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minnesota power

AN ALLETE COMPANY

2015 SOLAR ENERGY STANDARD PROGRESS REPORT

CUSTOMER | COMMUNITY | UTILITY



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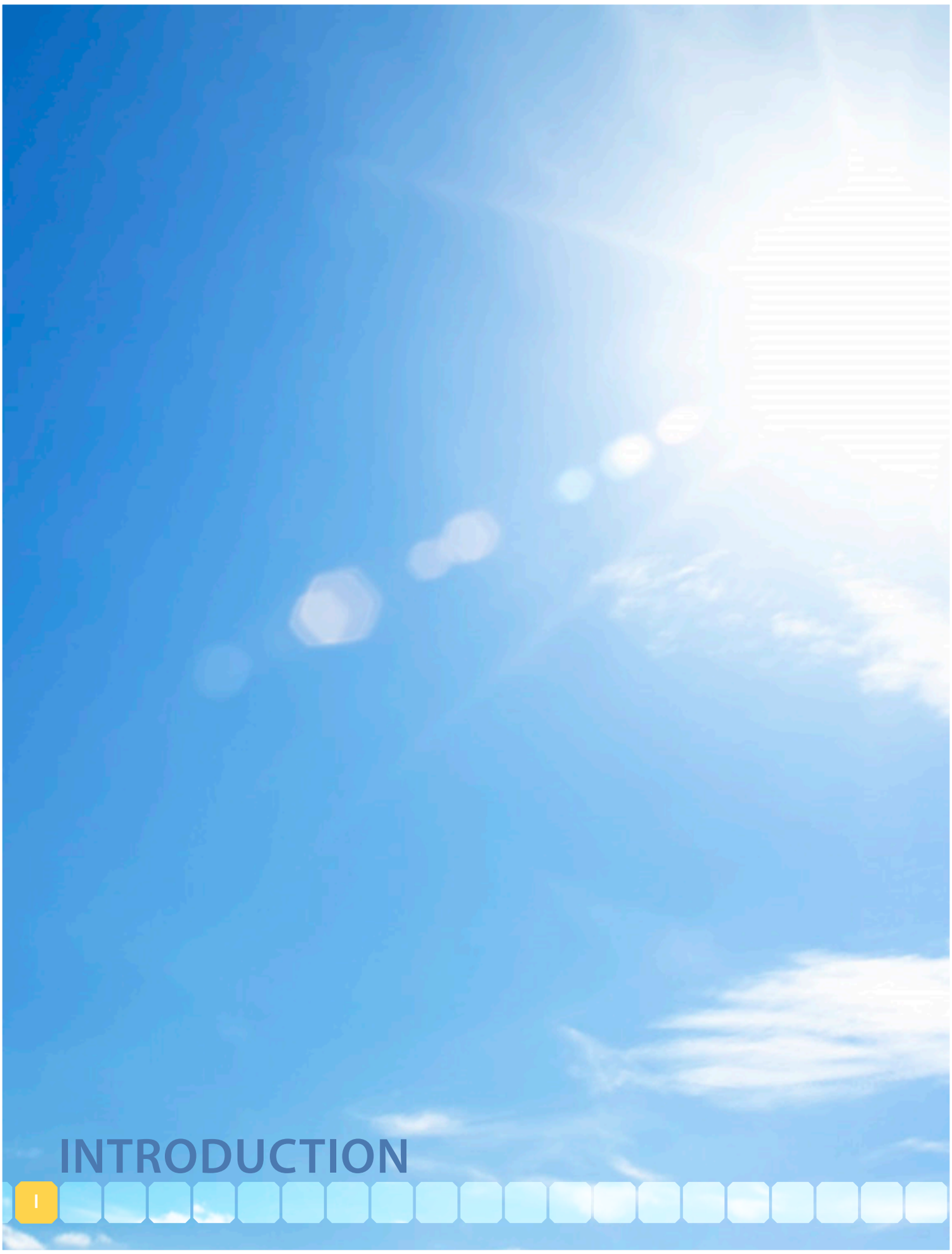


