in the incentive levels. Increased incentive levels correspond to increased awareness and willingness, while decreased incentive levels translate to lower awareness and willingness.

The scenario incentive level is expressed as a percent of incremental cost. However, if the scenario calls for higher incentives and the utility base year incentive for a specific measure is already higher than the scenario incentive level, the incentive level for this measure does not change. For instance, say the baseline incentive averages about 50% of incremental cost but a specific measure has a baseline incentive of 80% of incremental cost. A scenario may be to raise the average incentive to 75% of incremental cost. All measures with baseline incentives less than 75% would be increased to 75% but for this specific measure, the forecast incentive would remain at 80%.

The year in which the higher or lower incentive level goes into effect is a variable. For instance, if a utility has a mandated goal to achieve about 1.5% of energy sales each year, it may be necessary to increase the incentive in some future year in the forecast when the forecast of market potential begins to fall below the 1.5% goal. This is what was done in SMMPA's 1.5% scenario where incentives were increased from actual (if below 75%) to 75% of incremental beginning in 2016 with the goal of increasing savings to the 1.5% level.

3. Hourly Load Model

Included with EERAM is a companion 8,760 hourly load sub-model. The hourly load sub-model consists of four areas:

- The first is a set of hourly load shapes by sector and end-use.
- The second is a linked table of forecast results from EERAM by sector and end-use category. For each sector and end-use category, a load shape is assigned.
- The third is the calculated hourly loads for the forecast efficiency measures.
- The fourth is an assessment of coincident peak demand impacts based on the summed load shape results.

The potential study relied on annual end use load shapes to develop results, allocating savings potential across the different sectors (residential, commercial, and industrial.) Load shapes were derived by Navigant from a secondary source; Pacific Gas & Electric (PG&E) climate zone 2 and 16 (these two climate zones are combined within the PG&E database). The heating degree day (HDD) range for PG&E zones 2 and 16 is between 2,844 and 5,991. The cooling degree day range (CDD) for PG&E zones 2 and 16 is between 235 and 1,037. For Rochester, MN, the average HDD is about 8,029 (the potential study does not include any electric heating measures) and the average CDD about 280. Actual cooling characteristics and savings were as outlined in the Minnesota Deemed savings database. Load shapes were used solely to spread the savings for use in supply side modeling. The load shapes were reviewed for reasonableness and considered to be reasonable representations. All load shapes are expressed as hourly shares of an annual load and are not dependent on a specific CDD value. The sum of all 8,760 hours within a load shape is equal to 1.0. Figure 2 provides a graphic example of the residential end-use load shapes for a typical January weekday. All 8,760 hours are populated by end use category but typical day graphs are included in the sub-model by each of the four seasons to ensure that the dataset appears reasonable.

Figure 2. Residential Load Profiles for a January Weekday

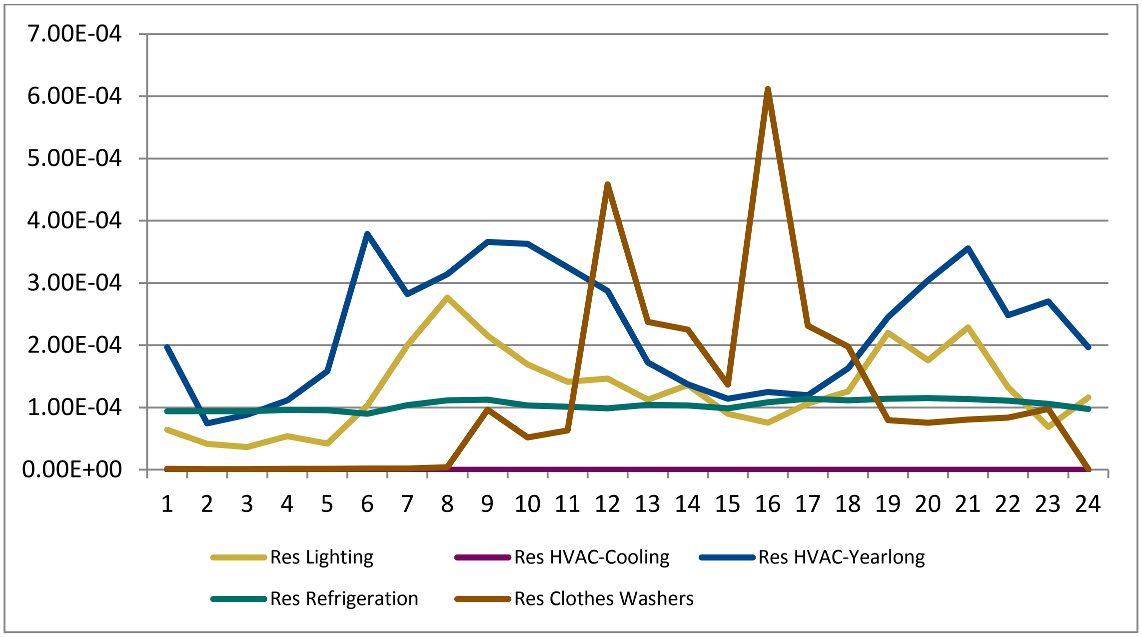
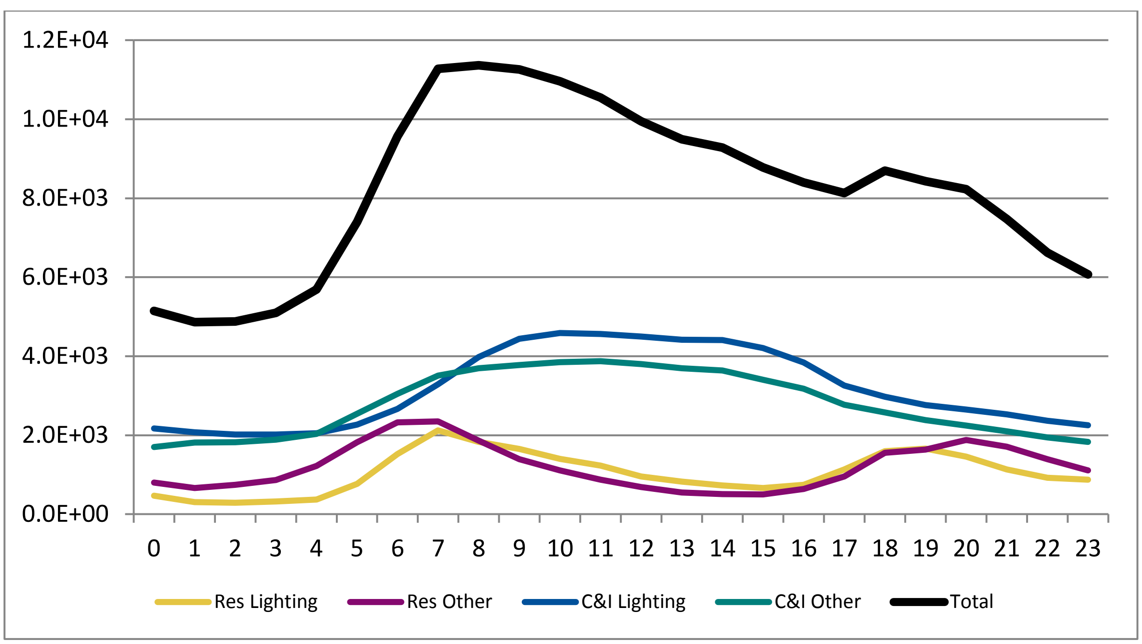


Figure 3 illustrates a 2014 January weekday DSM load shape result from the 8,760 hourly load sub-model. The biggest demand impacts are from the C&I lighting and C&I Other programs. However, the total load shape is heavily influenced by the large declines in the Residential Lighting and Residential Other programs, which decline between hour 8 and hour 16.

Figure 3. 2014 January Weekday DSM Load Shape (kW)



The load shapes used to generate the SMMPA potential study hourly load results were as follows:

Residential Load Shapes

- Interior Lighting
- HVAC-Cooling
- HVAC-Yearlong
- Refrigeration
- Clothes Washers
- Other

Non-Residential Load Shapes

- Cooling
- Cooking
- Air Compressor
- Process
- Motors
- Refrigeration
- Ventilation
- Lights-Interior
- Lights-Exterior
- Whole Building

For the purposes of expediting modeling runs, the technologies mapped to their respective load shape were then combined into four specific groups – Residential Lighting, Residential Other (all residential non-lighting technologies), Commercial & Industrial Lighting, and Commercial & Industrial Other (all C&I non-lighting technologies).

4. Efficiency Measure Characterization

A significant component underlying Navigant's estimate of energy efficiency and peak demand reduction potential is the set of residential, commercial, and industrial measure characterizations. In consultation with SMMPA staff, Navigant identified and selected measures currently offered by SMMPA members, measures included in the Minnesota Deemed Database, and measures offered by other utilities that could be of interest to SMMPA members. The data obtained from these sources include:

1. Base technology and efficient measure levels of annual consumption of all relevant resources.
2. The effective useful life (EUL) of the base technology and efficient measure.
3. The labor and materials cost of the base technology and efficient measure.
4. The incentive provided.
5. The density of the base and efficient technology.

Incentive amounts by measure utilized the current incentives provided by SMMPA member utilities. For measures included in the dataset that are not currently part of the portfolio of measures offered by SMMPA member utilities, the incentive was set to 50% of incremental technology cost.

Measure or technology density is another critical requirement for the estimation of energy efficiency and demand reduction potential. "Density" in this case refers to the prevalence of the technology in question throughout the member utility service areas. For example, using 60W incandescent and their lumen equivalent 13-18W CFLs as a technology group, the total technology density is about 23 sockets in a home. Of these 23, about 5 are CFLs and the balance incandescent. This gives a base technology density of 18 (23-5), an efficient density of 5, and a total technology group density of 23.

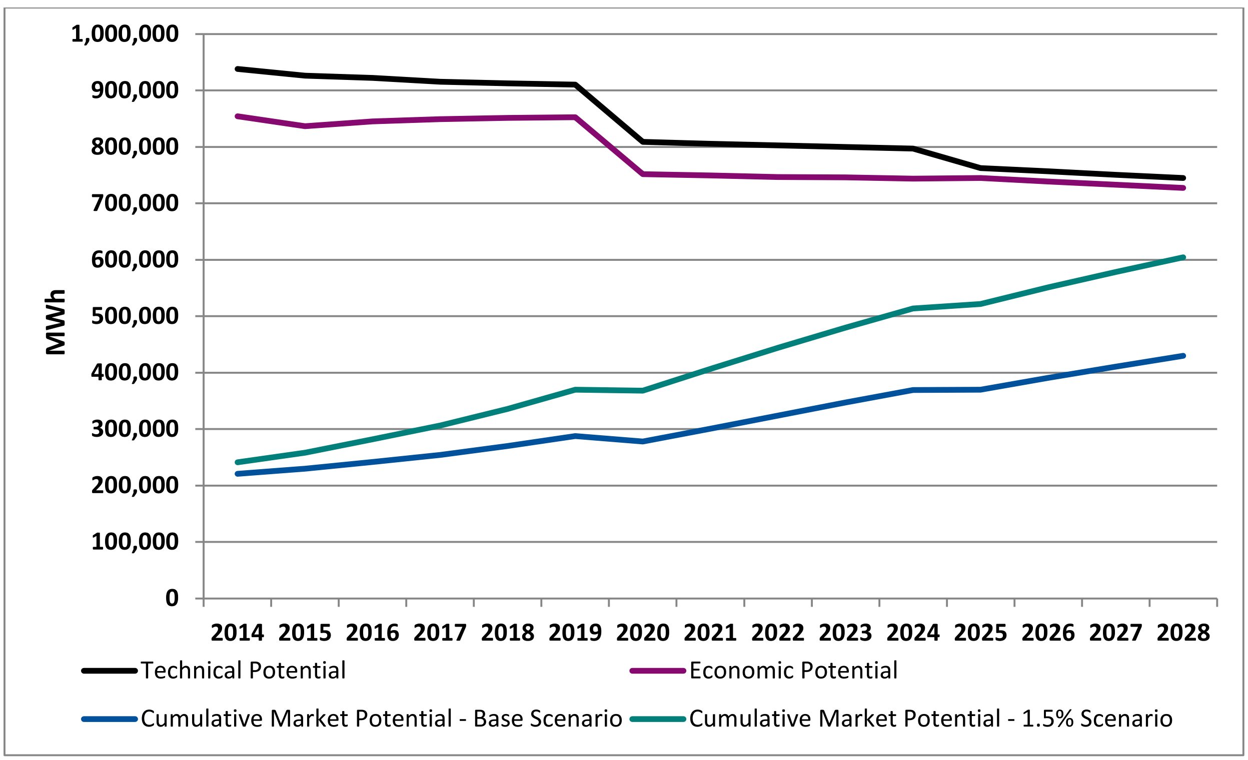
There are no SMMPA-specific measure density values available. The density values used for this study are estimates based on other sources. In previous work for the State of Minnesota (Minnesota Statewide Electricity Efficiency Potentials Report, Summit Blue Consulting, April 2010) which also included supplemental sites added for Ottertail Power, Navigant had conducted on-site surveys on 140 residential and 198 non-residential buildings in Minnesota to identify building characteristics. Navigant utilized this data and estimated baseline and energy efficiency measure densities and fuel shares by end-use.

5. Forecast Results

Figure 4 illustrates the energy potential and Figure 5 the demand potential for the combined SMMPA member utilities over the forecast horizon of 2014 to 2028. The potential estimates are provided for technical, economic and for both the base and 1.5% market potential scenarios. Table 2 through Table 6 provide the data used to create these two figures.

Both technical and economic potential decline over the forecast period. The decline is due to the impacts of codes and standards as well as building decay of existing buildings. The technical and economic potential values are of similar size. The size similarity is due to two issues. The first is that when measure lists, such as the Minnesota Deemed Database, are developed, they primarily include measures that a utility is considering including in their portfolio. This tends to create a measure dataset that is already nearly economically feasible. The second issue is how the TRC screen is utilized. The goal is to have programs, which are a group of measures, to be equal to or above a TRC value of 1.0. This means that each program can include a mix of measures below and above the TRC of 1.0. The EERAM model calculates TRC at the measure level for each year in the forecast and screens each forecast year. To proxy a program-level TRC of 1.0, EERAM utilizes a TRC screen value of 0.75.

Figure 4. Technical, Economic, and the Cumulative Base and 1.5% Scenario Market Energy Potential for All SMMPA Members (MWh)



Comparing the energy trends in Figure 4 to the demand trends in Figure 5 show that for the 1.5% scenario, cumulative demand market potential is nearer to economic potential than cumulative energy market potential and diverges by a greater amount from the base scenario by the year 2028. This is caused by a significant increase in anticipated participation for the ECM Furnace Fan Motor measure for the 1.5% scenario and the high demand coincidence factor (0.9) associated with this measure.

Figure 5. Technical, Economic, and the Cumulative Base and 1.5% Scenario Market Demand Potential for All SMMPA Members (KW)

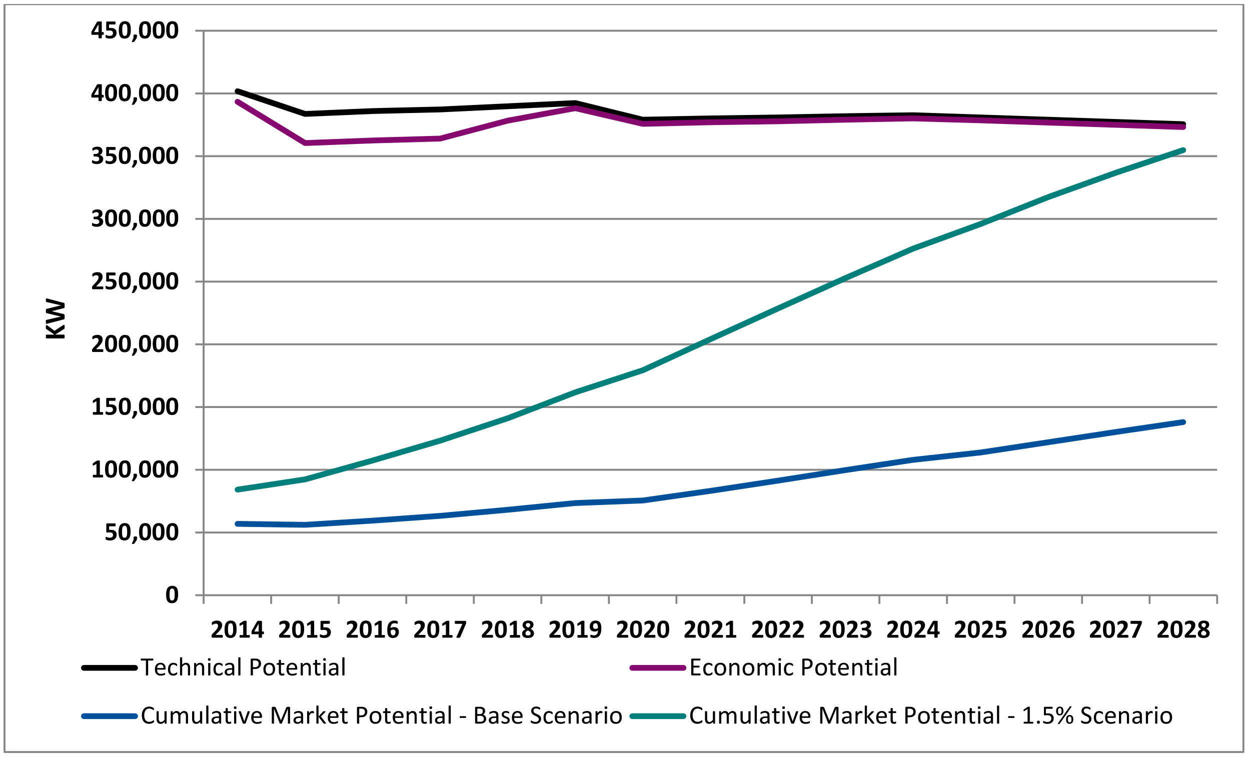
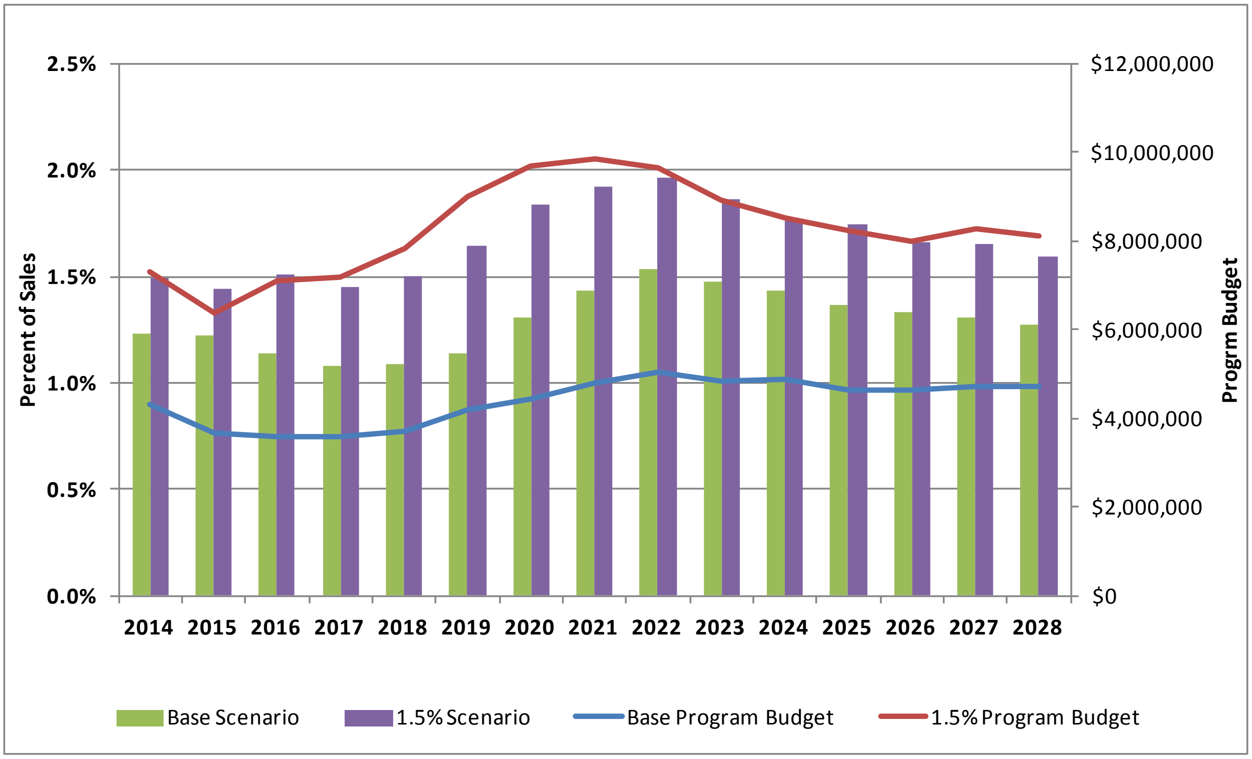


Figure 6 illustrates both the base and 1.5% scenario incremental market potential forecasts as expressed as a percent of the sales forecast as well as the budgets for these scenarios. The data illustrated in Figure 6 includes the combined results of forecast sector savings, savings attributable to reparticipation and savings attributable to code and standard changes. For the base scenario, the percentage share is always above 1% of sales, but only reaches the level of 1.5% of sales in the year 2022. The average is 1.29%.

The 1.5% scenario percentage share is at or above 1.5% of sales for all but three forecast years where the values are 1.44%, 1.45%, and 1.49%. The average is 1.67%. To achieve the 1.5% scenario values:

- The incentive level was increased from the base case (which is a mix of actual incentive values that are close to averaging 50% of incremental technology cost) to a value of 75% of incremental technology cost beginning in the year 2016.
- Marketing was assumed to increase in 2014, which improves consumer awareness of DSM measures and their willingness to install them.

Figure 6. Base and 1.5% Scenario Incremental Market Energy Potential for All SMMPA Members Expressed as Percent of Energy Sales



While the 1.5% scenario forecasts an ability to meet the 1.5% of energy sales goal established for Minnesota's Conservation Improvement program, as shown in Figure 6, it takes a significantly higher budget to drive to that target. As shown in Table 1, the average annual budget for the bases scenario is $4,384,499. The average annual budget for the 1.5% scenario is 89% higher at $8,275,131.

Table 1. Base and 1.5% Scenario Program Budget for All SMMPA Members

Scenario	Beginning Budget	Ending Budget	Total Budget	Average Budget
Base Scenario	$4,303,369	$4,708,571	$65,767,479	$4,384,499
1.5% Scenario	$7,310,336	$8,120,417	$124,126,967	$8,275,131

5.1 *Cumulative Market Potential*

Table 3 presents the base scenario cumulative market potential results of the analysis conducted through 2028. Table 4 presents the same information, but for the 1.5% scenario. Key results and comparisons of these two cumulative market potentials follow:

- The total cumulative net annual energy efficiency market potential savings through 2028 is estimated to be approximately 430 GWh for the base scenario and 604 GWh for the 1.5%

scenario. These are about 11% of sales for the base scenario and 16% of sales for the 1.5% scenario.

- The total cumulative net demand market potential savings through 2028 is estimated to be approximately 138 MW for the base scenario and 355 GWh for the 1.5% scenario. These are about 16% of the demand forecast for the base scenario and 41% for the 1.5% scenario.
- The sector share of cumulative net annual energy efficiency market potential savings through 2028 is:
  - Residential: 16% for the base scenario and 25% for the 1.5% scenario
  - Commercial: 36% for the base scenario and 30% for the 1.5% scenario
  - Industrial: 48% for the base scenario and 55% for the 1.5% scenario
- The sector share of cumulative net demand market potential savings through 2028 is:
  - Residential: 43% for the base scenario and 71% for the 1.5% scenario
  - Commercial: 27% for the base scenario and 12% for the 1.5% scenario
  - Industrial: 30% for the base scenario and 17% for the 1.5% scenario
- Between the base and 1.5% scenarios, the greatest increase comes from the residential sector, which more than doubled for energy and over four times for demand. The measure driving the residential sector significant increase is the ECM Furnace Fan Motor measure and the high demand coincidence factor (0.9) associated with this measure.

5.2 *Incremental Market Potential*

Table 5 presents the base scenario incremental market potential results of the analysis conducted through 2028. Table 6 presents the same information, but for the 1.5% scenario. Both tables represent the total forecast effect on the SMMPA system. This includes Sector savings as well as savings resulting from re-participation and the results of known changes in Codes and Standards. Key results and comparisons of these two incremental market potentials follow:

- The base scenario represents an expansion of measures included in the portfolio compared to the current measure offerings, using the same incentive levels for the currently offered measures and using an incentive representing 50% of incremental technology cost for all added measures.
- The 1.5% scenario includes the same portfolio of existing and new measures, but includes greater marketing as well as an increase in the incentive levels to 75% of incremental technology cost starting in 2016.
- The up and down incremental savings by year are caused by the effects of codes and standards and the adding of measures to the portfolio as they become cost effective. Cost effectiveness is tested each forecast year and measures can be added or subtracted from the portfolio depending on the economic screen results.
- In addition to these effects, the 1.5% scenario includes the effects of additional marketing and higher incentive levels. Marketing is assumed to increase starting in 2014 and the increased incentives in 2016. The increased marketing has an effect of increasing market potential by about 0.2%. The increased incentives and marketing increases market potential by about 0.35% to 0.5%, depending upon the year.

Table 2. Technical and Economic Potential by Sector for All SMMPA Members

Technical Potential

Energy Potential (MWh)

Sector	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Residential	302,293	300,398	302,513	303,782	305,417	307,240	245,341	246,098	246,917	247,887	248,804	224,860	224,530	224,193	223,821
Commercial	225,250	221,001	218,919	215,108	214,695	214,297	185,512	185,372	185,215	185,044	184,853	178,126	176,261	174,420	172,596
Industrial & Agriculture	410,864	404,673	400,658	396,683	392,749	388,858	378,114	374,368	370,659	366,986	363,350	359,765	355,973	352,221	348,509
Total All Buildings	**938,407**	**926,072**	**922,090**	**915,573**	**912,861**	**910,394**	**808,966**	**805,838**	**802,791**	**799,918**	**797,007**	**762,751**	**756,764**	**750,834**	**744,926**
% of Forecast Sales	30.79%	29.83%	29.15%	28.47%	27.95%	27.46%	24.04%	23.59%	23.16%	22.72%	22.29%	21.00%	20.50%	20.02%	19.56%

Demand Potential (kW)

Sector	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Residential	271,222	257,531	260,522	262,969	265,614	268,383	262,624	263,638	264,462	265,631	266,653	266,182	265,562	264,922	264,248
Commercial	38,975	37,956	37,819	37,373	37,886	38,393	32,244	32,787	33,314	33,828	34,326	33,646	33,294	32,946	32,601
Industrial & Agricultural	91,429	88,228	87,549	86,875	86,205	85,540	84,263	83,613	82,967	82,326	81,689	81,055	80,201	79,356	78,519
Total All Buildings	**401,627**	**383,715**	**385,890**	**387,217**	**389,705**	**392,316**	**379,131**	**380,037**	**380,743**	**381,785**	**382,669**	**380,884**	**379,057**	**377,223**	**375,369**
% of Forecast Sales	59.60%	55.74%	55.04%	54.11%	53.53%	52.94%	50.43%	49.55%	48.78%	48.06%	47.46%	46.29%	45.25%	44.27%	43.45%

Economic Potential

Energy Potential (MWh)

Sector	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Residential	279,845	281,840	283,077	287,310	293,292	297,417	235,819	236,704	237,532	240,114	241,038	217,102	216,780	216,451	216,086
Commercial	163,794	152,783	164,140	167,686	167,801	168,434	140,134	140,471	140,789	141,084	141,359	170,007	168,229	166,470	164,728
Industrial & Agriculture	410,468	404,473	400,441	396,448	392,497	388,858	378,114	374,368	370,659	366,986	363,350	359,765	355,973	352,221	348,509
Total All Buildings	**854,107**	**839,096**	**847,658**	**851,444**	**853,590**	**854,708**	**754,067**	**751,543**	**748,980**	**748,185**	**745,747**	**746,875**	**740,983**	**735,142**	**729,324**
% of Forecast Sales	28.03%	27.03%	26.80%	26.48%	26.14%	25.78%	22.41%	22.00%	21.60%	21.25%	20.85%	20.57%	20.07%	19.60%	19.15%

Demand Potential (kW)

Sector	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Residential	267,232	239,393	240,836	242,595	257,066	266,228	261,306	262,652	263,477	264,831	265,854	265,383	264,764	264,124	263,452
Commercial	35,178	33,113	34,235	34,737	35,334	36,406	30,278	30,842	31,390	31,924	32,442	32,187	31,850	31,516	31,187
Industrial & Agriculture	90,987	88,004	87,306	86,612	85,923	85,540	84,263	83,613	82,967	82,326	81,689	81,055	80,201	79,356	78,519
Total All Buildings	**393,396**	**360,510**	**362,376**	**363,944**	**378,323**	**388,174**	**375,847**	**377,107**	**377,834**	**379,080**	**379,985**	**378,625**	**376,815**	**374,996**	**373,157**
% of Forecast Sales	58.37%	52.37%	51.69%	50.86%	51.97%	52.38%	49.99%	49.17%	48.40%	47.72%	47.13%	46.02%	44.98%	44.01%	43.19%

Table 3. Base Scenario Cumulative Market Potential by Sector for All SMMPA Members

Cumulative Market Potential

Energy Potential (MWh)

Sector	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Residential	38,553	39,501	41,859	44,394	47,263	50,568	43,198	47,046	51,277	55,767	60,319	54,674	58,750	62,706	66,570
Commercial	82,252	83,878	85,736	87,848	92,777	98,457	90,885	99,157	107,991	117,034	126,063	128,685	138,083	147,475	156,914
Industrial & Agriculture	98,578	105,164	112,770	120,560	128,355	136,706	141,991	152,633	162,939	172,649	181,187	184,814	192,041	198,596	204,681
Load Management	1,510	1,543	1,571	1,604	1,631	1,661	1,685	1,719	1,749	1,780	1,807	1,844	1,877	1,910	1,936
Total All Buildings	**220,893**	**230,085**	**241,937**	**254,407**	**270,026**	**287,391**	**277,760**	**300,555**	**323,955**	**347,231**	**369,376**	**370,017**	**390,751**	**410,687**	**430,102**
% of Forecast Sales	7.25%	7.41%	7.65%	7.91%	8.27%	8.67%	8.25%	8.80%	9.34%	9.86%	10.33%	10.19%	10.59%	10.95%	11.30%

Demand Potential (kW)

Sector	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Residential	16,707	15,106	16,711	18,485	20,511	22,908	24,760	28,268	32,269	36,610	41,154	44,818	49,633	54,359	58,970
Commercial	20,754	21,008	21,345	21,748	22,924	24,266	22,865	24,765	26,761	28,787	30,791	31,561	33,475	35,343	37,191
Industrial & Agriculture	19,553	20,117	21,605	23,137	24,689	26,366	27,949	30,140	32,279	34,321	36,140	37,451	39,026	40,464	41,823
Load Management	35,782	36,540	37,209	37,984	38,638	39,333	39,900	40,700	41,416	42,143	42,771	43,651	44,452	45,212	45,832
Total All Buildings*	**57,014**	**56,232**	**59,660**	**63,369**	**68,124**	**73,539**	**75,575**	**83,173**	**91,308**	**99,719**	**108,084**	**113,830**	**122,134**	**130,166**	**137,984**
% of Forecast Sales*	8.46%	8.17%	8.51%	8.85%	9.36%	9.92%	10.05%	10.84%	11.70%	12.55%	13.41%	13.84%	14.58%	15.27%	15.97%

*** The totals and percentages do not include Load Management**

Table 4. 1.5% Scenario Cumulative Market Potential by Sector for All SMMPA Members

Cumulative Market Potential

Energy Potential (MWh)

Sector	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Residential	53,249	59,262	68,328	77,380	86,975	97,573	87,056	97,818	108,612	119,400	129,951	127,166	136,371	144,706	152,635
Commercial	82,329	84,004	86,529	89,559	95,973	104,033	98,890	109,493	120,114	130,731	141,271	145,317	156,253	167,139	178,006
Industrial & Agriculture	103,838	113,417	125,298	137,778	151,204	166,658	180,314	197,831	213,653	227,964	240,549	247,130	256,459	264,589	271,702
Load Management	1,510	1,543	1,571	1,604	1,631	1,661	1,685	1,719	1,749	1,780	1,807	1,844	1,877	1,910	1,936
Total All Buildings	**240,927**	**258,226**	**281,726**	**306,321**	**335,783**	**369,925**	**367,945**	**406,861**	**444,128**	**479,875**	**513,577**	**521,457**	**550,961**	**578,343**	**604,279**
% of Forecast Sales	7.91%	8.32%	8.91%	9.53%	10.28%	11.16%	10.93%	11.91%	12.81%	13.63%	14.36%	14.36%	14.93%	15.42%	15.87%

Demand Potential (kW)

Sector	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Residential	41,662	48,135	60,132	72,495	85,921	101,134	116,279	134,601	153,181	171,755	190,060	206,580	223,720	238,951	253,243
Commercial	20,768	21,032	21,521	22,131	23,639	25,508	24,642	27,049	29,429	31,790	34,113	35,160	37,367	39,515	41,629
Industrial & Agriculture	21,962	23,298	25,910	28,645	31,604	35,029	38,589	42,510	46,067	49,301	52,162	54,181	56,319	58,190	59,853
Load Management	35,782	36,540	37,209	37,984	38,638	39,333	39,900	40,700	41,416	42,143	42,771	43,651	44,452	45,212	45,832
Total All Buildings*	**84,392**	**92,464**	**107,563**	**123,270**	**141,164**	**161,671**	**179,510**	**204,160**	**228,678**	**252,846**	**276,335**	**295,922**	**317,405**	**336,656**	**354,725**
% of Forecast Sales*	12.52%	13.43%	15.34%	17.22%	19.39%	21.82%	23.88%	26.62%	29.30%	31.83%	34.28%	35.97%	37.89%	39.51%	41.06%

* The totals and percentages do not include Load Management

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Table 5. Base Scenario Incremental Market Potential by Sector for All SMMPA Members

Incremental Market Potential

Energy Potential (MWh)

Sector	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Residential	6,351	6,411	6,429	6,564	6,738	7,128	7,024	7,656	8,098	8,364	8,498	7,942	7,945	7,903	7,812
Commercial	5,224	4,642	4,709	4,856	5,211	6,062	7,220	8,734	9,744	9,874	9,859	10,310	10,350	10,381	10,404
Industrial & Agriculture	8,928	8,605	8,185	7,999	8,119	8,780	9,964	11,140	11,226	10,535	9,794	9,036	8,407	7,835	7,311
Load Management	1,510	1,543	1,571	1,604	1,631	1,661	1,685	1,719	1,749	1,780	1,807	1,844	1,877	1,910	1,936
Total All Buildings	**22,013**	**21,201**	**20,894**	**21,022**	**21,700**	**23,631**	**25,893**	**29,249**	**30,816**	**30,552**	**29,958**	**29,132**	**28,579**	**28,028**	**27,462**
% of Forecast Sales	0.72%	0.68%	0.66%	0.65%	0.66%	0.71%	0.77%	0.86%	0.89%	0.87%	0.84%	0.80%	0.77%	0.75%	0.72%
Utility Re-Participation	5,510	5,735	4,151	2,915	3,238	3,703	3,109	3,789	6,863	6,361	8,003	7,584	7,816	8,496	8,774
Program Goal (includes Re-participation)	**27,523**	**26,935**	**25,045**	**23,937**	**24,938**	**27,334**	**29,002**	**33,038**	**37,679**	**36,913**	**37,961**	**36,715**	**36,395**	**36,524**	**36,237**
% of Forecast Sales (incremental & re-participation)	**0.90%**	**0.87%**	**0.79%**	**0.74%**	**0.76%**	**0.82%**	**0.86%**	**0.97%**	**1.09%**	**1.05%**	**1.06%**	**1.01%**	**0.99%**	**0.97%**	**0.95%**
Codes & Standards	9,915	11,124	11,099	10,797	10,629	10,563	14,979	15,838	15,554	15,134	13,253	12,786	12,730	12,524	12,342
Program Goal (includes Re-participation and C&S)	**37,438**	**38,060**	**36,144**	**34,734**	**35,566**	**37,897**	**43,980**	**48,876**	**53,234**	**52,047**	**51,214**	**49,501**	**49,125**	**49,049**	**48,579**
Incremental & Re-participation & Codes and Standard Effects as % of Forecast	**1.23%**	**1.23%**	**1.14%**	**1.08%**	**1.09%**	**1.14%**	**1.31%**	**1.43%**	**1.54%**	**1.48%**	**1.43%**	**1.36%**	**1.33%**	**1.31%**	**1.28%**

Demand Potential (kW)

