MINNESOTA DEPARTMENT OF COMMERCE

85 7th Place East, Suite 500
St. Paul, Minnesota 55101-2198
mn.gov/commerce/
651.539.1500 FAX 651.539.1547
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May 19, 2014

Dr. Burl W. Haar
Executive Secretary
Minnesota Public Utilities Commission
121 Seventh Place East, Suite 350
St. Paul, Minnesota 55101

RE: **Reply Comments of the Minnesota Department of Commerce, Division of Energy Resources**
Docket No. E999/CI-11-852

Dear Dr. Haar,

On April 18, 2013, the Minnesota Public Utilities Commission (Commission) issued a *Notice of Supplemental Comments on Cost Impact Reports* in the following matter:

> Utility Renewable Energy Cost Impact Reports Required by Minnesota Statutes Section 216B.1691, Subd. 2e.

Attached please find the reply comments of the Minnesota Department of Commerce, Division of Energy Resources (Department). The Department is available to answer any questions the Commission may have.

Sincerely,

/s/ KATE O'CONNELL
Manager, Energy Regulation and Planning

KO/lt
Attachment

BEFORE THE MINNESOTA PUBLIC UTILITIES COMMISSION

COMMENTS OF THE
MINNESOTA DEPARTMENT OF COMMERCE
DIVISION OF ENERGY RESOURCES

DOCKET NO. E999/CI-11-852

I. BACKGROUND INFORMATION

On April 18, 2014, the Minnesota Public Utilities Commission (Commission) issued a *Notice of Supplemental Comment Period on Cost Impact Reports* seeking comment on two alternative templates for reporting the cost of Minnesota's Renewable Energy Standard (RES) as required by Minn. Stat. §216B.1691, subd. 2e.

Commenting parties included:

- Xcel Energy (Xcel);
- Otter Tail Power Corporation (OTP);
- Minnesota Power (MP);
- The Minnesota Large Industrial Group and Minnesota Chamber of Commerce, (collectively, Joint Business Intervenors or JBI);
- Great River Energy (GRE);
- Missouri River Energy Services (MRES); and
- Wind on the Wires.

II. DEPARTMENT'S ANALYSIS

The Department appreciates that Xcel proposed a template to allow parties to compare how different approaches could work. As noted in earlier comments, there is a trade-off between accuracy and ease of analysis with various approaches. Based on the feedback in parties' comments, the Department continues to recommend adoption of its proposed RES cost reporting template (Template #2) as the appropriate balance between the Commission's general guiding principles of "providing a realistic representation of baseline, actual (to date) and future expected costs for achieving and maintaining standard compliance" with "supporting consistency, coordination and non-burdensome administration."[1] OTP and MP also supported the Department's proposed reporting template; MRES did not explicitly support either reporting template, but did note concerns with the administrative burden involved in Xcel's proposal.

The Department addresses concerns raised by Xcel, the Joint Business Intervenors and Minnesota Power, below.

A. XCEL ENERGY

Xcel argues that using levelized cost estimates can mask the annual rate impact of renewable projects. The Department notes that levelizing the costs over the life of the project provides an easy basis for comparison, and should not disadvantage utility-owned projects compared to renewable power obtained from purchased power agreements (PPAs).

Both Xcel and the JBI maintain that the levelized cost of a natural gas fired combustion turbine (CT) or combined cycle (CC) unit is not the appropriate measure of the true avoided cost of renewables. Both parties argue that renewable generation is displacing baseload coal generation or market purchases, and consequently, an assumption that gas-fired generation would have been added in the absence of renewable generation may not hold true.

Given that coal resources have not been competitive alternatives in recent years, Minnesota utilities have two basic choices for meeting new energy needs – gas only, or gas and renewables. (Another option is hydropower, but these resources have generally been priced at the cost of gas facilities). Thus, using the cost of additional coal-fired generation as a comparison would not be an appropriate basis for comparison since such an approach would tend to make more renewable resources appear to be competitive than is reasonable to conclude. Instead, the goal of this analysis should be to compare the cost of renewable resources to what the utility would otherwise add to its system. Additionally, it would not be reasonable to compare the cost of renewable power to a long-term reliance on the market, for two reasons. First, because there is no regional entity to ensure that there will be adequate generation resources across the region to

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[1] In the Matter of Utility Renewable energy Cost Impact Reports Required by Minnesota Statutes Section 216B.1691, Subd. 2e, *Notice of Comment Period on Cost Impact Reports*, November 6, 2013, Docket No. E999/CI-11-852.

serve the demand for power at peak periods, it is not reasonable to assume that it will always be possible to buy power in the wholesale market and have it delivered to load when needed.[2] Second, there is no long-term forecast of prices in the wholesale energy market and thus no viable price to use for comparison, particularly given that the market price changes significantly in the face of higher demand relative to the supply of power over time.[3]

The Department continues to recommend using EIA levelized costs for either a CT or CC, in the absence of utility-specific cost information for these types of units. To the extent that a utility has recent experience with the costs of either type of unit, such costs could be used; however, not every utility required to provide RES cost reporting may have this type of information available.