INTRODUCTION

1

STATE OF MINNESOTA
BEFORE THE
MINNESOTA PUBLIC UTILITIES COMMISSION

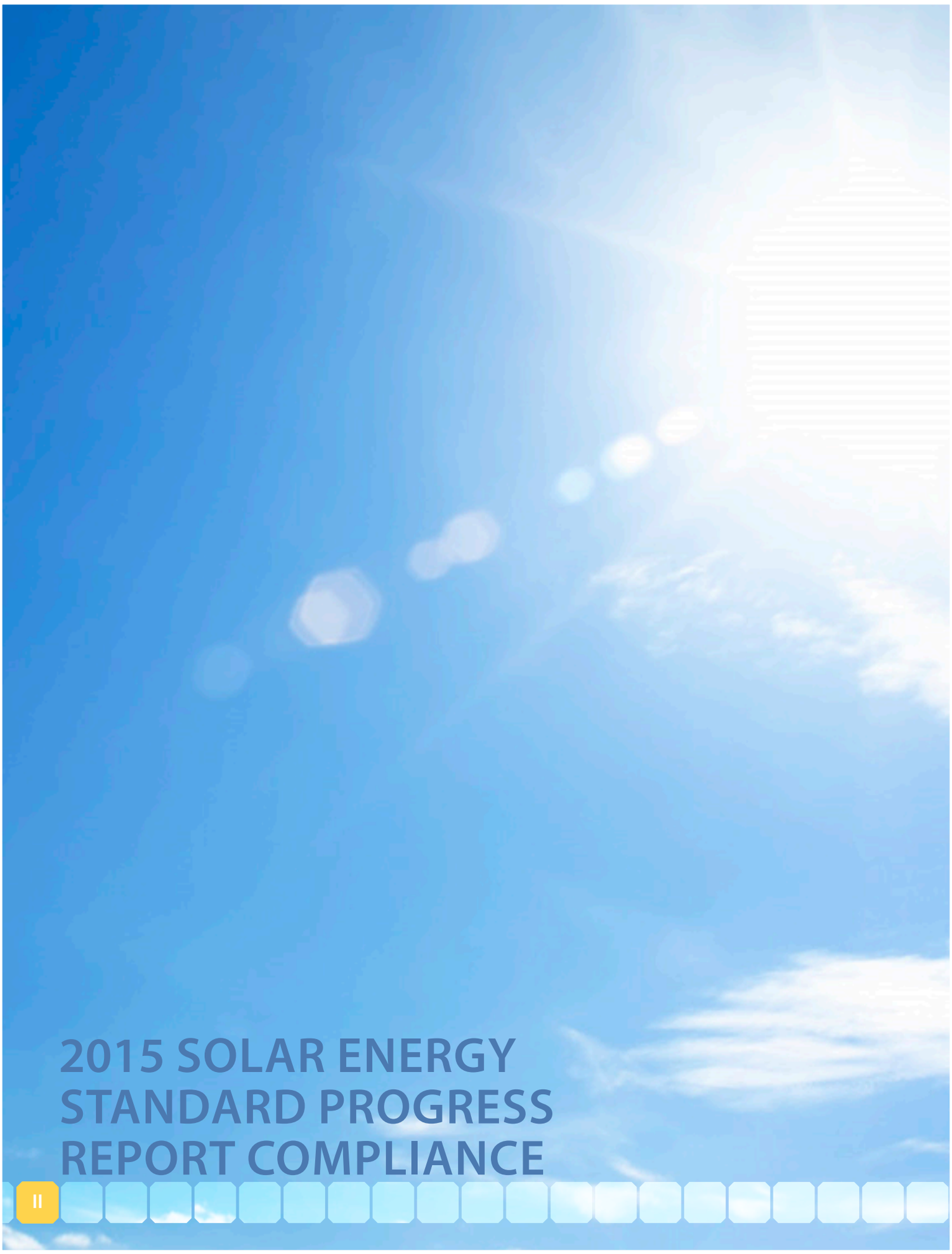
In the Matter of Utilities' Annual Reports on Progress In Achieving the Solar Energy Standard	Docket No. E999/M-16-342 **MINNESOTA POWER'S PROGRESS REPORT**

I. INTRODUCTION

During the 2013 legislative session, Minn. Stat. § 216B.1691, the statute establishing Minnesota's Renewable Energy Standard ("RES"), was amended to include an additional Solar Energy Standard ("SES"). The SES requires 1.5 percent of a public utility's retail sales, net of customer exclusions, to be served by solar energy resources by 2020. Of the 1.5 percent SES, at least 10 percent must come from solar energy generated by or procured from solar photovoltaic ("PV") devices with a nameplate capacity of 20 kilowatts ("kW") or less. Minn. Stat. § 216B.1691, subd. 2f requires each public utility to file an annual report with the Commission outlining its progress in achieving the SES.