Sector	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Residential	1,975	1,638	1,728	1,853	2,079	2,543	3,033	3,704	4,249	4,626	4,902	5,040	5,154	5,185	5,128
Commercial	1,244	1,115	1,107	1,135	1,212	1,401	1,650	1,971	2,181	2,191	2,170	2,131	2,106	2,080	2,053
Industrial & Agriculture	1,716	1,649	1,590	1,561	1,600	1,753	2,022	2,286	2,332	2,215	2,083	1,943	1,824	1,714	1,613
Load Management	35,782	36,540	37,209	37,984	38,638	39,333	39,900	40,700	41,416	42,143	42,771	43,651	44,452	45,212	45,832
Total All Buildings*	**4,935**	**4,402**	**4,425**	**4,549**	**4,892**	**5,697**	**6,705**	**7,960**	**8,762**	**9,033**	**9,155**	**9,114**	**9,084**	**8,979**	**8,794**
% of Forecast Sales*	**0.73%**	**0.64%**	**0.63%**	**0.64%**	**0.67%**	**0.77%**	**0.89%**	**1.04%**	**1.12%**	**1.14%**	**1.14%**	**1.11%**	**1.08%**	**1.05%**	**1.02%**
Utility Re-Participation	1,019	1,093	846	579	513	620	878	1,152	2,043	2,036	2,571	2,801	2,432	2,946	3,232
Program Goal (includes Re-participation)	**5,954**	**5,495**	**5,270**	**5,128**	**5,405**	**6,317**	**7,583**	**9,113**	**10,806**	**11,069**	**11,726**	**11,915**	**11,516**	**11,925**	**12,026**
% of Forecast Sales (incremental & re-participation)*	**0.88%**	**0.80%**	**0.75%**	**0.72%**	**0.74%**	**0.85%**	**1.01%**	**1.19%**	**1.38%**	**1.39%**	**1.45%**	**1.45%**	**1.37%**	**1.40%**	**1.39%**
Codes & Standards	1,823	4,204	4,199	4,146	4,100	4,090	4,970	5,146	5,096	5,046	4,517	4,257	4,242	4,213	4,183
Program Goal (includes Re-participation and C&S)	**7,777**	**9,699**	**9,469**	**9,273**	**9,505**	**10,407**	**12,553**	**14,259**	**15,902**	**16,115**	**16,243**	**16,172**	**15,758**	**16,138**	**16,210**
Incremental & Re-participation & Codes and Standard Effects as % of Forecast*	**1.15%**	**1.41%**	**1.35%**	**1.30%**	**1.31%**	**1.40%**	**1.67%**	**1.86%**	**2.04%**	**2.03%**	**2.01%**	**1.97%**	**1.88%**	**1.89%**	**1.88%**

*** The totals and percentages do not include Load Management**

Table 6. 1.5% Scenario Incremental Market Potential by Sector for All SMMPA Members

Incremental Market Potential

Energy Potential (MWh)

Sector	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Residential	11,632	11,510	13,137	13,081	13,464	14,459	13,989	14,737	14,901	14,891	14,721	13,705	13,305	12,970	12,523
Commercial	5,266	4,691	5,377	5,774	6,696	8,447	9,981	11,094	11,580	11,505	11,428	11,932	11,933	11,918	11,889
Industrial & Agriculture	11,714	11,333	12,477	12,642	13,698	15,851	17,773	17,998	16,734	15,136	13,668	12,367	11,109	9,977	8,946
Load Management	1,510	1,543	1,571	1,604	1,631	1,661	1,685	1,719	1,749	1,780	1,807	1,844	1,877	1,910	1,936
Total All Buildings	**30,122**	**29,077**	**32,562**	**33,101**	**35,490**	**40,418**	**43,428**	**45,548**	**44,964**	**43,313**	**41,624**	**39,847**	**38,224**	**36,775**	**35,294**
% of Forecast Sales	0.99%	0.94%	1.03%	1.03%	1.09%	1.22%	1.29%	1.33%	1.30%	1.23%	1.16%	1.10%	1.04%	0.98%	0.93%
Utility Re-Participation	5,510	4,594	4,216	2,757	3,061	3,609	3,606	4,389	7,586	7,090	8,109	10,928	10,439	12,593	12,936
Program Goal (includes Re-participation)	**35,632**	**33,671**	**36,778**	**35,858**	**38,551**	**44,027**	**47,034**	**49,937**	**52,550**	**50,403**	**49,733**	**50,775**	**48,662**	**49,369**	**48,230**
% of Forecast Sales (incremental & re-participation)	**1.17%**	**1.08%**	**1.16%**	**1.12%**	**1.18%**	**1.33%**	**1.40%**	**1.46%**	**1.52%**	**1.43%**	**1.39%**	**1.40%**	**1.32%**	**1.32%**	**1.27%**
Codes & Standards	9,915	11,124	11,099	10,797	10,630	10,564	14,979	15,838	15,554	15,134	13,253	12,786	12,730	12,524	12,342
Program Goal (includes Re-participation and C&S)	**45,547**	**44,795**	**47,877**	**46,655**	**49,181**	**54,591**	**62,013**	**65,775**	**68,104**	**65,537**	**62,986**	**63,561**	**61,393**	**61,893**	**60,572**
Incremental & Re-participation & Codes and Standard Effects as % of Forecast	**1.49%**	**1.44%**	**1.51%**	**1.45%**	**1.51%**	**1.65%**	**1.84%**	**1.93%**	**1.96%**	**1.86%**	**1.76%**	**1.75%**	**1.66%**	**1.65%**	**1.59%**

Demand Potential (kW)

Sector	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Residential	10,336	9,867	12,121	12,442	13,479	15,368	17,292	18,541	18,891	18,927	18,744	18,253	17,610	17,005	16,124
Commercial	1,251	1,124	1,259	1,343	1,544	1,930	2,257	2,485	2,577	2,539	2,502	2,446	2,408	2,369	2,328
Industrial & Agriculture	2,590	2,461	2,716	2,754	2,998	3,494	3,945	4,014	3,749	3,407	3,090	2,810	2,533	2,285	2,058
Load Management	35,782	36,540	37,209	37,984	38,638	39,333	39,900	40,700	41,416	42,143	42,771	43,651	44,452	45,212	45,832
Total All Buildings*	**14,177**	**13,452**	**16,096**	**16,539**	**18,021**	**20,792**	**23,495**	**25,040**	**25,217**	**24,872**	**24,336**	**23,509**	**22,552**	**21,659**	**20,510**
% of Forecast Sales*	**2.10%**	**1.95%**	**2.30%**	**2.31%**	**2.48%**	**2.81%**	**3.12%**	**3.26%**	**3.23%**	**3.13%**	**3.02%**	**2.86%**	**2.69%**	**2.54%**	**2.37%**
Utility Re-Participation	1,019	921	850	549	480	600	939	1,240	2,153	2,161	2,588	3,643	3,188	7,737	8,058
Program Goal (includes Re-participation)	**15,196**	**14,373**	**16,946**	**17,087**	**18,502**	**21,391**	**24,434**	**26,280**	**27,371**	**27,033**	**26,924**	**27,152**	**25,739**	**29,396**	**28,568**
% of Forecast Sales (incremental & re-participation)*	**2.25%**	**2.09%**	**2.42%**	**2.39%**	**2.54%**	**2.89%**	**3.25%**	**3.43%**	**3.51%**	**3.40%**	**3.34%**	**3.30%**	**3.07%**	**3.45%**	**3.31%**
Codes & Standards	1,823	4,204	4,199	4,146	4,101	4,090	4,970	5,146	5,096	5,046	4,517	4,257	4,242	4,213	4,183
Program Goal (includes Re-participation and C&S)	**17,019**	**18,577**	**21,145**	**21,233**	**22,602**	**25,482**	**29,404**	**31,426**	**32,467**	**32,079**	**31,441**	**31,409**	**29,982**	**33,609**	**32,751**
Incremental & Re-participation & Codes and Standard Effects as % of Forecast*	**2.53%**	**2.70%**	**3.02%**	**2.97%**	**3.10%**	**3.44%**	**3.91%**	**4.10%**	**4.16%**	**4.04%**	**3.90%**	**3.82%**	**3.58%**	**3.94%**	**3.79%**

* The totals and percentages do not include Load Management

5.3 *Measure Savings*

Appendix D provides the estimates of incremental savings at the measure level. The estimates are for both CROD and Non-CROD members as well as for the Base and 1.5% Scenario. Energy and demand values are provided for the years 2014 and 2028.

Table 7 identifies the top 20 measures in 2014 and Table 8 in 2028 for the CROD Base scenario. The top 20 measures provide about 85% of the total incremental potential in each year. In both 2014 and 2028, the residential Home Energy Report measure and Variable Speed Drives for HVAC Fans in the Commercial and Industrial sectors are the top three measures. The number four and number five measures vary between the two years with Recycled Refrigerators being in both but T12 to T8 lighting being in the top 5 in 2014 and Commercial Sector Parallel Racks in 2028.

In the 1.5% scenario, as provided for the CROD members in Table 9 for 2014 and Table 10 for 2028, the top 3 measures are the same as for the base scenario. However, ranked measures 3 and 4 for the 1.5% scenario are different from the base scenario. In the 1.5% scenario for both years, ECM furnace fan motors for residential single family and multi-family are part of the top 5 measures.

Table 7. Top 20 Measures in 2014: CROD-Base Scenario

Rank	Top Twenty Measures - 2014	2014 - Energy Savings (MWh)	2014 - Demand Savings (KW)	Energy % of Total	Demand % of Total
1	SFE - Home Energy Report	1,924	0	19.0%	0.0%
2	Com - VSD - For HVAC Fans	1,815	437	18.0%	16.5%
3	IND - VSD - For HVAC Fans	1,317	317	13.0%	12.0%
4	SFE - Recycle Refrigerator	482	55	4.8%	2.1%
5	Com - T12-T8 4ft	412	118	4.1%	4.5%
6	IND - T12-T8 8ft	292	29	2.9%	1.1%
7	IND - T12-T8 4ft	274	53	2.7%	2.0%
8	IND - Low Wattage T8 - 4ft	253	49	2.5%	1.9%
9	IND - T8 Linear fluorescent delamping 4 ft	230	45	2.3%	1.7%
10	IND - High bay fluorescent	206	40	2.0%	1.5%
11	SFE - Hardwired CFL Fixtures	196	19	1.9%	0.7%
12	Com - Compressed Air Leak Correction	181	38	1.8%	1.4%
13	IND - Occupancy Sensor - Motion	180	35	1.8%	1.3%
14	Com - Low Wattage T8 - 4ft	168	48	1.7%	1.8%
15	Com - Occupancy Sensor - Motion (for Premium T8s only)	133	38	1.3%	1.4%
16	SFE - CFL 13W-18W - Replacing 60W Incandescent	126	12	1.2%	0.5%
17	SFE - ECM Furnace Fan Motor	121	323	1.2%	12.2%
18	SFE - HVAC Quality Installation	107	285	1.1%	10.8%
19	IND - Time Clock Lighting Controls	82	0	0.8%	0.0%
20	IND - Compressed Air Leak Correction	77	11	0.8%	0.4%
	Top 20 Total	**8,577**	**1,950**	**84.9%**	**73.8%**

Table 8. Top 20 Measures in 2028: CROD-Base Scenario

Rank	Top Twenty Measures - 2028	2028 - Energy Savings (MWh)	2028 - Demand Savings (KW)	Energy % of Total	Demand % of Total
1	Com - VSD - For HVAC Fans	3,300	794	22.7%	15.8%
2	SFE - Home Energy Report	1,924	0	13.2%	0.0%
3	IND - VSD - For HVAC Fans	1,839	442	12.7%	8.8%
4	SFE - Hardwired LED Fixtures	738	70	5.1%	1.4%
5	Com - Parallel Rack	577	0	4.0%	0.0%
6	SFE - Recycle Refrigerator	564	64	3.9%	1.3%
7	SFE - HVAC Quality Installation	550	1,464	3.8%	29.1%
8	IND - Low Wattage T8 - 4ft	442	86	3.0%	1.7%
9	Com - High Evaporator Temp Cases	377	0	2.6%	0.0%
10	Com - Compressed Air Leak Correction	372	78	2.6%	1.6%
11	Com - High Eff Glass Door	328	0	2.3%	0.0%
12	Com - Occupancy Sensor - Motion (for Premium T8s only)	294	84	2.0%	1.7%
13	Com - Low Wattage T8 - 4ft	271	77	1.9%	1.5%
14	Com - LED Luminaire: 16-24 Watt Interior	250	44	1.7%	0.9%
15	SFE - ECM Furnace Fan Motor	240	638	1.7%	12.7%
16	Com - 320W Pulse Start Metal Halide	168	48	1.2%	1.0%
17	MFE - HVAC Quality Installation	146	389	1.0%	7.7%
18	SFE - Recycle Freezer	140	16	1.0%	0.3%
19	IND - Occupancy Sensor - Motion	132	26	0.9%	0.5%
20	Com - Daylighting - Continuous Dimming	96	28	0.7%	0.5%
	Top 20 Total	**12,749**	**4,347**	**87.8%**	**86.5%**

Table 9. Top 20 Measures in 2014: CROD-1.5% Scenario

Rank	Top Twenty Measures - 2014	2014 - Energy Savings (MWh)	2014 - Demand Savings (KW)	Energy % of Total	Demand % of Total
1	IND - VSD - For HVAC Fans	2,623	631	18.9%	8.7%
2	SFE - Home Energy Report	1,924	0	13.8%	0.0%
3	Com - VSD - For HVAC Fans	1,816	437	13.1%	6.0%
4	SFE - ECM Furnace Fan Motor	1,334	3,549	9.6%	48.9%
5	SFE - Hardwired CFL Fixtures	708	67	5.1%	0.9%
6	SFE - Recycle Refrigerator	571	65	4.1%	0.9%
7	SFE - CFL 13W-18W - Replacing 60W Incandescent	420	40	3.0%	0.5%
8	Com - T12-T8 4ft	412	118	3.0%	1.6%
9	MFE - ECM Furnace Fan Motor	378	1,004	2.7%	13.8%
10	IND - T12-T8 8ft	209	20	1.5%	0.3%
11	IND - T12-T8 4ft	195	38	1.4%	0.5%
12	Com - Compressed Air Leak Correction	181	38	1.3%	0.5%
13	IND - Low Wattage T8 - 4ft	173	34	1.2%	0.5%
14	Com - Low Wattage T8 - 4ft	168	48	1.2%	0.7%
15	IND - T8 Linear fluorescent delamping 4 ft	168	33	1.2%	0.4%
16	IND - High bay fluorescent	151	29	1.1%	0.4%
17	Com - Occupancy Sensor - Motion (for Premium T8s only)	133	38	1.0%	0.5%
18	IND - Occupancy Sensor - Motion	129	25	0.9%	0.3%
19	SFE - CFL 18W-25W - Replacing 75W Incandescent	122	12	0.9%	0.2%
20	SFE - HVAC Quality Installation	112	297	0.8%	4.1%
	Top 20 Total	**11,926**	**6,523**	**85.7%**	**89.9%**

Table 10. Top 20 Measures in 2028: CROD-1.5% Scenario

Rank	Top Twenty Measures - 2028	2028 - Energy Savings (MWh)	2028 - Demand Savings (KW)	Energy % of Total	Demand % of Total
1	Com - VSD - For HVAC Fans	3,725	896	19.8%	7.9%
2	IND - VSD - For HVAC Fans	2,546	612	13.5%	5.4%
3	SFE - Home Energy Report	1,924	0	10.2%	0.0%
4	SFE - ECM Furnace Fan Motor	1,530	4,071	8.1%	36.1%
5	MFE - ECM Furnace Fan Motor	860	2,288	4.6%	20.3%
6	SFE - Hardwired LED Fixtures	839	80	4.5%	0.7%
7	Com - Parallel Rack	732	0	3.9%	0.0%
8	SFE - Recycle Refrigerator	670	76	3.6%	0.7%
9	SFE - HVAC Quality Installation	606	1,612	3.2%	14.3%
10	Com - High Evaporator Temp Cases	447	0	2.4%	0.0%
11	Com - Compressed Air Leak Correction	400	84	2.1%	0.7%
12	Com - High Eff Glass Door	398	0	2.1%	0.0%
13	IND - Low Wattage T8 - 4ft	343	67	1.8%	0.6%
14	Com - Occupancy Sensor - Motion (for Premium T8s only)	335	96	1.8%	0.8%
15	Com - Low Wattage T8 - 4ft	328	93	1.7%	0.8%
16	Com - LED Luminaire: 16-24 Watt Interior	299	52	1.6%	0.5%
17	Com - 320W Pulse Start Metal Halide	204	58	1.1%	0.5%
18	MFE - HVAC Quality Installation	161	428	0.9%	3.8%
19	SFE - Recycle Freezer	144	16	0.8%	0.1%
20	IND - Occupancy Sensor - Motion	139	27	0.7%	0.2%
	Top 20 Total	**16,633**	**10,558**	**88.5%**	**93.6%**

Table 11 identifies the top 20 measures in 2014 and Table 12 in 2028 for the Non-CROD base scenario. The top 20 measures provide about 90% of the total incremental potential in each year. In both 2014 and 2028, the residential Home Energy Report measure and Variable Speed Drives for HVAC Fans in the Commercial and Industrial sectors are the top three measures. The number four and number five measures vary between the two years with Industrial 8 foot and 4 foot T12 to T8 lamps being number four and number five in 2014 but Commercial Compressed Air Leak Correction and Industrial Low Wattage 4 foot T8 lamps being in the top five in 2028.

In the 1.5% scenario, as provided for the Non-CROD members in Table 13 for 2014 and Table 14 for 2028, the top 4 measures are the same (though different order) between the two years. However, in 2014, the measure ranked number five in 2014 is Residential Hard-Wired CFL Fixtures and in 2028, Commercial Compressed Air Leak Correction.

Comparing the 2014 Non-CROD top five measures between the base and 1.5% scenarios finds three measures that are the same. The two that are different are Industrial 8 foot and 4 foot T12 to T8 lamps being in the 2014 base scenario while Residential ECM Furnace Fan Motors and Residential Hard-Wired CFL Fixtures are in the 1.5% scenario top five. In 2028, only one top five measure is different between the scenarios. Industrial Low Wattage T8 lamps are part of the base scenario top five in 2028 while Residential ECM Furnace Fan Motors are part of the 1.5% scenario 2028 top five.

Table 11. Top 20 Measures in 2014: Non-CROD-Base Scenario

Rank	Top Twenty Measures - 2014	2014 - Energy Savings (MWh)	2014 - Demand Savings (KW)	Energy % of Total	Demand % of Total
1	IND - VSD - For HVAC Fans	2,108	507	20.3%	22.1%
2	SFE - Home Energy Report	1,533	0	14.7%	0.0%
3	Com - VSD - For HVAC Fans	860	207	8.3%	9.0%
4	IND - T12-T8 8ft	524	51	5.0%	2.2%
5	IND - T12-T8 4ft	491	96	4.7%	4.2%
6	IND - Low Wattage T8 - 4ft	475	92	4.6%	4.0%
7	Com - Compressed Air Leak Correction	434	91	4.2%	4.0%
8	IND - T8 Linear fluorescent delamping 4 ft	402	78	3.9%	3.4%
9	IND - High bay fluorescent	355	69	3.4%	3.0%
10	SFE - Recycle Refrigerator	355	41	3.4%	1.8%
11	IND - Occupancy Sensor - Motion	321	62	3.1%	2.7%
12	Com - T12-T8 4ft	219	62	2.1%	2.7%
13	SFE - Hardwired CFL Fixtures	205	20	2.0%	0.9%
14	IND - Time Clock Lighting Controls	145	0	1.4%	0.0%
15	SFE - CFL 13W-18W - Replacing 60W Incandescent	134	13	1.3%	0.6%
16	IND - Compressed Air Leak Correction	131	18	1.3%	0.8%
17	IND - CFL Fixture 16 to 24W	123	11	1.2%	0.5%
18	SFE - HVAC Quality Installation	96	255	0.9%	11.1%
19	IND - CFL: >25W Screw-In Indoor	94	11	0.9%	0.5%
20	Com - Low Wattage T8 - 4ft	91	26	0.9%	1.1%
	Top 20 Total	**9,098**	**1,711**	**87.5%**	**74.5%**

Table 12. Top 20 Measures in 2028: Non-CROD-Base Scenario

Rank	Top Twenty Measures - 2028	2028 - Energy Savings (MWh)	2028 - Demand Savings (KW)	Energy % of Total	Demand % of Total
1	IND - VSD - For HVAC Fans	2,763	665	25.1%	17.6%
2	Com - VSD - For HVAC Fans	1,572	378	14.3%	10.0%
3	SFE - Home Energy Report	1,533	0	13.9%	0.0%
4	Com - Compressed Air Leak Correction	921	193	8.4%	5.1%
5	IND - Low Wattage T8 - 4ft	813	158	7.4%	4.2%
6	SFE - HVAC Quality Installation	430	1,144	3.9%	30.3%
7	SFE - Recycle Refrigerator	402	46	3.7%	1.2%
8	Com - Parallel Rack	243	0	2.2%	0.0%
9	Com - High Evaporator Temp Cases	164	0	1.5%	0.0%
10	Com - Low Wattage T8 - 4ft	146	42	1.3%	1.1%
11	Com - Occupancy Sensor - Motion (for Premium T8s only)	144	41	1.3%	1.1%
12	Com - High Eff Glass Door	138	0	1.3%	0.0%
13	IND - Occupancy Sensor - Motion	131	25	1.2%	0.7%
14	MFE - HVAC Quality Installation	114	304	1.0%	8.1%
15	IND - LED Luminaire: 16-24 Watt Interior	102	9	0.9%	0.2%
16	SFE - ECM Furnace Fan Motor	102	271	0.9%	7.2%
17	SFE - Recycle Freezer	94	11	0.9%	0.3%
18	Com - 320W Pulse Start Metal Halide	90	26	0.8%	0.7%
19	IND - T12-T8 8ft	76	7	0.7%	0.2%
20	IND - T12-T8 4ft	71	14	0.6%	0.4%
	Top 20 Total	**10,049**	**3,334**	**91.3%**	**88.4%**

Table 13. Top 20 Measures in 2014: Non-CROD-1.5% Scenario

Rank	Top Twenty Measures - 2014	2014 - Energy Savings (MWh)	2014 - Demand Savings (KW)	Energy % of Total	Demand % of Total
1	IND - VSD - For HVAC Fans	5,239	1,260	35.6%	18.2%
2	SFE - Home Energy Report	1,533	0	10.4%	0.0%
3	SFE - ECM Furnace Fan Motor	1,169	3,110	8.0%	44.9%
4	Com - VSD - For HVAC Fans	860	207	5.9%	3.0%
5	SFE - Hardwired CFL Fixtures	528	50	3.6%	0.7%
6	SFE - Recycle Refrigerator	501	57	3.4%	0.8%
7	Com - Compressed Air Leak Correction	434	91	3.0%	1.3%
8	MFE - ECM Furnace Fan Motor	332	882	2.3%	12.7%
9	SFE - CFL 13W-18W - Replacing 60W Incandescent	321	30	2.2%	0.4%
10	IND - T12-T8 8ft	300	29	2.0%	0.4%
11	IND - T12-T8 4ft	281	55	1.9%	0.8%
12	IND - Low Wattage T8 - 4ft	249	48	1.7%	0.7%
13	IND - T8 Linear fluorescent delamping 4 ft	241	47	1.6%	0.7%
14	Com - T12-T8 4ft	219	62	1.5%	0.9%
15	IND - High bay fluorescent	217	42	1.5%	0.6%
16	IND - Occupancy Sensor - Motion	185	36	1.3%	0.5%
17	IND - Compressed Air Leak Correction	158	22	1.1%	0.3%
18	IND - Premium Efficiency Motor 1800 RPM ODP	118	34	0.8%	0.5%
19	SFE - HVAC Quality Installation	101	269	0.7%	3.9%
20	SFE - CFL 18W-25W - Replacing 75W Incandescent	96	9	0.7%	0.1%
	Top 20 Total	**13,083**	**6,341**	**89.0%**	**91.6%**

Table 14. Top 20 Measures in 2028: Non-CROD-1.5% Scenario

Rank	Top Twenty Measures - 2028	2028 - Energy Savings (MWh)	2028 - Demand Savings (KW)	Energy % of Total	Demand % of Total
1	IND - VSD - For HVAC Fans	3,434	826	23.6%	8.9%
2	Com - VSD - For HVAC Fans	1,775	427	12.2%	4.6%
3	SFE - Home Energy Report	1,533	0	10.5%	0.0%
4	SFE - ECM Furnace Fan Motor	1,204	3,202	8.3%	34.7%
5	Com - Compressed Air Leak Correction	991	208	6.8%	2.3%
6	MFE - ECM Furnace Fan Motor	759	2,018	5.2%	21.9%
7	SFE - Recycle Refrigerator	574	65	3.9%	0.7%
8	IND - Low Wattage T8 - 4ft	493	96	3.4%	1.0%
9	SFE - HVAC Quality Installation	466	1,239	3.2%	13.4%
10	Com - Parallel Rack	278	0	1.9%	0.0%
11	IND - Occupancy Sensor - Motion	194	38	1.3%	0.4%
12	Com - High Evaporator Temp Cases	192	0	1.3%	0.0%
13	Com - Low Wattage T8 - 4ft	177	50	1.2%	0.5%
14	Com - High Eff Glass Door	165	0	1.1%	0.0%
15	Com - Occupancy Sensor - Motion (for Premium T8s only)	161	46	1.1%	0.5%
16	IND - T12-T8 8ft	145	14	1.0%	0.2%
17	IND - T12-T8 4ft	135	26	0.9%	0.3%
18	MFE - HVAC Quality Installation	124	329	0.8%	3.6%
19	IND - LED Luminaire: 16-24 Watt Interior	119	11	0.8%	0.1%
20	Com - 320W Pulse Start Metal Halide	109	31	0.8%	0.3%
	Top 20 Total	**13,028**	**8,628**	**89.5%**	**93.4%**

Appendix A. Glossary of Terms

Achievable Potential: The amount of energy use that efficiency can realistically be expected to displace assuming the most aggressive program scenario possible (such as providing end-users with payments for the entire incremental cost of more efficient equipment). This is often referred to as maximum achievable potential. Achievable potential takes into account real-world barriers to convincing end-users to adopt efficiency measures, the non-measure costs of delivering programs (for administration, marketing, tracking systems, monitoring and evaluation, etc.), and the capability of programs and administrators to ramp up program activity over time.

Cost-effectiveness: A measure of the relevant economic effects resulting from the implementation of an energy efficiency measure. If the benefits outweigh the cost, the measure is said to be cost-effective.

Cumulative Annual: Refers to the overall savings occurring in a given year from both new participants and savings continuing to result from past participation with measures that are still in place. Cumulative annual does not always equal the sum of all prior year incremental values as some measures have relatively short measure lives and, as a result, their savings drop off over time.

Early Replacement: Refers to an efficiency measure or efficiency program that seeks to encourage the replacement of functional equipment before the end of its operating life with higher-efficiency units

Economic Potential: The subset of the technical potential screen that is economically cost-effective as compared to conventional supply-side energy resources. Both technical and economic potential screens are theoretical numbers that assume immediate implementation of efficiency measures, with no regard for the gradual "ramping up" process of real-life programs. In addition, they ignore market barriers to ensuring actual implementation of efficiency. Finally, they only consider the costs of efficiency measures themselves, ignoring any programmatic costs (such as marketing, analysis, administration) that would be necessary to capture them.

Effective Useful Life (EUL): The number of years (or hours) that the new energy efficient equipment is expected to function based on the assumed or average general life of the measure. Useful life is also commonly referred to as "measure life." In the SMMPA technical potential study measure life was taken from the Deemed Savings Database. If there was not a measure life provided, average DSM assumptions were applied.

Emerging Technology: An energy efficiency measure just entering or about to enter the marketplace.

End-use: A category of equipment or service that consumes energy (e.g., lighting, refrigeration, heating, process heat).

Energy Efficiency: Using less energy to provide the same or an improved level of service to the energy consumer in an economically efficient way. Sometimes "conservation" is used as a synonym, but that term is usually taken to mean using less of a resource even if this results in a lower service level (e.g., setting a thermostat lower or reducing lighting levels). This recognizes that energy efficiency includes using less energy at any time, including at times of peak demand through demand response and peak shaving efforts.

Incremental: Savings or costs in a given year associated only with new installations happening in year.

Measure: Any action taken to increase efficiency, whether through changes in equipment, control strategies, or behavior. Examples are higher-efficiency central air conditioners, occupancy sensor control of lighting, and retro-commissioning. In some cases, bundles of technologies or practices may be modeled as single measures. For example, an ENERGY STAR® home package may be treated as a single measure.

Megawatt (MW): A unit of electrical output, equal to one million watts or one thousand kilowatts. It is typically used to refer to the output of a power plant.

Megawatt-hour (MWh): One thousand kilowatt-hours, or one million watt-hours. One MWh is equal to the use of 1,000,000 watts of power in one hour.

New Construction: A measure or package of measures is installed at the time of construction.

Net-to-gross (NTG) Ratio: Net-to-gross ratios are important in determining the actual energy savings attributable to a particular program, as distinct from energy efficiency occurring naturally (in the absence of a program). The net-to-gross ratio equals the net program load impact divided by the gross program load impact. This factor is applied to gross program savings to determine the program's net impact. Net to gross ratios in the SMMPA Technical Potential Model are set to 1.0.

Portfolio: Either a collection of similar programs addressing the same market, technology, or mechanisms; or the set of all programs conducted by one organization. An example might be residential lighting, or commercial food service.

Program: A mechanism for encouraging energy efficiency. May be funded by a variety of sources and pursued by a wide range of approaches. Typically includes multiple measures.

Program Potential: The efficiency potential possible given specific program funding levels and designs. Often, program potential studies are referred to as "achievable" in contrast to "maximum achievable."

Replace on Burnout (ROB): A fuel substitution measure is not implemented until the existing technology it is replacing fails. An example would be an energy efficient water heater being purchased after the failure of the existing water heater.

Remaining Useful Life (RUL): The length of time a measure is expected to remain in operation (the length of time until its effective useful life is at an end).

Retrofit: Refers to an efficiency measure or efficiency program that seeks to encourage the replacement of functional equipment before the end of its operating life with higher-efficiency units (also called "early retirement") or the installation of additional controls, equipment, or materials in existing facilities for purposes of reducing energy consumption (e.g., increased insulation, low flow devices, lighting occupancy controls, economizer ventilation systems).

Technical Potential: The theoretical maximum amount of energy use that could be displaced by efficiency, disregarding all non-engineering constraints such as cost-effectiveness and the willingness of end-users to adopt the efficiency measures. It is often estimated as a "snapshot" in time assuming immediate implementation of all technologically feasible energy saving measures, with additional efficiency opportunities assumed as they arise from activities such as new construction.

Appendix B. EERAM Economic Tests

Measure, program, end-use, building type, and overall portfolio level costs and benefits are calculated in EERAM. The costs and benefits calculated include:

- Administrative costs
- Avoided cost benefits
- Incentive costs
- Incremental technology costs
- Utility bill reductions

Within the "Financial Tests" worksheet, these streams of costs and benefits are converted to a net present value using the discount rate input in the "Summary Parameters" worksheet. Using this data, four financial tests[i] are calculated. These include:

- **Total Resource Cost (TRC)**[6,7,8]: The TRC test measures the net resource benefits from the perspective of all ratepayers by combining the net benefits of the program to participants and non-participants. The benefits are the avoided costs of the supply-side resources avoided or deferred. The TRC costs encompass the cost of the measures/equipment installed and the costs incurred by SMMPA and its members in program implementation. The formulation:
  - TRC = Benefits / Costs where:
    - Benefits = avoided costs
    - Costs = administrative costs + net incremental technology costs
- **Program Administrator Cost Test (the old Utility Cost Test) (PAC)**[6]: Sometimes referred to as the utility cost test, this test compares the utility's avoided cost benefits with energy efficiency program expenditures (incentives plus administrative costs). The formulation:
  - PAC = Benefits / Costs where:
    - Benefits = avoided costs
    - Costs = administrative costs + incentives

[6] *California Standard Practice Manual: Economic Analysis of Demand-Side Programs and Projects.* October 2001. http://www.energy.ca.gov/greenbuilding/documents/background/07-J_CPUC_STANDARD_PRACTICE_MANUAL.PDF

[7] *CPUC D0606063, Attachment 9.* http://www.cpuc.ca.gov/NR/rdonlyres/101F0713-7277-43A8-883D-8EF2712EFA8A/0/NumericalExamplesNTGAdjtoTRCD0709043.pdf

[8] CPUC http://docs.cpuc.ca.gov/published/final_decision/73172-10.htm

- **Ratepayer Impact Test (RIM)**[6]: This test measures what happens to customer bills or rates due to changes in utility revenue and operating costs caused by the program. The formulation:
  - RIM = Benefits / Costs where:
    - Benefits = avoided costs
    - Costs = administrative costs + incentives + net bill reductions
- **Participant Cost Test (PCT)**[6]: This test measures the quantifiable benefits and costs to the customer due to participation in the program. The formulation:
  - PCT = Benefits / Costs where:
    - Benefits = incentives + gross bill reductions
    - Costs = gross incremental technology costs