B. JOINT BUSINESS INTERVENORS

The JBI recommends adoption of Xcel's proposed template with four changes to rectify what it concludes are limitations to the Strategist model, namely that it (1) assumes no transmission restraints and has little power flow modeling; (2) ignores the variability risk associated with renewable generation; (3) ignores fuel price variability; and (4) has difficulty reflecting existing regulations in the modeling assumptions. To resolve these perceived limitations, the JBI recommend that utilities run the Promod model every fifth year, to provide additional analysis on transmission constraints, and use forecasted locational marginal prices (LMP) to estimate future avoided costs.

Given the goals of this proceeding to simplify this analysis, JBI's comments appear to be misplaced. Certainly, JBI could make such a suggestion in a certificate of need proceeding for a specific project and utility, but it seems excessive to require such an analysis here, if the goal continues to be simplification.

In addition, in its January 27, 2014 comments to the Commission in this docket, the Department addressed JBI's concerns regarding power flow modeling and perceived volatility resulting from the addition of renewable resources to a utility's generation portfolio. As the Department noted in the January 2014 comments, attempting to model transmission costs of hypothetical future projects is not likely to provide reliable information upon which to base a decision about an appropriate least-cost resource mix. The Department continues to conclude that the most appropriate way to address transmission costs is for utilities to use bidding processes in adding generation projects to reasonably ensure that they add the overall least-cost resources of any fuel type. However, this issue would be better addressed in resource planning or a certificate of need proceeding.

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[2] The responsibility to ensure that there are sufficient generation resources belongs with state commissions; entities such as the Midwest Reliability Organization and the MidContinent Independent System Operator are responsible for ensuring the reliability of the bulk transmission system only.

[3] Because of these reliability concerns and lack of realistic data on scarcity pricing, the Department has long advocated in resource planning against reliance on the market for energy and capacity needs beyond the short-term.

C. MINNESOTA POWER

Minnesota Power recommends using a Levelized Avoided Energy Cost (LACE) model, available through the U. S. Energy Information Administration (EIA) as the appropriate cost comparison rather than the levelized cost of a CC or CT unit. According to the EIA, LACE is a measure of what it would cost the grid to generate the electricity that is otherwise displaced by a new generation project. The methodology for calculating the LACE is attached to these comments as Attachment A.

LACE is calculated based on the weighted average of the marginal cost of electricity dispatch during the periods in which the project is assumed to operate weighted by the number of hours of assumed operation in each time period. In other words, LACE is calculated based on actual or assumed market prices. As a result, the Department does not believe LACE is an appropriate comparison for the cost of RES due to the reliability and pricing issues noted above. Consequently, the capital, fuel and operations and maintenance costs of alternative generation facilities such as a CC or CT unit are a more appropriate comparison of the longer-term cost of RES.

III. DEPARTMENT RECOMMENDATION

The Department recommends that the Commission adopt the Department's proposed RES cost reporting methodology (Template #2) as the best means of meeting the Commission's proposed guidelines for cost reporting.

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Attachment A

Independent Statistics & Analysis
U.S. Energy Information Administration

July 2013

Levelized Cost of Electricity and Levelized Avoided Cost of Electricity Methodology Supplement

Levelized Cost of Electricity

Levelized cost of electricity, as reported by EIA in conjunction with its Annual Energy Outlook publications, represents the average revenue per unit of energy production that would be required by a project owner to recover all investment and operating costs. It includes a specified return on investment over a specified project financial life, as well as an assumed project utilization rate. The computation for LCOE takes the following general form:

$$LCOE = \frac{fixed\ charge\ factor * capital\ costs + fixed\ O\&M}{annual\ expected\ generation\ hours} + variable\ O\&M + fuel$$

Where:

- **LCOE** is the levelized cost of electricity, expressed in units of $/Megawatthour ($/MWh).
- **Capital cost** is the initial investment per unit of capacity in the project, expressed in $/Megawatt ($/MW). For any given technology, this cost may vary over time based on a number of factors, including declining technology costs due to learning and cost adjustments from broader economic factors, such as the cost of construction commodities and availability of resources for geographically constrained energy sources like wind, geothermal, or hydro.
- **Fixed charge factor** annualizes the capital cost, accounting for the weighted average cost of capital (return on debt and return on equity), Federal tax burden for the project, and the expected financial life of the project. This factor is estimated using a cash-flow model within the National Energy Modeling System (NEMS), and may vary over time, based on changes to the cost of debt and cost of equity, and across technologies, based on differing tax depreciation treatments for different technologies and for the market risks associated with certain carbon-intensive generation options.
- **Fixed O&M** is the annual expenditure per unit of project capacity for operations and maintenance, expressed in $/MW/year. This includes costs that remain relatively constant, regardless of plant utilization levels, such as worker salaries and maintenance or refurbishment costs that are scheduled on a calendar basis rather than an operating-hours basis.
- **Annual expected generation hours** are the number of hours in a year that the plant is assumed to operate. For dispatchable generation such as coal, nuclear, or gas-fired plants, EIA calculates this based on an annual capacity factor that corresponds to the maximum annual availability for that unit. Alternatively, in the case of units primarily serving peak load, this calculation is based

on 30 percent annual capacity factor. For intermittent renewable resources, the calculation is based on location-specific resource availability.

- **Variable O&M** is the expenditure per unit of generation for operations and maintenance, expressed in $/MWh. This expenditure includes costs that are closely tied to the actual operating hours of the equipment, such as consumable maintenance items and refurbishment costs that are scheduled based on operating hours (rather than on a calendar basis).
- **Fuel** is the expenditure for fuel, expressed in terms of $/MWh It is the product of the heat rate of the equipment (a measure of unit conversion efficiency) and the fuel price in native units (e.g. $/thousand cubic feet or $/ton). These costs represent the hourly average of the long-term fuel costs over the assumed financial life of the equipment (not the fuel costs for the single year for which the estimate is provided).

LCOE Example:

Consider a wind turbine with a capital cost of $2,000/kW ($2 million/MW), and a fixed O&M cost of $40/kW/yr ($40,000/MW/year). There is no fuel cost and no variable O&M. The fixed charge factor for wind, accounting for the standard 5-year MACRS[1] depreciation, is 9% per year. The capacity factor is 30% per year.

- Annualized capital cost = $2 million/MW * 0.09 =$180,000/MW/year
- Total annual expenditure = $180,000/MW/year + $40,000/MW/year = $220,000/MW/year
- Expected annual hours of generation = 0.3 * 8760 hours/year = 2628 hours/year
- Levelized Cost = $220,000/MW/year / 2628 hours/year= $84/MWh

Levelized Avoided Cost of Electricity

The levelized avoided cost of electricity, as developed for this discussion, represents the potential revenue available to the project owner from the sale of energy and generating capacity. This cost is a weighted average of the marginal cost of electricity dispatch during the periods in which the project is assumed to operate, weighted by the number of hours of assumed operation in each time period. The marginal cost of meeting system planning reserves is weighted by the estimated capacity credit for each technology.

$$LACE = \frac{\sum_{t=1}^{Y}(marginal\ generation\ price_t * dispatched\ hours_t) + (cap\ payment * cap\ credit)}{annual\ expected\ generation\ hours}$$

Where:

- **LACE** is the levelized avoided cost of electricity, expressed in units of $/MWh.
- **t** is the time period and **Y** is the number of time periods in the year. NEMS represents nine time periods for electricity capacity planning purposes; each of the three seasons of the year (winter,

[1] The Modified Accelerated Cost Recovery System (MACRS) is the current depreciation method for most assets for the purpose of Federal taxes. Under MACRS, renewable energy equipment tends to have more rapid depreciation schedules relative to some other asset types.

summer, and fall/spring) includes a representation of peak hours, intermediate hours, and off-peak hours. The summation is performed for all of the periods in the year.