On October 28, 2015, the Minnesota Public Utilities Commission ("Commission" or "MPUC") issued an Order Accepting the 2014 Solar Energy Standard Reports.[1] Minnesota Power (or the "Company") respectfully submits its 2015 Annual Progress Report in Achieving the SES. Through this Report, the Company outlines its 2015 efforts in positioning itself for a balanced approach to be compliant with the SES in 2020 and beyond. In 2015, Minnesota Power embarked upon its first utility scale solar project with a 10 MW array at Camp Ripley in Little Falls, MN. The Camp Ripley Solar Project will be the largest solar array on any National Guard military base in the nation and represent nearly one third of the solar energy needed for Minnesota Power to meet its SES requirements.[2] The Company also filed its first proposed Community Solar Garden Pilot Program in 2015 which, if approved by the Commission, will offer customers a new option for accessing solar energy.[3] Finally, the Company continued its longstanding support of customer-sited solar systems with its SolarSense rebate program, which has been in place for over a decade.

[1] Docket No. E-999/M-15-462 or Docket No. E-999/CI-13-542. MPUC Order Dated October 28, 2015.
[2] Docket No. E015/M-15-773.
[3] Docket No. E015/M-15-825.



2015 SOLAR ENERGY STANDARD PROGRESS REPORT COMPLIANCE

II. 2015 SOLAR ENERGY STANDARD PROGRESS REPORT COMPLIANCE

A. Annual Minnesota retail sales for the previous calendar year

Minnesota Power's total retail sales for 2015 were nearly 8.4 million MWh,[4] as shown in Table 1.

Table 1: 2015 Retail Totals

	2015 Retail Sales (MWh)
Residential	1,026,454
Commercial	1,254,681
Industrial	6,073,273
Lighting	15,801
Public Authorities	54,470
Total Retail	**8,424,680**

B. Annual excluded customer sales for the previous calendar year

Per the Commission's Order on October 23, 2014,[5] utilities were directed to only report excluded sales from customers that have requested and been approved by the utility for exclusion from SES requirements.

Based upon a list of received applications from exempt customers in 2015, and verifying their NAICS codes[6] with the list of Commission-approved NAICS codes (see Table 2), 5.2 million MWh of excluded sales were identified. This translates to 62% of Minnesota Power's 2015 retail sales.

[4] ALLETE/Minnesota Power 2014 FERC Form No. 1, Pages 304-304.1.
[5] Docket No. E-999/M-14-321. Commission Order Dated October 23, 2014.
[6] The North American Industry Classification System (NAICS) codes are standards used by federal statistical agencies to classify businesses. NAICS codes are self-reported by customers.

Table 2: Commission-Approved NAICS Codes for SES Exemption

NAICS Code	NAICS Label
212210	Iron Ore Mining
321113	Sawmills
321114	Wood Preservation
321211	Hardwood Veneer and Plywood Manufacturing
321212	Softwood Veneer and Plywood Manufacturing
321213	Engineered Wood Member (Except Truss) Manufacturing
321214	Truss Manufacturing
321219	Reconstituted Wood Product Manufacturing
321911	Wood Window and Door Manufacturing
321912	Cut Stock, Resawing Lumber, and Planning
321918	Other Millwork (including Flooring)
321920	Wood Container and Pallet Manufacturing
321991	Manufactured Home (Mobile Home) Manufacturing
321992	Prefabricated Wood Building Manufacturing
321999	All Other Misc Wood Product Manufacturing
322110	Pulp Mills
322121	Paper (Except Newsprint) Mills
322122	Newsprint Mills
322130	Paperboard Mills
322211	Corrugated and Solid Fiber Box Manufacturing
322212	Folding Paperboard Container Manufacturing
322219	Other Paperboard Container Manufacturing
322220	Paper Bag and Coated and Treated Paper Manufacturing
322230	Sanitary Product Manufacturing
322291	Sanitary Paper Product Manufacturing
322299	All Other Converted Paper Product Manufacturing

Table 3: 2015 Excluded Customer Retail Sales (MWh)

	2015 Retail Sales	2015 Exclusions	2015 Sales After Exclusions
Residential	1,026,454	-	1,026,454
Commercial	1,254,681	-	1,254,681
Industrial	6,073,273	5,224,141	849,132
Lighting	15,801	-	15,801
Public Authority	54,470	-	54,470
Total Retail	8,424,680	5,224,141	3,200,538

Table 4: Projected 2015 Mandate Requirements after Exclusions (MWh)

Solar Mandate Based on 2015 Retail Only	
1.5 Percent of 2015 Sales After Exclusions	48,008
10 Percent of 1.5 Percent	4,801

C. Customers requesting exclusion from the requirements of SES, NAICS code and annual kWh usage

On November 19, 2014 the MPUC issued an Order requiring the public utilities subject to the SES to file a plan for processing customer exemptions from the SES, per Minn. Stat. § 216B.1691 subd. 2f. Minnesota Power's proposed SES exemption notification and administration process was approved by the MPUC on December 1, 2015.[7] The filing documented the proposed communication plan, which includes an educational bill insert in all commercial customer bills, a direct mailing to customers with approved NAICS codes, information on Minnesota Power's website (www.mnpower.com/SESexemption), and information included in all new commercial customer service agreement paperwork.