Appendix C. DSM Measure Data

Table C- 1. Residential Measures

Residential Sector Measure Name	Building Type	Units	Base Technology Density	Efficient Technology Density	Energy Impact (kWh/Unit)	Peak watts/kWh Ratio	Measure Life	Base Incentive ($/unit)	Material (& Labor if needed) Cost
Energy Star Ceiling Fans	SFE	Unit	1.865	0.098	151.00	0.596	10.0	$25.00	$25.00
ES Refrigerator	SFE	Refrigerator	0.632	0.361	83.00	0.114	14.0	$25.00	$54.00
ES Freezer	SFE	Freezer	0.805	0.030	42.00	0.114	11.0	$25.00	$54.00
ES Dehumdifier	SFE	Dehumidifier	0.421	0.090	105.00	1.086	12.0	$65.00	$65.00
Recycle Refrigerator	SFE	Refrigerator	0.429	0.000	844.00	0.114	7.5	$25.00	$175.00
Recycle Freezer	SFE	Freezer	0.308	0.000	479.00	0.114	7.5	$25.00	$175.00
ES Dishwasher	SFE	Dishwasher	0.444	0.188	60.00	0.620	12.0	$25.00	$12.00
ES Room AC (Window) 6,000 Btuh	SFE	Unit	0.111	0.000	32.66	6.700	9.0	$25.00	$25.00
ES Room AC (Window) 12,000 Btuh	SFE	Unit	0.059	0.000	64.06	6.700	15.0	$25.00	$75.00
SEER 14 Central AC unit	SFE	Per Ton	1.917	0.023	77.63	2.660	14.0	$200.00	$200.00
SEER 16 Central AC unit	SFE	Per Ton	1.939	0.000	140.70	2.660	14.0	$200.00	$315.03
SEER 14.5 Heat Pump	SFE	Per Ton	0.239	0.023	77.63	2.860	12.0	$200.00	$754.11
SEER 16 Heat Pump	SFE	Per Ton	0.239	0.023	140.70	2.860	12.0	$200.00	$970.64
Ground Source Heat Pump	SFE	Per Ton	0.218	0.043	4,122.00	2.660	20.0	$200.00	$6,825.33
HVAC Quality Installation	SFE	Per Ton	1.757	0.443	180.75	2.660	6.5	$50.00	$100.00
CFL <13W - Replacing 40W Incandescent	SFE	Bulb	6.105	0.368	29.24	0.095	9.4	$2.00	$2.49
CFL 13W-18W - Replacing 60W Incandescent	SFE	Bulb	18.090	4.940	43.36	0.095	9.4	$2.00	$2.49
7.5 Watt LED Bulb	SFE	Bulb	0.000	0.083	52.94	0.095	15.0	$10.00	$21.00
CFL 18W-25W - Replacing 75W Incandescent	SFE	Bulb	3.511	1.541	50.42	0.095	9.4	$2.00	$3.26
CFL >25W - Replacing 100W Incandescent	SFE	Bulb	2.511	0.338	73.61	0.095	9.4	$2.00	$3.26
17 Watt LED Bulb	SFE	Bulb	2.850	0.000	83.69	0.095	20.0	$15.00	$40.00
Hardwired CFL Fixtures	SFE	Fixture	16.030	0.083	71.04	0.095	6.0	$15.00	$35.00
Hardwired LED Fixtures	SFE	Fixture	16.113	0.015	49.95	0.095	15.0	$15.00	$40.00
ENERGY STAR Torchiere	SFE	Bulb	1.460	0.020	142.08	0.095	9.4	$15.00	$41.97
LED Holiday Lights	SFE	Per Strip	2.567	0.066	78.16	0.000	20.0	$12.00	$36.00
ES Clothes Washer (Electric Water Heat/Electric Dryer)	SFE	Clothes Washer	0.053	0.015	224.00	0.137	14.0	$50.00	$50.00
ES Clothes Washer (Electric Water Heat/Gas Dryer)	SFE	Clothes Washer	0.398	0.038	141.00	0.137	14.0	$50.00	$50.00
ES Clothes Washer (Gas Water Heat/Electric Dryer)	SFE	Clothes Washer	0.068	0.038	97.00	0.137	14.0	$50.00	$50.00
Marathon Electric Water Heater 50 Gallon (Replacing Electric)	SFE	Water Heater	0.526	0.008	207.00	0.103	10.0	$50.00	$460.00
Energy Star Ceiling Fans	MFE	Unit	0.895	0.368	151.00	0.596	10.0	$25.00	$25.00
ES Refrigerator	MFE	Refrigerator	0.579	0.421	83.00	0.114	14.0	$25.00	$54.00
ES Freezer	MFE	Freezer	0.684	0.053	42.00	0.114	11.0	$25.00	$54.00
ES Dehumdifier	MFE	Dehumidifier	0.053	0.053	105.00	1.086	12.0	$65.00	$65.00
Recycle Refrigerator	MFE	Refrigerator	0.158	0.000	844.00	0.114	7.5	$25.00	$175.00
Recycle Freezer	MFE	Freezer	0.075	0.000	479.00	0.114	7.5	$25.00	$175.00
ES Dishwasher	MFE	Dishwasher	0.368	0.211	60.00	0.620	12.0	$25.00	$12.00
ES Room AC (Window) 6,000 Btuh	MFE	Unit	0.177	0.000	32.66	6.700	9.0	$25.00	$25.00
ES Room AC (Window) 12,000 Btuh	MFE	Unit	0.113	0.000	64.06	6.700	15.0	$25.00	$75.00
SEER 14 Central AC unit	MFE	Per Ton	1.135	0.000	77.63	2.660	14.0	$200.00	$200.00
SEER 16 Central AC unit	MFE	Per Ton	1.135	0.000	140.70	2.660	14.0	$200.00	$315.03
SEER 14.5 Heat Pump	MFE	Per Ton	0.000	0.000	77.63	2.860	12.0	$200.00	$754.11
SEER 16 Heat Pump	MFE	Per Ton	0.000	0.000	140.70	2.860	12.0	$200.00	$970.64
Ground Source Heat Pump	MFE	Per Ton	0.000	0.000	4,122.00	2.660	20.0	$200.00	$6,825.33
HVAC Quality Installation	MFE	Per Ton	0.906	0.229	180.75	2.660	6.5	$50.00	$100.00
CFL <13W - Replacing 40W Incandescent	MFE	Bulb	6.158	0.211	29.24	0.095	9.4	$2.00	$2.49
CFL 13W-18W - Replacing 60W Incandescent	MFE	Bulb	11.263	3.842	43.36	0.095	9.4	$2.00	$2.49
7.5 Watt LED Bulb	MFE	Bulb	15.105	0.000	52.94	0.095	15.0	$10.00	$21.00
CFL 18W-25W - Replacing 75W Incandescent	MFE	Bulb	1.000	1.105	50.42	0.095	9.4	$2.00	$3.26
CFL >25W - Replacing 100W Incandescent	MFE	Bulb	1.684	0.632	73.61	0.095	9.4	$2.00	$3.26
17 Watt LED Bulb	MFE	Bulb	2.316	0.000	83.69	0.095	20.0	$15.00	$40.00
Hardwired CFL Fixtures	MFE	Fixture	8.895	0.000	71.04	0.095	6.0	$15.00	$35.00
Hardwired LED Fixtures	MFE	Fixture	8.895	0.000	49.95	0.095	15.0	$15.00	$40.00
ENERGY STAR Torchiere	MFE	Bulb	0.280	0.000	142.08	0.095	9.4	$15.00	$41.97
LED Holiday Lights	MFE	Per Strip	1.755	0.045	78.16	0.000	20.0	$12.00	$36.00
ES Clothes Washer (Electric Water Heat/Electric Dryer)	MFE	Clothes Washer	0.000	0.053	224.00	0.137	14.0	$50.00	$50.00
ES Clothes Washer (Electric Water Heat/Gas Dryer)	MFE	Clothes Washer	0.105	0.000	141.00	0.137	14.0	$50.00	$50.00
ES Clothes Washer (Gas Water Heat/Electric Dryer)	MFE	Clothes Washer	0.053	0.053	97.00	0.137	14.0	$50.00	$50.00
Marathon Electric Water Heater 50 Gallon (Replacing Electric)	MFE	Water Heater	0.158	0.000	207.00	0.103	10.0	$50.00	$460.00
ECM Furnace Fan Motor	SFE	Motor	0.950	0.050	600.00	2.660	15.0	$150.00	$300.00
ECM Furnace Fan Motor	MFE	Motor	0.500	0.000	600.00	2.660	15.0	$150.00	$300.00
WB - NC - 15%	RNC	Home	1.000	0.000	698.00	0.890	20.0	$150.00	$300.00
WB - NC - 25%	RNC	Home	1.000	0.000	1,602.00	0.890	20.0	$1,610.00	$3,220.00
WB - NC - 30%	RNC	Home	1.000	0.000	1,775.00	0.930	20.0	$2,707.00	$5,414.00
Low Income	LI	Home	1.000	0.000	391.00	0.500	10.0	$339.00	$678.00
Home Energy Report	SFE	Per Home	0.800	0.000	54.39	0.000	1.0	$0.00	$1.00

Table C- 2. Commercial Sector Measures (part 1)

Commercial - Part 1 Sector Measure Name	Building Type	Units	Base Technology Density	Efficient Technology Density	Energy Impact (kWh/Unit)	Peak watts/kWh Ratio	Measure Life	Base Incentive ($/unit)	Material (& Labor if needed) Cost
Solid State Fryer	Com	Unit	0.012	0.000	1,412.33	0.198	11.0	$2,000.00	$4,000.00
Efficient Griddle	Com	Unit	0.006	0.000	2,508.47	0.198	11.0	$850.00	$1,700.00
Convection Oven	Com	Unit	0.047	0.010	1,878.75	0.198	11.0	$89.52	$179.04
Flashbake Oven	Com	Unit	0.047	0.000	1,159.38	0.198	11.0	$1,800.00	$3,600.00
Combination Oven	Com	Unit	0.047	0.000	1,264.78	0.198	11.0	$1,100.00	$2,200.00
Induction Cooktop	Com	Unit	0.015	0.000	2,023.64	0.198	11.0	$1,400.00	$2,800.00
Vacuum Steamer (Connectionless)	Com	Unit	0.005	0.004	6,359.01	0.198	11.0	$2,500.00	$5,000.00
Dishwashers (Electric)	Com	Unit	0.016	0.000	11,965.00	0.229	20.0	$110.00	$220.00
HE Ice Maker	Com	Unit	0.008	0.000	1,197.10	0.115	8.0	$150.00	$150.00
Low-Flow Pre-Rinse Spray Valves	Com	Unit	0.002	0.000	7,749.61	0.114	5.0	$35.00	$70.00
Food Holding Cabinet	Com	Unit	0.007	0.000	4,840.00	0.229	11.0	$555.00	$1,110.00
CFL <13W - Replacing 40W Incandescent	Com	Lamp	0.335	0.000	137.49	0.107	4.0	$4.14	$4.14
7.5 Watt LED Bulb	Com	Lamp	0.335	0.000	248.91	0.174	20.0	$0.00	$0.00
CFL 13W-18W - Replacing 60W Incandescent	Com	Lamp	0.802	0.031	222.84	0.174	4.0	$4.79	$4.79
LED: 14 Watt Interior Lamp	Com	Lamp	0.833	0.000	289.21	0.185	20.0	$0.00	$0.00
CFL 18W - Replacing 75W Incandescent	Com	Lamp	0.007	0.407	237.06	0.185	4.0	$5.37	$5.37
LED: 17 Watt Interior Lamp	Com	Lamp	0.413	0.000	393.52	0.285	20.0	$0.00	$0.00
CFL: 23W Screw-In Indoor	Com	Lamp	0.239	0.084	365.07	0.285	4.0	FALSE	$5.95
LED: 20 Watt Interior Lamp	Com	Lamp	0.323	0.000	379.29	0.285	20.0	$0.00	$0.00
CFL: >25W Screw-In Indoor	Com	Lamp	0.070	0.208	450.41	0.352	4.0	$3.76	$7.52
CFL Fixture Under 15W	Com	Fixture	0.336	0.070	176.87	0.138	20.0	$0.00	$0.00
LED Luminaire <15W Interior	Com	Fixture	0.185	0.000	170.68	0.133	20.0	$0.00	$0.00
CFL Fixture 16 to 24W	Com	Fixture	0.680	0.014	363.76	0.174	20.0	$0.00	$0.00
LED Luminaire: 16-24 Watt Interior	Com	Fixture	0.694	0.000	360.33	0.174	20.0	$0.00	$0.00
CFL Fixture Over 24W	Com	Fixture	0.051	0.035	404.78	0.285	20.0	$0.00	$0.00
LED Luminaire: >25 Watt Interior	Com	Fixture	0.086	0.000	403.00	0.285	20.0	$0.00	$0.00
T8 Linear fluorescent delamping 4 ft	Com	Fixture	0.040	0.000	136.39	0.285	12.0	$19.09	$38.18
Low Wattage T8 - 4ft	Com	Bulb	8.243	0.000	21.57	0.285	5.0	$1.00	$2.00
T12-T8 4ft	Com	Fixture	2.741	0.000	51.41	0.285	20.0	$21.73	$43.45
T12-T8 8ft	Com	Fixture	0.451	0.000	102.12	0.285	20.0	$85.68	$171.36
150W Pulse Start Metal Halide	Com	Fixture	0.000	0.000	129.58	0.285	12.0	$51.31	$102.62
320W Pulse Start Metal Halide	Com	Fixture	0.059	0.000	399.24	0.285	12.0	$51.31	$102.62
Pulse Start Metal Halide - Replacing High Pressure Sodium	Com	Fixture	0.016	0.000	304.68	0.285	12.0	$51.31	$102.62
High bay fluorescent	Com	Fixture	0.050	0.000	603.62	0.285	12.0	$96.44	$192.88
LED Exit sign	Com	Fixture	0.030	0.025	133.08	0.090	20.0	$51.31	$102.62
Occupancy Sensor - Motion (for Premium T8s only)	Com	Control	2.061	0.000	73.54	0.285	18.0	$27.50	$55.00
Daylighting - Continuous Dimming	Com	Control	1.030	0.000	123.34	0.285	18.0	$15.00	$65.00
LED: Recessed Fixtures	Com	Fixture	0.005	0.000	197.00	0.152	15.4	$30.00	$44.00
Rooftop or Split-System, Less than 65,000 BTU/hr (5.4 Tons) 14 SEER	Com	Per Ton	0.268	0.004	58.15	1.125	20.0	$82.50	$165.00
Rooftop or Split-System, 65,001-134,999 BTU/hr (5.4 to 11.2 Tons) 13 SEER	Com	Per Ton	0.163	0.000	60.56	0.802	20.0	$75.00	$150.00
Rooftop or Split-System, 135,000-239,999 BTU/hr (11.2 to 20 Tons) 13 SEER	Com	Per Ton	0.000	0.000	114.27	0.911	20.0	$70.00	$140.00
Rooftop or Split-System, 240,000-759,999 BTU/hr (20 to 63.3 Tons) 13 SEER	Com	Per Ton	0.064	0.000	53.39	1.461	20.0	$62.50	$125.00
Rooftop or Split-System, 760,000 BTU/hour and Greater (63.3+ Tons) 13 SEER	Com	Per Ton	0.000	0.000	165.85	0.295	20.0	$62.50	$125.00

Table C- 3. Commercial Sector Measures (part 2)

Commercial - Part 2 Sector Measure Name	Building Type	Units	Base Technology Density	Efficient Technology Density	Energy Impact (kWh/Unit)	Peak watts/kWh Ratio	Measure Life	Base Incentive ($/unit)	Material (& Labor if needed) Cost
Packaged Terminal AC Units (14 SEER)	Com	Per Ton	0.228	0.000	90.72	1.227	20.0	$94.00	$188.00
Water source heat pumps (15 SEER)	Com	Tons of Cooling	0.239	0.000	90.19	0.907	20.0	$100.00	$200.00
Water-Cooled Chillers	Com	Tons of Cooling	0.463	0.000	26.46	3.401	20.0	$50.00	$100.00
Air-Cooled Chiller (all types)	Com	Tons of Cooling	0.954	0.000	308.71	0.204	20.0	$20.00	$40.00
Direct GeoExchange GSHP - 16 SEER	Com	Per Ton	0.499	0.132	312.36	0.964	20.0	$90.00	$180.00
VSD - For HVAC Fans	Com	horsepower	0.192	0.006	1,093.33	0.241	13.0	$60.00	$183.73
VSD - For Pumps	Com	HP	0.021	0.090	1,746.00	0.108	13.0	$60.00	$183.73
Compressed Air Leak Correction	Com	HP	0.550	0.050	320.03	0.210	3.0	$4.00	$35.00
Premium Efficiency Motor 1800 RPM ODP (HVAC Pump)	Com	Per HP	0.013	0.000	180.94	0.340	20.0	$40.00	$243.70
Enhanced Efficiency Motor (HVAC Pump)	Com	Per HP	0.013	0.000	198.29	0.340	20.0	$50.00	$292.44
Premium Efficiency Motor 1800 RPM ODP (Other Application)	Com	Per HP	0.252	0.004	355.07	0.173	20.0	$40.00	$243.70
Enhanced Efficiency Motor (Other Application)	Com	Per HP	0.252	0.004	389.11	0.173	20.0	$50.00	$292.44
Premium Efficiency Motor 1800 RPM ODP (Ventilation Fan)	Com	Per HP	0.026	0.000	395.91	0.156	20.0	$40.00	$243.70
Enhanced Efficiency Motor (Ventilation Fan)	Com	Per HP	0.026	0.000	433.87	0.156	20.0	$50.00	$292.44
Enhanced Efficiency Motor (HVAC Pump)	Com	Per HP	0.013	0.000	17.35	0.340	20.0	$18.00	$48.74
Enhanced Efficiency Motor (Other Application)	Com	Per HP	0.252	0.000	67.45	0.173	20.0	$18.00	$48.74
Enhanced Efficiency Motor (Ventilation Fan)	Com	Per HP	0.026	0.000	37.96	0.156	20.0	$18.00	$48.74
Pulse Start Metal Halide - Replacing Incadenscent Bulb	Com	Fixture	0.107	0.045	379.22	0.000	20.0	$136.15	$272.30
Pulse Start Metal Halide - Replacing Mercury Vapor	Com	Fixture	0.057	0.045	408.39	0.000	20.0	$51.31	$102.62
Pulse Start Metal Halide - Replacing High Pressure Sodium	Com	Fixture	0.082	0.045	306.29	0.000	20.0	$56.12	$112.24
Photocell Lighting Controls	Com	Unit	0.028	0.185	262.80	0.002	8.0	$55.50	$111.01
Time Clock Lighting Controls	Com	Unit	0.213	0.041	262.80	0.002	8.0	$42.91	$85.81
LED Strip Fridge/Freezer Case Lighting 4-7W/Ln Ft	Com	Linear Feet	0.196	0.000	57.59	1.221	10.0	$8.00	$34.27
Vending Miser	Com	Control	0.008	0.001	1,250.00	0.018	10.0	$90.00	$180.00
Door Miser/Anti-Sweat Heater Controls	Com	Control	0.800	0.005	133.06	0.166	10.0	$434.12	$868.24
Glass/Mixed Door Refrig/Freezer (19 to 30 ft3)	Com	Unit	0.097	0.000	1,622.00	0.117	10.0	$1,100.00	$2,200.00
Solid Door Refrig-Freezer	Com	Unit	0.161	0.000	1,675.00	0.113	11.0	$373.50	$747.00
Parallel Rack	Com	per unit	0.039	0.012	42,160.00	0.000	10.0	$1,897.00	$30,000.00
High Eff Glass Door	Com	Unit	0.131	0.000	12,320.00	0.000	10.0	$554.00	$2,200.00
High Eff ECM Evap Fan Motor - Retro	Com	per unit	0.670	0.000	699.00	0.100	15.0	$40.00	$100.00
Solid State Cond Fan Control	Com	Unit	0.013	0.000	11,760.00	0.000	10.0	$529.00	$3,720.00
High Evaporator Temp Cases	Com	per unit	0.047	0.000	12,240.00	0.000	10.0	$551.00	$6,150.00
Premium Efficiency Motor 1800 RPM ODP (HVAC Pump)	Com	Per HP	0.013	0.000	180.94	0.340	20.0	$40.00	$243.70
Enhanced Efficiency Motor (HVAC Pump)	Com	Per HP	0.013	0.000	198.29	0.340	20.0	$50.00	$292.44
Premium Efficiency Motor 1800 RPM ODP (Other Application)	Com	Per HP	0.252	0.004	355.07	0.173	20.0	$40.00	$243.70
Enhanced Efficiency Motor (Other Application)	Com	Per HP	0.252	0.004	389.11	0.173	20.0	$50.00	$292.44
Premium Efficiency Motor 1800 RPM ODP (Ventilation Fan)	Com	Per HP	0.026	0.000	395.91	0.156	20.0	$40.00	$243.70
Enhanced Efficiency Motor (Ventilation Fan)	Com	Per HP	0.026	0.000	433.87	0.156	20.0	$50.00	$292.44

Table C- 4. Industrial Sector Measures

Industrial Sector Measure Name	Building Type	Units	Base Technology Density	Efficient Technology Density	Energy Impact (kWh/Unit)	Peak watts/kWh Ratio	Measure Life	Base Incentive ($/unit)	Material (& Labor if needed) Cost
CFL <13W - Replacing 40W Incandescent	IND	Lamp	0.010	0.000	165.13	0.035	4.0	$4.14	$4.14
7.5 Watt LED Bulb	IND	Lamp	0.010	0.008	298.94	0.063	20.0	$0.00	$0.00
CFL 13W-18W - Replacing 60W Incandescent	IND	Lamp	0.164	0.000	267.62	0.056	4.0	$4.79	$4.79
LED: 14 Watt Interior Lamp	IND	Lamp	0.164	0.000	347.33	0.073	20.0	$0.00	$0.00
CFL 18W - Replacing 75W Incandescent	IND	Lamp	0.010	0.028	284.70	0.060	4.0	$5.37	$5.37
LED: 17 Watt Interior Lamp	IND	Lamp	0.038	0.000	472.60	0.099	20.0	$0.00	$0.00
CFL: 23W Screw-In Indoor	IND	Lamp	0.065	0.015	438.44	0.092	4.0	$5.95	$5.95
LED: 20 Watt Interior Lamp	IND	Lamp	0.080	0.000	455.52	0.096	20.0	$0.00	$0.00
CFL: >25W Screw-In Indoor	IND	Lamp	0.058	0.198	540.93	0.114	4.0	$7.52	$7.52
CFL Fixture Under 15W	IND	Fixture	0.031	0.007	212.41	0.045	20.0	$0.00	$0.00
LED Luminaire <15W Interior	IND	Fixture	0.038	0.000	204.98	0.043	20.0	$0.00	$0.00
CFL Fixture 16 to 24W	IND	Fixture	0.149	0.001	436.87	0.092	20.0	$0.00	$0.00
LED Luminaire: 16-24 Watt Interior	IND	Fixture	0.150	0.000	432.74	0.091	20.0	$0.00	$0.00
CFL Fixture Over 24W	IND	Fixture	0.058	0.000	486.13	0.102	20.0	$0.00	$0.00
LED Luminaire: >25 Watt Interior	IND	Fixture	0.058	0.000	483.99	0.102	20.0	$0.00	$0.00
High bay fluorescent	IND	Fixture	0.194	0.000	1,131.27	0.195	12.0	$96.44	$192.88
T8 Linear fluorescent delamping 4 ft	IND	Fixture	0.780	0.000	255.62	0.195	12.0	$19.09	$38.18
Low Wattage T8 - 4ft	IND	Bulb	14.535	0.000	40.43	0.195	5.0	$1.00	$2.00
T12-T8 4ft	IND	Fixture	1.508	0.000	96.35	0.195	20.0	$21.73	$43.45
T12-T8 8ft	IND	Fixture	0.810	0.000	191.39	0.098	20.0	$85.68	$171.36
150W Pulse Start Metal Halide	IND	Fixture	0.056	0.000	242.85	0.195	12.0	$51.31	$102.62
320W Pulse Start Metal Halide	IND	Fixture	0.012	0.000	748.23	0.195	12.0	$51.31	$102.62
Pulse Start Metal Halide - Replacing Mercury Vapor	IND	Fixture	0.001	0.000	551.33	0.195	12.0	$51.31	$102.62
Pulse Start Metal Halide - Replacing High Pressure Sodium	IND	Fixture	0.038	0.000	571.02	0.195	12.0	$51.31	$102.62
LED Exit sign	IND	Fixture	0.080	0.019	249.41	0.195	20.0	$51.31	$102.62
Occupancy Sensor - Motion	IND	Control	3.635	0.000	137.83	0.195	18.0	$27.50	$55.00
Daylighting - Continuous Dimming	IND	Control	1.818	0.000	231.16	0.195	18.0	$15.00	$65.00
LED: Recessed Fixtures	IND	Fixture	0.005	0.000	197.00	0.152	15.4	$30.00	$44.00
Rooftop or Split-System, Less than 65,000 BTU/hr (5.4 Tons) 14 SEER	IND	Per Ton	0.190	0.013	58.35	1.121	20.0	$82.50	$165.00
Rooftop or Split-System, 65,001-134,999 BTU/hr (5.4 to 11.2 Tons) 13 SEER	IND	Per Ton	0.132	0.010	119.12	1.184	20.0	$75.00	$150.00
Rooftop or Split-System, 135,000-239,999 BTU/hr (11.2 to 20 Tons) 13 SEER	IND	Per Ton	0.485	0.000	173.01	1.190	20.0	$70.00	$140.00
Rooftop or Split-System, 240,000-759,999 BTU/hr (20 to 63.3 Tons) 13 SEER	IND	Per Ton	0.000	0.000	111.92	2.049	20.0	$62.50	$125.00
Rooftop or Split-System, 760,000 BTU/hour and Greater (63.3+ Tons) 13 SEER	IND	Per Ton	0.000	0.000	224.77	1.185	20.0	$62.50	$125.00
Packaged Terminal AC Units (14 SEER)	IND	Per Ton	0.005	0.000	91.03	1.223	20.0	$94.00	$188.00
Water source heat pumps (15 SEER)	IND	Tons of Cooling	0.000	0.000	90.50	0.585	20.0	$100.00	$200.00
Water-Cooled Chillers	IND	Tons of Cooling	0.000	0.000	150.45	1.077	20.0	$50.00	$100.00
Air-Cooled Chiller (all types)	IND	Tons of Cooling	0.039	0.000	309.76	0.203	20.0	$20.00	$40.00
Direct GeoExchange GSHP - 16 SEER	IND	Per Ton	0.011	0.000	311.92	0.958	20.0	$90.00	$180.00
VSD - For HVAC Fans	IND	Per HP	3.753	2.677	1,093.33	0.241	13.0	$60.00	$183.73
VSD - For Pumps	IND	HP	0.007	0.015	1,746.00	0.108	13.0	$60.00	$183.73
Compressed Air Leak Correction	IND	HP	1.008	0.100	480.05	0.140	3.0	$4.00	$35.00
Pulse Start Metal Halide - Replacing Incadenscent Bulb	IND	Fixture	0.074	0.034	379.22	0.000	20.0	$136.15	$272.30
Pulse Start Metal Halide - Replacing Mercury Vapor	IND	Fixture	0.062	0.034	408.39	0.000	20.0	$51.31	$102.62
Photocell Lighting Controls	IND	Unit	0.043	0.110	262.80	0.002	8.0	$55.50	$111.01
Time Clock Lighting Controls	IND	Unit	0.153	0.040	262.80	0.002	8.0	$42.91	$85.81
Premium Efficiency Motor 1800 RPM ODP	IND	HP	1.529	0.035	216.59	0.284	20.0	$20.00	$243.70

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Appendix D. Measure Savings: CROD/Non-CROD Base and 1.5% Scenarios

Table D- 1. Residential Measure Savings CROD – Base

Residential Sector Measure Name	Building Type	2014 - Energy Savings (MWh)	2014 - Demand Savings (KW)	2028 - Energy Savings (MWh)	2028 - Demand Savings (KW)
Energy Star Ceiling Fans	SFE	2.6	1.5	8.3	5.0
ES Refrigerator	SFE	0.0	0.0	20.7	2.4
ES Freezer	SFE	0.0	0.0	49.9	5.7
ES Dehumdifier	SFE	4.0	4.4	13.0	14.1
Recycle Refrigerator	SFE	482.2	55.0	564.3	64.4
Recycle Freezer	SFE	0.0	0.0	139.9	16.0
ES Dishwasher	SFE	3.5	2.1	7.0	4.3
ES Room AC (Window) 6,000 Btuh	SFE	0.2	1.6	0.2	1.6
ES Room AC (Window) 12,000 Btuh	SFE	0.0	0.0	0.0	0.0
SEER 14 Central AC unit	SFE	56.2	149.4	19.2	51.1
SEER 16 Central AC unit	SFE	30.9	82.1	25.2	67.1
SEER 14.5 Heat Pump	SFE	0.0	0.0	3.5	10.1
SEER 16 Heat Pump	SFE	0.0	0.0	8.6	24.6
Ground Source Heat Pump	SFE	0.0	0.0	0.0	0.0
HVAC Quality Installation	SFE	107.2	285.0	550.3	1,463.7
CFL <13W - Replacing 40W Incandescent	SFE	33.9	3.2	0.0	0.0
CFL 13W-18W - Replacing 60W Incandescent	SFE	125.9	12.0	0.0	0.0
7.5 Watt LED Bulb	SFE	32.0	3.0	0.0	0.0
CFL 18W-25W - Replacing 75W Incandescent	SFE	35.0	3.3	0.0	0.0
CFL >25W - Replacing 100W Incandescent	SFE	28.1	2.7	0.0	0.0
17 Watt LED Bulb	SFE	4.6	0.4	0.0	0.0
Hardwired CFL Fixtures	SFE	195.7	18.6	50.2	4.8
Hardwired LED Fixtures	SFE	75.6	7.2	737.5	70.1
ENERGY STAR Torchiere	SFE	2.8	0.3	10.7	1.0
LED Holiday Lights	SFE	1.1	0.0	4.2	0.0
ES Clothes Washer (Electric Water Heat/Electric Dryer)	SFE	0.0	0.0	0.0	0.0
ES Clothes Washer (Electric Water Heat/Gas Dryer)	SFE	23.9	3.3	22.7	3.1
ES Clothes Washer (Gas Water Heat/Electric Dryer)	SFE	2.8	0.4	2.6	0.4
Marathon Electric Water Heater 50 Gallon (Replacing Electric)	SFE	0.0	0.0	0.0	0.0
Energy Star Ceiling Fans	MFE	0.6	0.4	2.1	1.2
ES Refrigerator	MFE	0.0	0.0	4.2	0.5
ES Freezer	MFE	0.0	0.0	21.9	2.5
ES Dehumdifier	MFE	0.0	0.0	0.0	0.0
Recycle Refrigerator	MFE	42.1	4.8	60.7	6.9
Recycle Freezer	MFE	0.0	0.0	7.9	0.9
ES Dishwasher	MFE	1.5	0.9	3.0	1.9
ES Room AC (Window) 6,000 Btuh	MFE	0.2	1.4	0.2	1.3
ES Room AC (Window) 12,000 Btuh	MFE	0.0	0.0	0.0	0.0
SEER 14 Central AC unit	MFE	17.1	45.6	5.9	15.6
SEER 16 Central AC unit	MFE	9.3	24.7	7.6	20.2
SEER 14.5 Heat Pump	MFE	0.0	0.0	0.0	0.0
SEER 16 Heat Pump	MFE	0.0	0.0	0.0	0.0
Ground Source Heat Pump	MFE	0.0	0.0	0.0	0.0
HVAC Quality Installation	MFE	28.5	75.7	146.2	389.0
CFL <13W - Replacing 40W Incandescent	MFE	8.3	0.8	0.0	0.0
CFL 13W-18W - Replacing 60W Incandescent	MFE	17.4	1.7	0.0	0.0
7.5 Watt LED Bulb	MFE	4.7	0.4	0.0	0.0
CFL 18W-25W - Replacing 75W Incandescent	MFE	2.1	0.2	0.0	0.0
CFL >25W - Replacing 100W Incandescent	MFE	4.2	0.4	0.0	0.0
17 Watt LED Bulb	MFE	0.8	0.1	0.0	0.0
Hardwired CFL Fixtures	MFE	24.1	2.3	6.2	0.6
Hardwired LED Fixtures	MFE	9.3	0.9	90.7	8.6
ENERGY STAR Torchiere	MFE	0.1	0.0	0.5	0.0
LED Holiday Lights	MFE	0.4	0.0	1.5	0.0
ES Clothes Washer (Electric Water Heat/Electric Dryer)	MFE	0.0	0.0	0.0	0.0
ES Clothes Washer (Electric Water Heat/Gas Dryer)	MFE	3.2	0.4	3.1	0.4
ES Clothes Washer (Gas Water Heat/Electric Dryer)	MFE	1.1	0.2	1.1	0.1
Marathon Electric Water Heater 50 Gallon (Replacing Electric)	MFE	0.0	0.0	0.0	0.0
ECM Furnace Fan Motor	SFE	121.4	323.0	239.8	637.9
ECM Furnace Fan Motor	MFE	33.2	88.3	68.0	180.8
WB - NC - 15%	RNC	0.0	0.0	0.0	0.0
WB - NC - 25%	RNC	0.0	0.0	0.0	0.0
WB - NC - 30%	RNC	0.0	0.0	0.0	0.0
Low Income	LI	0.0	0.0	0.0	0.0
Home Energy Report	SFE	1,924.3	0.0	1,924.3	0.0

Table D- 2. Commercial Measure Savings – CROD – Base – Part 1

Commercial - Part 1 Sector Measure Name	Building Type	2014 - Energy Savings (MWh)	2014 - Demand Savings (KW)		2028 - Energy Savings (MWh)	2028 - Demand Savings (KW)
Solid State Fryer	Com	0.0	0.0		0.0	0.0
Efficient Griddle	Com	3.4	0.7		27.3	5.4
Convection Oven	Com	1.3	0.3		0.0	0.0
Flashbake Oven	Com	0.0	0.0		0.0	0.0
Combination Oven	Com	0.0	0.0		0.0	0.0
Induction Cooktop	Com	0.0	0.0		31.2	6.2
Vacuum Steamer (Connectionless)	Com	0.0	0.0		60.4	12.0
Dishwashers (Electric)	Com	0.7	0.2		1.4	0.3
HE Ice Maker	Com	0.3	0.0		0.5	0.1
Low-Flow Pre-Rinse Spray Valves	Com	3.9	0.4		6.0	0.7
Food Holding Cabinet	Com	0.0	0.0		0.0	0.0
CFL <13W - Replacing 40W Incandescent	Com	0.0	0.0		0.0	0.0
7.5 Watt LED Bulb	Com	12.5	2.2		0.0	0.0
CFL 13W-18W - Replacing 60W Incandescent	Com	0.0	0.0		0.0	0.0
LED: 14 Watt Interior Lamp	Com	35.8	6.6		0.0	0.0
CFL 18W - Replacing 75W Incandescent	Com	0.0	0.0		0.0	0.0
LED: 17 Watt Interior Lamp	Com	14.8	4.2		0.0	0.0
CFL: 23W Screw-In Indoor	Com	0.0	0.0		0.0	0.0
LED: 20 Watt Interior Lamp	Com	11.8	3.4		0.0	0.0
CFL: >25W Screw-In Indoor	Com	0.0	0.0		0.0	0.0
CFL Fixture Under 15W	Com	1.4	0.2		0.0	0.0
LED Luminaire <15W Interior	Com	3.9	0.5		31.5	4.2
CFL Fixture 16 to 24W	Com	1.4	0.2		0.0	0.0
LED Luminaire: 16-24 Watt Interior	Com	30.8	5.4		250.4	43.6
CFL Fixture Over 24W	Com	0.0	0.0		0.0	0.0
LED Luminaire: >25 Watt Interior	Com	4.3	1.2		34.7	9.9
T8 Linear fluorescent delamping 4 ft	Com	0.0	0.0		0.0	0.0
Low Wattage T8 - 4ft	Com	167.9	47.9		271.0	77.3
T12-T8 4ft	Com	412.3	117.5		0.0	0.0
T12-T8 8ft	Com	0.0	0.0		0.0	0.0
150W Pulse Start Metal Halide	Com	0.0	0.0		0.0	0.0
320W Pulse Start Metal Halide	Com	57.8	16.5		168.4	48.0
Pulse Start Metal Halide - Replacing High Pressure Sodium	Com	4.0	1.1		0.0	0.0
High bay fluorescent	Com	64.5	18.4		94.5	26.9
LED Exit sign	Com	0.0	0.0		0.0	0.0
Occupancy Sensor - Motion (for Premium T8s only)	Com	132.9	37.9		293.5	83.7
Daylighting - Continuous Dimming	Com	32.9	9.4		96.5	27.5
LED: Recessed Fixtures	Com	0.2	0.0		2.0	0.3
Rooftop or Split-System, Less than 65,000 BTU/hr (5.4 Tons) 14 SEER	Com	0.0	0.0		6.8	7.6
Rooftop or Split-System, 65,001-134,999 BTU/hr (5.4 to 11.2 Tons) 13 SEER	Com	0.0	0.0		4.3	3.4
Rooftop or Split-System, 135,000-239,999 BTU/hr (11.2 to 20 Tons) 13 SEER	Com	0.0	0.0		0.0	0.0
Rooftop or Split-System, 240,000-759,999 BTU/hr (20 to 63.3 Tons) 13 SEER	Com	0.1	0.2		0.2	0.2
Rooftop or Split-System, 760,000 BTU/hour and Greater (63.3+ Tons) 13 SEER	Com	0.0	0.0		0.0	0.0

Table D- 3. Commercial Measure Savings – CROD – Base – Part 2

Commercial - Part 2 Sector Measure Name	Building Type	2014 - Energy Savings (MWh)	2014 - Demand Savings (KW)		2028 - Energy Savings (MWh)	2028 - Demand Savings (KW)
Packaged Terminal AC Units (14 SEER)	Com	0.9	1.1		2.4	2.9
Water source heat pumps (15 SEER)	Com	0.0	0.0		18.9	17.2
Water-Cooled Chillers	Com	0.4	1.4		1.2	4.0
Air-Cooled Chiller (all types)	Com	9.6	2.0		28.2	5.8
Direct GeoExchange GSHP - 16 SEER	Com	20.5	19.8		0.0	0.0
VSD - For HVAC Fans	Com	1,815.0	436.6		3,300.1	793.8
VSD - For Pumps	Com	0.0	0.0		0.0	0.0
Compressed Air Leak Correction	Com	180.5	37.9		371.6	78.0
Premium Efficiency Motor 1800 RPM ODP (HVAC Pump)	Com	1.8	0.6		2.1	0.7
Enhanced Efficiency Motor (HVAC Pump)	Com	0.0	0.0		0.5	0.2
Premium Efficiency Motor 1800 RPM ODP (Other Application)	Com	64.3	11.1		75.6	13.1
Enhanced Efficiency Motor (Other Application)	Com	7.1	1.2		19.8	3.4
Premium Efficiency Motor 1800 RPM ODP (Ventilation Fan)	Com	7.4	1.1		8.7	1.3
Enhanced Efficiency Motor (Ventilation Fan)	Com	0.8	0.1		2.3	0.4
Enhanced Efficiency Motor (HVAC Pump)	Com	0.0	0.0		0.0	0.0
Enhanced Efficiency Motor (Other Application)	Com	2.1	0.4		6.2	1.1
Enhanced Efficiency Motor (Ventilation Fan)	Com	0.0	0.0		0.4	0.1
Pulse Start Metal Halide - Replacing Incadenscent Bulb	Com	28.0	0.0		24.2	0.0
Pulse Start Metal Halide - Replacing Mercury Vapor	Com	13.1	0.0		35.0	0.0
Pulse Start Metal Halide - Replacing High Pressure Sodium	Com	5.3	0.0		0.0	0.0
Photocell Lighting Controls	Com	0.0	0.0		0.3	0.0
Time Clock Lighting Controls	Com	48.4	0.1		38.3	0.1
LED Strip Fridge/Freezer Case Lighting 4-7W/Ln Ft	Com	0.8	1.0		6.8	8.3
Vending Miser	Com	0.0	0.0		0.0	0.0
Door Miser/Anti-Sweat Heater Controls	Com	0.0	0.0		0.0	0.0
Glass/Mixed Door Refrig/Freezer (19 to 30 ft3)	Com	0.0	0.0		0.0	0.0
Solid Door Refrig-Freezer	Com	3.6	0.4		3.7	0.4
Parallel Rack	Com	0.0	0.0		577.0	0.0
High Eff Glass Door	Com	0.0	0.0		328.1	0.0
High Eff ECM Evap Fan Motor - Retro	Com	31.8	3.2		71.3	7.1
Solid State Cond Fan Control	Com	7.8	0.0		0.0	0.0
High Evaporator Temp Cases	Com	47.5	0.0		377.3	0.0
Premium Efficiency Motor 1800 RPM ODP (HVAC Pump)	Com	0.0	0.0		0.0	0.0
Enhanced Efficiency Motor (HVAC Pump)	Com	0.0	0.0		0.0	0.0
Premium Efficiency Motor 1800 RPM ODP (Other Application)	Com	0.0	0.0		0.0	0.0
Enhanced Efficiency Motor (Other Application)	Com	0.0	0.0		0.0	0.0
Premium Efficiency Motor 1800 RPM ODP (Ventilation Fan)	Com	0.0	0.0		0.0	0.0
Enhanced Efficiency Motor (Ventilation Fan)	Com	0.0	0.0		0.0	0.0