- **Marginal generation price** is the cost of serving load to meet the demand in the specified time period. This price is typically determined by the variable cost (fuel cost plus variable O&M) of the most expensive generating unit that needs to be dispatched to meet energy demand. This price may also be impacted by the cost of meeting any environmental or portfolio policy requirements by the marginal generators (that is, the cost of purchasing renewable energy credits for a non-qualifying generator).
- **Dispatched hours** is the estimated number of hours in the time period the unit is dispatched. This number is consistent with the utilization parameters assumed for the LCOE calculation.
- **Capacity payment** is the value to the system of meeting the reliability reserve margin. It is determined as the payment that would be required to incentivize the last unit of capacity needed to satisfy a regional reliability reserve requirement.
- **Capacity credit** is the ability of the unit to provide system reliability reserves. For dispatchable units, the entire nameplate capacity is allowed to participate in the reliability capacity market (capacity credit of 1 or 100%). For intermittent renewables, the capacity credit is derated as a function of the availability of the resource during peak load periods and the estimated probability of correlated resource-derived outages within a given region. For example, the capacity credit is the probability that if the wind is not blowing in on part of the region, it is or isn't blowing in a different part of the region.
- **Annual expected generation hours** are the number of hours in a year that the plant is assumed to operate; the derivation is identical to that described in the LCOE section above.

LACE Example:

The wholesale price of electricity (marginal generation price) is known for 9 time periods during the year, representing the daytime peak, nighttime off-peak, and shoulder hours during the winter, summer, and spring/fall seasons. The number of dispatched hours is calculated for each period by multiplying the number of hours in that period by the corresponding assumed capacity factor. The revenue available for each period is calculated by multiplying dispatched hours by the wholesale electricity price. In the region used in this example, wind has a capacity credit of 15 percent, and the cost of a new combustion turbine to meet reliability requirements is $670/kW, or, using the fixed charge factor derived for the LCOE calculation, $60/kW/year ($60,000/MW/year).

Table 1: Energy Value

Season	Time-of-Day	Wholesale Electricity Price ($/MWh)	Wind Capacity Factor	Hours in Period	Dispatched Hours	Revenue Available
Summer	Daytime	$110	0.2	640	128	$14,080
	Nighttime	$80	0.4	1100	440	$35,200
	Shoulder	$90	0.5	460	230	$20,700
Winter	Daytime	$90	0.3	460	138	$12,420
	Nighttime	$70	0.5	1100	550	$38,500
	Shoulder	$80	0.3	640	192	$15,360
Spring/Fall	Daytime	$80	0.4	1090	436	$34,880
	Nighttime	$60	0.6	2180	1308	$78,480
	Shoulder	$70	0.5	1090	545	$38,150
Annual Total					3,967	$287,770

The wind plant earns energy revenue of $287,770/MW/year, and has a capacity payment of 0.15*$60,000=$9,000/MW/year. The total annual revenue stream is $296,770/MW/yr. With annual generation of 3,967 MWh/MW (3,967 equivalent operating hours), the average revenue per MWh for this plant is $75/MWh.

Computing Net Value

The net value is simply the difference between the LACE and the LCOE, and can be thought of as the potential profit (or loss) per unit of energy production for the plant.

$$Net\,Value = LACE - LCOE$$

Net Value Example

From the examples above, the wind plant has a LCOE of $84/MWh and a LACE of $75/MWh, resulting in a net value of -$9/MWh.

CERTIFICATE OF SERVICE

I, Sharon Ferguson, hereby certify that I have this day, served copies of the following document on the attached list of persons by electronic filing, certified mail, e-mail, or by depositing a true and correct copy thereof properly enveloped with postage paid in the United States Mail at St. Paul, Minnesota.