The Commission-approved customer communications were administered in early 2016. Additionally, an educational bill insert will be sent to commercial customers in 2018 and 2020 to notify new customers, and customers whose primary business purpose may have changed since the initial bill insert, of the SES exemption.

Thirteen customers were approved by the Company for exclusion from the SES in December 2015.[8] Because Minnesota Power's SES exemption notification and administration process was not approved until late 2015, the Company expects to receive additional exemption requests in 2016 from customers other than the thirteen listed below, which could represent a significant amount of sales. In order to give an accurate depiction of the sales excluded from the SES, Minnesota Power has included in Section G for the 2020 forecast a breakdown of excluded sales for customers approved for SES exemption in 2015, and also included sales to customers the Company believes qualify for exemption and are likely to request exclusion from the SES in 2016.

[7] Docket No. E999/CI-13-542.
[8] One of the thirteen customers approved for exemption in 2015 was not operating and therefore had no usage to note in Table 5.

The following Minnesota Power customers applied for and were approved for exclusion from the SES in 2015:

1. ArcelorMittal USA (Minorca Mine)
2. Boise White Paper, LLC
3. Hibbing Taconite Company
4. Mesabi Nugget
5. Mesabi Mining, LLC
6. Mining Resources, LLC
7. Verso Corporation
8. Northshore Mining Company
9. Sappi Cloquet, LLC
10. Silver Bay Power Corporation
11. United States Steel Corporation (Keewatin Taconite and Minntac Mine)
12. United Taconite, LLC
13. Blandin Paper Company

Shown below in Table 5 are twelve iron mining and paper mill customers that make up the excluded 2015 sales approved by the Company. There are thirteen customers currently approved for exemption but due to one customer not operating in 2015 there are only twelve customers with energy sales reported in Table 5.

Table 5: 2015 Excludable Sales in Iron Mining or Paper

Customer Name [TRADE SECRET DATA EXCISED]	Usage (MWh) [TRADE SECRET DATA EXCISED]	NAICS
		322121
		322121
		212210
		212210
		212210
		212210
		322121
		212210
		322121
		212210
		212210
		212210

D. Total Minnesota retail sales for customer excluded from SES

For those customers that have applied in 2015 for SES exemption, their 2015 retail sales totaled 5.2 million MWh (as shown in Table 3 and 5).

E. Annual solar generation on the utility's system for the previous calendar year

As of the end of 2015, there were 153 solar net metered customers in Minnesota Power's service territory.[9] Of the 153 installations, approximately 80 percent were incentivized with solar rebates, the majority of which were either through Minnesota Power's SolarSense program, the Made in Minnesota program, or prior incentive programs run through the state that are no longer funded.[10] Current solar customers sign the uniform statewide interconnection contract with Minnesota Power.[11] Additionally, starting in 2015, new SolarSense customers are required to sign a Solar Renewable Energy Credit Contract to transfer the system's Solar Renewable Energy Credits ("SREC") to Minnesota Power. These SRECs are used for the Company's compliance with the SES Small Scale Carve-Out requirement and are being tracked in the Midwest Renewable Energy Tracking System ("M-RETS").

Historically, Minnesota Power has not required production meters on customer-sited solar PV systems. Production meters were first introduced for those customers receiving the Made in Minnesota incentives starting in 2014, as this annual incentive is based on actual production. Beginning in 2015, as a general practice, Minnesota Power now requires all distributed generation systems, including solar installations, to have a production meter. Minnesota Power provides the production meter for the customer, as it enables the Company to more accurately track customer-generated solar energy for compliance with the SES.

F. Estimated amount of solar generation required to obtain in 2020 and additional information on assumed capacity factor

Minnesota Power estimates that based upon its projected retail sales, approximately 32 MW of solar generation will be required to meet the SES. Transitioning to this amount of installed solar generation, assumed to be located in Minnesota, is expected to generate enough solar energy and associated SRECs for the Company to comply with the SES in 2020.