Table D- 4. Industrial Measure Savings – CROD – Base

Industrial Sector Measure Name	Building Type	2014 - Energy Savings (MWh)	2014 - Demand Savings (KW)	2028 - Energy Savings (MWh)	2028 - Demand Savings (KW)
CFL <13W - Replacing 40W Incandescent	IND	0.0	0.0	0.0	0.0
7.5 Watt LED Bulb	IND	0.3	0.0	0.0	0.0
CFL 13W-18W - Replacing 60W Incandescent	IND	0.0	0.0	0.0	0.0
LED: 14 Watt Interior Lamp	IND	5.3	0.4	0.0	0.0
CFL 18W - Replacing 75W Incandescent	IND	0.0	0.0	0.0	0.0
LED: 17 Watt Interior Lamp	IND	1.0	0.1	0.0	0.0
CFL: 23W Screw-In Indoor	IND	0.0	0.0	0.0	0.0
LED: 20 Watt Interior Lamp	IND	2.2	0.2	0.0	0.0
CFL: >25W Screw-In Indoor	IND	52.8	6.0	0.0	0.0
CFL Fixture Under 15W	IND	7.5	0.3	0.0	0.0
LED Luminaire <15W Interior	IND	0.6	0.0	5.0	0.2
CFL Fixture 16 to 24W	IND	74.2	6.8	0.0	0.0
LED Luminaire: 16-24 Watt Interior	IND	5.1	0.5	41.2	3.7
CFL Fixture Over 24W	IND	32.3	3.3	0.0	0.0
LED Luminaire: >25 Watt Interior	IND	2.2	0.2	18.0	1.8
High bay fluorescent	IND	205.7	40.0	50.2	9.8
T8 Linear fluorescent delamping 4 ft	IND	230.2	44.8	57.3	11.1
Low Wattage T8 - 4ft	IND	252.8	49.2	442.1	86.0
T12-T8 4ft	IND	274.1	53.3	85.1	16.5
T12-T8 8ft	IND	292.4	28.6	90.7	8.9
150W Pulse Start Metal Halide	IND	14.9	2.9	11.0	2.1
320W Pulse Start Metal Halide	IND	9.6	1.9	7.1	1.4
Pulse Start Metal Halide - Replacing Mercury Vapor	IND	0.0	0.0	0.0	0.0
Pulse Start Metal Halide - Replacing High Pressure Sodium	IND	5.3	1.0	3.7	0.7
LED Exit sign	IND	22.6	4.4	16.1	3.1
Occupancy Sensor - Motion	IND	180.0	35.0	131.7	25.6
Daylighting - Continuous Dimming	IND	31.3	6.1	19.7	3.8
LED: Recessed Fixtures	IND	0.2	0.0	1.3	0.2
Rooftop or Split-System, Less than 65,000 BTU/hr (5.4 Tons) 14 SEER	IND	0.0	0.0	1.9	2.1
Rooftop or Split-System, 65,001-134,999 BTU/hr (5.4 to 11.2 Tons) 13 SEER	IND	0.9	1.1	1.4	1.7
Rooftop or Split-System, 135,000-239,999 BTU/hr (11.2 to 20 Tons) 13 SEER	IND	4.9	5.8	7.5	8.9
Rooftop or Split-System, 240,000-759,999 BTU/hr (20 to 63.3 Tons) 13 SEER	IND	0.0	0.0	0.0	0.0
Rooftop or Split-System, 760,000 BTU/hour and Greater (63.3+ Tons) 13 SEER	IND	0.0	0.0	0.0	0.0
Packaged Terminal AC Units (14 SEER)	IND	0.0	0.0	0.1	0.1
Water source heat pumps (15 SEER)	IND	0.0	0.0	0.0	0.0
Water-Cooled Chillers	IND	0.0	0.0	0.0	0.0
Air-Cooled Chiller (all types)	IND	0.7	0.1	2.2	0.5
Direct GeoExchange GSHP - 16 SEER	IND	10.4	9.9	0.0	0.0
VSD - For HVAC Fans	IND	1,317.0	316.8	1,839.3	442.4
VSD - For Pumps	IND	4.2	0.4	5.8	0.6
Compressed Air Leak Correction	IND	77.5	10.8	71.2	10.0
Pulse Start Metal Halide - Replacing Incadenscent Bulb	IND	30.8	0.0	23.0	0.0
Pulse Start Metal Halide - Replacing Mercury Vapor	IND	27.9	0.0	20.8	0.0
Photocell Lighting Controls	IND	11.4	0.0	5.1	0.0
Time Clock Lighting Controls	IND	81.9	0.1	20.9	0.0
Premium Efficiency Motor 1800 RPM ODP	IND	36.8	10.5	31.8	9.0

Table D- 5. Residential Measure Savings Non-CROD – Base

Residential Sector Measure Name	Building Type	2014 - Energy Savings (MWh)	2014 - Demand Savings (KW)	2028 - Energy Savings (MWh)	2028 - Demand Savings (KW)
Energy Star Ceiling Fans	SFE	1.1	0.7	3.5	2.1
ES Refrigerator	SFE	0.0	0.0	15.4	1.8
ES Freezer	SFE	0.0	0.0	36.1	4.1
ES Dehumdifier	SFE	1.3	1.4	4.3	4.6
Recycle Refrigerator	SFE	355.3	40.6	401.8	45.9
Recycle Freezer	SFE	0.0	0.0	93.7	10.7
ES Dishwasher	SFE	3.1	2.0	6.4	3.9
ES Room AC (Window) 6,000 Btuh	SFE	0.1	0.5	0.1	0.5
ES Room AC (Window) 12,000 Btuh	SFE	0.0	0.0	0.0	0.0
SEER 14 Central AC unit	SFE	26.3	69.9	26.9	71.6
SEER 16 Central AC unit	SFE	10.0	26.5	8.1	21.6
SEER 14.5 Heat Pump	SFE	0.0	0.0	2.4	7.0
SEER 16 Heat Pump	SFE	0.0	0.0	6.6	18.8
Ground Source Heat Pump	SFE	3.3	8.8	0.0	0.0
HVAC Quality Installation	SFE	95.8	254.9	430.0	1,143.8
CFL <13W - Replacing 40W Incandescent	SFE	33.0	3.1	0.0	0.0
CFL 13W-18W - Replacing 60W Incandescent	SFE	134.0	12.7	0.0	0.0
7.5 Watt LED Bulb	SFE	25.4	2.4	0.0	0.0
CFL 18W-25W - Replacing 75W Incandescent	SFE	38.4	3.6	0.0	0.0
CFL >25W - Replacing 100W Incandescent	SFE	30.0	2.9	0.0	0.0
17 Watt LED Bulb	SFE	3.7	0.3	0.0	0.0
Hardwired CFL Fixtures	SFE	205.4	19.5	0.0	0.0
Hardwired LED Fixtures	SFE	60.1	5.7	0.0	0.0
ENERGY STAR Torchiere	SFE	3.1	0.3	11.4	1.1
LED Holiday Lights	SFE	1.2	0.0	4.6	0.0
ES Clothes Washer (Electric Water Heat/Electric Dryer)	SFE	0.0	0.0	0.0	0.0
ES Clothes Washer (Electric Water Heat/Gas Dryer)	SFE	20.6	2.8	19.6	2.7
ES Clothes Washer (Gas Water Heat/Electric Dryer)	SFE	2.4	0.3	2.3	0.3
Marathon Electric Water Heater 50 Gallon (Replacing Electric)	SFE	0.0	0.0	0.0	0.0
Energy Star Ceiling Fans	MFE	0.3	0.2	0.9	0.5
ES Refrigerator	MFE	0.0	0.0	3.1	0.4
ES Freezer	MFE	0.0	0.0	15.8	1.8
ES Dehumdifier	MFE	0.0	0.0	0.0	0.0
Recycle Refrigerator	MFE	31.0	3.5	43.1	4.9
Recycle Freezer	MFE	0.0	0.0	5.3	0.6
ES Dishwasher	MFE	1.3	0.8	2.7	1.7
ES Room AC (Window) 6,000 Btuh	MFE	0.1	0.4	0.1	0.4
ES Room AC (Window) 12,000 Btuh	MFE	0.0	0.3	0.0	0.0
SEER 14 Central AC unit	MFE	8.0	21.3	8.2	21.8
SEER 16 Central AC unit	MFE	3.0	8.0	2.4	6.5
SEER 14.5 Heat Pump	MFE	0.0	0.0	0.0	0.0
SEER 16 Heat Pump	MFE	0.0	0.0	0.0	0.0
Ground Source Heat Pump	MFE	0.0	0.0	0.0	0.0
HVAC Quality Installation	MFE	25.5	67.7	114.3	304.0
CFL <13W - Replacing 40W Incandescent	MFE	8.6	0.8	0.0	0.0
CFL 13W-18W - Replacing 60W Incandescent	MFE	18.5	1.8	0.0	0.0
7.5 Watt LED Bulb	MFE	3.7	0.4	0.0	0.0
CFL 18W-25W - Replacing 75W Incandescent	MFE	2.2	0.2	0.0	0.0
CFL >25W - Replacing 100W Incandescent	MFE	4.5	0.4	0.0	0.0
17 Watt LED Bulb	MFE	0.7	0.1	0.0	0.0
Hardwired CFL Fixtures	MFE	25.3	2.4	0.0	0.0
Hardwired LED Fixtures	MFE	7.4	0.7	0.0	0.0
ENERGY STAR Torchiere	MFE	0.1	0.0	0.5	0.0
LED Holiday Lights	MFE	0.4	0.0	1.6	0.0
ES Clothes Washer (Electric Water Heat/Electric Dryer)	MFE	0.0	0.0	0.0	0.0
ES Clothes Washer (Electric Water Heat/Gas Dryer)	MFE	2.8	0.4	2.7	0.4
ES Clothes Washer (Gas Water Heat/Electric Dryer)	MFE	1.0	0.1	0.9	0.1
Marathon Electric Water Heater 50 Gallon (Replacing Electric)	MFE	0.0	0.0	0.0	0.0
ECM Furnace Fan Motor	SFE	51.1	135.9	102.0	271.3
ECM Furnace Fan Motor	MFE	13.9	37.0	28.3	75.3
WB - NC - 15%	RNC	0.0	0.0	0.0	0.0
WB - NC - 25%	RNC	0.0	0.0	0.0	0.0
WB - NC - 30%	RNC	0.0	0.0	0.0	0.0
Low Income	LI	52.4	26.2	40.8	20.4
Home Energy Report	SFE	1,533.3	0.0	1,533.3	0.0

Table D- 6. Commercial Measure Savings – Non-CROD – Base – Part 1

Commercial - Part 1 Sector Measure Name	Building Type	2014 - Energy Savings (MWh)	2014 - Demand Savings (KW)		2028 - Energy Savings (MWh)	2028 - Demand Savings (KW)
Solid State Fryer	Com	0.0	0.0		0.0	0.0
Efficient Griddle	Com	1.4	0.3		11.9	2.4
Convection Oven	Com	0.1	0.0		0.0	0.0
Flashbake Oven	Com	0.0	0.0		0.0	0.0
Combination Oven	Com	0.0	0.0		0.0	0.0
Induction Cooktop	Com	0.0	0.0		13.4	2.7
Vacuum Steamer (Connectionless)	Com	0.0	0.0		26.3	5.2
Dishwashers (Electric)	Com	0.1	0.0		0.1	0.0
HE Ice Maker	Com	0.0	0.0		0.0	0.0
Low-Flow Pre-Rinse Spray Valves	Com	0.4	0.0		0.6	0.1
Food Holding Cabinet	Com	0.0	0.0		0.0	0.0
CFL <13W - Replacing 40W Incandescent	Com	0.0	0.0		0.0	0.0
7.5 Watt LED Bulb	Com	5.3	0.9		0.0	0.0
CFL 13W-18W - Replacing 60W Incandescent	Com	0.0	0.0		0.0	0.0
LED: 14 Watt Interior Lamp	Com	15.1	2.8		0.0	0.0
CFL 18W - Replacing 75W Incandescent	Com	0.0	0.0		0.0	0.0
LED: 17 Watt Interior Lamp	Com	6.3	1.8		0.0	0.0
CFL: 23W Screw-In Indoor	Com	0.0	0.0		0.0	0.0
LED: 20 Watt Interior Lamp	Com	5.0	1.4		0.0	0.0
CFL: >25W Screw-In Indoor	Com	0.0	0.0		0.0	0.0
CFL Fixture Under 15W	Com	0.0	0.0		0.0	0.0
LED Luminaire <15W Interior	Com	1.7	0.2		0.0	0.0
CFL Fixture 16 to 24W	Com	0.0	0.0		0.0	0.0
LED Luminaire: 16-24 Watt Interior	Com	13.6	2.4		0.0	0.0
CFL Fixture Over 24W	Com	0.0	0.0		0.0	0.0
LED Luminaire: >25 Watt Interior	Com	1.9	0.5		0.0	0.0
T8 Linear fluorescent delamping 4 ft	Com	0.0	0.0		0.0	0.0
Low Wattage T8 - 4ft	Com	90.5	25.8		146.0	41.6
T12-T8 4ft	Com	218.6	62.3		0.0	0.0
T12-T8 8ft	Com	0.0	0.0		0.0	0.0
150W Pulse Start Metal Halide	Com	0.0	0.0		0.0	0.0
320W Pulse Start Metal Halide	Com	30.8	8.8		90.1	25.7
Pulse Start Metal Halide - Replacing High Pressure Sodium	Com	0.8	0.2		0.0	0.0
High bay fluorescent	Com	32.1	9.2		46.4	13.2
LED Exit sign	Com	0.0	0.0		0.0	0.0
Occupancy Sensor - Motion (for Premium T8s only)	Com	70.8	20.2		143.7	41.0
Daylighting - Continuous Dimming	Com	17.8	5.1		52.0	14.8
LED: Recessed Fixtures	Com	0.1	0.0		0.9	0.1
Rooftop or Split-System, Less than 65,000 BTU/hr (5.4 Tons) 14 SEER	Com	0.0	0.0		3.0	3.4
Rooftop or Split-System, 65,001-134,999 BTU/hr (5.4 to 11.2 Tons) 13 SEER	Com	0.0	0.0		1.9	1.5
Rooftop or Split-System, 135,000-239,999 BTU/hr (11.2 to 20 Tons) 13 SEER	Com	0.0	0.0		0.0	0.0
Rooftop or Split-System, 240,000-759,999 BTU/hr (20 to 63.3 Tons) 13 SEER	Com	0.1	0.2		0.2	0.2
Rooftop or Split-System, 760,000 BTU/hour and Greater (63.3+ Tons) 13 SEER	Com	0.0	0.0		0.0	0.0

Table D- 7. Commercial Measure Savings – Non-CROD – Base – Part 2

Commercial - Part 2 Sector Measure Name	Building Type	2014 - Energy Savings (MWh)	2014 - Demand Savings (KW)		2028 - Energy Savings (MWh)	2028 - Demand Savings (KW)
Packaged Terminal AC Units (14 SEER)	Com	0.9	1.1		2.3	2.9
Water source heat pumps (15 SEER)	Com	0.0	0.0		9.1	8.2
Water-Cooled Chillers	Com	0.4	1.3		1.1	3.9
Air-Cooled Chiller (all types)	Com	9.4	1.9		27.6	5.6
Direct GeoExchange GSHP - 16 SEER	Com	0.0	0.0		0.0	0.0
VSD - For HVAC Fans	Com	860.0	206.9		1,571.9	378.1
VSD - For Pumps	Com	0.0	0.0		0.0	0.0
Compressed Air Leak Correction	Com	434.3	91.1		921.4	193.3
Premium Efficiency Motor 1800 RPM ODP (HVAC Pump)	Com	0.8	0.3		0.9	0.3
Enhanced Efficiency Motor (HVAC Pump)	Com	0.0	0.0		0.2	0.1
Premium Efficiency Motor 1800 RPM ODP (Other Application)	Com	29.6	5.1		34.8	6.0
Enhanced Efficiency Motor (Other Application)	Com	3.1	0.5		8.8	1.5
Premium Efficiency Motor 1800 RPM ODP (Ventilation Fan)	Com	3.4	0.5		4.0	0.6
Enhanced Efficiency Motor (Ventilation Fan)	Com	0.4	0.1		1.0	0.2
Enhanced Efficiency Motor (HVAC Pump)	Com	0.0	0.0		0.0	0.0
Enhanced Efficiency Motor (Other Application)	Com	0.9	0.2		2.7	0.5
Enhanced Efficiency Motor (Ventilation Fan)	Com	0.0	0.0		0.2	0.0
Pulse Start Metal Halide - Replacing Incadenscent Bulb	Com	14.6	0.0		6.5	0.0
Pulse Start Metal Halide - Replacing Mercury Vapor	Com	6.5	0.0		17.6	0.0
Pulse Start Metal Halide - Replacing High Pressure Sodium	Com	0.5	0.0		0.0	0.0
Photocell Lighting Controls	Com	0.0	0.0		0.3	0.0
Time Clock Lighting Controls	Com	26.1	0.0		20.7	0.0
LED Strip Fridge/Freezer Case Lighting 4-7W/Ln Ft	Com	0.4	0.5		3.0	3.7
Vending Miser	Com	0.0	0.0		0.0	0.0
Door Miser/Anti-Sweat Heater Controls	Com	0.0	0.0		0.0	0.0
Glass/Mixed Door Refrig/Freezer (19 to 30 ft3)	Com	0.0	0.0		0.0	0.0
Solid Door Refrig-Freezer	Com	0.4	0.0		0.4	0.0
Parallel Rack	Com	0.0	0.0		242.9	0.0
High Eff Glass Door	Com	0.0	0.0		138.4	0.0
High Eff ECM Evap Fan Motor - Retro	Com	3.2	0.3		7.2	0.7
Solid State Cond Fan Control	Com	0.8	0.0		0.0	0.0
High Evaporator Temp Cases	Com	19.9	0.0		163.6	0.0
Premium Efficiency Motor 1800 RPM ODP (HVAC Pump)	Com	0.0	0.0		0.0	0.0
Enhanced Efficiency Motor (HVAC Pump)	Com	0.0	0.0		0.0	0.0
Premium Efficiency Motor 1800 RPM ODP (Other Application)	Com	0.0	0.0		0.0	0.0
Enhanced Efficiency Motor (Other Application)	Com	0.0	0.0		0.0	0.0
Premium Efficiency Motor 1800 RPM ODP (Ventilation Fan)	Com	0.0	0.0		0.0	0.0
Enhanced Efficiency Motor (Ventilation Fan)	Com	0.0	0.0		0.0	0.0

Table D- 8. Industrial Measure Savings – Non-CROD – Base

Industrial Sector Measure Name	Building Type	2014 - Energy Savings (MWh)	2014 - Demand Savings (KW)		2028 - Energy Savings (MWh)	2028 - Demand Savings (KW)
CFL <13W - Replacing 40W Incandescent	IND	0.0	0.0		0.0	0.0
7.5 Watt LED Bulb	IND	0.4	0.0		0.0	0.0
CFL 13W-18W - Replacing 60W Incandescent	IND	0.0	0.0		0.0	0.0
LED: 14 Watt Interior Lamp	IND	7.1	0.5		0.0	0.0
CFL 18W - Replacing 75W Incandescent	IND	0.0	0.0		0.0	0.0
LED: 17 Watt Interior Lamp	IND	1.4	0.1		0.0	0.0
CFL: 23W Screw-In Indoor	IND	0.0	0.0		0.0	0.0
LED: 20 Watt Interior Lamp	IND	3.0	0.3		0.0	0.0
CFL: >25W Screw-In Indoor	IND	93.5	10.6		0.0	0.0
CFL Fixture Under 15W	IND	12.5	0.6		0.0	0.0
LED Luminaire <15W Interior	IND	1.5	0.1		12.3	0.5
CFL Fixture 16 to 24W	IND	123.2	11.3		0.0	0.0
LED Luminaire: 16-24 Watt Interior	IND	12.6	1.1		102.0	9.3
CFL Fixture Over 24W	IND	53.6	5.5		0.0	0.0
LED Luminaire: >25 Watt Interior	IND	5.5	0.6		44.4	4.5
High bay fluorescent	IND	355.5	69.1		32.3	6.3
T8 Linear fluorescent delamping 4 ft	IND	402.2	78.2		39.1	7.6
Low Wattage T8 - 4ft	IND	475.1	92.4		812.6	158.1
T12-T8 4ft	IND	491.0	95.5		71.2	13.8
T12-T8 8ft	IND	523.8	51.3		75.9	7.4
150W Pulse Start Metal Halide	IND	27.2	5.3		11.2	2.2
320W Pulse Start Metal Halide	IND	17.6	3.4		7.2	1.4
Pulse Start Metal Halide - Replacing Mercury Vapor	IND	0.0	0.0		0.0	0.0
Pulse Start Metal Halide - Replacing High Pressure Sodium	IND	9.3	1.8		3.4	0.7
LED Exit sign	IND	41.5	8.1		16.2	3.2
Occupancy Sensor - Motion	IND	321.2	62.5		131.0	25.5
Daylighting - Continuous Dimming	IND	47.2	9.2		12.6	2.5
LED: Recessed Fixtures	IND	0.2	0.0		1.8	0.3
Rooftop or Split-System, Less than 65,000 BTU/hr (5.4 Tons) 14 SEER	IND	0.0	0.0		2.6	2.9
Rooftop or Split-System, 65,001-134,999 BTU/hr (5.4 to 11.2 Tons) 13 SEER	IND	3.1	3.7		4.7	5.6
Rooftop or Split-System, 135,000-239,999 BTU/hr (11.2 to 20 Tons) 13 SEER	IND	16.8	19.9		25.2	30.0
Rooftop or Split-System, 240,000-759,999 BTU/hr (20 to 63.3 Tons) 13 SEER	IND	0.0	0.0		0.0	0.0
Rooftop or Split-System, 760,000 BTU/hour and Greater (63.3+ Tons) 13 SEER	IND	0.0	0.0		0.0	0.0
Packaged Terminal AC Units (14 SEER)	IND	0.1	0.2		0.3	0.4
Water source heat pumps (15 SEER)	IND	0.0	0.0		0.0	0.0
Water-Cooled Chillers	IND	0.0	0.0		0.0	0.0
Air-Cooled Chiller (all types)	IND	2.4	0.5		7.4	1.5
Direct GeoExchange GSHP - 16 SEER	IND	0.0	0.0		0.0	0.0
VSD - For HVAC Fans	IND	2,108.0	507.1		2,762.7	664.6
VSD - For Pumps	IND	6.7	0.7		8.7	0.9
Compressed Air Leak Correction	IND	131.5	18.4		0.0	0.0
Pulse Start Metal Halide - Replacing Incadenscent Bulb	IND	56.4	0.0		23.6	0.0
Pulse Start Metal Halide - Replacing Mercury Vapor	IND	51.1	0.0		21.4	0.0
Photocell Lighting Controls	IND	16.0	0.0		8.3	0.0
Time Clock Lighting Controls	IND	145.3	0.2		15.6	0.0
Premium Efficiency Motor 1800 RPM ODP	IND	58.0	16.5		46.4	13.2

Table D- 9. Residential Measure Savings CROD – 1.5% Scenario

Residential Sector Measure Name	Building Type	2014 - Energy Savings (MWh)	2014 - Demand Savings (KW)	2028 - Energy Savings (MWh)	2028 - Demand Savings (KW)
Energy Star Ceiling Fans	SFE	29.4	17.5	99.9	59.6
ES Refrigerator	SFE	0.0	0.0	23.2	2.6
ES Freezer	SFE	0.0	0.0	53.7	6.1
ES Dehumdifier	SFE	4.6	5.0	0.0	0.0
Recycle Refrigerator	SFE	571.4	65.2	669.7	76.5
Recycle Freezer	SFE	0.0	0.0	144.5	16.5
ES Dishwasher	SFE	1.4	0.9	3.0	1.8
ES Room AC (Window) 6,000 Btuh	SFE	0.3	1.9	0.3	1.9
ES Room AC (Window) 12,000 Btuh	SFE	0.0	0.0	0.0	0.0
SEER 14 Central AC unit	SFE	58.5	155.6	20.3	54.0
SEER 16 Central AC unit	SFE	34.9	92.8	32.7	87.1
SEER 14.5 Heat Pump	SFE	0.0	0.0	3.9	11.3
SEER 16 Heat Pump	SFE	0.0	0.0	9.6	27.4
Ground Source Heat Pump	SFE	0.0	0.0	0.0	0.0
HVAC Quality Installation	SFE	111.8	297.5	606.1	1,612.3
CFL <13W - Replacing 40W Incandescent	SFE	98.5	9.4	0.0	0.0
CFL 13W-18W - Replacing 60W Incandescent	SFE	419.8	39.9	0.0	0.0
7.5 Watt LED Bulb	SFE	38.9	3.7	0.0	0.0
CFL 18W-25W - Replacing 75W Incandescent	SFE	122.5	11.6	0.0	0.0
CFL >25W - Replacing 100W Incandescent	SFE	95.2	9.0	0.0	0.0
17 Watt LED Bulb	SFE	5.6	0.5	0.0	0.0
Hardwired CFL Fixtures	SFE	708.2	67.3	0.0	0.0
Hardwired LED Fixtures	SFE	92.2	8.8	839.5	79.8
ENERGY STAR Torchiere	SFE	9.5	0.9	41.2	3.9
LED Holiday Lights	SFE	3.7	0.0	15.9	0.0
ES Clothes Washer (Electric Water Heat/Electric Dryer)	SFE	0.0	0.0	0.0	0.0
ES Clothes Washer (Electric Water Heat/Gas Dryer)	SFE	10.5	1.4	10.6	1.4
ES Clothes Washer (Gas Water Heat/Electric Dryer)	SFE	1.2	0.2	1.2	0.2
Marathon Electric Water Heater 50 Gallon (Replacing Electric)	SFE	0.0	0.0	0.0	0.0
Energy Star Ceiling Fans	MFE	7.3	4.3	24.7	14.7
ES Refrigerator	MFE	0.0	0.0	4.7	0.5
ES Freezer	MFE	0.0	0.0	23.5	2.7
ES Dehumdifier	MFE	0.2	0.3	0.0	0.0
Recycle Refrigerator	MFE	49.9	5.7	74.9	8.5
Recycle Freezer	MFE	0.0	0.0	8.1	0.9
ES Dishwasher	MFE	0.6	0.4	1.3	0.8
ES Room AC (Window) 6,000 Btuh	MFE	0.2	1.5	0.2	1.6
ES Room AC (Window) 12,000 Btuh	MFE	0.0	0.0	0.0	0.0
SEER 14 Central AC unit	MFE	17.8	47.5	6.2	16.5
SEER 16 Central AC unit	MFE	10.5	28.0	9.9	26.3
SEER 14.5 Heat Pump	MFE	0.0	0.0	0.0	0.0
SEER 16 Heat Pump	MFE	0.0	0.0	0.0	0.0
Ground Source Heat Pump	MFE	0.0	0.0	0.0	0.0
HVAC Quality Installation	MFE	29.7	79.1	161.1	428.5
CFL <13W - Replacing 40W Incandescent	MFE	26.5	2.5	0.0	0.0
CFL 13W-18W - Replacing 60W Incandescent	MFE	58.0	5.5	0.0	0.0
7.5 Watt LED Bulb	MFE	5.7	0.5	0.0	0.0
CFL 18W-25W - Replacing 75W Incandescent	MFE	6.9	0.7	0.0	0.0
CFL >25W - Replacing 100W Incandescent	MFE	14.2	1.3	0.0	0.0
17 Watt LED Bulb	MFE	1.0	0.1	0.0	0.0
Hardwired CFL Fixtures	MFE	87.2	8.3	0.0	0.0
Hardwired LED Fixtures	MFE	11.3	1.1	103.2	9.8
ENERGY STAR Torchiere	MFE	0.4	0.0	1.8	0.2
LED Holiday Lights	MFE	1.3	0.0	5.6	0.0
ES Clothes Washer (Electric Water Heat/Electric Dryer)	MFE	0.0	0.0	0.0	0.0
ES Clothes Washer (Electric Water Heat/Gas Dryer)	MFE	1.4	0.2	1.4	0.2
ES Clothes Washer (Gas Water Heat/Electric Dryer)	MFE	0.5	0.1	0.5	0.1
Marathon Electric Water Heater 50 Gallon (Replacing Electric)	MFE	0.0	0.0	0.0	0.0
ECM Furnace Fan Motor	SFE	1,334.2	3,549.0	1,530.4	4,071.0
ECM Furnace Fan Motor	MFE	377.6	1,004.5	860.1	2,287.8
WB - NC - 15%	RNC	0.0	0.0	0.0	0.0
WB - NC - 25%	RNC	0.0	0.0	0.0	0.0
WB - NC - 30%	RNC	0.0	0.0	0.0	0.0
Low Income	LI	0.0	0.0	0.0	0.0
Home Energy Report	SFE	1,924.3	0.0	1,924.3	0.0

Table D- 10. Commercial Measure Savings – CROD – 1.5% Scenario – Part 1

Commercial - Part 1 Sector Measure Name	Building Type	2014 - Energy Savings (MWh)	2014 - Demand Savings (KW)	2028 - Energy Savings (MWh)	2028 - Demand Savings (KW)
Solid State Fryer	Com	0.0	0.0	0.0	0.0
Efficient Griddle	Com	4.1	0.8	32.6	6.5
Convection Oven	Com	1.3	0.3	0.0	0.0
Flashbake Oven	Com	0.0	0.0	0.0	0.0
Combination Oven	Com	0.0	0.0	0.0	0.0
Induction Cooktop	Com	0.0	0.0	39.9	7.9
Vacuum Steamer (Connectionless)	Com	0.0	0.0	73.7	14.6
Dishwashers (Electric)	Com	0.7	0.2	2.1	0.5
HE Ice Maker	Com	0.3	0.0	0.5	0.1
Low-Flow Pre-Rinse Spray Valves	Com	3.9	0.4	7.3	0.8
Food Holding Cabinet	Com	0.0	0.0	0.0	0.0
CFL <13W - Replacing 40W Incandescent	Com	0.0	0.0	0.0	0.0
7.5 Watt LED Bulb	Com	15.2	2.6	0.0	0.0
CFL 13W-18W - Replacing 60W Incandescent	Com	0.0	0.0	0.0	0.0
LED: 14 Watt Interior Lamp	Com	43.5	8.1	0.0	0.0
CFL 18W - Replacing 75W Incandescent	Com	0.0	0.0	0.0	0.0
LED: 17 Watt Interior Lamp	Com	18.0	5.1	0.0	0.0
CFL: 23W Screw-In Indoor	Com	0.0	0.0	0.0	0.0
LED: 20 Watt Interior Lamp	Com	14.4	4.1	0.0	0.0
CFL: >25W Screw-In Indoor	Com	0.0	0.0	0.0	0.0
CFL Fixture Under 15W	Com	1.3	0.2	0.0	0.0
LED Luminaire <15W Interior	Com	4.7	0.6	37.6	5.0
CFL Fixture 16 to 24W	Com	0.6	0.1	0.0	0.0
LED Luminaire: 16-24 Watt Interior	Com	37.5	6.5	299.1	52.0
CFL Fixture Over 24W	Com	0.0	0.0	0.0	0.0
LED Luminaire: >25 Watt Interior	Com	5.2	1.5	41.5	11.8
T8 Linear fluorescent delamping 4 ft	Com	0.0	0.0	0.0	0.0
Low Wattage T8 - 4ft	Com	168.0	47.9	327.9	93.5
T12-T8 4ft	Com	412.4	117.6	0.0	0.0
T12-T8 8ft	Com	0.0	0.0	0.0	0.0
150W Pulse Start Metal Halide	Com	0.0	0.0	0.0	0.0
320W Pulse Start Metal Halide	Com	57.9	16.5	204.2	58.2
Pulse Start Metal Halide - Replacing High Pressure Sodium	Com	4.0	1.1	0.0	0.0
High bay fluorescent	Com	64.5	18.4	114.8	32.7
LED Exit sign	Com	0.0	0.0	0.0	0.0
Occupancy Sensor - Motion (for Premium T8s only)	Com	133.1	37.9	335.4	95.6
Daylighting - Continuous Dimming	Com	33.0	9.4	105.7	30.1
LED: Recessed Fixtures	Com	0.3	0.0	2.4	0.4
Rooftop or Split-System, Less than 65,000 BTU/hr (5.4 Tons) 14 SEER	Com	0.0	0.0	7.5	8.4
Rooftop or Split-System, 65,001-134,999 BTU/hr (5.4 to 11.2 Tons) 13 SEER	Com	0.0	0.0	4.7	3.8
Rooftop or Split-System, 135,000-239,999 BTU/hr (11.2 to 20 Tons) 13 SEER	Com	0.0	0.0	0.0	0.0
Rooftop or Split-System, 240,000-759,999 BTU/hr (20 to 63.3 Tons) 13 SEER	Com	0.1	0.2	0.2	0.3
Rooftop or Split-System, 760,000 BTU/hour and Greater (63.3+ Tons) 13 SEER	Com	0.0	0.0	0.0	0.0

Table D- 11. Commercial Measure Savings – CROD – 1.5% Scenario – Part 2

Commercial - Part 2 Sector Measure Name	Building Type	2014 - Energy Savings (MWh)	2014 - Demand Savings (KW)		2028 - Energy Savings (MWh)	2028 - Demand Savings (KW)
Packaged Terminal AC Units (14 SEER)	Com	0.9	1.1		2.6	3.2
Water source heat pumps (15 SEER)	Com	0.0	0.0		20.7	18.8
Water-Cooled Chillers	Com	0.4	1.4		1.4	4.8
Air-Cooled Chiller (all types)	Com	9.6	2.0		34.1	7.0
Direct GeoExchange GSHP - 16 SEER	Com	20.5	19.8		0.0	0.0
VSD - For HVAC Fans	Com	1,815.6	436.7		3,725.4	896.1
VSD - For Pumps	Com	0.0	0.0		0.0	0.0
Compressed Air Leak Correction	Com	180.6	37.9		399.8	83.9
Premium Efficiency Motor 1800 RPM ODP (HVAC Pump)	Com	1.8	0.6		2.2	0.8
Enhanced Efficiency Motor (HVAC Pump)	Com	0.0	0.0		0.6	0.2
Premium Efficiency Motor 1800 RPM ODP (Other Application)	Com	64.2	11.1		82.1	14.2
Enhanced Efficiency Motor (Other Application)	Com	8.5	1.5		20.7	3.6
Premium Efficiency Motor 1800 RPM ODP (Ventilation Fan)	Com	7.4	1.1		9.4	1.5
Enhanced Efficiency Motor (Ventilation Fan)	Com	1.0	0.2		2.4	0.4
Enhanced Efficiency Motor (HVAC Pump)	Com	0.0	0.0		0.0	0.0
Enhanced Efficiency Motor (Other Application)	Com	2.5	0.4		6.0	1.0
Enhanced Efficiency Motor (Ventilation Fan)	Com	0.0	0.0		0.4	0.1
Pulse Start Metal Halide - Replacing Incadenscent Bulb	Com	28.1	0.0		8.4	0.0
Pulse Start Metal Halide - Replacing Mercury Vapor	Com	13.1	0.0		42.3	0.0
Pulse Start Metal Halide - Replacing High Pressure Sodium	Com	5.3	0.0		0.0	0.0
Photocell Lighting Controls	Com	0.0	0.0		0.4	0.0
Time Clock Lighting Controls	Com	48.5	0.1		32.1	0.1
LED Strip Fridge/Freezer Case Lighting 4-7W/Ln Ft	Com	1.0	1.2		8.1	9.9
Vending Miser	Com	0.0	0.0		0.0	0.0
Door Miser/Anti-Sweat Heater Controls	Com	0.0	0.0		0.0	0.0
Glass/Mixed Door Refrig/Freezer (19 to 30 ft3)	Com	0.0	0.0		0.0	0.0
Solid Door Refrig-Freezer	Com	3.6	0.4		4.5	0.5
Parallel Rack	Com	0.0	0.0		732.4	0.0
High Eff Glass Door	Com	0.0	0.0		398.2	0.0
High Eff ECM Evap Fan Motor - Retro	Com	31.8	3.2		82.4	8.3
Solid State Cond Fan Control	Com	7.8	0.0		0.0	0.0
High Evaporator Temp Cases	Com	56.9	0.0		446.7	0.0
Premium Efficiency Motor 1800 RPM ODP (HVAC Pump)	Com	0.0	0.0		0.0	0.0
Enhanced Efficiency Motor (HVAC Pump)	Com	0.0	0.0		0.0	0.0
Premium Efficiency Motor 1800 RPM ODP (Other Application)	Com	0.0	0.0		0.0	0.0
Enhanced Efficiency Motor (Other Application)	Com	0.0	0.0		0.0	0.0
Premium Efficiency Motor 1800 RPM ODP (Ventilation Fan)	Com	0.0	0.0		0.0	0.0
Enhanced Efficiency Motor (Ventilation Fan)	Com	0.0	0.0		0.0	0.0