Minnesota Department of Commerce
Reply Comments

Docket No. E999/CI-11-852

Dated this **20th** day of **May 2014**

/s/Sharon Ferguson

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
David	Aafedt	daafedt@winthrop.com	Winthrop & Weinstine, P.A.	Suite 3500, 225 South Sixth Street Minneapolis, MN 554024629	Electronic Service	No	SPL_SL_11-852_Interested Parties
Julia	Anderson	Julia.Anderson@ag.state.mn.us	Office of the Attorney General-DOC	1800 BRM Tower 445 Minnesota St St. Paul, MN 551012134	Electronic Service	Yes	SPL_SL_11-852_Interested Parties
Christopher	Anderson	canderson@allete.com	Minnesota Power	30 W Superior St Duluth, MN 558022191	Electronic Service	No	SPL_SL_11-852_Interested Parties
William A.	Blazar	bblazar@mnchamber.com	Minnesota Chamber Of Commerce	Suite 1500 400 Robert Street North St. Paul, MN 55101	Electronic Service	No	SPL_SL_11-852_Interested Parties
Michael	Bradley	mike.bradley@lawmoss.com	Moss & Barnett	Suite 4800 90 S 7th St Minneapolis, MN 55402-4129	Electronic Service	No	SPL_SL_11-852_Interested Parties
Jon	Brekke	jbrekke@grenergy.com	Great River Energy	12300 Elm Creek Boulevard Maple Grove, MN 553694718	Electronic Service	No	SPL_SL_11-852_Interested Parties
Mark B.	Bring	mbring@otpco.com	Otter Tail Power Company	215 South Cascade Street PO Box 496 Fergus Falls, MN 565380496	Electronic Service	No	SPL_SL_11-852_Interested Parties
B. Andrew	Brown	brown.andrew@dorsey.com	Dorsey & Whitney LLP	Suite 1500 50 South Sixth Street Minneapolis, MN 554021498	Electronic Service	No	SPL_SL_11-852_Interested Parties
Christina	Brusven	cbrusven@fredlaw.com	Fredrikson & Byron, P.A.	200 S 6th St Ste 4000 Minneapolis, MN 554021425	Electronic Service	No	SPL_SL_11-852_Interested Parties
Tammie	Carino	tcarino@GREnergy.com	Great River Energy	12300 Elm Creek Blvd. Maple Grove, MN 55369-4718	Electronic Service	No	SPL_SL_11-852_Interested Parties

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Douglas M.	Carnival		McGrann Shea Anderson Carnival	Straugn & Lamb 800 Nicollet Mall, Suite 2600 Minneapolis, MN 554027035	Paper Service	No	SPL_SL_11-852_Interested Parties
Kenneth A.	Colburn	kcolburn@symbioticstrategies.com	Symbiotic Strategies, LLC	26 Winton Road Meredith, NH 32535413	Electronic Service	No	SPL_SL_11-852_Interested Parties
George	Crocker	gwillc@nawo.org	North American Water Office	PO Box 174 Lake Elmo, MN 55042	Electronic Service	No	SPL_SL_11-852_Interested Parties
Mark F.	Dahlberg	markdahlberg@nweco.com	Northwestern Wisconsin Electric Company	P.O. Box 9 104 South Pine Street Grantsburg, WI 548400009	Electronic Service	No	SPL_SL_11-852_Interested Parties
Jeffrey A.	Daugherty	jeffrey.daugherty@centerpointenergy.com	CenterPoint Energy	800 LaSalle Ave Minneapolis, MN 55402	Electronic Service	No	SPL_SL_11-852_Interested Parties
Curt	Dieren	cdieren@dgrnet.com	L&O Power Cooperative	1302 South Union Street PO Box 511 Rock Rapids, IA 51246	Electronic Service	No	SPL_SL_11-852_Interested Parties
Ian	Dobson	ian.dobson@ag.state.mn.us	Office of the Attorney General-RUD	Antitrust and Utilities Division 445 Minnesota Street, 1400 BRM Tower St. Paul, MN 55101	Electronic Service	No	SPL_SL_11-852_Interested Parties
Kristen	Eide Tollefson	HealingSystems@earthlink.net	R-CURE	P O Box 129 Frontenac, MN 55026	Paper Service	No	SPL_SL_11-852_Interested Parties
Bob	Eleff		Regulated Industries Cmte	100 Rev Dr Martin Luther King Jr Blvd Room 600 St. Paul, MN 55155	Paper Service	No	SPL_SL_11-852_Interested Parties

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Pam	Fergen		Henepin County Government Center CAO	A2000 300 S. Sixth Street Minneapolis, MN 55487	Paper Service	No	SPL_SL_11-852_Interested Parties
Sharon	Ferguson	sharon.ferguson@state.mn.us	Department of Commerce	85 7th Place E Ste 500 Saint Paul, MN 551012198	Electronic Service	No	SPL_SL_11-852_Interested Parties
John	Fuller	john.fuller@senate.mn	MN Senate	75 Rev Dr Martin Luther King Jr Blvd Room G-17 St. Paul, MN 55155	Electronic Service	No	SPL_SL_11-852_Interested Parties
Edward	Garvey	garveyed@aol.com	Residence	32 Lawton St Saint Paul, MN 55102	Paper Service	No	SPL_SL_11-852_Interested Parties
Benjamin	Gerber	bgerber@mnchamber.com	Minnesota Chamber of Commerce	400 Robert Street North Suite 1500 St. Paul, Minnesota 55101	Electronic Service	No	SPL_SL_11-852_Interested Parties
Darrell	Gerber		Clean Water Action Alliance of Minnesota	308 Hennepin Ave. E. Minneapolis, MN 55414	Paper Service	No	SPL_SL_11-852_Interested Parties
Elizabeth	Goodpaster	bgoodpaster@mncenter.org	MN Center for Environmental Advocacy	Suite 206 26 East Exchange Street St. Paul, MN 551011667	Electronic Service	No	SPL_SL_11-852_Interested Parties
Bryan	Gower	N/A	APX, Inc.	224 Airport Parkway Suite 600 San Jose, CA 95110	Paper Service	No	SPL_SL_11-852_Interested Parties
Todd J.	Guerrero	todd.guerrero@kutakrock.com	Kutak Rock LLP	Suite 1750 220 South Sixth Street Minneapolis, MN 554021425	Electronic Service	No	SPL_SL_11-852_Interested Parties
Burl W.	Haar	burl.haar@state.mn.us	Public Utilities Commission	Suite 350 121 7th Place East St. Paul, MN 551012147	Electronic Service	Yes	SPL_SL_11-852_Interested Parties