The capacity for existing customer owned solar generation is not currently accredited with the Midcontinent Independent System Operator ("MISO"); however it is included as part of the inherent load forecast process. For power supply planning purposes, when considering new utility scale solar generation as a future resource, assumptions are made about the capacity factor and accredited capacity value. The capacity factor is based upon a generic solar system modeled in Minnesota where the generation output is estimated using the PVSyst tool.[12] The PVSyst tool supports the capacity factors listed in Table 6. Using the same hourly generation shape from the PVSyst tool, the MISO accredited capacity value is estimated per the MISO Resource Adequacy Tariff for Intermittent Non-Wind Generation. As Minnesota Power obtains data from additional solar generation in its service territory, it may update capacity factors that are currently being used for planning purposes.

The estimated amount of solar generation Minnesota Power is required to obtain totals approximately 32 MW, as shown in Table 6.

Table 6: Estimated Amount of Solar Generation Required in 2020

[9] Docket No. PR-16-9. 2015 Qualifying Facilities Report.
[10] Docket No. E015/CIP-13-409. Minnesota Power's 2014-2016 CIP Triennial Filing. Pages 59-64.
[11] Minn. Rule 7835.9910 addresses the Uniform Statewide Contract and is available online at the following link: http://www.mnpower.com/Content/Documents/CustomerService/DistributedGeneration/
[12] PVSyst is a photovoltaic ("PV") centric simulation tool initially developed at the University of Geneva, Switzerland.

Solar Mandate Requirement	2020 Retail Sales After Exclusion (MWh)	Capacity Factor	Generation Required to Obtain SES (MW)
90% of 1.5 Percent	49,733	0.20	28
10% of 1.5 Percent	5,526	0.16	4
Total 1.5 Percent SES Requirement	**55,259**		**32**

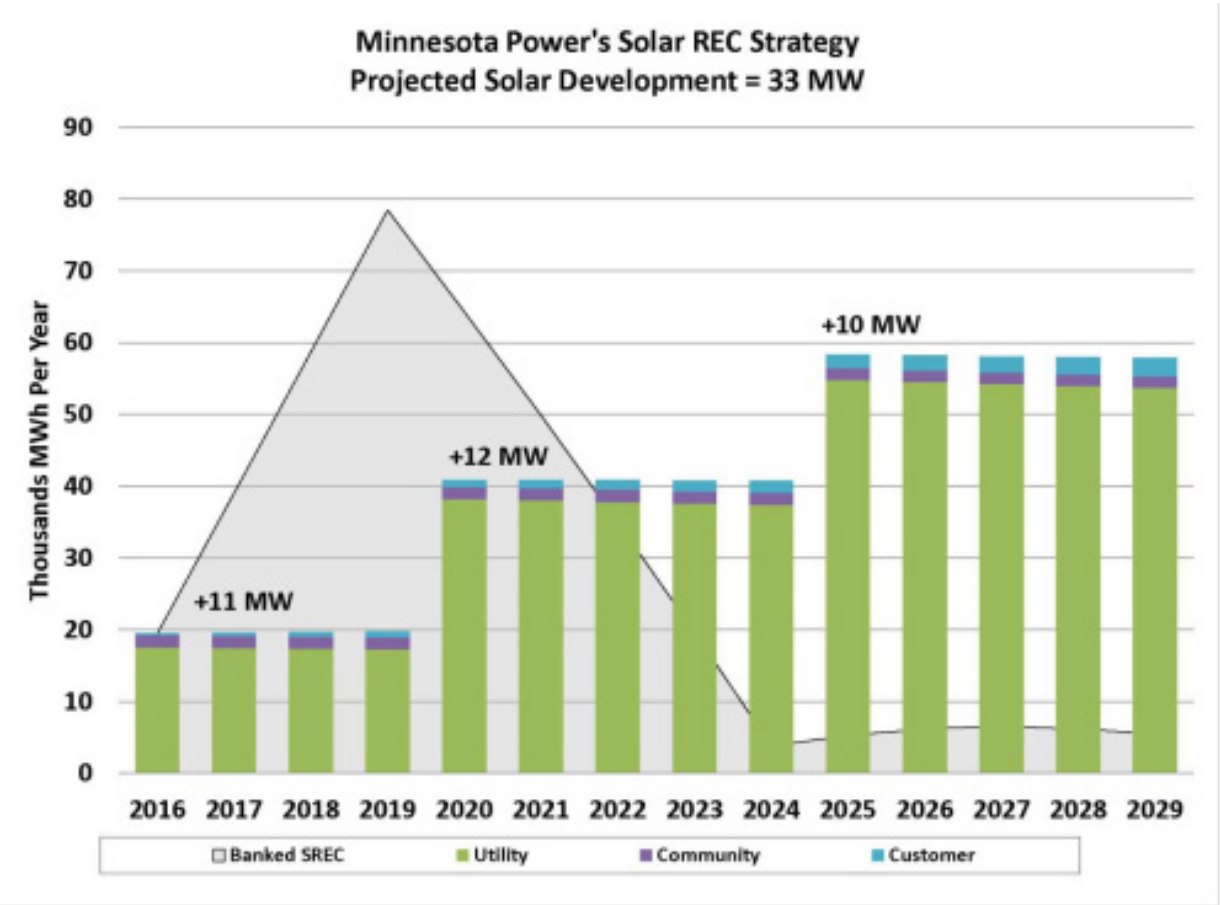
While Table 6 represents the maximum amount of solar generation required to meet the SES in 2020, early action and use of SRECs can provide flexibility to meet this energy standard without development of the entire 32 MW in the next four years.