Table D- 12. Industrial Measure Savings – CROD – 1.5% Scenario

Industrial Sector Measure Name	Building Type	2014 - Energy Savings (MWh)	2014 - Demand Savings (KW)	2028 - Energy Savings (MWh)	2028 - Demand Savings (KW)
CFL <13W - Replacing 40W Incandescent	IND	0.0	0.0	0.0	0.0
7.5 Watt LED Bulb	IND	0.4	0.0	0.0	0.0
CFL 13W-18W - Replacing 60W Incandescent	IND	0.0	0.0	0.0	0.0
LED: 14 Watt Interior Lamp	IND	6.5	0.5	0.0	0.0
CFL 18W - Replacing 75W Incandescent	IND	0.0	0.0	0.0	0.0
LED: 17 Watt Interior Lamp	IND	1.3	0.1	0.0	0.0
CFL: 23W Screw-In Indoor	IND	0.0	0.0	0.0	0.0
LED: 20 Watt Interior Lamp	IND	2.7	0.3	0.0	0.0
CFL: >25W Screw-In Indoor	IND	38.6	4.4	0.0	0.0
CFL Fixture Under 15W	IND	5.7	0.3	0.0	0.0
LED Luminaire <15W Interior	IND	0.7	0.0	5.9	0.3
CFL Fixture 16 to 24W	IND	56.5	5.2	0.0	0.0
LED Luminaire: 16-24 Watt Interior	IND	6.2	0.6	49.3	4.5
CFL Fixture Over 24W	IND	24.6	2.5	0.0	0.0
LED Luminaire: >25 Watt Interior	IND	2.7	0.3	21.5	2.2
High bay fluorescent	IND	151.2	29.4	65.0	12.6
T8 Linear fluorescent delamping 4 ft	IND	167.6	32.6	72.7	14.1
Low Wattage T8 - 4ft	IND	172.8	33.6	342.5	66.6
T12-T8 4ft	IND	195.5	38.0	99.4	19.3
T12-T8 8ft	IND	208.5	20.4	106.0	10.4
150W Pulse Start Metal Halide	IND	10.4	2.0	11.3	2.2
320W Pulse Start Metal Halide	IND	6.7	1.3	7.3	1.4
Pulse Start Metal Halide - Replacing Mercury Vapor	IND	0.0	0.0	0.0	0.0
Pulse Start Metal Halide - Replacing High Pressure Sodium	IND	3.9	0.8	4.1	0.8
LED Exit sign	IND	15.8	3.1	16.7	3.2
Occupancy Sensor - Motion	IND	128.9	25.1	139.3	27.1
Daylighting - Continuous Dimming	IND	25.3	4.9	26.7	5.2
LED: Recessed Fixtures	IND	0.2	0.0	1.5	0.2
Rooftop or Split-System, Less than 65,000 BTU/hr (5.4 Tons) 14 SEER	IND	0.0	0.0	2.0	2.2
Rooftop or Split-System, 65,001-134,999 BTU/hr (5.4 to 11.2 Tons) 13 SEER	IND	6.3	7.5	10.6	12.6
Rooftop or Split-System, 135,000-239,999 BTU/hr (11.2 to 20 Tons) 13 SEER	IND	33.7	40.1	56.8	67.5
Rooftop or Split-System, 240,000-759,999 BTU/hr (20 to 63.3 Tons) 13 SEER	IND	0.0	0.0	0.0	0.0
Rooftop or Split-System, 760,000 BTU/hour and Greater (63.3+ Tons) 13 SEER	IND	0.0	0.0	0.0	0.0
Packaged Terminal AC Units (14 SEER)	IND	0.3	0.3	0.7	0.9
Water source heat pumps (15 SEER)	IND	0.0	0.0	0.0	0.0
Water-Cooled Chillers	IND	0.0	0.0	0.0	0.0
Air-Cooled Chiller (all types)	IND	4.8	1.0	17.3	3.5
Direct GeoExchange GSHP - 16 SEER	IND	9.4	9.0	0.0	0.0
VSD - For HVAC Fans	IND	2,622.7	630.9	2,546.1	612.5
VSD - For Pumps	IND	8.3	0.9	8.0	0.9
Compressed Air Leak Correction	IND	96.9	13.6	57.1	8.0
Pulse Start Metal Halide - Replacing Incadenscent Bulb	IND	21.5	0.0	23.5	0.0
Pulse Start Metal Halide - Replacing Mercury Vapor	IND	19.5	0.0	21.3	0.0
Photocell Lighting Controls	IND	12.1	0.0	5.3	0.0
Time Clock Lighting Controls	IND	58.6	0.1	25.7	0.0
Premium Efficiency Motor 1800 RPM ODP	IND	66.1	18.8	36.5	10.4

Table D- 13. Residential Measure Savings Non-CROD – 1.5% Scenario

Residential Sector Measure Name	Building Type	2014 - Energy Savings (MWh)	2014 - Demand Savings (KW)	2028 - Energy Savings (MWh)	2028 - Demand Savings (KW)
Energy Star Ceiling Fans	SFE	26.3	15.7	89.2	53.2
ES Refrigerator	SFE	0.0	0.0	17.3	2.0
ES Freezer	SFE	0.0	0.0	38.6	4.4
ES Dehumdifier	SFE	4.1	4.4	0.0	0.0
Recycle Refrigerator	SFE	501.1	57.2	573.7	65.5
Recycle Freezer	SFE	0.0	0.0	96.0	11.0
ES Dishwasher	SFE	1.3	0.8	2.7	1.6
ES Room AC (Window) 6,000 Btuh	SFE	0.2	1.7	0.3	1.7
ES Room AC (Window) 12,000 Btuh	SFE	0.0	0.0	0.0	0.0
SEER 14 Central AC unit	SFE	27.2	72.3	29.5	78.4
SEER 16 Central AC unit	SFE	30.6	81.5	29.2	77.6
SEER 14.5 Heat Pump	SFE	0.0	0.0	2.8	8.0
SEER 16 Heat Pump	SFE	0.0	0.0	7.5	21.4
Ground Source Heat Pump	SFE	10.2	27.1	0.0	0.0
HVAC Quality Installation	SFE	101.1	268.9	465.7	1,238.7
CFL <13W - Replacing 40W Incandescent	SFE	68.7	6.5	0.0	0.0
CFL 13W-18W - Replacing 60W Incandescent	SFE	320.9	30.5	0.0	0.0
7.5 Watt LED Bulb	SFE	27.0	2.6	0.0	0.0
CFL 18W-25W - Replacing 75W Incandescent	SFE	95.9	9.1	0.0	0.0
CFL >25W - Replacing 100W Incandescent	SFE	72.8	6.9	0.0	0.0
17 Watt LED Bulb	SFE	3.9	0.4	0.0	0.0
Hardwired CFL Fixtures	SFE	528.5	50.2	0.0	0.0
Hardwired LED Fixtures	SFE	63.8	6.1	0.0	0.0
ENERGY STAR Torchiere	SFE	7.7	0.7	31.6	3.0
LED Holiday Lights	SFE	3.0	0.0	12.6	0.0
ES Clothes Washer (Electric Water Heat/Electric Dryer)	SFE	0.0	0.0	0.0	0.0
ES Clothes Washer (Electric Water Heat/Gas Dryer)	SFE	9.4	1.3	9.4	1.3
ES Clothes Washer (Gas Water Heat/Electric Dryer)	SFE	1.1	0.2	1.1	0.2
Marathon Electric Water Heater 50 Gallon (Replacing Electric)	SFE	0.0	0.0	0.0	0.0
Energy Star Ceiling Fans	MFE	6.5	3.9	22.1	13.1
ES Refrigerator	MFE	0.0	0.0	3.5	0.4
ES Freezer	MFE	0.0	0.0	16.9	1.9
ES Dehumdifier	MFE	0.2	0.2	0.0	0.0
Recycle Refrigerator	MFE	43.8	5.0	63.8	7.3
Recycle Freezer	MFE	0.0	0.0	5.4	0.6
ES Dishwasher	MFE	0.5	0.3	1.1	0.7
ES Room AC (Window) 6,000 Btuh	MFE	0.2	1.4	0.2	1.4
ES Room AC (Window) 12,000 Btuh	MFE	0.1	0.9	0.0	0.0
SEER 14 Central AC unit	MFE	8.3	22.1	9.0	23.9
SEER 16 Central AC unit	MFE	9.2	24.6	8.8	23.4
SEER 14.5 Heat Pump	MFE	0.0	0.0	0.0	0.0
SEER 16 Heat Pump	MFE	0.0	0.0	0.0	0.0
Ground Source Heat Pump	MFE	0.0	0.0	0.0	0.0
HVAC Quality Installation	MFE	26.9	71.4	123.8	329.2
CFL <13W - Replacing 40W Incandescent	MFE	19.9	1.9	0.0	0.0
CFL 13W-18W - Replacing 60W Incandescent	MFE	44.3	4.2	0.0	0.0
7.5 Watt LED Bulb	MFE	3.9	0.4	0.0	0.0
CFL 18W-25W - Replacing 75W Incandescent	MFE	5.2	0.5	0.0	0.0
CFL >25W - Replacing 100W Incandescent	MFE	10.8	1.0	0.0	0.0
17 Watt LED Bulb	MFE	0.7	0.1	0.0	0.0
Hardwired CFL Fixtures	MFE	65.0	6.2	0.0	0.0
Hardwired LED Fixtures	MFE	7.8	0.7	0.0	0.0
ENERGY STAR Torchiere	MFE	0.3	0.0	1.4	0.1
LED Holiday Lights	MFE	1.0	0.0	4.4	0.0
ES Clothes Washer (Electric Water Heat/Electric Dryer)	MFE	0.0	0.0	0.0	0.0
ES Clothes Washer (Electric Water Heat/Gas Dryer)	MFE	1.3	0.2	1.3	0.2
ES Clothes Washer (Gas Water Heat/Electric Dryer)	MFE	0.4	0.1	0.4	0.1
Marathon Electric Water Heater 50 Gallon (Replacing Electric)	MFE	0.0	0.0	0.0	0.0
ECM Furnace Fan Motor	SFE	1,169.1	3,109.7	1,203.9	3,202.3
ECM Furnace Fan Motor	MFE	331.5	881.8	758.7	2,018.3
WB - NC - 15%	RNC	0.0	0.0	0.0	0.0
WB - NC - 25%	RNC	0.0	0.0	0.0	0.0
WB - NC - 30%	RNC	0.0	0.0	0.0	0.0
Low Income	LI	52.4	26.2	40.8	20.4
Home Energy Report	SFE	1,533.3	0.0	1,533.3	0.0

Table D- 14. Commercial Measure Savings – Non-CROD – 1.5% Scenario – Part 1

Commercial - Part 1 Sector Measure Name	Building Type	2014 - Energy Savings (MWh)	2014 - Demand Savings (KW)		2028 - Energy Savings (MWh)	2028 - Demand Savings (KW)
Solid State Fryer	Com	0.0	0.0		0.0	0.0
Efficient Griddle	Com	1.5	0.3		14.0	2.8
Convection Oven	Com	0.1	0.0		0.0	0.0
Flashbake Oven	Com	0.0	0.0		0.0	0.0
Combination Oven	Com	0.0	0.0		0.0	0.0
Induction Cooktop	Com	0.0	0.0		15.3	3.0
Vacuum Steamer (Connectionless)	Com	0.0	0.0		31.2	6.2
Dishwashers (Electric)	Com	0.1	0.0		0.2	0.0
HE Ice Maker	Com	0.0	0.0		0.0	0.0
Low-Flow Pre-Rinse Spray Valves	Com	0.4	0.0		0.8	0.1
Food Holding Cabinet	Com	0.0	0.0		0.0	0.0
CFL <13W - Replacing 40W Incandescent	Com	0.0	0.0		0.0	0.0
7.5 Watt LED Bulb	Com	5.6	1.0		0.0	0.0
CFL 13W-18W - Replacing 60W Incandescent	Com	0.0	0.0		0.0	0.0
LED: 14 Watt Interior Lamp	Com	16.0	3.0		0.0	0.0
CFL 18W - Replacing 75W Incandescent	Com	0.0	0.0		0.0	0.0
LED: 17 Watt Interior Lamp	Com	6.7	1.9		0.0	0.0
CFL: 23W Screw-In Indoor	Com	0.0	0.0		0.0	0.0
LED: 20 Watt Interior Lamp	Com	5.3	1.5		0.0	0.0
CFL: >25W Screw-In Indoor	Com	0.0	0.0		0.0	0.0
CFL Fixture Under 15W	Com	0.0	0.0		0.0	0.0
LED Luminaire <15W Interior	Com	1.8	0.2		0.0	0.0
CFL Fixture 16 to 24W	Com	0.0	0.0		0.0	0.0
LED Luminaire: 16-24 Watt Interior	Com	14.4	2.5		0.0	0.0
CFL Fixture Over 24W	Com	0.0	0.0		0.0	0.0
LED Luminaire: >25 Watt Interior	Com	2.0	0.6		0.0	0.0
T8 Linear fluorescent delamping 4 ft	Com	0.0	0.0		0.0	0.0
Low Wattage T8 - 4ft	Com	90.6	25.8		176.7	50.4
T12-T8 4ft	Com	218.7	62.3		0.0	0.0
T12-T8 8ft	Com	0.0	0.0		0.0	0.0
150W Pulse Start Metal Halide	Com	0.0	0.0		0.0	0.0
320W Pulse Start Metal Halide	Com	30.8	8.8		109.5	31.2
Pulse Start Metal Halide - Replacing High Pressure Sodium	Com	0.8	0.2		0.0	0.0
High bay fluorescent	Com	32.1	9.2		56.5	16.1
LED Exit sign	Com	0.0	0.0		0.0	0.0
Occupancy Sensor - Motion (for Premium T8s only)	Com	71.0	20.2		160.9	45.9
Daylighting - Continuous Dimming	Com	17.8	5.1		57.1	16.3
LED: Recessed Fixtures	Com	0.1	0.0		1.0	0.2
Rooftop or Split-System, Less than 65,000 BTU/hr (5.4 Tons) 14 SEER	Com	0.0	0.0		3.3	3.8
Rooftop or Split-System, 65,001-134,999 BTU/hr (5.4 to 11.2 Tons) 13 SEER	Com	0.0	0.0		2.1	1.7
Rooftop or Split-System, 135,000-239,999 BTU/hr (11.2 to 20 Tons) 13 SEER	Com	0.0	0.0		0.0	0.0
Rooftop or Split-System, 240,000-759,999 BTU/hr (20 to 63.3 Tons) 13 SEER	Com	0.1	0.2		0.2	0.3
Rooftop or Split-System, 760,000 BTU/hour and Greater (63.3+ Tons) 13 SEER	Com	0.0	0.0		0.0	0.0

Table D- 15. Commercial Measure Savings – Non-CROD – 1.5% Scenario – Part 2

Commercial - Part 2 Sector Measure Name	Building Type	2014 - Energy Savings (MWh)	2014 - Demand Savings (KW)		2028 - Energy Savings (MWh)	2028 - Demand Savings (KW)
Packaged Terminal AC Units (14 SEER)	Com	0.9	1.1		2.6	3.2
Water source heat pumps (15 SEER)	Com	0.0	0.0		9.9	9.0
Water-Cooled Chillers	Com	0.4	1.3		1.4	4.7
Air-Cooled Chiller (all types)	Com	9.4	1.9		33.3	6.8
Direct GeoExchange GSHP - 16 SEER	Com	0.0	0.0		0.0	0.0
VSD - For HVAC Fans	Com	860.3	206.9		1,775.2	427.0
VSD - For Pumps	Com	0.0	0.0		0.0	0.0
Compressed Air Leak Correction	Com	434.5	91.1		991.3	208.0
Premium Efficiency Motor 1800 RPM ODP (HVAC Pump)	Com	0.8	0.3		1.0	0.4
Enhanced Efficiency Motor (HVAC Pump)	Com	0.0	0.0		0.3	0.1
Premium Efficiency Motor 1800 RPM ODP (Other Application)	Com	29.6	5.1		37.8	6.6
Enhanced Efficiency Motor (Other Application)	Com	3.3	0.6		9.6	1.7
Premium Efficiency Motor 1800 RPM ODP (Ventilation Fan)	Com	3.4	0.5		4.3	0.7
Enhanced Efficiency Motor (Ventilation Fan)	Com	0.4	0.1		1.1	0.2
Enhanced Efficiency Motor (HVAC Pump)	Com	0.0	0.0		0.0	0.0
Enhanced Efficiency Motor (Other Application)	Com	1.0	0.2		2.9	0.5
Enhanced Efficiency Motor (Ventilation Fan)	Com	0.0	0.0		0.2	0.0
Pulse Start Metal Halide - Replacing Incadenscent Bulb	Com	14.6	0.0		0.0	0.0
Pulse Start Metal Halide - Replacing Mercury Vapor	Com	6.5	0.0		21.3	0.0
Pulse Start Metal Halide - Replacing High Pressure Sodium	Com	0.5	0.0		0.0	0.0
Photocell Lighting Controls	Com	0.0	0.0		0.3	0.0
Time Clock Lighting Controls	Com	26.1	0.0		20.1	0.0
LED Strip Fridge/Freezer Case Lighting 4-7W/Ln Ft	Com	0.4	0.5		3.5	4.3
Vending Miser	Com	0.0	0.0		0.0	0.0
Door Miser/Anti-Sweat Heater Controls	Com	0.0	0.0		0.0	0.0
Glass/Mixed Door Refrig/Freezer (19 to 30 ft3)	Com	0.0	0.0		0.0	0.0
Solid Door Refrig-Freezer	Com	0.4	0.0		0.5	0.1
Parallel Rack	Com	0.0	0.0		277.6	0.0
High Eff Glass Door	Com	0.0	0.0		165.2	0.0
High Eff ECM Evap Fan Motor - Retro	Com	3.2	0.3		8.4	0.8
Solid State Cond Fan Control	Com	0.8	0.0		0.0	0.0
High Evaporator Temp Cases	Com	21.0	0.0		191.8	0.0
Premium Efficiency Motor 1800 RPM ODP (HVAC Pump)	Com	0.0	0.0		0.0	0.0
Enhanced Efficiency Motor (HVAC Pump)	Com	0.0	0.0		0.0	0.0
Premium Efficiency Motor 1800 RPM ODP (Other Application)	Com	0.0	0.0		0.0	0.0
Enhanced Efficiency Motor (Other Application)	Com	0.0	0.0		0.0	0.0
Premium Efficiency Motor 1800 RPM ODP (Ventilation Fan)	Com	0.0	0.0		0.0	0.0
Enhanced Efficiency Motor (Ventilation Fan)	Com	0.0	0.0		0.0	0.0

Table D- 16. Industrial Measure Savings – Non-CROD – 1.5% Scenario

Industrial Sector Measure Name	Building Type	2014 - Energy Savings (MWh)	2014 - Demand Savings (KW)		2028 - Energy Savings (MWh)	2028 - Demand Savings (KW)
CFL <13W - Replacing 40W Incandescent	IND	0.1	0.0		0.0	0.0
7.5 Watt LED Bulb	IND	0.4	0.0		0.0	0.0
CFL 13W-18W - Replacing 60W Incandescent	IND	2.7	0.2		0.0	0.0
LED: 14 Watt Interior Lamp	IND	7.5	0.5		0.0	0.0
CFL 18W - Replacing 75W Incandescent	IND	0.1	0.0		0.0	0.0
LED: 17 Watt Interior Lamp	IND	1.5	0.1		0.0	0.0
CFL: 23W Screw-In Indoor	IND	2.2	0.2		0.0	0.0
LED: 20 Watt Interior Lamp	IND	3.1	0.3		0.0	0.0
CFL: >25W Screw-In Indoor	IND	56.5	6.4		0.0	0.0
CFL Fixture Under 15W	IND	8.3	0.4		0.0	0.0
LED Luminaire <15W Interior	IND	1.6	0.1		14.4	0.6
CFL Fixture 16 to 24W	IND	81.9	7.5		0.0	0.0
LED Luminaire: 16-24 Watt Interior	IND	13.3	1.2		119.3	10.8
CFL Fixture Over 24W	IND	35.6	3.6		0.0	0.0
LED Luminaire: >25 Watt Interior	IND	5.8	0.6		51.9	5.3
High bay fluorescent	IND	216.9	42.2		88.6	17.2
T8 Linear fluorescent delamping 4 ft	IND	240.6	46.8		99.3	19.3
Low Wattage T8 - 4ft	IND	249.3	48.5		493.4	96.0
T12-T8 4ft	IND	281.1	54.7		135.4	26.3
T12-T8 8ft	IND	300.0	29.4		144.5	14.2
150W Pulse Start Metal Halide	IND	15.0	2.9		15.6	3.0
320W Pulse Start Metal Halide	IND	9.7	1.9		10.1	2.0
Pulse Start Metal Halide - Replacing Mercury Vapor	IND	0.0	0.0		0.0	0.0
Pulse Start Metal Halide - Replacing High Pressure Sodium	IND	5.6	1.1		5.6	1.1
LED Exit sign	IND	22.9	4.4		23.0	4.5
Occupancy Sensor - Motion	IND	185.4	36.1		193.6	37.7
Daylighting - Continuous Dimming	IND	36.0	7.0		36.8	7.1
LED: Recessed Fixtures	IND	0.2	0.0		2.1	0.3
Rooftop or Split-System, Less than 65,000 BTU/hr (5.4 Tons) 14 SEER	IND	0.0	0.0		2.7	3.0
Rooftop or Split-System, 65,001-134,999 BTU/hr (5.4 to 11.2 Tons) 13 SEER	IND	5.4	6.4		9.2	10.9
Rooftop or Split-System, 135,000-239,999 BTU/hr (11.2 to 20 Tons) 13 SEER	IND	29.1	34.6		49.1	58.5
Rooftop or Split-System, 240,000-759,999 BTU/hr (20 to 63.3 Tons) 13 SEER	IND	0.0	0.0		0.0	0.0
Rooftop or Split-System, 760,000 BTU/hour and Greater (63.3+ Tons) 13 SEER	IND	0.0	0.0		0.0	0.0
Packaged Terminal AC Units (14 SEER)	IND	0.2	0.3		0.6	0.8
Water source heat pumps (15 SEER)	IND	0.0	0.0		0.0	0.0
Water-Cooled Chillers	IND	0.0	0.0		0.0	0.0
Air-Cooled Chiller (all types)	IND	4.1	0.8		14.9	3.0
Direct GeoExchange GSHP - 16 SEER	IND	6.7	6.4		0.0	0.0
VSD - For HVAC Fans	IND	5,239.2	1,260.3		3,434.2	826.1
VSD - For Pumps	IND	16.6	1.8		10.9	1.2
Compressed Air Leak Correction	IND	157.8	22.1		65.9	9.2
Pulse Start Metal Halide - Replacing Incadenscent Bulb	IND	31.0	0.0		32.5	0.0
Pulse Start Metal Halide - Replacing Mercury Vapor	IND	28.1	0.0		29.5	0.0
Photocell Lighting Controls	IND	16.8	0.0		8.7	0.0
Time Clock Lighting Controls	IND	83.8	0.1		35.2	0.1
Premium Efficiency Motor 1800 RPM ODP	IND	118.5	33.7		39.2	11.2

Appendix E. TRC Values by Measure – CROD and Non-CROD

Table E- 1. Residential TRC Values by Measure – CROD and Non-CROD

Residential Sector Measure Name	Building Type	CROD Total Resource Cost Test (TRC) - 2014	Non-CROD Total Resource Cost Test (TRC) - 2014
Energy Star Ceiling Fans	SFE	2.93	2.92
ES Refrigerator	SFE	0.42	0.42
ES Freezer	SFE	0.43	0.43
ES Dehumdifier	SFE	1.65	1.64
Recycle Refrigerator	SFE	1.14	1.14
Recycle Freezer	SFE	0.73	0.72
ES Dishwasher	SFE	1.57	1.57
ES Room AC (Window) 6,000 Btuh	SFE	2.57	2.57
ES Room AC (Window) 12,000 Btuh	SFE	3.22	3.22
SEER 14 Central AC unit	SFE	0.94	0.94
SEER 16 Central AC unit	SFE	1.08	1.08
SEER 14.5 Heat Pump	SFE	0.23	0.23
SEER 16 Heat Pump	SFE	0.32	0.32
Ground Source Heat Pump	SFE	1.98	1.98
HVAC Quality Installation	SFE	1.19	1.19
CFL <13W - Replacing 40W Incandescent	SFE	2.86	2.84
CFL 13W-18W - Replacing 60W Incandescent	SFE	3.44	3.42
7.5 Watt LED Bulb	SFE	1.15	1.15
CFL 18W-25W - Replacing 75W Incandescent	SFE	3.15	3.13
CFL >25W - Replacing 100W Incandescent	SFE	3.75	3.72
17 Watt LED Bulb	SFE	1.20	1.20
Hardwired CFL Fixtures	SFE	0.75	0.75
Hardwired LED Fixtures	SFE	0.88	0.88
ENERGY STAR Torchiere	SFE	1.70	1.69
LED Holiday Lights	SFE	2.00	1.99
ES Clothes Washer (Electric Water Heat/Electric Dryer)	SFE	2.17	2.17
ES Clothes Washer (Electric Water Heat/Gas Dryer)	SFE	1.50	1.50
ES Clothes Washer (Gas Water Heat/Electric Dryer)	SFE	1.09	1.09
Marathon Electric Water Heater 50 Gallon (Replacing Electric)	SFE	0.19	0.19
Energy Star Ceiling Fans	MFE	2.93	2.92
ES Refrigerator	MFE	0.42	0.42
ES Freezer	MFE	0.43	0.43
ES Dehumdifier	MFE	1.65	1.64
Recycle Refrigerator	MFE	1.14	1.14
Recycle Freezer	MFE	0.73	0.72
ES Dishwasher	MFE	1.57	1.57
ES Room AC (Window) 6,000 Btuh	MFE	2.57	2.57
ES Room AC (Window) 12,000 Btuh	MFE	3.22	3.22
SEER 14 Central AC unit	MFE	0.94	0.94
SEER 16 Central AC unit	MFE	1.08	1.08
SEER 14.5 Heat Pump	MFE	0.23	0.23
SEER 16 Heat Pump	MFE	0.32	0.32
Ground Source Heat Pump	MFE	1.98	1.98
HVAC Quality Installation	MFE	1.19	1.19
CFL <13W - Replacing 40W Incandescent	MFE	2.86	2.84
CFL 13W-18W - Replacing 60W Incandescent	MFE	3.44	3.42
7.5 Watt LED Bulb	MFE	1.15	1.15
CFL 18W-25W - Replacing 75W Incandescent	MFE	3.15	3.13
CFL >25W - Replacing 100W Incandescent	MFE	3.75	3.72
17 Watt LED Bulb	MFE	1.20	1.20
Hardwired CFL Fixtures	MFE	0.75	0.75
Hardwired LED Fixtures	MFE	0.88	0.88
ENERGY STAR Torchiere	MFE	1.70	1.69
LED Holiday Lights	MFE	2.00	1.99
ES Clothes Washer (Electric Water Heat/Electric Dryer)	MFE	2.17	2.17
ES Clothes Washer (Electric Water Heat/Gas Dryer)	MFE	1.50	1.50
ES Clothes Washer (Gas Water Heat/Electric Dryer)	MFE	1.09	1.09
Marathon Electric Water Heater 50 Gallon (Replacing Electric)	MFE	0.19	0.19
ECM Furnace Fan Motor	SFE	4.67	4.66
ECM Furnace Fan Motor	MFE	4.67	4.66
WB - NC - 15%	RNC	2.63	2.63
WB - NC - 25%	RNC	0.64	0.64
WB - NC - 30%	RNC	0.44	0.44
Home Energy Report - Non-State Adjusted	SFE	0.98	1.04
Home Energy Report - State Adjusted	SFE	0.33	0.35

Table E- 2. Commercial TRC Values by Measure – CROD and Non-CROD – Part 1

Commercial - Part 1 Sector Measure Name	Building Type	CROD Total Resource Cost Test (TRC) - 2014	Non-CROD Total Resource Cost Test (TRC) - 2014
Solid State Fryer	Com	0.19	0.19
Efficient Griddle	Com	0.79	0.78
Convection Oven	Com	5.41	4.98
Flashbake Oven	Com	0.18	0.18
Combination Oven	Com	0.31	0.31
Induction Cooktop	Com	0.39	0.39
Vacuum Steamer (Connectionless)	Com	0.68	0.67
Dishwashers (Electric)	Com	19.56	16.57
HE Ice Maker	Com	2.80	2.63
Low-Flow Pre-Rinse Spray Valves	Com	17.52	10.45
Food Holding Cabinet	Com	2.37	2.29
CFL <13W - Replacing 40W Incandescent	Com	5.64	4.40
7.5 Watt LED Bulb	Com	>20	>20
CFL 13W-18W - Replacing 60W Incandescent	Com	7.61	5.53
LED: 14 Watt Interior Lamp	Com	>20	>20
CFL 18W - Replacing 75W Incandescent	Com	6.79	5.08
LED: 17 Watt Interior Lamp	Com	>20	>20
CFL: 23W Screw-In Indoor	Com	9.31	6.40
LED: 20 Watt Interior Lamp	Com	>20	>20
CFL: >25W Screw-In Indoor	Com	9.19	6.35
CFL Fixture Under 15W	Com	>20	>20
LED Luminaire <15W Interior	Com	>20	>20
CFL Fixture 16 to 24W	Com	>20	>20
LED Luminaire: 16-24 Watt Interior	Com	>20	>20
CFL Fixture Over 24W	Com	>20	>20
LED Luminaire: >25 Watt Interior	Com	>20	>20
T8 Linear fluorescent delamping 4 ft	Com	2.32	2.25
Low Wattage T8 - 4ft	Com	2.55	2.34
T12-T8 4ft	Com	0.90	0.89
T12-T8 8ft	Com	0.46	0.45
150W Pulse Start Metal Halide	Com	0.83	0.82
320W Pulse Start Metal Halide	Com	2.52	2.44
Pulse Start Metal Halide - Replacing High Pressure Sodium	Com	1.93	1.88
High bay fluorescent	Com	2.03	1.98
LED Exit sign	Com	1.71	1.68
Occupancy Sensor - Motion (for Premium T8s only)	Com	1.21	1.20
Daylighting - Continuous Dimming	Com	1.71	1.68
LED: Recessed Fixtures	Com	3.40	3.26
Rooftop or Split-System, Less than 65,000 BTU/hr (5.4 Tons) 14 SEER	Com	0.67	0.67
Rooftop or Split-System, 65,001-134,999 BTU/hr (5.4 to 11.2 Tons) 13 SEER	Com	0.63	0.63
Rooftop or Split-System, 135,000-239,999 BTU/hr (11.2 to 20 Tons) 13 SEER	Com	1.35	1.35
Rooftop or Split-System, 240,000-759,999 BTU/hr (20 to 63.3 Tons) 13 SEER	Com	0.96	0.96
Rooftop or Split-System, 760,000 BTU/hour and Greater (63.3+ Tons) 13 SEER	Com	1.34	1.33

Table E- 3. Commercial TRC Values by Measure – CROD and Non-CROD – Part 2

Commercial - Part 2 Sector Measure Name	Building Type	CROD Total Resource Cost Test (TRC) - 2014	CROD Total Resource Cost Test (TRC) - 2014
Packaged Terminal AC Units (14 SEER)	Com	0.96	0.96
Water source heat pumps (15 SEER)	Com	0.74	0.73
Water-Cooled Chillers	Com	1.11	1.11
Air-Cooled Chiller (all types)	Com	6.75	6.35
Direct GeoExchange GSHP - 16 SEER	Com	2.90	2.86
VSD - For HVAC Fans	Com	3.83	3.65
VSD - For Pumps	Com	5.22	4.84
Compressed Air Leak Correction	Com	1.14	1.06
Premium Efficiency Motor 1800 RPM ODP (HVAC Pump)	Com	0.82	0.85
Enhanced Efficiency Motor (HVAC Pump)	Com	0.71	0.70
Premium Efficiency Motor 1800 RPM ODP (Other Application)	Com	1.26	1.24
Enhanced Efficiency Motor (Other Application)	Com	1.15	1.14
Premium Efficiency Motor 1800 RPM ODP (Ventilation Fan)	Com	1.37	1.36
Enhanced Efficiency Motor (Ventilation Fan)	Com	1.26	1.24
Enhanced Efficiency Motor (HVAC Pump)	Com	0.37	0.37
Enhanced Efficiency Motor (Other Application)	Com	1.20	1.18
Enhanced Efficiency Motor (Ventilation Fan)	Com	0.66	0.66
Pulse Start Metal Halide - Replacing Incadenscent Bulb	Com	0.96	0.95
Pulse Start Metal Halide - Replacing Mercury Vapor	Com	2.59	2.51
Pulse Start Metal Halide - Replacing High Pressure Sodium	Com	1.79	1.75
Photocell Lighting Controls	Com	0.74	0.72
Time Clock Lighting Controls	Com	0.95	0.93
LED Strip Fridge/Freezer Case Lighting 4-7W/Ln Ft	Com	1.85	1.82
Vending Miser	Com	2.66	2.52
Door Miser/Anti-Sweat Heater Controls	Com	0.08	0.08
Glass/Mixed Door Refrig/Freezer (19 to 30 ft3)	Com	0.11	0.11
Solid Door Refrig-Freezer	Com	1.07	1.05
Parallel Rack	Com	0.54	0.54
High Eff Glass Door	Com	0.70	0.69
High Eff ECM Evap Fan Motor - Retro	Com	4.22	3.99
Solid State Cond Fan Control	Com	1.20	1.17
High Evaporator Temp Cases	Com	0.76	0.75
Premium Efficiency Motor 1800 RPM ODP (HVAC Pump)	Com	0.18	0.18
Enhanced Efficiency Motor (HVAC Pump)	Com	0.16	0.16
Premium Efficiency Motor 1800 RPM ODP (Other Application)	Com	0.29	0.29
Enhanced Efficiency Motor (Other Application)	Com	0.27	0.27
Premium Efficiency Motor 1800 RPM ODP (Ventilation Fan)	Com	0.32	0.32
Enhanced Efficiency Motor (Ventilation Fan)	Com	0.29	0.29