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Tony	Hainault	anthony.hainault@co.hennepin.mn.us	Hennepin County DES	701 4th Ave S Ste 700 Minneapolis, MN 55415-1842	Electronic Service	No	SPL_SL_11-852_Interested Parties
Bill	Heaney	billheaney@billheaney.com	IBEW Minnesota State Council	940 44th Ave NE Unite 21067 Columbia Hts, MN 55421-3099	Electronic Service	No	SPL_SL_11-852_Interested Parties
John	Helmers	helmers.john@co.olmsted.mn.us	Olmsted County Waste to Energy	2122 Campus Drive SE Rochester, MN 55904-4744	Electronic Service	No	SPL_SL_11-852_Interested Parties
Jared	Hendricks	hendricksj@owatonnautilities.com	Owatonna Public Utilities	PO Box 800 208 S Walnut Ave Owatonna, MN 55060-2940	Electronic Service	No	SPL_SL_11-852_Interested Parties
Annete	Henkel	mui@mnutilityinvestors.org	Minnesota Utility Investors	413 Wacouta Street #230 St.Paul, MN 55101	Electronic Service	No	SPL_SL_11-852_Interested Parties
Jessy	Hennesy	jessy.hennesy@avantenergy.com	Avant Energy	220 S. Sixth St. Ste 1300 Minneapolis, Minnesota 55402	Electronic Service	No	SPL_SL_11-852_Interested Parties
Ashley	Houston			120 Fairway Rd Chestnut Hill, MA 24671850	Paper Service	No	SPL_SL_11-852_Interested Parties
Lori	Hoyum	lhoyum@mnpower.com	Minnesota Power	30 West Superior Street Duluth, MN 55802	Electronic Service	No	SPL_SL_11-852_Interested Parties
Casey	Jacobson	cjacobson@bepc.com	Basin Electric Power Cooperative	1717 East Interstate Avenue Bismarck, ND 58501	Electronic Service	No	SPL_SL_11-852_Interested Parties
Eric	Jensen	ejensen@iwla.org	Izaak Walton League of America	Suite 202 1619 Dayton Avenue St. Paul, MN 55104	Electronic Service	No	SPL_SL_11-852_Interested Parties

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Paula	Johnson	paulajohnson@alliantenergy.com	Alliant Energy-Interstate Power and Light Company	P.O. Box 351 200 First Street, SE Cedar Rapids, IA 524060351	Electronic Service	No	SPL_SL_11-852_Interested Parties
Larry	Johnston	lw.johnston@smmpa.org	SMMPA	500 1st Ave SW Rochester, MN 55902-3303	Electronic Service	No	SPL_SL_11-852_Interested Parties
Nancy	Kelly	bademailnancyk@eurekarecycling.org	Eureka Recycling	2828 Kennedy Street NE Minneapolis, MN 55413	Paper Service	No	SPL_SL_11-852_Interested Parties
Julie	Ketchum	N/A	Waste Management	20520 Keokuk Ave Lakeville, MN 55044	Paper Service	No	SPL_SL_11-852_Interested Parties
Hank	Koegel	hank.koegel@edf-re.com	EDF Renewable Eenrgy	10 2nd St NE Ste 400 Minneapolis, MN 55413-2652	Electronic Service	No	SPL_SL_11-852_Interested Parties
Douglas	Larson	dlarson@dakotaelectric.com	Dakota Electric Association	4300 220th St W Farmington, MN 55024	Electronic Service	No	SPL_SL_11-852_Interested Parties
John	Lindell	agorud.ecf@ag.state.mn.us	Office of the Attorney General-RUD	1400 BRM Tower 445 Minnesota St St. Paul, MN 551012130	Electronic Service	Yes	SPL_SL_11-852_Interested Parties
Mark	Lindquist	N/A	The Minnesota Project	57107 422nd St New Ulm, MN 56073-4321	Paper Service	No	SPL_SL_11-852_Interested Parties
Pam	Marshall	pam@energycents.org	Energy CENTS Coalition	823 7th St E St. Paul, MN 55106	Electronic Service	No	SPL_SL_11-852_Interested Parties
Dave	McNary	N/A	Hennepin County DES	701 Fourth Avenue South suite 700 Minneapolis, MN 55415-1842	Paper Service	No	SPL_SL_11-852_Interested Parties