In September 2015, the Company filed its Integrated Resource Plan[13] ("IRP") which includes a short term action plan during the five year period of 2015-2019. Through this docket, Minnesota Power noted that adding new solar generation beyond the Company's current SES strategy was shown as a less cost-effective resource alternative for customers. The solar generation characteristics do not align well with the energy needs of the Company's customer mix as Minnesota Power has a high load factor due to the large concentration of industrial load on its system that requires energy around the clock. The Company also has a winter peak that normally occurs during the late evening when the sun is not available, which limits the economic benefit of solar generation following demand peak hours to only the summer months when Minnesota peak demand characteristics are more aligned with neighboring utilities.

Minnesota Power recognizes that solar technology is continuing to become more efficient and costs are declining. In the IRP analysis process, solar energy began to show economic benefit for customers in the mid-2020s under certain sensitivities. Adding utility scale solar in the short-term action plan period (2015-2019) was not beneficial to customers at the current cost outlooks. Given that at certain cost ranges, solar starts to show a benefit for customers during the study period, Minnesota Power will continue to evaluate new solar technology trends in future resource plans to identify when it would be beneficial to customers to augment the power supply with additional utility scale solar beyond what is required to comply with the SES. However, early action and use of SREC banking can provide flexibility to meet the SES while adding solar to the Company's resource mix in a cost-effective way for customers. Figure 1, as outlined in the Company's IRP and noted below, demonstrates Minnesota Power's strategy to use SRECs to meet the SES.

[13] Docket No. E015/RP-15-690.

Figure 1: Minnesota Power's Solar REC Strategy



Minnesota Power would rely on banked SRECS and about 23 MW of installed solar capacity to meet its 2020 requirements. The Company expects the remainder of this bank will allow Minnesota Power to meet and exceed SREC requirements in 2021, 2022, and 2023. Should there be any SREC deficits, those deficits are assumed to be met with SREC purchases in that particular year so no negative balance is carried into the following year.

G. Estimated solar energy requirements to meet the SES in 2020

The estimated solar energy requirements for 2020 include estimated customer exemptions along with approved exemptions in the Company's SES obligation. The energy sales for exempt customers are based on the Moderate Growth Scenario from Minnesota Power's 2015 Annual Electric Utility Forecast Report, as depicted in Table 7. The projected industrial sale exclusion value in 2020 is the aggregate of all presently exempt customers and customers who are expected to apply for exemption within the next year. The energy outlook for these customers totals 5,672,871 MWh in 2020.

Table 7: 2020 Retail Sales Forecast, Sales after Exclusions and 2020 Goal

Projected 2020 Solar Mandate (MWh)

	2020 Retail Sales	2020 Exclusions	2020 Sales After Exclusions
Residential	1,117,731	-	1,117,731
Commercial	1,361,815	-	1,361,815
Industrial	6,799,860	5,672,871	1,126,989
Lighting	16,886	-	16,886
Pub Authority	60,533	-	60,533
Total Retail	9,356,826	5,672,871	3,683,955

Retail Sales Solar Mandate Requirement	As % of Retail Sales		After Exclusions
1.5 Percent	140,352		55,259
10% of 1.5 Percent	14,035		5,526

H. Brief summary of the state in which solar generation is located or anticipated

The planning process is underway to identify future locations and applications for solar generation in Minnesota Power's service territory. At this time, Minnesota Power does not anticipate generating solar energy outside of Minnesota. However, evaluation of solar opportunities is ongoing at the Company as the technology advances and economics improve.