Table E- 4. Industrial TRC Values by Measure – CROD and Non-CROD

Industrial Sector Measure Name	Building Type	CROD Total Resource Cost Test (TRC) - 2014	Non-CROD Total Resource Cost Test (TRC) - 2014
CFL <13W - Replacing 40W Incandescent	IND	6.57	4.94
7.5 Watt LED Bulb	IND	>20	>20
CFL 13W-18W - Replacing 60W Incandescent	IND	8.75	6.09
LED: 14 Watt Interior Lamp	IND	>20	>20
CFL 18W - Replacing 75W Incandescent	IND	7.83	5.62
LED: 17 Watt Interior Lamp	IND	>20	>20
CFL: 23W Screw-In Indoor	IND	10.57	6.92
LED: 20 Watt Interior Lamp	IND	>20	>20
CFL: >25W Screw-In Indoor	IND	10.40	6.85
CFL Fixture Under 15W	IND	>20	>20
LED Luminaire <15W Interior	IND	>20	>20
CFL Fixture 16 to 24W	IND	>20	>20
LED Luminaire: 16-24 Watt Interior	IND	>20	>20
CFL Fixture Over 24W	IND	>20	>20
LED Luminaire: >25 Watt Interior	IND	>20	>20
High bay fluorescent	IND	3.44	3.28
T8 Linear fluorescent delamping 4 ft	IND	3.92	3.71
Low Wattage T8 - 4ft	IND	4.44	3.81
T12-T8 4ft	IND	2.02	1.98
T12-T8 8ft	IND	0.91	0.90
150W Pulse Start Metal Halide	IND	1.41	1.38
320W Pulse Start Metal Halide	IND	4.26	4.01
Pulse Start Metal Halide - Replacing Mercury Vapor	IND	3.16	3.02
Pulse Start Metal Halide - Replacing High Pressure Sodium	IND	3.27	3.12
LED Exit sign	IND	3.61	3.49
Occupancy Sensor - Motion	IND	2.04	2.00
Daylighting - Continuous Dimming	IND	2.88	2.80
LED: Recessed Fixtures	IND	3.40	3.26
Rooftop or Split-System, Less than 65,000 BTU/hr (5.4 Tons) 14 SEER	IND	0.67	0.67
Rooftop or Split-System, 65,001-134,999 BTU/hr (5.4 to 11.2 Tons) 13 SEER	IND	1.55	1.54
Rooftop or Split-System, 135,000-239,999 BTU/hr (11.2 to 20 Tons) 13 SEER	IND	2.41	2.38
Rooftop or Split-System, 240,000-759,999 BTU/hr (20 to 63.3 Tons) 13 SEER	IND	2.55	2.53
Rooftop or Split-System, 760,000 BTU/hour and Greater (63.3+ Tons) 13 SEER	IND	3.48	3.43
Packaged Terminal AC Units (14 SEER)	IND	0.97	0.96
Water source heat pumps (15 SEER)	IND	0.59	0.59
Water-Cooled Chillers	IND	2.69	2.66
Air-Cooled Chiller (all types)	IND	6.77	6.36
Direct GeoExchange GSHP - 16 SEER	IND	2.89	2.85
VSD - For HVAC Fans	IND	3.83	3.65
VSD - For Pumps	IND	5.22	4.84
Compressed Air Leak Correction	IND	1.67	1.51
Pulse Start Metal Halide - Replacing Incadenscent Bulb	IND	0.96	0.95
Pulse Start Metal Halide - Replacing Mercury Vapor	IND	2.70	2.62
Photocell Lighting Controls	IND	0.77	0.75
Time Clock Lighting Controls	IND	0.99	0.96
Premium Efficiency Motor 1800 RPM ODP	IND	0.87	0.87

Appendix F. Measures Within Competition Groups

Table F- 1. Residential Measures Within Competition Groups

Residential Efficiency Measures	Building Type	Efficiency Competition Group
SEER 14 Central AC unit	SFE	1
SEER 16 Central AC unit	SFE	1
SEER 14.5 Heat Pump	SFE	2
SEER 16 Heat Pump	SFE	2
Ground Source Heat Pump	SFE	2
CFL 13W-18W - Replacing 60W Incandescent	SFE	3
7.5 Watt LED Bulb	SFE	3
CFL >25W - Replacing 100W Incandescent	SFE	4
17 Watt LED Bulb	SFE	4
Hardwired CFL Fixtures	SFE	5
Hardwired LED Fixtures	SFE	5
SEER 14 Central AC unit	MFE	6
SEER 16 Central AC unit	MFE	6
SEER 14.5 Heat Pump	MFE	7
SEER 16 Heat Pump	MFE	7
Ground Source Heat Pump	MFE	7
CFL 13W-18W - Replacing 60W Incandescent	MFE	8
7.5 Watt LED Bulb	MFE	8
CFL >25W - Replacing 100W Incandescent	MFE	9
17 Watt LED Bulb	MFE	9
Hardwired CFL Fixtures	MFE	10
Hardwired LED Fixtures	MFE	10

Table F- 2. Commercial Measures Within Competition Groups

Commercial Efficiency Measures	Building Type	Efficiency Competition Group
Photocell Lighting Controls	Com	103
Time Clock Lighting Controls	Com	103
Convection Oven	Com	111
Flashbake Oven	Com	111
Combination Oven	Com	111
CFL <13W - Replacing 40W Incandescent	Com	222
7.5 Watt LED Bulb	Com	222
CFL 13W-18W - Replacing 60W Incandescent	Com	333
LED: 14 Watt Interior Lamp	Com	333
CFL 18W - Replacing 75W Incandescent	Com	444
LED: 17 Watt Interior Lamp	Com	444
CFL: 23W Screw-In Indoor	Com	555
LED: 20 Watt Interior Lamp	Com	555
CFL Fixture Under 15W	Com	777
LED Luminaire <15W Interior	Com	777
CFL Fixture 16 to 24W	Com	888
LED Luminaire: 16-24 Watt Interior	Com	888
Premium Efficiency Motor 1800 RPM ODP (HVAC Pump)	Com	900
Enhanced Efficiency Motor (HVAC Pump)	Com	900
Premium Efficiency Motor 1800 RPM ODP (Other Application)	Com	901
Enhanced Efficiency Motor (Other Application)	Com	901
Premium Efficiency Motor 1800 RPM ODP (Ventilation Fan)	Com	902
Enhanced Efficiency Motor (Ventilation Fan)	Com	902
CFL Fixture Over 24W	Com	999
LED Luminaire: >25 Watt Interior	Com	999

Table F- 3. Industrial Measures Within Competition Groups

Industrial Efficiency Measures	Building Type	Efficiency Competition Group
Pulse Start Metal Halide - Replacing Mercury Vapor	IND	1111
Pulse Start Metal Halide - Replacing High Pressure Sodium	IND	1111
CFL <13W - Replacing 40W Incandescent	IND	2222
7.5 Watt LED Bulb	IND	2222
CFL 13W-18W - Replacing 60W Incandescent	IND	3333
LED: 14 Watt Interior Lamp	IND	3333
CFL 18W - Replacing 75W Incandescent	IND	4444
LED: 17 Watt Interior Lamp	IND	4444
CFL: 23W Screw-In Indoor	IND	5555
LED: 20 Watt Interior Lamp	IND	5555
CFL Fixture Under 15W	IND	7777
LED Luminaire <15W Interior	IND	7777
CFL Fixture 16 to 24W	IND	8888
LED Luminaire: 16-24 Watt Interior	IND	8888
CFL Fixture Over 24W	IND	9999
LED Luminaire: >25 Watt Interior	IND	9999

Appendix G. Measures Using Diffusion Curve Decision Method

Table G- 1. Measures Using the Diffusion Curve Decision Method

Efficiency Measure	Building Type
7.5 Watt LED Bulb	SFE
17 Watt LED Bulb	SFE
Hardwired LED Fixtures	SFE
7.5 Watt LED Bulb	MFE
17 Watt LED Bulb	MFE
Hardwired LED Fixtures	MFE
7.5 Watt LED Bulb	Com
LED: 14 Watt Interior Lamp	Com
LED: 17 Watt Interior Lamp	Com
LED: 20 Watt Interior Lamp	Com
LED Luminaire <15W Interior	Com
LED Luminaire: 16-24 Watt Interior	Com
LED Luminaire: >25 Watt Interior	Com
LED: Recessed Fixtures	Com
Enhanced Efficiency Motor (HVAC Pump)	Com
Enhanced Efficiency Motor (Other Application)	Com
Enhanced Efficiency Motor (Ventilation Fan)	Com
LED Strip Fridge/Freezer Case Lighting 4-7W/Ln Ft	Com
7.5 Watt LED Bulb	IND
LED: 14 Watt Interior Lamp	IND
LED: 17 Watt Interior Lamp	IND
LED: 20 Watt Interior Lamp	IND
LED Luminaire <15W Interior	IND
LED Luminaire: 16-24 Watt Interior	IND
LED Luminaire: >25 Watt Interior	IND
LED: Recessed Fixtures	IND

SOUTHERN MINNESOTA MUNICIPAL POWER AGENCY

MINNESOTA ELECTRIC UTILITY ANNUAL REPORT

7610.0120 REGISTRATION

ENTITY ID#	190	Number of Power Plants	20
REPORT YEAR	2012		

UTILITY DETAILS	
UTILITY NAME	Southern Minnesota Municipal Power Agency
STREET ADDRESS	500 First Ave S.W.
CITY	Rochester
STATE	MN
ZIP CODE	55902
TELEPHONE	(507) 285-0478
	Scroll down to see allowable UTILITY TYPES
* UTILITY TYPE	Public

CONTACT INFORMATION	
CONTACT NAME	Patrick J. Egan
CONTACT TITLE	Engineering Technician
CONTACT STREET ADDRESS	500 First Avenue S.W.
CITY	Rochester
STATE	MN
ZIP CODE	55902
TELEPHONE	(507) 285-0478
CONTACT E-MAIL	pjegan@smmpa.org

UTILITY OFFICERS

NAME		TITLE
David P. Geschwind		Executive Director & CEO
Lawrence W. Johnston		Director of Corporate Development, Agency
		Officer of Legisative & Regulatory Affairs
Mark S. Mitchell		Director of Operations & Chief Operating Officer
John D. Winter		Director of Finance and Accounting
		and Chief Financial Officier
#N/A	#	#N/A

PREPARER INFORMATION	
PERSON PREPARING FORMS	Patrick J. Egan
PREPARER'S TITLE	Engineering Technician
DATE	6/18/2013

COMMENTS

ALLOWABLE UTILITY TYPES

Code

Private
Public
Co-op

MINNESOTA ELECTRIC UTILITY ANNUAL REPORT (Continued)

7610.0150 FEDERAL OR STATE DATA SUBSTITUTION

			FILING CYCLE (enter an "X" in the cell)		
FEDERAL AGENCY	FORM NUMBER	FORM TITLE	MONTHLY	YEARLY	OTHER
N/A					

COMMENTS

Not Appliciable

MINNESOTA ELECTRIC UTILITY ANNUAL REPORT (Continued)

7610.0600 OTHER INFORMATION REPORTED ANNUALLY

A utility shall provide the following information for the last calendar year:

B. LARGEST CUSTOMER LIST - ATTACHMENT ELEC-1

If applicable, the Largest Customer List must be submitted either in electronic or paper format. If information is Trade Secret, note it as such.

See "LargestCustomers" worksheet for data entry.

C. MINNESOTA SERVICE AREA MAP

The referenced map must be submitted either in electronic or paper format.

See Instructions for details of the information required on the Minnesota Service Area Map.

D. PURCHASES AND SALES FOR RESALE			RESALE ONLY
		MWH	MWH
UTILITY NAME	INTERCONNECTED UTILITY	PURCHASED	SOLD FOR RESALE
			14,633
Olmsted Waste			253,085
MISO			
OLM CO WASTE PLANT		14,633	
IBM		43	
AMEREN ENERGY MARKETING		286,400	
AMEREN UE		0	
CARGILL		362,400	
EDF TRADING		0	
GREAT RIVER ENERGY		118,400	
HUTCHINSON UTILITIES		15,990	
MANITOBA HYDRO		185,643	
MINNESOTA POWER		31,200	
MINNKOTA POWER		353,600	
MORGAN STANLEY CAPITAL GROUP		33,600	
NEXTERA		685,600	
NSP		0	
REDWOOD FALLS - REC		0	
RPU		0	
THE ENERGY AUTHORITY/MISO		102,400	
WAPSI		321,095	
WeENGERGIES		0	
MISO		542,852	
Total MWH		3,053,856	267,718

MINNESOTA ELECTRIC UTILITY ANNUAL REPORT (Continued)

7610.0600 OTHER INFORMATION REPORTED ANNUALLY (continued)

A utility shall provide the following information for the last calendar year:

E. RATE SCHEDULES	**The rate schedule and monthly power cost adjustment information must be submitted in electronic or paper format.**

See Instructions for details of the information required on the Rate Schedules and Monthly Power Cost Adjustments.

F. REPORT FORM EIA-861	**A copy of report form EIA-861 filed with the US Dept. of Energy must be submitted in electronic or paper format.**

A copy of the report form EIA-861 filed with the Energy Information Administration of the US Dept. of Energy must be submitted.

G. FINANCIAL AND STATISTICAL REPORT	**If applicable, a copy of the Financial and Statistical Report filed with the US Dept. of Agriculture must be submitted in electronic or paper format.**

For rural electric cooperatives, a copy of the Financial and Statistical Report to the US Dept of Agriculture must be submitted.

H. GENERATION DATA

If the utility has Minnesota power plants, enter the fuel requirements and generation data on the Plant1, Plant2, etc. worksheets.

I. ELECTRIC USE BY MINNESOTA RESIDENTIAL SPACE HEATING USERS

See Instructions for details of the information required for residential space heating users.

COL. 1 NO. OF RESIDENTIAL ELECTRICAL SPACE HEATING CUSTOMERS	COL. 2 NO. OF RESIDENTIAL UNITS SERVED WITH ELECTRICAL SPACE HEATING	COL. 3 TOTAL MWH USED BY THESE CUSTOMERS AND UNITS
N/A	N/A	N/A

Comments

MINNESOTA ELECTRIC UTILITY ANNUAL REPORT (Continued)

7610.0600 OTHER INFORMATION REPORTED ANNUALLY (continued)

J. ITS DELIVERIES TO ULTIMATE CONSUMERS BY COUNTY FOR THE LAST CALENDAR YEAR

ENERGY DELIVERED TO ULTIMATE CONSUMERS BY COUNTY

COUNTY CODE	COUNTY NAME	MWH DELIVERED	COUNTY CODE	COUNTY NAME	MWH DELIVERED
1	Aitkin		46	Martin	156017
2	Anoka		47	Meeker	48014
3	Becker		48	Mille Lacs	53708
4	Beltrami		49	Morrison	
5	Benton		50	Mower	349242
6	Big Stone		51	Murray	
7	Blue Earth		52	Nicollet	97283
8	Brown		53	Nobles	
9	Carlton		54	Norman	
10	Carver		55	Olmstead	1258185
11	Cass		56	Otter Tail	
12	Chippewa		57	Pennington	
13	Chisago	27943	58	Pine	
14	Clay		59	Pipestone	
15	Clearwater		60	Polk	
16	Cook	23348	61	Pope	
17	Cottonwood		62	Ramsey	
18	Crow Wing		63	Red Lake	
19	Dakota		64	Redwood	27823
20	Dodge		65	Renville	
21	Douglas		66	Rice	
22	Faribault	19055	67	Rock	
23	Fillmore	34965	68	Roseau	
24	Freeborn		69	St. Louis	
25	Goodhue		70	Scott	
26	Grant		71	Sherburne	
27	Hennepin		72	Sibley	
28	Houston		73	Stearns	
29	Hubbard		74	Steele	383891
30	Isanti		75	Stevens	
31	Itasca		76	Swift	
32	Jackson		77	Todd	
33	Kanabec	58244	78	Traverse	
34	Kandiyohi		79	Wabasha	151461
35	Kittson		80	Wadena	
36	Koochiching		81	Waseca	65039
37	Lac Qui Parle		82	Washington	
38	Lake		83	Watonwan	
39	Lake of the Woods		84	Wilkin	
40	Le Sueur	67888	85	Winona	
41	Lincoln		86	Wright	
42	Lyon		87	Yellow Medicine	
43	McLeod				
44	Mahnomen			GRAND TOTAL (Entered)	2822105
45	Marshall				
				GRAND TOTAL (Calculated)	2822105

<= (Should e
column total o

COMMENTS

MINNESOTA ELECTRIC UTILITY ANNUAL REPORT (Continued)

7610.0600 OTHER INFORMATION REPORTED ANNUALLY (continued)

J. ITS DELIVERIES TO ULTIMATE CONSUMERS BY MONTH FOR THE LAST CALENDAR YEAR

See Instructions for details of the information required concerning electricity delivered to ultimate consumers.

Past Year Entire System		A Non-Farm Residential	B Residential With Space Heat	C Farm	D Small Commercial & Industrial	E Irrigation	F Large Commercial & Industrial	G Street & Highway Lighting	H Other (Include Municipals)	I Total (Columns A through H)
January	No. of Customers	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0
	MWH	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0
February	No. of Customers									0
	MWH									0
March	No. of Customers									0
	MWH									0
April	No. of Customers									0
	MWH									0
May	No. of Customers									0
	MWH									0
June	No. of Customers									0
	MWH									0
July	No. of Customers									0
	MWH									0
August	No. of Customers									0
	MWH									0
September	No. of Customers									0
	MWH									0
October	No. of Customers									0
	MWH									0
November	No. of Customers									0
	MWH									0
December	No. of Customers									0
	MWH									0
	Total MWH	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	0

Comments

Exclude station use, distribution losses, and unaccounted for energy losses from this table altogether.

Classification of Energy Delivered to Ultimate Consumers (include energy used during the year for irrigation and drainage pumping)	In this column report the number of farms, residences, commercial establishments, etc., and not the number of meters, where different. Number of Customers at End of Year	This column total should equal the grand total in the worksheet labeled "ElectricityByCounty" which provides deliveries by county. Megawatt-hours (round to nearest MWH)	This column total will be used for the Alternative Energy Assessment and should not include revenues from sales for resale (MN Statutes Sec. 216B.62, Subd. 5). Revenue ($)
Farm			
Nonfarm-residential	98,531	764,183	65,399,985
Commercial	12,028	1,044,194	74,985,790
Industrial	444	960,531	55,537,769
Street and highway lighting			
All other	3,704	53,197	3,829,398
Entered Total			
CALCULATED TOTAL	114,707	2,822,105	199,752,942

Comments

Street, Hwy Lighting and Farm is combined with the All Other catergory

MINNESOTA ELECTRIC UTILITY ANNUAL REPORT

7610.0600 OTHER INFORMATION REPORTED ANNUALLY

PLEASE PROVIDE THE FOLLOWING INFORMATION FOR THOSE CUSTOMERS USING IN EXCESS OF 10,000 MWH. BE SURE TO INCLUDE YOUR LARGE CUSTOMERS LOCATED IN AND OUTSIDE MINNESOTA.

B. LARGEST CUSTOMER LIST - ATTACHMENT ELEC-1

[TRADE SECRET DATA BEGINS

ID#	CUSTOMER NAME	ADDRESS	CITY	STATE	ZIP	MWH
N/A	AUSTIN UTILITIES	400 Fourth St NE	AUSTIN	MN	55912	349,242
N/A	BLOOMING PRAIRIE PU	146 3rd Ave SE	BLOOMING PRAIRIE	MN	55917	25,773
N/A	FAIRMONT UTILITIES COM	100 Downtown Plaza	FAIRMONT	MN	56031	156,017
N/A	GRAND MARAIS PUC	15 Nth Broadway	GRAND MARAIS	MN	55604	23,348
N/A	LAKE CITY UTILITIES	205 W Center St	LAKE CITY	MN	55041	151,461
N/A	LITCHFIELD PU	421 3rd St	LITCHFIELD	MN	55355	48,014
N/A	MORA UTILITIES	117 SE Railroad Ave	MORA	MN	55051	58,244
N/A	NEW PRAGUE PUC	118 Central Ave N	NEW PRAGUE	MN	56071	67,888
N/A	NORTH BRANCH MUN WATER & LIGHT	6388 Maple St	NORTH BRANCH	MN	55056	27,943
N/A	OWATONNA PU	208 South Walnut Ave	OWATONNA	MN	55060	358,118
N/A	PRESTON PU	210 Fillmore St W	PRESTON	MN	55965	14,685
N/A	PRINCETON PUC	907 First St	PRINCETON	MN	55371	53,708
N/A	REDWOOD FALLS PU	333 South Washington St	REDWOOD FALLS	MN	56283	27,823
N/A	ROCHESTER PU	4000 East River Rd NE	ROCHESTER	MN	55906	1,258,185
N/A	SPRING VALLEY PU	104 South Section Ave	SPRING VALLEY	MN	55975	20,280
N/A	ST. PETER UTIL	405 West Julien St	ST. PETER	MN	56082	97,283
N/A	WASECA UTIL	508 South State St	WASECA	MN	56093	65,039
N/A	WELLS PU	101 First St SE	WELLS	MN	56097	19,055

TRADE SECRET DATA ENDS]

COMMENTS

MINNESOTA ELECTRIC UTILITY ANNUAL REPORT (Continued)

7610.0430 FUEL REQUIREMENTS AND GENERATION BY FUEL TYPE

POWER PLANT AND GENERATING UNIT DATA REPORT 2012

INSTRUCTIONS: Complete one worksheet for each power plant
Scroll down below the data entry tables to see the ALLOWABLE CODES to be used for Unit Status, Unit Type, Energy Source, Fuel Type, and Unit of Measure fields
Scroll down below the ALLOWABLE CODES to see DEFINITIONS for Capacity Factor, Operating Factor and Forced Outage Rate.

A. PLANT DATA

PLANT NAME	Austin DT	PLANT ID	190001
STREET ADDRESS	500 NE 4 Ave.		
CITY	Austin		
STATE	MN	NUMBER OF UNITS	4
ZIP CODE	55912		
COUNTY	Mower		
CONTACT PERSON			
TELEPHONE			

B. INDIVIDUAL GENERATING UNIT DATA

Unit ID #	Unit Status *	Unit Type **	Year Installed	Energy Source ***	Net Generation (mwh)	Comments
2	RET	ST	1940	DIESEL/NG		
3	RET	ST	1946	DIESEL/NG		
4	RET	ST	1954	DIESEL/NG		
5	STB	CT	1960	DIESEL/NG		
				PLANT TOTAL	0.0	

C. UNIT CAPABILITY DATA

CAPACITY (MEGAWATTS)

Unit ID #	Summer	Winter	Capacity Factor (%)	Operating Factor (%)	Forced Outage Rate (%)	Comments
2	.0	.0				
3	.0	.0				
4	.0	.0				
5	5.1	5.1				
PLANT TOTAL	5.1	5.1				

D. UNIT FUEL USED

	PRIMARY FUEL USE				SECONDARY FUEL USE			
Unit ID #	Fuel Type ***	Quantity	Unit of Measure ****	BTU Content (for coal only)	Fuel Type	Quantity	Unit of Measure ****	BTU Content (for coal only)
2	NG		MCF		NG			
3	NG		MCF		NG			
4	NG		MCF		NG			
5	NG		MCF		NG			
		0						
		0	MCF					

MINNESOTA ELECTRIC UTILITY ANNUAL REPORT (Continued)

7610.0430 FUEL REQUIREMENTS AND GENERATION BY FUEL TYPE

POWER PLANT AND GENERATING UNIT DATA REPORT 2012

INSTRUCTIONS: Complete one worksheet for each power plant
Scroll down below the data entry tables to see the ALLOWABLE CODES to be used for Unit Status, Unit Type, Energy Source, Fuel Type, and Unit of Measure fields
Scroll down below the ALLOWABLE CODES to see DEFINITIONS for Capacity Factor, Operating Factor and Forced Outage Rate.

A. PLANT DATA

PLANT NAME	SW Sub Zeigler Temps	PLANT ID	190022
STREET ADDRESS	SW SUB		
CITY	Austin		
STATE	MN	NUMBER OF UNITS	0
ZIP CODE	55912		
COUNTY	Mower		
CONTACT PERSON			
TELEPHONE			

B. INDIVIDUAL GENERATING UNIT DATA

Unit ID #	Unit Status *	Unit Type **	Year Installed	Energy Source ***	Net Generation (mwh)	Comments
1	RET	IC	2001	FO2		
2	RET	IC	2001	FO2		
3	RET	IC	2001	FO2		
4	RET	IC	2001	FO2		
5	RET	IC	2001	FO2		
				PLANT TOTAL	0.0	

C. UNIT CAPABILITY DATA

Unit ID #	CAPACITY (MEGAWATTS) Summer	Winter	Capacity Factor (%)	Operating Factor (%)	Forced Outage Rate (%)	Comments
1	.0					
2	.0					
3	.0					
4	.0					
5	.0					
PLANT TOTAL	.0	.0				

D. UNIT FUEL USED

Unit ID #	PRIMARY FUEL USE Fuel Type ***	Quantity	Unit of Measure ****	BTU Content (for coal only)	SECONDARY FUEL USE Fuel Type	Quantity	Unit of Measure ****	BTU Content (for coal only)
1	NG		MCF		FO2		BARREL	
2	NG		MCF		FO2		BARREL	
3	NG		MCF		FO2		BARREL	
4	NG		MCF		FO2		BARREL	
5	NG		MCF		FO2		BARREL	

MINNESOTA ELECTRIC UTILITY ANNUAL REPORT (Continued)

7610.0430 FUEL REQUIREMENTS AND GENERATION BY FUEL TYPE

POWER PLANT AND GENERATING UNIT DATA REPORT 2012

INSTRUCTIONS: Complete one worksheet for each power plant
Scroll down below the data entry tables to see the ALLOWABLE CODES to be used for Unit Status, Unit Type, Energy Source, Fuel Type, and Unit of Measure fields
Scroll down below the ALLOWABLE CODES to see DEFINITIONS for Capacity Factor, Operating Factor and Forced Outage Rate.

A. PLANT DATA

PLANT NAME	Austin NE	PLANT ID	190002
STREET ADDRESS	500 NE 4 Ave		
CITY	Austin		
STATE	MN	NUMBER OF UNITS	1
ZIP CODE	55912		
COUNTY	Mower		
CONTACT PERSON			
TELEPHONE			

B. INDIVIDUAL GENERATING UNIT DATA

Unit ID #	Unit Status *	Unit Type **	Year Installed	Energy Source ***	Net Generation (mwh)	Comments
1	USE	ST	1971	NG/Coal	0	
				PLANT TOTAL	0	

C. UNIT CAPABILITY DATA

CAPACITY (MEGAWATTS)

Unit ID #	Summer	Winter	Capacity Factor (%)	Operating Factor (%)	Forced Outage Rate (%)	Comments
1	0.00	0.00				
PLANT TOTAL	0.00	0.00				

D. UNIT FUEL USED

	PRIMARY FUEL USE				SECONDARY FUEL USE			
Unit ID #	Fuel Type ***	Quantity	Unit of Measure ****	BTU Content (for coal only)	Fuel Type	Quantity	Unit of Measure ****	BTU Content (for coal only)
1	NG		MCF		COAL		TONS	

MINNESOTA ELECTRIC UTILITY ANNUAL REPORT (Continued)

7610.0430 FUEL REQUIREMENTS AND GENERATION BY FUEL TYPE

POWER PLANT AND GENERATING UNIT DATA REPORT 2012

INSTRUCTIONS: Complete one worksheet for each power plant
Scroll down below the data entry tables to see the ALLOWABLE CODES to be used for Unit Status, Unit Type, Energy Source, Fuel Type, and Unit of Measure fields
Scroll down below the ALLOWABLE CODES to see DEFINITIONS for Capacity Factor, Operating Factor and Forced Outage Rate.

A. PLANT DATA

PLANT NAME	Blooming Prairie	PLANT ID	190003
STREET ADDRESS	146 SE 3 Ave		
CITY	Blooming Prairie		
STATE	MN	NUMBER OF UNITS	3
ZIP CODE	55917		
COUNTY	Steele		
CONTACT PERSON			
TELEPHONE			

B. INDIVIDUAL GENERATING UNIT DATA

Unit ID #	Unit Status *	Unit Type **	Year Installed	Energy Source ***	Net Generation (mwh)	Comments
1	RET	IC	1957	FO2/NG		
2	USE	IC	1975	FO2/NG		
3	RET	IC	1975	FO2/NG		
5	USE	IC	2003	FO2/NG		
6	USE	IC	2009	FO2		
7	USE	IC	2012	FO2/NG		
					315	
				PLANT TOTAL	315.0	

C. UNIT CAPABILITY DATA

CAPACITY (MEGAWATTS)

Unit ID #	Summer	Winter	Capacity Factor (%)	Operating Factor (%)	Forced Outage Rate (%)	Comments
1	.0	.0				
2						
5						
6						
7						
	5.2	5.2				
PLANT TOTAL	5.2	5.2				

D. UNIT FUEL USED

	PRIMARY FUEL USE				SECONDARY FUEL USE			
Unit ID #	Fuel Type ***	Quantity	Unit of Measure ****	BTU Content (for coal only)	Fuel Type	Quantity	Unit of Measure ****	BTU Content (for coal only)
1	FO2		BARREL					
2	FO2		BARREL					
5	FO2		BARREL					
6	FO2		BARREL					
		537	BARREL					
		537	BARREL					

MINNESOTA ELECTRIC UTILITY ANNUAL REPORT (Continued)

7610.0430 FUEL REQUIREMENTS AND GENERATION BY FUEL TYPE

POWER PLANT AND GENERATING UNIT DATA REPORT 2012

INSTRUCTIONS: Complete one worksheet for each power plant
Scroll down below the data entry tables to see the ALLOWABLE CODES to be used for Unit Status, Unit Type, Energy Source, Fuel Type, and Unit of Measure fields
Scroll down below the ALLOWABLE CODES to see DEFINITIONS for Capacity Factor, Operating Factor and Forced Outage Rate.

A. PLANT DATA

PLANT NAME	Fairmont	PLANT ID	190006
STREET ADDRESS	Lincoln Street Plant		
CITY	Fairmont		
STATE	MN	NUMBER OF UNITS	5
ZIP CODE			
COUNTY	Martin		
CONTACT PERSON			
TELEPHONE			

B. INDIVIDUAL GENERATING UNIT DATA

Unit ID #	Unit Status *	Unit Type **	Year Installed	Energy Source ***	Net Generation (mwh)	Comments
3	RET	ST	1945	NG		
4	RET	ST	1946	NG		
5	RET	ST	1958	NG		
6	USE	IC	1975	NG/FO2		
7	USE	IC	1975	NG/FO2		
				PLANT TOTAL	0	

C. UNIT CAPABILITY DATA

Unit ID #	CAPACITY (MEGAWATTS) Summer	Winter	Capacity Factor (%)	Operating Factor (%)	Forced Outage Rate (%)	Comments
3						
4						
5						
6						
7						
	12.7	12.7				
PLANT TOTAL	12.7	12.7				

D. UNIT FUEL USED

Unit ID #	PRIMARY FUEL USE Fuel Type ***	Quantity	Unit of Measure ****	BTU Content (for coal only)	SECONDARY FUEL USE Fuel Type	Quantity	Unit of Measure ****	BTU Content (for coal only)
3	NG		MCF		Coal		Tons	
4	NG		MCF		Coal		Tons	
5	NG		MCF		Coal		Tons	
6	NG		MCF		FO2	0	BARRELS	
7	NG		MCF		FO2	0	BARRELS	
						0	BARRELS	

MINNESOTA ELECTRIC UTILITY ANNUAL REPORT (Continued)

7610.0430 FUEL REQUIREMENTS AND GENERATION BY FUEL TYPE

POWER PLANT AND GENERATING UNIT DATA REPORT 2012

INSTRUCTIONS: Complete one worksheet for each power plant
Scroll down below the data entry tables to see the ALLOWABLE CODES to be used for Unit Status, Unit Type, Energy Source, Fuel Type, and Unit of Measure fields
Scroll down below the ALLOWABLE CODES to see DEFINITIONS for Capacity Factor, Operating Factor and Forced Outage Rate.

A. PLANT DATA

PLANT NAME	Fairmont Wind Farm	PLANT ID	190023
STREET ADDRESS	HWY 15 South		
CITY	Fairmont		
STATE	MN	NUMBER OF UNITS	4
ZIP CODE			
COUNTY	Martin		
CONTACT PERSON			
TELEPHONE			

B. INDIVIDUAL GENERATING UNIT DATA

Unit ID #	Unit Status *	Unit Type **	Year Installed	Energy Source ***	Net Generation (mwh)	Comments
1	USE	WI	2003	WIND		
2	USE	WI	2003	WIND		
3	USE	WI	2004	WIND		
4	USE	WI	2005	WIND		
					15869.0	
				PLANT TOTAL	15,869	

C. UNIT CAPABILITY DATA

CAPACITY (MEGAWATTS)

Unit ID #	Summer	Winter	Capacity Factor (%)	Operating Factor (%)	Forced Outage Rate (%)	Comments
1						
2						
3						
4						
	0.4	0.4				
PLANT TOTAL	0.4	0.4				

D. UNIT FUEL USED

	PRIMARY FUEL USE				SECONDARY FUEL USE			
Unit ID #	Fuel Type ***	Quantity	Unit of Measure ****	BTU Content (for coal only)	Fuel Type	Quantity	Unit of Measure ****	BTU Content (for coal only)
1	WI							
2	WI							
3	WI							
4	WI							

MINNESOTA ELECTRIC UTILITY ANNUAL REPORT (Continued)

7610.0430 FUEL REQUIREMENTS AND GENERATION BY FUEL TYPE

POWER PLANT AND GENERATING UNIT DATA REPORT 2012

INSTRUCTIONS: Complete one worksheet for each power plant
Scroll down below the data entry tables to see the ALLOWABLE CODES to be used for Unit Status, Unit Type, Energy Source, Fuel Type, and Unit of Measure fields
Scroll down below the ALLOWABLE CODES to see DEFINITIONS for Capacity Factor, Operating Factor and Forced Outage Rate.

A. PLANT DATA

PLANT NAME	Grand Marais	PLANT ID	190005
STREET ADDRESS	Box 600		
CITY	Grand Marais		
STATE	MN	NUMBER OF UNITS	3
ZIP CODE	55604		
COUNTY	Cook		
CONTACT PERSON			
TELEPHONE			

B. INDIVIDUAL GENERATING UNIT DATA

Unit ID #	Unit Status *	Unit Type **	Year Installed	Energy Source ***	Net Generation (mwh)	Comments
1	USE	IC	2003	FO2		
2	USE	IC	2003	FO2		
3	USE	IC	2003	FO2		
					312.0	
				PLANT TOTAL	312.0	

C. UNIT CAPABILITY DATA

Unit ID #	CAPACITY (MEGAWATTS) Summer	Winter	Capacity Factor (%)	Operating Factor (%)	Forced Outage Rate (%)	Comments
1						
2						
3						
	6	6				
PLANT TOTAL	6.0	6.0				

D. UNIT FUEL USED

Unit ID #	PRIMARY FUEL USE Fuel Type ***	Quantity	Unit of Measure ****	BTU Content (for coal only)	SECONDARY FUEL USE Fuel Type	Quantity	Unit of Measure ****	BTU Content (for coal only)
1	FO2		BRLS					
2	FO2		BRLS					
3	FO2		BRLS					
		546						
		546	BRLS					

MINNESOTA ELECTRIC UTILITY ANNUAL REPORT (Continued)

7610.0430 FUEL REQUIREMENTS AND GENERATION BY FUEL TYPE

POWER PLANT AND GENERATING UNIT DATA REPORT 2012

INSTRUCTIONS: Complete one worksheet for each power plant
Scroll down below the data entry tables to see the ALLOWABLE CODES to be used for Unit Status, Unit Type, Energy Source, Fuel Type, and Unit of Measure fields
Scroll down below the ALLOWABLE CODES to see DEFINITIONS for Capacity Factor, Operating Factor and Forced Outage Rate.

A. PLANT DATA

PLANT NAME	Wells	PLANT ID	190020
STREET ADDRESS	101 SE 1 St		
CITY	Wells		
STATE	MN	NUMBER OF UNITS	5
ZIP CODE	56097		
COUNTY	Fairbault		
CONTACT PERSON			
TELEPHONE			

B. INDIVIDUAL GENERATING UNIT DATA

Unit ID #	Unit Status *	Unit Type **	Year Installed	Energy Source ***	Net Generation (mwh)	Comments
1	USE	IC	1953	NG/FO2		
2	USE	IC	1957	NG/FO2		
3	USE	IC	1950	NG/FO2		
4	USE	IC	1966	NG/FO2		
5	USE	IC	1975	NG/FO2		
					806	
				PLANT TOTAL	806.0	

C. UNIT CAPABILITY DATA

CAPACITY (MEGAWATTS)

Unit ID #	Summer	Winter	Capacity Factor (%)	Operating Factor (%)	Forced Outage Rate (%)	Comments
1						
2						
3						
4						
5						
	8.5	8.5				
PLANT TOTAL	8.5	8.5				

D. UNIT FUEL USED

Unit ID #	PRIMARY FUEL USE Fuel Type ***	Quantity	Unit of Measure ****	BTU Content (for coal only)	SECONDARY FUEL USE Fuel Type	Quantity	Unit of Measure ****	BTU Content (for coal only)
1	NG		MCF		FO2		BARRELS	
2	NG		MCF		FO2		BARRELS	
3	NG		MCF		FO2		BARRELS	
4	NG		MCF		FO2		BARRELS	
5	NG		MCF		FO2		BARRELS	
		6980				185		
		6980	MCF			185	BARRELS	

MINNESOTA ELECTRIC UTILITY ANNUAL REPORT (Continued)

7610.0430 FUEL REQUIREMENTS AND GENERATION BY FUEL TYPE

POWER PLANT AND GENERATING UNIT DATA REPORT 2012

INSTRUCTIONS: Complete one worksheet for each power plant
Scroll down below the data entry tables to see the ALLOWABLE CODES to be used for Unit Status, Unit Type, Energy Source, Fuel Type, and Unit of Measure fields
Scroll down below the ALLOWABLE CODES to see DEFINITIONS for Capacity Factor, Operating Factor and Forced Outage Rate.