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
John	McWilliams	jmm@dairynet.com	Dairyland Power Cooperative	3200 East Ave SPO Box 817 La Crosse, WI 54601-7227	Electronic Service	No	SPL_SL_11-852_Interested Parties
Valerie	Means	valerie.means@lawmoss.com	Moss & Barnett	Suite 4800 90 South Seventh Street Minneapolis, MN 55402	Electronic Service	No	SPL_SL_11-852_Interested Parties
Brian	Meloy	brian.meloy@stinsonleonard.com	Stinson,Leonard, Street LLP	150 S 5th St Ste 2300 Minneapolis, MN 55402	Electronic Service	No	SPL_SL_11-852_Interested Parties
Peder	Mewis	Peder.Mewis@senate.mn	Senate Energy, Util and Telecom Committee	Room 322, State Capitol 75 Rev. Dr. Martin Luther King Jr. Blvd. St. Paul, MN 55155-1606	Electronic Service	No	SPL_SL_11-852_Interested Parties
Stacy	Miller	stacy.miller@state.mn.us	Department of Commerce	State Energy Office 85 7th Place East, Suite 500 St. Paul, MN 55101	Electronic Service	No	SPL_SL_11-852_Interested Parties
David	Moeller	dmoeller@allete.com	Minnesota Power	30 W Superior St Duluth, MN 558022093	Electronic Service	No	SPL_SL_11-852_Interested Parties
Andrew	Moratzka	apmoratzka@stoel.com	Stoel Rives LLP	33 South Sixth Street Suite 4200 Minneapolis, MN 55402	Electronic Service	No	SPL_SL_11-852_Interested Parties
Carl	Nelson	cnelson@mncee.org	Center for Energy and Environment	212 3rd Ave N Ste 560 Minneapolis, MN 55401	Electronic Service	No	SPL_SL_11-852_Interested Parties
David W.	Niles	david.niles@avantenergy.com	Minnesota Municipal Power Agency	Suite 300 200 South Sixth Street Minneapolis, MN 55402	Electronic Service	No	SPL_SL_11-852_Interested Parties

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Russell	Olson	N/A	Heartland Consumers Power District	PO Box 248 Madison, SD 570420248	Paper Service	No	SPL_SL_11-852_Interested Parties
Thomas L.	Osteraas	bademailthomasosteraas@leonard.com	Excelsior Energy	150 South 5th Street Suite 2300 Minneapolis, MN 55402	Paper Service	No	SPL_SL_11-852_Interested Parties
Joshua	Pearson	N/A	enXco, Inc.	15445 Innovation Drive San Diego, CA 92128	Paper Service	No	SPL_SL_11-852_Interested Parties
Mary Beth	Peranteau	mperanteau@wheelerlaw.com	Wheeler Van Sickle & Anderson SC	Suite 801 25 West Main Street Madison, WI 537033398	Electronic Service	No	SPL_SL_11-852_Interested Parties
John C.	Reinhardt		Laura A. Reinhardt	3552 26Th Avenue South Minneapolis, MN 55406	Paper Service	No	SPL_SL_11-852_Interested Parties
Kevin	Reuther	kreuther@mncenter.org	MN Center for Environmental Advocacy	26 E Exchange St, Ste 206 St. Paul, MN 551011667	Paper Service	No	SPL_SL_11-852_Interested Parties
Craig	Rustad	crustad@minnkota.com	Minnkota Power	1822 Mill Road PO Box 13200 Grand Forks, ND 582083200	Electronic Service	No	SPL_SL_11-852_Interested Parties
Robert K.	Sahr	bsahr@eastriver.coop	East River Electric Power Cooperative	P.O. Box 227 Madison, SD 57042	Electronic Service	No	SPL_SL_11-852_Interested Parties
Raymond	Sand	rms@dairynet.com	Dairyland Power Cooperative	P.O. Box 8173200 East Avenue South LaCrosse, WI 546020817	Electronic Service	No	SPL_SL_11-852_Interested Parties