I. Purchases and sales of solar renewable energy credits ("SREC") to meet the SES

Minnesota Power did not purchase or sell any SRECs in 2015.

J. Breakdown of SRECs generated in previous calendar year

1. Facilities receiving a value of solar rate: Minnesota Power is currently not generating any SRECs from facilities receiving a value of solar rate.
2. Community Solar Gardens: Minnesota Power is currently not generating any SRECs from Community Solar Gardens.
3. Facilities under a net metering tariff: As of the end of 2015, Minnesota Power had 153 solar net-metered customers.[14] For reporting purposes in this filing, customers receiving SolarSense or Made in Minnesota rebates will be reported under number 6 (facilities receiving an incentive). Minnesota Power did not specifically contract for the SRECs from customer owned net-metered installations that did not receive an incentive, and therefore did not obtain any SRECs from these facilities.

[14] 2015 Qualifying Facilities Report Docket No. E999/PR-16-9

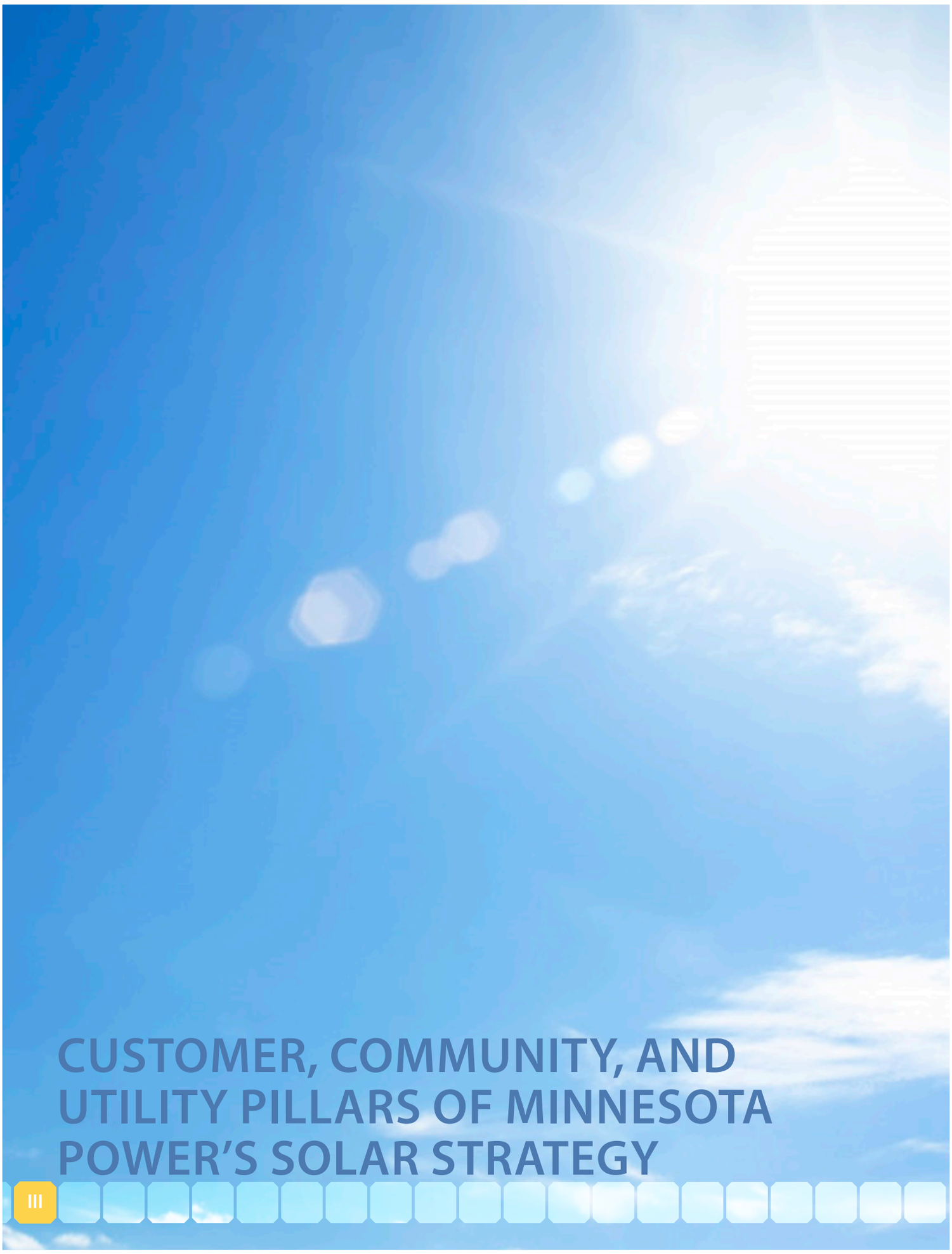
4. Utility owned solar projects: In 2015, Minnesota Power did not own any qualifying solar projects.