A. PLANT DATA

PLANT NAME	Litchfield Main Plant	PLANT ID	190007
STREET ADDRESS	421 W 3 St.		
CITY	Litchfield		
STATE	MN	NUMBER OF UNITS	2
ZIP CODE	55355		
COUNTY	Meeker		
CONTACT PERSON			
TELEPHONE			

B. INDIVIDUAL GENERATING UNIT DATA

Unit ID #	Unit Status *	Unit Type **	Year Installed	Energy Source ***	Net Generation (mwh)	Comments
5	USE	IC	1963	NG/DIESEL		
6	USE	IC	1963	NG/DIESEL	260.0	
1	USE	IC	2009	Diesel		
2	USE	IC	2009	Diesel		
3	USE	IC	2009	Diesel		
4	USE	IC	2009	Diesel		
7	USE	IC	2009	Diesel	561	
				PLANT TOTAL	821.0	

C. UNIT CAPABILITY DATA

Unit ID #	CAPACITY (MEGAWATTS) Summer	Winter	Capacity Factor (%)	Operating Factor (%)	Forced Outage Rate (%)	Comments
5						
6						
	4.1	4.1				
1						
2						
3						
4						
7						
	9.2	9.2				
PLANT TOTAL	13.3	13.3				

D. UNIT FUEL USED

	PRIMARY FUEL USE				SECONDARY FUEL USE			
Unit ID #	Fuel Type ***	Quantity	Unit of Measure ****	BTU Content (for coal only)	Fuel Type	Quantity	Unit of Measure ****	BTU Content (for coal only)
5	NG		MCF		FO2		BARRELS	
6	NG	2585	MCF		FO2		BARRELS	
1					FO2		BARRELS	
2					FO2		BARRELS	
3					FO2		BARRELS	
4					FO2		BARRELS	
7					FO2		BARRELS	
						996		
		2585	MCF			996	BARRELS	

MINNESOTA ELECTRIC UTILITY ANNUAL REPORT (Continued)

7610.0430 FUEL REQUIREMENTS AND GENERATION BY FUEL TYPE

POWER PLANT AND GENERATING UNIT DATA REPORT 2012

INSTRUCTIONS: Complete one worksheet for each power plant
Scroll down below the data entry tables to see the ALLOWABLE CODES to be used for Unit Status, Unit Type, Energy Source, Fuel Type, and Unit of Measure fields
Scroll down below the ALLOWABLE CODES to see DEFINITIONS for Capacity Factor, Operating Factor and Forced Outage Rate.

A. PLANT DATA

PLANT NAME	Mora	PLANT ID	190008
STREET ADDRESS	16 N. Lake St.		
CITY	Mora		
STATE	MN	NUMBER OF UNITS	3
ZIP CODE	55051		
COUNTY	Kanebec		
CONTACT PERSON			
TELEPHONE			

B. INDIVIDUAL GENERATING UNIT DATA

Unit ID #	Unit Status *	Unit Type **	Year Installed	Energy Source ***	Net Generation (mwh)	Comments
2	USE	IC	1960	NG/FO2		
5	USE	IC	1972	NG/FO2		
6	USE	IC	1975	NG/FO2		
					1031	
				PLANT TOTAL	1031.0	

C. UNIT CAPABILITY DATA

Unit ID #	Summer	Winter	Capacity Factor (%)	Operating Factor (%)	Forced Outage Rate (%)	Comments
	CAPACITY (MEGAWATTS)					
2						
5						
6						
	13.8	13.8				
PLANT TOTAL	13.8	13.8				

D. UNIT FUEL USED

Unit ID #	PRIMARY FUEL USE: Fuel Type ***	Quantity	Unit of Measure ****	BTU Content (for coal only)	SECONDARY FUEL USE: Fuel Type	Quantity	Unit of Measure ****	BTU Content (for coal only)
2	FO2		BRLS		N/G		MCF	
5	FO2		BRLS		N/G		MCF	
6	FO2				N/G		MCF	
		1030				4486		
		1030	BRLS			4486	MCF	

MINNESOTA ELECTRIC UTILITY ANNUAL REPORT (Continued)

7610.0430 FUEL REQUIREMENTS AND GENERATION BY FUEL TYPE

POWER PLANT AND GENERATING UNIT DATA REPORT 2012

INSTRUCTIONS: Complete one worksheet for each power plant
Scroll down below the data entry tables to see the ALLOWABLE CODES to be used for Unit Status, Unit Type, Energy Source, Fuel Type, and Unit of Measure fields
Scroll down below the ALLOWABLE CODES to see DEFINITIONS for Capacity Factor, Operating Factor and Forced Outage Rate.

A. PLANT DATA

PLANT NAME	New Prague	PLANT ID	190009
STREET ADDRESS	300 E. Main St		
CITY	New Prague		
STATE	MN	NUMBER OF UNITS	5
ZIP CODE	56071		
COUNTY	LeSueur		
CONTACT PERSON			
TELEPHONE			

B. INDIVIDUAL GENERATING UNIT DATA

Unit ID #	Unit Status *	Unit Type **	Year Installed	Energy Source ***	Net Generation (mwh)	Comments
1	USE	IC	1948	NG/FO2		
2	USE	IC	1975	NG/FO2		
3	USE	IC	1963	NG/FO2		
4	USE	IC	1967	NG/FO2		
6	USE	IC	1981	NG/FO2		
					3160	
				PLANT TOTAL	3160.0	

C. UNIT CAPABILITY DATA

CAPACITY (MEGAWATTS)

Unit ID #	Summer	Winter	Capacity Factor (%)	Operating Factor (%)	Forced Outage Rate (%)	Comments
1						
2						
3						
4						
6						
	16.4	16.4				
PLANT TOTAL	16.4	16.4				

D. UNIT FUEL USED

	PRIMARY FUEL USE				SECONDARY FUEL USE			
Unit ID #	Fuel Type ***	Quantity	Unit of Measure ****	BTU Content (for coal only)	Fuel Type	Quantity	Unit of Measure ****	BTU Content (for coal only)
2	N/G		MCF		FO2		BARRELS	
3	N/G		MCF		FO2		BARRELS	
4	N/G		MCF		FO2		BARRELS	
6	N/G		MCF		FO2		BARRELS	
		2774				386		
		2774	MCF			386	BARRELS	

MINNESOTA ELECTRIC UTILITY ANNUAL REPORT (Continued)

7610.0430 FUEL REQUIREMENTS AND GENERATION BY FUEL TYPE

POWER PLANT AND GENERATING UNIT DATA REPORT 2012

INSTRUCTIONS: Complete one worksheet for each power plant
Scroll down below the data entry tables to see the ALLOWABLE CODES to be used for Unit Status, Unit Type, Energy Source, Fuel Type, and Unit of Measure fields
Scroll down below the ALLOWABLE CODES to see DEFINITIONS for Capacity Factor, Operating Factor and Forced Outage Rate.

A. PLANT DATA

PLANT NAME	North Branch	PLANT ID	190010
STREET ADDRESS	712 Maple St.		
CITY	North Branch		
STATE	MN	NUMBER OF UNITS	4
ZIP CODE			
COUNTY	Chisago		
CONTACT PERSON			
TELEPHONE			

B. INDIVIDUAL GENERATING UNIT DATA

Unit ID #	Unit Status *	Unit Type **	Year Installed	Energy Source ***	Net Generation (mwh)	Comments
1	RET	IC	1960	NG/FO2		
2	RET	IC	1970	NG/FO2		
3	USE	IC	2003	NG/FO2		
4	USE	IC	2003	NG/FO2		
5	USE	IC	2011	NG/FO2		
6	USE	IC	2011	NG/FO2		
7	USE	IC	2011	NG/FO2		
					396	
				PLANT TOTAL	396.0	

C. UNIT CAPABILITY DATA

Unit ID #	CAPACITY (MEGAWATTS) Summer	Winter	Capacity Factor (%)	Operating Factor (%)	Forced Outage Rate (%)	Comments
1						
2						
3						
4						
5						
6						
7						
	10	10				
PLANT TOTAL	10.0	10.0				

D. UNIT FUEL USED

Unit ID #	PRIMARY FUEL USE Fuel Type ***	Quantity	Unit of Measure ****	BTU Content (for coal only)	SECONDARY FUEL USE Fuel Type	Quantity	Unit of Measure ****	BTU Content (for coal only)
1	FO2		BRLS		N/G		MCF	
2	FO2		BRLS		N/G		MCF	
3	FO2		BRLS					
4	FO2		BRLS					
5	FO2		BRLS					
6	FO2		BRLS					
7	FO2		BRLS					
		722						
		722	BRLS					

MINNESOTA ELECTRIC UTILITY ANNUAL REPORT (Continued)

7610.0430 FUEL REQUIREMENTS AND GENERATION BY FUEL TYPE

POWER PLANT AND GENERATING UNIT DATA REPORT 2012

INSTRUCTIONS: Complete one worksheet for each power plant
Scroll down below the data entry tables to see the ALLOWABLE CODES to be used for Unit Status, Unit Type, Energy Source, Fuel Type, and Unit of Measure fields
Scroll down below the ALLOWABLE CODES to see DEFINITIONS for Capacity Factor, Operating Factor and Forced Outage Rate.

A. PLANT DATA

PLANT NAME	Owatonna	PLANT ID	190011
STREET ADDRESS	208 Walnut Ave.		
CITY	Owatonna		
STATE	MN	NUMBER OF UNITS	2
ZIP CODE	55060		
COUNTY	Steele		
CONTACT PERSON			
TELEPHONE			

B. INDIVIDUAL GENERATING UNIT DATA

Unit ID #	Unit Status *	Unit Type **	Year Installed	Energy Source ***	Net Generation (mwh)	Comments
5	RET	ST	1957	NG		
6	STB	ST	1969	NG		
7	USE	CT	1982	NG	953	
				PLANT TOTAL	953	

C. UNIT CAPABILITY DATA

CAPACITY (MEGAWATTS)

Unit ID #	Summer	Winter	Capacity Factor (%)	Operating Factor (%)	Forced Outage Rate (%)	Comments
5						
6	0	0				
7	15.4	15.4				
PLANT TOTAL	15.4	15.4				

D. UNIT FUEL USED

	PRIMARY FUEL USE				SECONDARY FUEL USE			
Unit ID #	Fuel Type ***	Quantity	Unit of Measure ****	BTU Content (for coal only)	Fuel Type	Quantity	Unit of Measure ****	BTU Content (for coal only)
5	NG		MCF					
6	NG		MCF					
7	NG	9,482	MCF					
			MCF					
		9,482	MCF					

MINNESOTA ELECTRIC UTILITY ANNUAL REPORT (Continued)

7610.0430 FUEL REQUIREMENTS AND GENERATION BY FUEL TYPE

POWER PLANT AND GENERATING UNIT DATA REPORT 2012

INSTRUCTIONS: Complete one worksheet for each power plant
Scroll down below the data entry tables to see the ALLOWABLE CODES to be used for Unit Status, Unit Type, Energy Source, Fuel Type, and Unit of Measure fields
Scroll down below the ALLOWABLE CODES to see DEFINITIONS for Capacity Factor, Operating Factor and Forced Outage Rate.

A. PLANT DATA

PLANT NAME	Princeton	PLANT ID	190013
STREET ADDRESS	Box 218		
CITY	Princeton		
STATE	MN	NUMBER OF UNITS	5
ZIP CODE	55371		
COUNTY	Mille Lacs		
CONTACT PERSON			
TELEPHONE			

B. INDIVIDUAL GENERATING UNIT DATA

Unit ID #	Unit Status *	Unit Type **	Year Installed	Energy Source ***	Net Generation (mwh)	Comments
3	USE	IC	1977	FO2		
4	USE	IC	1967	FO2		
5	USE	IC	1962	FO2		
6	USE	IC	1954	FO2		
7	USE	IC	2003	FO2		
					841	
				PLANT TOTAL	841.0	

C. UNIT CAPABILITY DATA

Unit ID #	CAPACITY (MEGAWATTS) Summer	Winter	Capacity Factor (%)	Operating Factor (%)	Forced Outage Rate (%)	Comments
3						
4						
5						
6						
7						
	12	12				
PLANT TOTAL	12.0	12.0				

D. UNIT FUEL USED

Unit ID #	PRIMARY FUEL USE Fuel Type ***	Quantity	Unit of Measure ****	BTU Content (for coal only)	SECONDARY FUEL USE Fuel Type	Quantity	Unit of Measure ****	BTU Content (for coal only)
3	FO2		BRLS					
4	FO2		BRLS					
5	FO2		BRLS					
6	FO2		BRLS					
7	FO2		BRLS					
		1585						
		1585	BRLS					

MINNESOTA ELECTRIC UTILITY ANNUAL REPORT (Continued)

7610.0430 FUEL REQUIREMENTS AND GENERATION BY FUEL TYPE

POWER PLANT AND GENERATING UNIT DATA REPORT 2012

INSTRUCTIONS: Complete one worksheet for each power plant
Scroll down below the data entry tables to see the ALLOWABLE CODES to be used for Unit Status, Unit Type, Energy Source, Fuel Type, and Unit of Measure fields
Scroll down below the ALLOWABLE CODES to see DEFINITIONS for Capacity Factor, Operating Factor and Forced Outage Rate.

A. PLANT DATA

PLANT NAME	Preston	PLANT ID	190012
STREET ADDRESS	Box 657		
CITY	Preston		
STATE	MN	NUMBER OF UNITS	3
ZIP CODE	55965		
COUNTY	Fillmore		
CONTACT PERSON			
TELEPHONE			

B. INDIVIDUAL GENERATING UNIT DATA

Unit ID #	Unit Status *	Unit Type **	Year Installed	Energy Source ***	Net Generation (mwh)	Comments
1	RET	IC	1935	FO2/NG		
2	RET	IC	1935	FO2/NG		
3	RET	IC	1939	FO2/NG		
4	USE	IC	1949	FO2/NG		
5	USE	IC	1954	FO2/NG		
6	USE	IC	1974	FO2/NG		
					176	
				PLANT TOTAL	176.0	

C. UNIT CAPABILITY DATA

CAPACITY (MEGAWATTS)

Unit ID #	Summer	Winter	Capacity Factor (%)	Operating Factor (%)	Forced Outage Rate (%)	Comments
1						
2						
3						
4						
5						
6						
	4.2	4.2				
PLANT TOTAL	4.2	4.2				

D. UNIT FUEL USED

	PRIMARY FUEL USE				SECONDARY FUEL USE			
Unit ID #	Fuel Type ***	Quantity	Unit of Measure ****	BTU Content (for coal only)	Fuel Type	Quantity	Unit of Measure ****	BTU Content (for coal only)
1	FO2		BRLS		N/G		MCF	
2	FO2		BRLS		N/G		MCF	
3	FO2		BRLS		N/G		MCF	
4	FO2		BRLS		N/G		MCF	
5	FO2		BRLS		N/G		MCF	
6	FO2		BRLS		N/G		MCF	
		307						
		307	BRLS					

MINNESOTA ELECTRIC UTILITY ANNUAL REPORT (Continued)

7610.0430 FUEL REQUIREMENTS AND GENERATION BY FUEL TYPE

POWER PLANT AND GENERATING UNIT DATA REPORT 2012

INSTRUCTIONS: Complete one worksheet for each power plant
Scroll down below the data entry tables to see the ALLOWABLE CODES to be used for Unit Status, Unit Type, Energy Source, Fuel Type, and Unit of Measure fields
Scroll down below the ALLOWABLE CODES to see DEFINITIONS for Capacity Factor, Operating Factor and Forced Outage Rate.

A. PLANT DATA

PLANT NAME	Redwood Falls Wind Farm
STREET ADDRESS	333 S. Washington
CITY	Redwood Falls
STATE	MN
ZIP CODE	56283
COUNTY	Redwood
CONTACT PERSON	
TELEPHONE	
PLANT ID	190024
NUMBER OF UNITS	2

B. INDIVIDUAL GENERATING UNIT DATA

Unit ID #	Unit Status *	Unit Type **	Year Installed	Energy Source ***	Net Generation (mwh)	Comments
1	USE	WND	2004	WND		
2	USE	WND	2005	WND		
					10724	
				PLANT TOTAL	10,724.0	

C. UNIT CAPABILITY DATA

Unit ID #	CAPACITY (MEGAWATTS) Summer	Winter	Capacity Factor (%)	Operating Factor (%)	Forced Outage Rate (%)	Comments
1						
2						
	0.3	0.3				
PLANT TOTAL	0.3	0.3				

D. UNIT FUEL USED

Unit ID #	PRIMARY FUEL USE Fuel Type ***	Quantity	Unit of Measure ****	BTU Content (for coal only)	SECONDARY FUEL USE Fuel Type	Quantity	Unit of Measure ****	BTU Content (for coal only)
1	WND							
2	WND							

MINNESOTA ELECTRIC UTILITY ANNUAL REPORT (Continued)

7610.0430 FUEL REQUIREMENTS AND GENERATION BY FUEL TYPE

POWER PLANT AND GENERATING UNIT DATA REPORT 2012

INSTRUCTIONS: Complete one worksheet for each power plant
Scroll down below the data entry tables to see the ALLOWABLE CODES to be used for Unit Status, Unit Type, Energy Source, Fuel Type, and Unit of Measure fields
Scroll down below the ALLOWABLE CODES to see DEFINITIONS for Capacity Factor, Operating Factor and Forced Outage Rate.

A. PLANT DATA

PLANT NAME	Redwood Falls	PLANT ID	190014
STREET ADDRESS	333 S. Washington		
CITY	Redwood Falls		
STATE	MN	NUMBER OF UNITS	5
ZIP CODE	56283		
COUNTY	Redwood		
CONTACT PERSON			
TELEPHONE			

B. INDIVIDUAL GENERATING UNIT DATA

Unit ID #	Unit Status *	Unit Type **	Year Installed	Energy Source ***	Net Generation (mwh)	Comments
1	USE	IC	1970	FO2/NG		
2	USE	IC	1974	FO2/NG		
3	USE	IC	1974	FO2/NG		
4	USE	IC	1974	FO2/NG		
5	USE	IC	1974	FO2/NG		
					1091	
				PLANT TOTAL	1091.0	

C. UNIT CAPABILITY DATA

CAPACITY (MEGAWATTS)

Unit ID #	Summer	Winter	Capacity Factor (%)	Operating Factor (%)	Forced Outage Rate (%)	Comments
1						
2						
3						
4						
5						
	12.1	12.1				
PLANT TOTAL	12.1	12.1				

D. UNIT FUEL USED

	PRIMARY FUEL USE				SECONDARY FUEL USE			
Unit ID #	Fuel Type ***	Quantity	Unit of Measure ****	BTU Content (for coal only)	Fuel Type	Quantity	Unit of Measure ****	BTU Content (for coal only)
1	FO2		BRLS		N/G		MCF	
2	FO2		BRLS		N/G		MCF	
3	FO2		BRLS		N/G		MCF	
4	FO2		BRLS		N/G		MCF	
5	FO2		BRLS		N/G		MCF	
		900				5808		
		900	BRLS			5808	MCF	

MINNESOTA ELECTRIC UTILITY ANNUAL REPORT (Continued)

7610.0430 FUEL REQUIREMENTS AND GENERATION BY FUEL TYPE

POWER PLANT AND GENERATING UNIT DATA REPORT 2012

INSTRUCTIONS: Complete one worksheet for each power plant
Scroll down below the data entry tables to see the ALLOWABLE CODES to be used for Unit Status, Unit Type, Energy Source, Fuel Type, and Unit of Measure fields
Scroll down below the ALLOWABLE CODES to see DEFINITIONS for Capacity Factor, Operating Factor and Forced Outage Rate.

A. PLANT DATA

PLANT NAME	Saint Peter	PLANT ID	190030
STREET ADDRESS	1308 West Broadway		
CITY	Saint Peter		
STATE	MN	NUMBER OF UNITS	6
ZIP CODE	56082		
COUNTY	Nicollet		
CONTACT PERSON			
TELEPHONE			

B. INDIVIDUAL GENERATING UNIT DATA

Unit ID #	Unit Status *	Unit Type **	Year Installed	Energy Source ***	Net Generation (mwh)	Comments
1	USE	IC	2003	F02		
2	USE	IC	2003	F02		
3	USE	IC	2003	F02		
4	USE	IC	2003	F02		
5	USE	IC	2003	F02		
6	USE	IC	2003	F02		
					931	
				PLANT TOTAL	931.0	

C. UNIT CAPABILITY DATA

CAPACITY (MEGAWATTS)

Unit ID #	Summer	Winter	Capacity Factor (%)	Operating Factor (%)	Forced Outage Rate (%)	Comments
1		.0				
2		.0				
3		.0				
4		.0				
5		.0				
6		.0				
	11.8	11.8				
PLANT TOTAL	11.8	11.8				

D. UNIT FUEL USED

	PRIMARY FUEL USE				SECONDARY FUEL USE			
Unit ID #	Fuel Type ***	Quantity	Unit of Measure ****	BTU Content (for coal only)	Fuel Type	Quantity	Unit of Measure ****	BTU Content (for coal only)
1	FO2		BRLS					
2	FO2		BRLS					
3	FO2		BRLS					
5	FO2		BRLS					
6	FO2		BRLS					
		1646						
		1646	BRLS					

MINNESOTA ELECTRIC UTILITY ANNUAL REPORT (Continued)

7610.0430 FUEL REQUIREMENTS AND GENERATION BY FUEL TYPE

POWER PLANT AND GENERATING UNIT DATA REPORT 2012

INSTRUCTIONS: Complete one worksheet for each power plant
Scroll down below the data entry tables to see the ALLOWABLE CODES to be used for Unit Status, Unit Type, Energy Source, Fuel Type, and Unit of Measure fields
Scroll down below the ALLOWABLE CODES to see DEFINITIONS for Capacity Factor, Operating Factor and Forced Outage Rate.

A. PLANT DATA

PLANT NAME	Sherco 3	PLANT ID	190018
STREET ADDRESS	rr1, box 146		
CITY	Becker		
STATE	MN	NUMBER OF UNITS	1
ZIP CODE	55308		
COUNTY	Sherburne		
CONTACT PERSON			
TELEPHONE			

B. INDIVIDUAL GENERATING UNIT DATA

Unit ID #	Unit Status *	Unit Type **	Year Installed	Energy Source ***	Net Generation (mwh)	Comments
3	USE	ST	1988	COAL	0	
				PLANT TOTAL	0	

C. UNIT CAPABILITY DATA

CAPACITY (MEGAWATTS)

Unit ID #	Summer	Winter	Capacity Factor (%)	Operating Factor (%)	Forced Outage Rate (%)	Comments
3	329.6	329.6				
PLANT TOTAL	329.6	329.6				

D. UNIT FUEL USED

	PRIMARY FUEL USE				SECONDARY FUEL USE			
Unit ID #	Fuel Type ***	Quantity	Unit of Measure ****	BTU Content (for coal only)	Fuel Type	Quantity	Unit of Measure ****	BTU Content (for coal only)
3	COAL	0	TONS					
		0	TONS					

MINNESOTA ELECTRIC UTILITY ANNUAL REPORT (Continued)

7610.0430 FUEL REQUIREMENTS AND GENERATION BY FUEL TYPE

POWER PLANT AND GENERATING UNIT DATA REPORT 2012

INSTRUCTIONS: Complete one worksheet for each power plant
Scroll down below the data entry tables to see the ALLOWABLE CODES to be used for Unit Status, Unit Type, Energy Source, Fuel Type, and Unit of Measure fields
Scroll down below the ALLOWABLE CODES to see DEFINITIONS for Capacity Factor, Operating Factor and Forced Outage Rate.

A. PLANT DATA

PLANT NAME	Spring Valley	PLANT ID	190019
STREET ADDRESS	104 S Section Ave		
CITY	Spring Valley		
STATE	MN	NUMBER OF UNITS	4
ZIP CODE	55975		
COUNTY	Fillmore		
CONTACT PERSON			
TELEPHONE			

B. INDIVIDUAL GENERATING UNIT DATA

Unit ID #	Unit Status *	Unit Type **	Year Installed	Energy Source ***	Net Generation (mwh)	Comments
1	RET	IC	1952	NG/FO2		
2	USE	IC	1952	NG/FO2		
3	USE	IC	1960	NG/FO2		
4	USE	IC	2009	FO2		
5	USE	IC	2009	FO2		
					682	
				PLANT TOTAL	682.0	

C. UNIT CAPABILITY DATA

CAPACITY (MEGAWATTS)

Unit ID #	Summer	Winter	Capacity Factor (%)	Operating Factor (%)	Forced Outage Rate (%)	Comments
1	.0	.0				
2						
3						
4						
5						
	7.2	7.2				
PLANT TOTAL	7.2	7.2				

D. UNIT FUEL USED

	PRIMARY FUEL USE				SECONDARY FUEL USE			
Unit ID #	Fuel Type ***	Quantity	Unit of Measure ****	BTU Content (for coal only)	Fuel Type	Quantity	Unit of Measure ****	BTU Content (for coal only)
1	NG		MCF		FO2		BARRELS	
2	NG		MCF		FO2		BARRELS	
3	NG		MCF		FO2		BARRELS	
		1796				890		
		1796	MCF			890	BARRELS	

MINNESOTA ELECTRIC UTILITY INFORMATION REPORTING - FORECAST SECTION

INSTRUCTIONS

The individual worksheets in this spreadsheet file correspond closely to the tables in the paper forms received by the utility.
The instructions provided with the paper forms also pertain to the data to be entered in each of the worksheets in this file.
PLEASE DO NOT CHANGE THE NAME OR ORDER OF ANY OF THE WORKSHEET TABS IN THIS FILE

In general, the following scheme is used on each worksheet:

Cells shown with a light green background correspond to headings for columns, rows or individual fields.
Cells shown with a light yellow background require data to be entered by the utility.
Cells shown with a light brown background generally correspond to fields that are calculated from the data entered, or correspond to fields that are informational and not to be modified by the utility.

Each worksheet contains a section labeled Comments below the main data entry area.
You may enter any comments in that section that may be needed to explain or clarify the data being entered on the worksheet.

Please complete the required worksheets and save the completed spreadsheet file to your local computer.
Then attach the completed spreadsheet file to an e-mail message and send it to the following e-mail address:

rule7610.reports@state.mn.us

If you have any questions please contact:

Steve Loomis
MN Department of Commerce
steve.loomis@state.mn.us
(651) 296-8963

MINNESOTA ELECTRIC UTILITY INFORMATION REPORTING - FORECAST SECTION

7610.0120 REGISTRATION

ENTITY ID#	190	RILS ID#	U12734
REPORT YEAR	2012		

UTILITY DETAILS		CONTACT INFORMATION	
UTILITY NAME	Southern MN Municipal Power Agency	CONTACT NAME	Patrick Egan
STREET ADDRESS	500 First Avenue SW	CONTACT TITLE	Engineering Technician
CITY	Rochester	CONTACT STREET ADDRESS	500 First Ave SW
STATE	MN	CITY	Rochaester
ZIP CODE	55902	STATE	MN
TELEPHONE	507/285-0478	ZIP CODE	55902
	Scroll down to see allowable UTILITY TYPES	TELEPHONE	507-292-6456
* UTILITY TYPE	PUBLIC	CONTACT E-MAIL	pjegan@smmpa.org

COMMENTS		PREPARER INFORMATION	
		PERSON PREPARING FORMS	Patrick Egan
		PREPARER'S TITLE	Engineering Technician
		DATE	6/18/2013

ALLOWABLE UTILITY TYPES

Code

Private

Public

Co-op

MINNESOTA ELECTRIC UTILITY INFORMATION REPORTING - FORECAST SECTION (Continued)

7610.0310 Item A. SYSTEM FORECAST OF ANNUAL ELECTRIC CONSUMPTION BY ULTIMATE CONSUMERS

Provide actual data for your entire system for the past year, your estimate for the present year and all future forecast years.

Please remember that the number of customers should reflect the number of customers at year's end, not the number of meters.

			FARM	NON-FARM RESIDENTIAL	COMMERCIAL	MINING *	INDUSTRIAL	STREET & HIGHWAY LIGHTING	OTHER	SYSTEM TOTALS	Calculated System Totals
Past Year	2012	No. of Cust.		98,531	12,028		444		3,704	114,707	114,707
		MWH		764,183	1,044,194		960,531		53,197	2,822,105	2,822,105
Present Year	2013	No. of Cust.		100,612	12,135		450			113,197	113,197
		MWH		799,339	1,105,856		968,908		43,076	2,917,179	2,917,179
1st Forecast Year	2014	No. of Cust.		101,870	12,308		459			114,637	114,637
		MWH		811,455	1,121,613		988,878		43,076	2,965,022	2,965,022
2nd Forecast Year	2015	No. of Cust.		103,291	12,501		468			116,261	116,261
		MWH		825,534	1,139,198		1,009,186		43,076	3,016,993	3,016,993
3rd Forecast Year	2016	No. of Cust.		104,656	12,738		479			117,874	117,874
		MWH		842,002	1,160,787		1,032,734		43,076	3,078,599	3,078,599
4th Forecast Year	2017	No. of Cust.		105,953	12,924		488			119,365	119,365
		MWH		854,496	1,177,738		1,051,080		43,076	3,126,389	3,126,389
5th Forecast Year	2018	No. of Cust.		107,067	13,124		497			120,687	120,687
		MWH		867,612	1,195,913		1,069,663		43,076	3,176,264	3,176,264
6th Forecast Year	2019	No. of Cust.		108,145	13,319		504			121,968	121,968
		MWH		880,324	1,213,717		1,086,651		43,076	3,223,769	3,223,769
7th Forecast Year	2020	No. of Cust.		109,235	13,541		513			123,290	123,290
		MWH		895,029	1,233,955		1,105,553		43,076	3,277,613	3,277,613
8th Forecast Year	2021	No. of Cust.		110,252	13,723		520			124,495	124,495
		MWH		906,069	1,250,560		1,120,219		43,076	3,319,925	3,319,925
9th Forecast Year	2022	No. of Cust.		111,230	13,934		528			125,692	125,692
		MWH		918,983	1,269,771		1,136,897		43,076	3,368,728	3,368,728
10th Forecast Year	2023	No. of Cust.		112,205	14,143		535			126,883	126,883
		MWH		931,830	1,288,771		1,153,271		43,076	3,416,948	3,416,948
11th Forecast Year	2024	No. of Cust.		113,208	14,381		545			128,134	128,134
		MWH		946,899	1,310,504		1,173,330		43,076	3,473,809	3,473,809
12th Forecast Year	2025	No. of Cust.		114,206	14,575		551			129,333	129,333
		MWH		958,476	1,328,187		1,188,028		43,076	3,517,768	3,517,768
13th Forecast Year	2026	No. of Cust.		115,209	14,800		560			130,569	130,569
		MWH		972,096	1,348,628		1,207,272		43,076	3,571,072	3,571,072
14th Forecast Year	2027	No. of Cust.		116,203	15,024		570			131,797	131,797
		MWH		985,657	1,369,114		1,227,179		43,076	3,625,026	3,625,026

* MINING needs to be reported as a separate category only if annual sales are greater than 1,000 GWH. Otherwise, include MINING in the INDUSTRIAL category.

COMMENTS

MINNESOTA ELECTRIC UTILITY INFORMATION REPORTING - FORECAST SECTION (Continued)

7610.0310 Item A. MINNESOTA-ONLY FORECAST OF ANNUAL ELECTRIC CONSUMPTION BY ULTIMATE CONSUMERS

Provide actual data for your Minnesota service area only, for the past year, your best estimate for the present year and all future forecast years.

Please remember that the number of customers <u>should reflect the number of customers at year's end, not the number of meters</u>.

			FARM	NON-FARM RESIDENTIAL	COMMERCIAL	MINING *	INDUSTRIAL	STREET & HIGHWAY LIGHTING	OTHER	MN-ONLY TOTALS	Calculated MN-Only Totals
Past Year	2012	No. of Cust.		98,531	12,028		444		3,704	114,707	114,707
		MWH		764,183	1,044,194		960,531		53,197	2,822,105	2,822,105
Present Year	2013	No. of Cust.		100,612	12,135		450			113,197	113,197
		MWH		799,339	1,105,856		968,908		43,076	2,917,179	2,917,179
1st Forecast Year	2014	No. of Cust.		101,870	12,308		459			114,637	114,637
		MWH		811,455	1,121,613		988,878		43,076	2,965,022	2,965,022
2nd Forecast Year	2015	No. of Cust.		103,291	12,501		468			116,261	116,261
		MWH		825,534	1,139,198		1,009,186		43,076	3,016,993	3,016,993
3rd Forecast Year	2016	No. of Cust.		104,656	12,738		479			117,874	117,874
		MWH		842,002	1,160,787		1,032,734		43,076	3,078,599	3,078,599
4th Forecast Year	2017	No. of Cust.		105,953	12,924		488			119,365	119,365
		MWH		854,496	1,177,738		1,051,080		43,076	3,126,389	3,126,389
5th Forecast Year	2018	No. of Cust.		107,067	13,124		497			120,687	120,687
		MWH		867,612	1,195,913		1,069,663		43,076	3,176,264	3,176,264
6th Forecast Year	2019	No. of Cust.		108,145	13,319		504			121,968	121,968
		MWH		880,324	1,213,717		1,086,651		43,076	3,223,769	3,223,769
7th Forecast Year	2020	No. of Cust.		109,235	13,541		513			123,290	123,290
		MWH		895,029	1,233,955		1,105,553		43,076	3,277,613	3,277,613
8th Forecast Year	2021	No. of Cust.		110,252	13,723		520			124,495	124,495
		MWH		906,069	1,250,560		1,120,219		43,076	3,319,925	3,319,925
9th Forecast Year	2022	No. of Cust.		111,230	13,934		528			125,692	125,692
		MWH		918,983	1,269,771		1,136,897		43,076	3,368,728	3,368,728
10th Forecast Year	2023	No. of Cust.		112,205	14,143		535			126,883	126,883
		MWH		931,830	1,288,771		1,153,271		43,076	3,416,948	3,416,948
11th Forecast Year	2024	No. of Cust.		113,208	14,381		545			128,134	128,134
		MWH		946,899	1,310,504		1,173,330		43,076	3,473,809	3,473,809
12th Forecast Year	2025	No. of Cust.		114,206	14,575		551			129,333	129,333
		MWH		958,476	1,328,187		1,188,028		43,076	3,517,768	3,517,768
13th Forecast Year	2026	No. of Cust.		115,209	14,800		560			130,569	130,569
		MWH		972,096	1,348,628		1,207,272		43,076	3,571,072	3,571,072
14th Forecast Year	2027	No. of Cust.		116,203	15,024		570			131,797	131,797
		MWH		985,657	1,369,114		1,227,179		43,076	3,625,026	3,625,026

* MINING needs to be reported as a separate category only if annual sales are greatere than 1,000 GWH. Otherwise, include MINING in the INDUSTRIAL category.

COMMENTS

MINNESOTA ELECTRIC UTILITY INFORMATION REPORTING - FORECAST SECTION (Continued)

7610.0310 Item B. FORECAST OF ANNUAL SYSTEM CONSUMPTION AND GENERATION DATA (Express in MWH)

NOTE: (Column 1 + Column 2) = (Column 3 + Column 5) - (Column 4 + Column 6)

It is recognized that there may be circumstances in which the data entered by the utility is more appropriate or accurate than the value in the corresponding automatically-calculated cell.
If the value in the automatically-calculated cell does not match the value that your utility entered, please provide an explanation in the Comments area at the bottom of the worksheet.

		Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8	CALCULATED
		CONSUMPTION BY ULTIMATE CONSUMERS IN MINNESOTA in MWH [7610.0310 B(1)]	CONSUMPTION BY ULTIMATE CONSUMERS OUTSIDE OF MINNESOTA in MWH [7610.0310 B(2)]	RECEIVED FROM OTHER UTILITIES in MWH [7610.0310 B(3)]	DELIVERED FOR RESALE in MWH [7610.0310 B(4)]	TOTAL ANNUAL NET GENERATION in MWH [7610.0310 B(5)]	TRANSMISSION LINE SUBSTATION AND DISTRIBUTION LOSSES in MWH [7610.0310 B(6)]	TOTAL WINTER CONSUMPTION in MWH [7610.0310 B(7)]	TOTAL SUMMER CONSUMPTION in MWH [7610.0310 B(7)]	(GENERATION + RECEIVED) MINUS (RESALE + LOSSES) MINUS (CONSUMPTION) SHOULD EQUAL ZERO
Past Year	2012	2,822,105	0	3,053,856	267,718	233,514	197,547	1,340,500	1,481,605	0
Present Year	2013	2,917,179	0	0	0	3,121,382	204,203	1,385,660	1,531,519	0
1st Forecast Year	2014	2,965,022	0	0	0	3,172,574	207,552	1,408,385	1,556,637	0
2nd Forecast Year	2015	3,016,993	0	0	0	3,228,183	211,190	1,433,072	1,583,921	0
3rd Forecast Year	2016	3,078,599	0	0	0	3,294,101	215,502	1,462,335	1,616,264	0
4th Forecast Year	2017	3,126,389	0	0	0	3,345,236	218,847	1,485,035	1,641,354	0
5th Forecast Year	2018	3,176,264	0	0	0	3,398,602	222,338	1,508,725	1,667,539	0
6th Forecast Year	2019	3,223,769	0	0	0	3,449,433	225,664	1,531,290	1,692,479	0
7th Forecast Year	2020	3,277,613	0	0	0	3,507,046	229,433	1,556,866	1,720,747	0
8th Forecast Year	2021	3,319,925	0	0	0	3,552,320	232,395	1,576,964	1,742,961	0
9th Forecast Year	2022	3,368,728	0	0	0	3,604,539	235,811	1,600,146	1,768,582	0
10th Forecast Year	2023	3,416,948	0	0	0	3,656,134	239,186	1,623,050	1,793,898	0
11th Forecast Year	2024	3,473,809	0	0	0	3,716,976	243,167	1,650,059	1,823,750	0
12th Forecast Year	2025	3,517,768	0	0	0	3,764,012	246,244	1,670,940	1,846,828	0
13th Forecast Year	2026	3,571,072	0	0	0	3,821,047	249,975	1,696,259	1,874,813	0
14th Forecast Year	2027	3,625,026	0	0	0	3,878,778	253,752	1,721,887	1,903,139	0

COMMENTS

MINNESOTA ELECTRIC UTILITY INFORMATION REPORTING - FORECAST SECTION (Continued)

7610.0310 Item C. PEAK DEMAND BY ULTIMATE CONSUMERS AT THE TIME OF ANNUAL SYSTEM PEAK (in MW)

		FARM	NON-FARM RESIDENTIAL	COMMERCIAL	MINING	INDUSTRIAL	STREET & HIGHWAY LIGHTING	OTHER	SYSTEM TOTALS	Calculated System Totals
Last Year Peak Day	2012	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0

7610.0310 Item D. PEAK DEMAND BY MONTH FOR THE LAST CALENDAR YEAR (in MW)

		JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
Last Year	2012	402.0	387.7	386.3	370.9	420.8	509.9	530.3	517.7	504.5	375.3	389.9	397.9

COMMENTS

MINNESOTA ELECTRIC UTILITY INFORMATION REPORTING - FORECAST SECTION (Continued)

7610.0310 Item E. PART 1: FIRM PURCHASES (Express in MW)

		NAME OF OTHER UTILITY =>	Manitoba Hydro	HUTCHINSON	XCEL	RPU	Nextera	GRE	Ameren UE	EAGL	AEMT	WE Energies	MISO VCA	Otter Tail	Cargill	Austin Utilities	Mid American	Wapsi Wind
Past Year	2012	Summer	30	20	10	35	0	70	100	50	50	50	24	0	0	0	0	17.2
		Winter	30	20	10	35	0	70	100	50	50	50	0	0	0	0	0	17.2
Present Year	2013	Summer	50	40	90	0	50	0	0	0	0	0	0	75	50	20	15	15.1
		Winter	50	40	90	0	50	0	0	0	0	0	0	75	50	20	15	15.1
1st Forecast Year	2014	Summer	0	0	30	0	30	0	0	0	0	0	0	0	0	0	0	15.1
		Winter	0	0	30	0	30	0	0	0	0	0	0	0	0	0	0	15.1
2nd Forecast Year	2015	Summer	0	0	0	0	30	0	0	0	0	0	0	0	0	0	0	15.1
		Winter	0	0	0	0	30	0	0	0	0	0	0	0	0	0	0	15.1
3rd Forecast Year	2016	Summer	0	0	0	0	30	0	0	0	0	0	0	0	0	0	0	15.1
		Winter	0	0	0	0	30	0	0	0	0	0	0	0	0	0	0	15.1
4th Forecast Year	2017	Summer	0	0	0	0	30	0	0	0	0	0	0	0	0	0	0	15.1
		Winter	0	0	0	0	30	0	0	0	0	0	0	0	0	0	0	15.1
5th Forecast Year	2018	Summer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15.1
		Winter	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15.1
6th Forecast Year	2019	Summer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15.1
		Winter	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15.1
7th Forecast Year	2020	Summer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15.1
		Winter	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15.1
8th Forecast Year	2021	Summer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30.3
		Winter	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30.3
9th Forecast Year	2022	Summer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30.3
		Winter	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30.3
10th Forecast Year	2023	Summer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30.3
		Winter	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30.3
11th Forecast Year	2024	Summer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30.3
		Winter	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30.3
12th Forecast Year	2025	Summer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30.3
		Winter	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30.3
13th Forecast Year	2026	Summer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30.3
		Winter	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30.3
14th Forecast Year	2027	Summer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30.3
		Winter	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30.3

COMMENTS

MINNESOTA ELECTRIC UTILITY INFORMATION REPORTING - FORECAST SECTION (Continued)

7610.0310 Item E. PART 2: FIRM SALES (Express in MW)

		NAME OF OTHER UTILITY =>	None										
Past Year	2012	Summer											
		Winter											
Present Year	2013	Summer											
		Winter											
1st Forecast Year	2014	Summer											
		Winter											
2nd Forecast Year	2015	Summer											
		Winter											
3rd Forecast Year	2016	Summer											
		Winter											
4th Forecast Year	2017	Summer											
		Winter											
5th Forecast Year	2018	Summer											
		Winter											
6th Forecast Year	2019	Summer											
		Winter											
7th Forecast Year	2020	Summer											
		Winter											
8th Forecast Year	2021	Summer											
		Winter											
9th Forecast Year	2022	Summer											
		Winter											
10th Forecast Year	2023	Summer											
		Winter											
11th Forecast Year	2024	Summer											
		Winter											
12th Forecast Year	2025	Summer											
		Winter											
13th Forecast Year	2026	Summer											
		Winter											
14th Forecast Year	2027	Summer											
		Winter											

COMMENTS

MINNESOTA ELECTRIC UTILITY INFORMATION REPORTING - FORECAST SECTION (Continued)

7610.0310 Item F. PART 1: PARTICIPATION PURCHASES (Express in MW)

NAME OF OTHER UTILITY =>			None									
Past Year	2012	Summer										
		Winter										
Present Year	2013	Summer										
		Winter										
1st Forecast Year	2014	Summer										
		Winter										
2nd Forecast Year	2015	Summer										
		Winter										
3rd Forecast Year	2016	Summer										
		Winter										
4th Forecast Year	2017	Summer										
		Winter										
5th Forecast Year	2018	Summer										
		Winter										
6th Forecast Year	2019	Summer										
		Winter										
7th Forecast Year	2020	Summer										
		Winter										
8th Forecast Year	2021	Summer										
		Winter										
9th Forecast Year	2022	Summer										
		Winter										
10th Forecast Year	2023	Summer										
		Winter										
11th Forecast Year	2024	Summer										
		Winter										
12th Forecast Year	2025	Summer										
		Winter										
13th Forecast Year	2026	Summer										
		Winter										
14th Forecast Year	2027	Summer										
		Winter										

COMMENTS

MINNESOTA ELECTRIC UTILITY INFORMATION REPORTING - FORECAST SECTION (Continued)

7610.0310 Item F. PART 2: PARTICIPATION SALES (Express in MW)

NAME OF OTHER UTILITY =>			None										
Past Year	2012	Summer											
		Winter											
Present Year	2013	Summer											
		Winter											
1st Forecast Year	2014	Summer											
		Winter											
2nd Forecast Year	2015	Summer											
		Winter											
3rd Forecast Year	2016	Summer											
		Winter											
4th Forecast Year	2017	Summer											
		Winter											
5th Forecast Year	2018	Summer											
		Winter											
6th Forecast Year	2019	Summer											
		Winter											
7th Forecast Year	2020	Summer											
		Winter											
8th Forecast Year	2021	Summer											
		Winter											
9th Forecast Year	2022	Summer											
		Winter											
10th Forecast Year	2023	Summer											
		Winter											
11th Forecast Year	2024	Summer											
		Winter											
12th Forecast Year	2025	Summer											
		Winter											
13th Forecast Year	2026	Summer											
		Winter											
14th Forecast Year	2027	Summer											
		Winter											

COMMENTS

MINNESOTA ELECTRIC UTILITY INFORMATION REPORTING - FORECAST SECTION (Continued)

7610.0310 Item G. LOAD AND GENERATION CAPACITY (Express in MW)

			Column 1 SEASONAL MAXIMUM DEMAND	Column 2 SCHEDULE L. PURCHASE AT THE TIME OF SEASONAL SYSTEM DEMAND	Column 3 SEASONAL SYSTEM DEMAND	Column 4 ANNUAL SYSTEM DEMAND	Column 5 SEASONAL FIRM PURCHASES (TOTAL)	Column 6 SEASONAL FIRM SALES (TOTAL)	Column 7 SEASONAL ADJUSTED NET DEMAND (3 - 5 + 6)	Column 8 ANNUAL ADJUSTED NET DEMAND (4 - 5 + 6)	Column 9 NET GENERATING CAPABILITY	Column 10 PARTICIPATION PURCHASES (TOTAL)	Column 11 PARTICIPATION SALES (TOTAL)	Column 12 ADJUSTED NET CAPABILITY (9 + 10 - 11)	Column 13 NET RESERVE CAPACITY OBLIGATION	Column 14 TOTAL FIRM CAPACITY OBLIGATION (7 + 13)	Column 15 SURPLUS (+) OR DEFICIT (-) CAPACITY (12 - 14)
Past Year	2012	Summer	530	0	530	530	456	0	74	74	150	0	0	150	5	79	71
		Winter	402	0	402	530	432	0	-30	98	150	0	0	150	-2	-32	182
Present Year	2013	Summer	525	0	525	525	405	0	120	120	148	0	0	148	8	128	20
		Winter	427	0	427	525	405	0	22	120	148	0	0	148	1	23	125
1st Forecast Year	2014	Summer	530	0	530	530	75	0	455	455	515	0	0	515	29	484	31
		Winter	434	0	434	530	75	0	359	455	515	0	0	515	23	382	133
2nd Forecast Year	2015	Summer	534	0	534	534	45	0	489	489	515	0	0	515	31	520	-5
		Winter	441	0	441	534	45	0	396	489	515	0	0	515	25	421	94
3rd Forecast Year	2016	Summer	539	0	539	539	45	0	494	494	515	0	0	515	32	526	-11
		Winter	450	0	450	539	45	0	405	494	515	0	0	515	26	431	84
4th Forecast Year	2017	Summer	544	0	544	544	45	0	499	499	515	0	0	515	32	531	-16
		Winter	458	0	458	544	45	0	413	499	515	0	0	515	26	439	76
5th Forecast Year	2018	Summer	549	0	549	549	15	0	534	534	515	0	0	515	34	568	-53
		Winter	467	0	467	549	15	0	452	534	515	0	0	515	29	481	34
6th Forecast Year	2019	Summer	553	0	553	553	15	0	538	538	515	0	0	515	34	572	-57
		Winter	475	0	475	553	15	0	460	538	515	0	0	515	29	489	26
7th Forecast Year	2020	Summer	556	0	556	556	15	0	541	541	515	0	0	515	35	576	-61
		Winter	482	0	482	556	15	0	467	541	515	0	0	515	30	497	18
8th Forecast Year	2021	Summer	561	0	561	561	30	0	531	531	515	0	0	515	34	565	-50
		Winter	487	0	487	561	30	0	457	531	515	0	0	515	29	486	29
9th Forecast Year	2022	Summer	565	0	565	565	30	0	535	535	515	0	0	515	34	569	-54
		Winter	490	0	490	565	30	0	460	535	515	0	0	515	29	489	26
10th Forecast Year	2023	Summer	569	0	569	569	30	0	539	539	515	0	0	515	34	573	-58
		Winter	493	0	493	569	30	0	463	539	515	0	0	515	30	492	23
11th Forecast Year	2024	Summer	572	0	572	572	30	0	542	542	515	0	0	515	35	576	-61
		Winter	496	0	496	572	30	0	466	542	515	0	0	515	30	496	19
12th Forecast Year	2025	Summer	576	0	576	576	30	0	546	546	515	0	0	515	35	581	-66
		Winter	499	0	499	576	30	0	469	546	515	0	0	515	30	499	16
13th Forecast Year	2026	Summer	580	0	580	580	30	0	550	550	515	0	0	515	35	585	-70
		Winter	503	0	503	580	30	0	473	550	515	0	0	515	30	503	12
14th Forecast Year	2027	Summer	584	0	584	584	30	0	554	554	515	0	0	515	35	589	-74
		Winter	507	0	507	584	30	0	477	554	515	0	0	515	31	507	8

COMMENTS

MINNESOTA ELECTRIC UTILITY INFORMATION REPORTING - FORECAST SECTION (Continued)

7610.0310 Item H. ADDITIONS AND RETIREMENTS (Express in MW)

		ADDITIONS	RETIREMENTS
Past Year	2012		
Present Year	2013		
1st Forecast Year	2014	23.4	
2nd Forecast Year	2015		
3rd Forecast Year	2016		
4th Forecast Year	2017		
5th Forecast Year	2018		
6th Forecast Year	2019		
7th Forecast Year	2020		
8th Forecast Year	2021		
9th Forecast Year	2022		
10th Forecast Year	2023		
11th Forecast Year	2024		
12th Forecast Year	2025		
13th Forecast Year	2026		
14th Forecast Year	2027		

COMMENTS

MINNESOTA ELECTRIC UTILITY INFORMATION REPORTING - FORECAST SECTION (Continued)

7610.0430 FUEL REQUIREMENTS AND GENERATION BY FUEL TYPE

Please use the appropriate code for the fuel type as shown in the list at the bottom of the worksheet.

		FUEL TYPE 1		FUEL TYPE 2		FUEL TYPE 3		FUEL TYPE 4		FUEL TYPE 5		FUEL TYPE 6	
		Name of Fuel	Coal	Name of Fuel	Natural Gas	Name of Fuel	FO2	Name of Fuel	Landfil Gas	Name of Fuel	Wind	Name of Fuel	
		Unit of Measure	Tons	Unit of Measure	MCF	Unit of Measure	Gals	Unit of Measure	MCF	Unit of Measure	N/A	Unit of Measure	
		QUANTITY OF FUEL USED	NET MWH GENERATED	QUANTITY OF FUEL USED	NET MWH GENERATED	QUANTITY OF FUEL USED	NET MWH GENERATED	QUANTITY OF FUEL USED	NET MWH GENERATED	QUANTITY OF FUEL USED	NET MWH GENERATED	QUANTITY OF FUEL USED	NET MWH GENERATED
Past Year	2012	0	0	58771	5907	401160	5608	118370	11837	N/A	348062		
Present Year	2013	203100	334000	2097999	206354	5118	68	131712	13171	N/A	484620		
1st Forecast Year	2014	2289836	1277816.24	3279795	323908	4272	56	131712	13171	N/A	531976		
2nd Forecast Year	2015	2405569	1380685.57	2347703	230518	3882	51	131712	13171	N/A	579332		
3rd Forecast Year	2016	2369095	1360449.83	2442249	239289	5265	70	131712	13171	N/A	674048		
4th Forecast Year	2017	2274657	1274108.9	3494360	343647	5437	72	131712	13171	N/A	721405		
5th Forecast Year	2018	2362670	1357306.74	2748806	268395	8841	117	131712	13171	N/A	768760		
6th Forecast Year	2019	2378739	1366387.66	2878022	298031	6019	79	131712	13171	N/A	784546		
7th Forecast Year	2020	2249095	1257235.89	4118825	423831	5639	74	131712	13171	N/A	847688		
8th Forecast Year	2021	2359105	1355790.7	3195147	329864	5439	72	131712	13171	N/A	895045		
9th Forecast Year	2022	2351636	1351853.64	3425113	352740	6850	91	131712	13171	N/A	958188		
10th Forecast Year	2023	2251746	1262369.23	4625425	475106	9346	124	131712	13171	N/A	1005544		
11th Forecast Year	2024	2341483	1346471.57	3615071	408880	6762	89	131712	13171	N/A	1068686		
12th Forecast Year	2025	2332628	1341736.88	3822165	430709	7429	98	131712	13171	N/A	1131826		
13th Forecast Year	2026	2232039	1249853.15	5196933	577817	8567	113	131712	13171	N/A	1147611		
14th Forecast Year	2027	2381932	1370129	4321746	484533	10730	142	131712	13171	N/A	1163397		

LIST OF FUEL TYPES

BIT - Bituminous Coal	LPG - Liquefied Propane Gas	HYD - Hydro (water)
COAL - Coal (general)	NG - Natural Gas	WIND - Wind
DIESEL - Diesel	NUC - Nuclear	WOOD - Wood
FO2 - Fuel Oil #2 (Mid-distillate)	REF - Refuse, Bagasse, Peat, Non-wo	SOLAR - Solar
FO6 - Fuel Oil #6 (Residual fuel oil)	STM - Steam	
LIG - Lignite	SUB - Sub-bituminous coal	

COMMENTS

MINNESOTA ELECTRIC UTILITY INFORMATION REPORTING - FORECAST SECTION (Continued)

7610.0500 TRANSMISSION LINES

Subpart 1. **Existing transmission lines**. Each utility shall report the following information in regard to each transmission line of 200 kilovolts now in existence:

- A. a map showing the location of each line;
- B. the design voltage of each line;
- C. the size and type of conductor;
- D. the approximate location of d.c. terminals or a.c. substations; and
- E. the approximate length of each line in Minnesota.

Subpart 2. **Transmission line additions**. Each generating and transmission utility, as defined in part 7610.0100, shall report the information required in subpart 1 for all future transmission lines over 200 kilovolts that the utility plans to build within the next 15 years.

Subpart 3. **Transmission line retirements**. Each generating and transmission utility, as defined in part 7610.0100, shall identify all present transmission lines over 200 kilovolts that the utility plans to retire within the next 15 years.

In Use (enter X for selection)	To Be Built (enter X for selection)	To Be Retired (enter X for selection)	DESIGN VOLTAGE	SIZE OF CONDUCTOR	TYPE OF CONDUCTOR	D.C. OR A.C. (specify)	LOCATION OF D.C. TERMINALS OR A.C. SUBSTATIONS	INDICATE YEAR IF "TO BE BUILT" OR "RETIRED"	LENGTH IN MINNESOTA (miles)
X			230.	1,272	ACSR 45/7	AC	Benton County to Milaca	NA	17.09

COMMENTS

MINNESOTA ELECTRIC UTILITY INFORMATION REPORTING - FORECAST SECTION (Continued)

7610.0600, item A. 24 - HOUR PEAK DAY DEMAND

Each utility shall provide the following information for the last calendar year:

A table of the demand in megawatts by the hour over a 24-hour period for:

1. the 24-hour period during the summer season when the megawatt demand on the system was the greatest; and
2. the 24-hour period during the winter season when the megawatt demand on the system was the greatest

	DATE	DATE	
	7/17/12	1/3/13	<= ENTER DATES
TIME OF DAY	MW USED ON SUMMER PEAK DAY	MW USED ON WINTER PEAK DAY	
0100	423	273	
0200	396	266	
0300	373	266	
0400	362	268	
0500	364	276	
0600	376	303	
0700	398	339	
0800	441	374	
0900	489	376	
1000	501	383	
1100	516	389	
1200	516	385	
1300	524	385	
1400	528	382	
1500	**530**	378	
1600	526	373	
1700	526	387	
1800	520	**402**	
1900	523	399	
2000	519	390	
2100	521	375	
2200	508	352	
2300	506	333	
2400	478	309	

COMMENTS

US Department of Energy Energy Information Administration Form EIA-861 (2010)	ANNUAL ELECTRIC POWER INDUSTRY REPORT	Form Approved OMB No. 1905-0129 Approved Expires 11/30/2013

SCHEDULE 1. IDENTIFICATION

SURVEY CONTACTS: Persons to contact with question about this form

RESPONSE DUE DATE: **Please submit by April 30th following the close of calendar year**

REPORT FOR: Southern Minnesota Mun P Agny 40580

REPORTING PERIOD: 2012

Contact Laura Sandwick
Title: Manager of Accounting

Phone: (507) 285-0478 FAX: (507) 292-6414 Email: lm.sandwick@smmpa.org

Logged By / Date: 200003688 03/21/2013

Logged In: x Receipt Date (mm/dd/yyyy):

Supervisor John Winter
Title: Director of Finance & Accounting

Phone: (507) 285-0478 FAX: (507) 292-6414 Email: jd.winter@smmpa.org

1	Legal Name of Industry Participant	Southern Minnesota Mun P Agny	**Submission Status/Date:** Submitted 03/21/2013
2	Current Address of Principal Business Office	500 First Ave SW Rochester MN 55902 3303	
3	Preparer's Legal Name Operator (if different than line 1)		
4	Current Address of Preparer's Office (if different than line 2)		
5	Respondent Type (Check One)	[ ] Federal [x] Political Subdivision [ ] Municipal Marketing Authority [ ] Cooperative [ ] Independent Power Producer or Qualifying Facility	[ ] State [ ] Municipal [ ] Investor-Owned [ ] Retail Power Marketer (or Energy Service Provider) [ ] Wholesale Power Marketer [ ] Transmission

For questions or additional information about the Form EIA-861 contact the Survey Manager: Fax: (202) 287 - 1938 Email: EIA-861@eia.gov
Jorge Luna-Camara Phone: (202) 586-3945 jorge.luna-camara@eia.gov **Stephen Scott** Phone: (202) 586-5140 Email: stephen.scott@eia.gov

REPORT FOR: Southern Minnesota Mun P Agny 40580

REPORT PERIOD ENDING: 2012

SCHEDULE 2, PART A. GENERAL INFORMATION

LINE NO.			
1	Regional North American Electric Reliability Council (Not applicable for power marketers)	[ ] TRE (formerly ERCOT); [ ] FRCC; [x] MRO; [ ] NPCC; [ ] RFC (formerly ECAR, MAIN. MAAC); [ ] SERC; [ ] SPP; [ ] WECC	
1a	Name of RTO or ISO	[ ] California ISO; [ ] Electric Reliability Council of Texas; [ ] PJM Interconnection; [ ] New York ISO	[ ] Southwest Power Pool; [X] Midwest ISO; [ ] ISO New England; [ ] None
2	(For EIA Use Only) Identify the North American Electric Reliability Council where you are physically located	MRO	
3	Enter Control Area Operator(s) Responsible for Your Oversite	Midwest Independent System Ope	56669
4	Did Your Company Operate Generating Plants(s)?	[x] Yes [ ] No	
5	Identify The Activities Your Company Was Engaged In During The Year (Check appropriate activities)	[x] Generation from company owned plant; [x] Transmission; [x] Buying transmission services on other electrical system; [ ] Distribution using owned/leased electric wires	[ ] Buying distribution on other electrical system; [x] Wholesale power marketing; [ ] Retail power marketing; [ ] Bundled Services (electricity plus other services such as gas, water, etc. in addition to electric service))
6	Highest Hourly Electrical Peak System Demand	Summer (Megawatts) 607.0	Prior Year 620.8
		Winter (Megawatts) 432.0	Prior Year 420.5
	Did Your Company Operate Alternative-Fueled Vehicles During the Year?	[x] Yes [ ] No	
	Does Your Company Plan to Operate Such Vehicles During the Coming Year?	[x] Yes [ ] No	
7	If "Yes", Please Provide Additional Contact Information	Name: Dan Hayes; Title: Manager of Member Support; Telephone: 507 - 285 - 0478; Fax: 507 - 292 - 6414	Email: dm.hayes@smmpa.org

ANNUAL ELECTRIC POWER
INDUSTRY REPORT

Form Approved
OMB No. 1905-0129
Approved Expires 11/30/2013

REPORT FOR: Southern Minnesota Mun P Agny 40580

REPORT PERIOD ENDING: 2012

SCHEDULE 2. PART B ENERGY SOURCES AND DISPOSITION

	SOURCE OF ENERGY		MEGAWATTHOURS		DISPOSITION OF ENERGY	MEGAWATTHOURS
1	Net Generation		30,455	11	Sales to Ultimate Consumers	
2	Purchases from Electricity Suppliers		3,065,371	12	Sales For Resale	3,089,823
3	Exchanged Received (In)			13	Energy Furnished Without Charge	
4	Exchanged Delivered (Out)			14	Energy Consumed By Respondent Without Charge	
5	Exchanged Net					
6	Wheeled Received (In)					
7	Wheeled Delivered (Out)			15	Total Energy Losses (positive number)	6,003
8	Wheeled Net					
9	Transmission by Others Losses (Negative Number)					
10	Total Sources (sum of lines 1, 2, 5, 8 & 9)		3,095,826	16	Total Disposition (sum of lines 11, 12, 13, 14, & 15)	3,095,826

REPORT FOR: Southern Minnesota Mun P Agny 40580

REPORT PERIOD ENDING: 2012

SCHEDULE 2, PART C. GREEN PRICING PROGRAMS

Green Pricing programs are voluntary programs that allow customers to pay an extra fee to purchase electricty generated from renewable sources. Renewable Energy Certificates (RECS) are a category of Green Pricing that involves the sale of the renewable attribute created with renewable electricity generation.

STATE/ TERRITORY	TYPE OF CUSTOMER SERVICE PROGRAM (a)	RESIDENTIAL (b)	COMMERCIAL (c)	INDUSTRIAL (d)	TRANSPORTATION (e)	TOTAL (d)
	Green Pricing Revenues (thousand $)					
	Green Pricing Sales (MWh)					
	Green Pricing Customers					
	Cents/kWh					
	Green Pricing Revenues (thousand $)					
	Green Pricing Sales (MWh)					
	Green Pricing Customers					
	Cents/kWh					
	Green Pricing Revenues (thousand $)					
	Green Pricing Sales (MWh)					
	Green Pricing Customers					
	Cents/kWh					
	Green Pricing Revenues (thousand $)					
	Green Pricing Sales (MWh)					
	Green Pricing Customers					
	Cents/kWh					

Report For Southern Minnesota Mun P Agny 40580

Report Period Ending: 2012

SCHEDULE 2, PART D. NET METERING

Net Metering programs allow customers to sell excess power they generate back to the electrical grid to offset consumption. For net metering applications of 2 MW nameplate capacity and less, provide the information about programs by State and customer class.

State/Territoty (a)		Residential (b)	Commercial (c)	Industrial (d)	Transportation (e)	Total (f)
Photovoltaic	Installed Net Metering Capacity (MW)					
	Net Metering Customers					
	Electricty Sold back to Utility (MWh)					
	Capacity/Customer					
Wind	Installed Net Metering Capacity (MW)					
	Net Metering Customers					
	Electricty Sold back to Utility (MWh)					
	Capacity/Customer					
Other	Installed Net Metering Capacity (MW)					
	Net Metering Customers					
	Electricty Sold back to Utility (MWh)					
	Capacity/Customer					
Total	Installed Net Metering Capacity (MW)					
	Net Metering Customers					
	Electricty Sold back to Utility (MWh)					
	Capacity/Customer					

REPORT FOR: Southern Minnesota Mun P Agny 40580

REPORT PERIOD ENDING: 2012

SCHEDULE 3. ELECTRIC OPERATING REVENUE

LINE NO.	TYPE OF OPERATING REVENUE OR COST	THOUSAND DOLLARS		
1	Electric Operating Revenue From Sales To Ultimate Customers (Schedule 4, Parts A, B and D)	.0		
2	Revenue From Unbundled (Delivery) Customers (Schedule 4, Part C)	.0		
3	Electric Operating Revenue from Sale for Resale	219,716.0	Cents/kWh	7.1
4	Electric Credits / Other Adjustments	-185.0		
5	Revenues from Transmission	21,721.0		
6	Other Electric Operating Revenue	2,876.0		
7	Total Electric Operating Revenue (sum of lines 1, 2, 3, 4, 5 and 6)	244,128.0		

REPORT FOR: Southern Minnesota Mun P Agny 40580

REPORT PERIOD ENDING: 2012

SCHEDULE 4, PART -A . SALES TO ULTIMATE CUSTOMERS. FULL SERVICE - ENERGY AND DELIVERY SERVICE (BUNDLED)

STATE / TERRITORY	RESIDENTIAL (a)	COMMERCIAL (b)	INDUSTRIAL (c)	TRANSPORTATION (d)	TOTAL (e)
Revenue (thousand dollars)					
Megawatthours					
Number of Customers					
Cents/Kwh					
STATE					
Revenue (thousand dollars)					
Megawatthours					
Number of Customers					
Cents/kWh					
STATE					
Revenue (thousand dollars)					
Megawatthours					
Number of Customers					
Cents/kWh					

Total

Revenue (thousand dollars)

Megawatthours

Number of Customers

REPORT FOR: Southern Minnesota Mun P Agny 40580

REPORT PERIOD ENDING: 2012

SCHEDULE 4, PART -B . SALES TO ULTIMATE CUSTOMERS. ENERGY ONLY (WITHOUT DELIVERY SERVICE)

STATE / TERRITORY	RESIDENTIAL (a)	COMMERCIAL (b)	INDUSTRIAL (c)	TRANSPORTATION (d)	TOTAL (e)
Revenue (thousand dollars)					
Megawatthours					
Number of Customers					
Cents/kWh					
STATE					
Revenue (thousand dollars)					
Megawatthours					
Number of Customers					
Cents/kWh					
STATE					
Revenue (thousand dollars)					
Megawatthours					
Number of Customers					
Cents/kWh					
Total					
Revenue (thousand dollars)					
Megawatthours					
Number of Customers					

REPORT FOR: Southern Minnesota Mun P Agny 40580

REPORT PERIOD ENDING: 2012

SCHEDULE 4, PART -C . SALES TO ULTIMATE CUSTOMERS. DELIVERY ONLY SERVICE (AND ALL OTHER CHARGES)

STATE / TERRITORY	RESIDENTIAL (a)	COMMERCIAL (b)	INDUSTRIAL (c)	TRANSPORTATION (d)	TOTAL (e)
Revenue (thousand dollars)					
Megawatthours					
Number of Customers					
Cents/kWh					
STATE					
Revenue (thousand dollars)					
Megawatthours					
Number of Customers					
Cents/kWh					
STATE					
Revenue (thousand dollars)					
Megawatthours					
Number of Customers					
Cents/kWh					
Total					
Revenue (thousand dollars)					
Megawatthours					
Number of Customers					

REPORT FOR: Southern Minnesota Mun P Agny 40580

REPORT PERIOD ENDING: 2012

SCHEDULE 4, PART D. BUNDLED SERVICE BY RETAIL ENERGY PROVIDERS, OR ANY POWER MARKETER THAT PROVIDES "BUNDLED SERVICE"

STATE / TERRITORY	RESIDENTIAL (a)	COMMERCIAL (b)	INDUSTRIAL (c)	TRANSPORTATION (d)	TOTAL (e)
Revenue (thousand dollars)					
Megawatthours					
Number of Customers					
Cents/kWh					
STATE					
Revenue (thousand dollars)					
Megawatthours					
Number of Customers					
Cents/kWh					
STATE					
Revenue (thousand dollars)					
Megawatthours					
Number of Customers					
Censt/kWh					
Total					
Revenue (thousand dollars)					
Megawatthours					
Number of Customers					

Schedule 5. Mergers and/or Acquistions

REPORT FOR: Southern Minnesota Mun P Agny Utility Id 40580

REPORTING PERIOD: 2012

Mergers and/or acquisitions during the reporting month

If Yes, Provide:

Date of Merger or Acquisition

Company merged with or acquired

Name of new parent company

Address

City

State, Zip

New Contact Name

Telephone No.

Email address

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REPORT FOR: Southern Minnesota Mun P Agny 40580

REPORT PERIOD ENDING: 2012

SCHEDULE 6A. DEMAND - SIDE MANAGEMENT INFORMATION

LINE NO.		
2	If your Demand-Side Management activities are reported on Schedule 6 of another company's form identify the company	

Note: If you do not have any DSM or another company reports your DSM activities on their Schedule 6, proceed to schedule 6, Part D.

State/Territory		PART A. ACTUAL EFFECTS									
		ANNUAL INCREMENTAL EFFECTS					ACTUAL ANNUAL EFFECTS				
ENERGY EFFICIENCY		RESIDENTIAL (a)	COMMERCIAL (b)	INDUSTRIAL (c)	TRANS (d)	Total (e)	RESIDENTIAL (f)	COMMERCIAL (g)	INDUSTRIAL (h)	TRANS	Total (e)
3	Energy Effects (megawatthours)										
4	Actual Peak Reduction (megawatts)										
LOAD MANAGEMENT											
5	Energy Effects (megawatthours)										
6	Potential Peak Reduction (megawatts)										
7	Actual Peak Reduction (megawatts)										

7b	Were these savings verified through an independent evaluation?	N
7c	Are these estimates based on a forecast?	N

REPORT FOR: Southern Minnesota Mun P Agny 40580

REPORT PERIOD ENDING: 2012

SCHEDULE 6 PART B. ANNUAL COSTS (THOUSAND DOLLARS)

	State/Territory	(a) Residential	(b) Commercial	(c) Industrial	(d) Transportation	(e) Total
8	Directs Costs excluding incentive payments-Energy Efficiency					
9	Direct Costs excluding incentive payments-Load Management					
10	Incentive Payments-Energy Efficiency					
11	Incentive Payments-Load Management					
12	Indirect Costs					
13	Total Cost (sum of all above)					

REPORT FOR: Southern Minnesota Mun P Agny 40580

REPORT PERIOD ENDING: 2012

Line	Question	Yes	No
14	Have there been any major changes to your Demand-Side Management programs (e.g., terminated programs, new information or financing programs, or a shift to programs with dual load building objectives and energy efficiency objectives), program tracking procedures, or reporting methods that affect the comparison of demand-side management data reported on this schedule to data from previous years? (check Yes or No)		x
15	Does your company currently operate any incentive-based demand response programs (e.g., direct load control, interruptible programs, demand bidding/buyback, emergency demand response, capacity market programs, and ancillary service market programs)? (check Yes or No) .		x

Line		State	Residential	Commercial	Industrial	Transportation
16	If the anser to line 15 is Yes, Please disclose the number of participating customers by state and class					

Line	Question	Yes	No
17	Does your company currently operate any time-based rate programs (e.g. real-time pricing, critical peak pricing, variable peak pricing and time-of-use rates?		x

Line		State	Residential	Commercial	Industrial	Transportation
18	If the anser to line 17 is Yes, Please disclose the number of participating customers by state and class					

SCHEDULE 6, PART D ADVANCED METERING

Only customers from schedule 4A and 4C need to be reported on this schedule.
AMR- data transmitted one-way, to the utility.
AMI- data transmitted in both directions, to the utility and customer

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State		Residential	Commercial	Industrial	Transportation	Total
	Number of AMR Meters					
	Number of AMI Meters					
	Energy Served through AMI Meters (MWh)					

SCHEDULE 7. DISTRIBUTED AND DISPERSED GENERATION

If your company owns and/or operates a distribution system, please report information on known distributed generation capacity on the system. Such capacity must be utility or customer-owned

PART A. NUMBER AND CAPACITY

State/
Territory

Distributed Generators (Commercial and Industrial Grid Connected/Synchronized Generators) (a)	Dispersed Generators (Commercial and Industrial Generators Not Connected/Synchronized to the Grid) (b)
< 1MW	< 1MW
1. Number of generators	1. Number of generators
2. Total combined capacity (MW)	2. Total combined capacity (MW)
3. Capacity that consists of backup-only units	3. Capacity that consists of backup-only units
4 Capacity owned by respondent	4. Capacity owned by respondent
5. Nature of data reported	5. Nature of data reported

PART B. TYPE OF GENERATORS

1. Internal combustion/reciprocating engines	1. Internal combustion/reciprocating engines
2. Combustion turbine(s)	2. Combustion turbine(s)
3. Steam turbine(s)	3. Steam turbine(s)
4. Hydroelectric	4. Hydroelectric
5. Wind turbine(s)	5. Wind turbine(s)
6, Photovoltaic	6. Photovoltaic
7. Storage	7. Storage
8. Other	8. Other
9. Total	9. Total
10. Nature of data reported	10. Nature of data reported

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SCHEDULE 8. DISTRIBUTION SYSTEM INFORMATION

If your company owns a distribution system, please identify the names of the counties (parish, etc.) by State in which the electric wire/equipment are located.

LINE NO.	STATE (US Postal Abbreviation) (a)	COUNTY (Parish, Etc.) (b)	LINE NO.	STATE (US Postal Abbreviation) (a)	COUNTY (Parish, Etc.) (b)
1	-				

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SCHEDULE 9. COMMENTS

SCHEDULE (a)	PART (b)	LINE NO. (c)	COLUMN (d)	NOTES (e)

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EIA861 ERROR LOG

Part	State	Error No.	Error Description/Override Comment	Type	Override