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Richard	Savelkoul	rsavelkoul@martinsquires.com	Martin & Squires, P.A.	332 Minnesota Street Ste W2750 St. Paul, MN 55101	Electronic Service	No	SPL_SL_11-852_Interested Parties
Matthew J.	Schuerger P.E.	mjsreg@earthlink.net	Energy Systems Consulting Services, LLC	PO Box 16129 St. Paul, MN 55116	Electronic Service	No	SPL_SL_11-852_Interested Parties
Robert H.	Schulte	rhs@schulteassociates.com	Schulte Associates LLC	15347 Boulder Pointe Road Eden Prairie, MN 55347	Electronic Service	No	SPL_SL_11-852_Interested Parties
Dean	Sedgwick	N/A	Itasca Power Company	PO Box 457 Bigfork, MN 56628-0457	Paper Service	No	SPL_SL_11-852_Interested Parties
Andrew	Serri	aserri@bepc.com	Basin Electric Power Coopertive	1717 E Interstate Ave. Bismarck, ND 58503-0564	Electronic Service	No	SPL_SL_11-852_Interested Parties
Mrg	Simon	mrgsimon@mrenergy.com	Missouri River Energy Services	3724 W. Avera Drive P.O. Box 88920 Sioux Falls, SD 571098920	Electronic Service	No	SPL_SL_11-852_Interested Parties
Beth H.	Soholt	bsoholt@windonthewires.org	Wind on the Wires	570 Asbury Street Suite 201 St. Paul, MN 55104	Electronic Service	No	SPL_SL_11-852_Interested Parties
Erin	Stojan Ruccolo	ruccolo@fresh-energy.org	Fresh Energy	408 Saint Peter St Ste 220 Saint Paul, MN 55102-1125	Electronic Service	No	SPL_SL_11-852_Interested Parties
James M.	Strommen	jstrommen@kennedy-graven.com	Kennedy & Graven, Chartered	470 U.S. Bank Plaza 200 South Sixth Street Minneapolis, MN 55402	Electronic Service	No	SPL_SL_11-852_Interested Parties

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Eric	Swanson	eswanson@winthrop.com	Winthrop Weinstine	225 S 6th St Ste 3500 Capella Tower Minneapolis, MN 554024629	Electronic Service	No	SPL_SL_11-852_Interested Parties
Steve	Thompson		Central Minnesota Municipal Power Agency	459 S Grove St Blue Earth, MN 56013-2629	Paper Service	No	SPL_SL_11-852_Interested Parties
SaGonna	Thompson	Regulatory.Records@xcelenergy.com	Xcel Energy	414 Nicollet Mall FL 7 Minneapolis, MN 554011993	Electronic Service	No	SPL_SL_11-852_Interested Parties
Douglas	Tiffany	tiffa002@umn.edu	University of Minnesota	316d Ruttan Hall 1994 Buford Avenue St. Paul, MN 55108	Electronic Service	No	SPL_SL_11-852_Interested Parties
Pat	Treseler	pat.jcplaw@comcast.net	Paulson Law Office LTD	Suite 325 7301 Ohms Lane Edina, MN 55439	Electronic Service	No	SPL_SL_11-852_Interested Parties
Darryl	Tveitbakk		Northern Municipal Power Agency	123 Second Street West Thief River Falls, MN 56701	Paper Service	No	SPL_SL_11-852_Interested Parties
Roger	Warehime	warehimer@owatonnautilities.com	Owatonna Public Utilities	208 South WalnutPO Box 800 Owatonna, MN 55060	Electronic Service	No	SPL_SL_11-852_Interested Parties
Paul	White	paul.white@prcwind.com	Project Resources Corp./Tamarac Line LLC/Ridgewind	618 2nd Ave SE Minneapolis, MN 55414	Electronic Service	No	SPL_SL_11-852_Interested Parties
Robyn	Woeste	robynwoeste@alliantenergy.com	Interstate Power and Light Company	200 First St SE Cedar Rapids, IA 52401	Electronic Service	No	SPL_SL_11-852_Interested Parties
Thomas J.	Zaremba	TZaremba@wheelerlaw.com	WHEELER, VAN SICKLE & ANDERSON	Suite 801 25 West Main Street Madison, WI 537033398	Electronic Service	No	SPL_SL_11-852_Interested Parties