5. Solar facilities that have entered into a PPA with the utility: As of the end of 2015, Minnesota Power was not a party to any solar PPAs.

6. Facilities receiving an incentive: Minnesota Power has provided rebates to customers who install solar PV systems through its SolarSense rebate program since 2004. In 2015, the Company began contracting for and registering SRECS from customers receiving a SolarSense or Made in Minnesota incentive with MRETS for compliance with the SES.[15] The Company implemented an SREC Contract to allow SolarSense customers to transfer SREC ownership to Minnesota Power. In addition to the SREC contract for SolarSense program participants, the Company also now requires customers participating in the SolarSense and Made in Minnesota programs to complete a Schedule A form to allow the Company to register SRECs with M-RETS.

   In 2015, the Company awarded SolarSense rebates to 13 customers (110 kW).[16] Additionally, five Minnesota Power customers received a Made in Minnesota incentive (67 kW). This amounted to a total installed capacity of 177 kW for projects receiving an incentive in 2015. The Company registered 39 small scale SRECs and 38 large scale SRECs with M-RETS for these projects.

[15] Minn. Stat. 216C.414 Subd.5. "Renewable energy credits associated with energy provided to a public utility for which an incentive payment is made belong to the utility."
[16] The Company awarded SolarSense incentives to 13 customers in 2015 but 5 customers were granted an extension and the systems were installed in 2016.



CUSTOMER, COMMUNITY, AND UTILITY PILLARS OF MINNESOTA POWER'S SOLAR STRATEGY

III

III. CUSTOMER, COMMUNITY, AND UTILITY PILLARS OF MINNESOTA POWER'S SOLAR STRATEGY

A. Short summary of ongoing efforts to obtain solar energy

Minnesota Power is pursuing solar energy resources that are consistent with its current *Energy***Forward** resource strategy, which is designed to deliver safe and reliable service at the lowest possible cost to customers while protecting and improving the region's quality of life. Minnesota Power's *Energy***Forward** strategy is reshaping the Company's power supply toward a more diverse, flexible and lower emission portfolio while minimizing customer cost and maintaining reliability.

Minnesota Power is ahead of schedule in meeting its requirement to have 25 percent of projected 2025 electric sales from Minnesota Renewable Energy Standard ("RES") qualified renewable resources and the Company will build upon this experience in its efforts to obtain solar energy in a way that is beneficial to all customers. Minnesota Power will strive to maintain continuous progress towards the 2020 SES requirement.

The implementation of Minnesota Power's solar energy strategy will take into consideration customer outlooks, technology advancements, consumer trends and reasonable implementation costs. Utilizing each of the three pillars of focus – Customer, Community and Utility – will enable Minnesota Power to be more flexible with its implementation plans and create a diverse approach to integrating solar energy into its power supply portfolio. This is consistent with Minnesota Power's broader resource planning principles. Minnesota Power will continue to evolve this outlook while working closely with stakeholders to ensure reasonable cost and reliability are maintained.

Throughout Section III, Minnesota Power will outline the efforts undertaken in 2015 that support each pillar of the Company's Solar Strategy: Customer, Community and Utility. Through this strategy, Minnesota Power will be capturing economies of scale while supporting distributed generation in the spirit of the SES and making solar more accessible to those who do not have the ideal conditions to install solar at their home or business.

Figure 2: Pillars of Minnesota Power's Solar Strategy

Utility Pillar

Containing the largest quantity of solar energy, the Utility pillar is able to leverage economies of scale with each deployment and typically has access to the lowest cost solar resource for customers. Minnesota Power has determined principles for embarking on large scale solar that include: 1) ensuring underutilized land is given priority as to carefully manage Minnesota's natural resource based economies, 2) diversify locations within the service territory footprint, and 3) work with partners to achieve multiple business, community, and customer objectives. These principles, along with searching for reasonable cost solutions, will position Minnesota Power for a successful SES implementation.

The Camp Ripley Solar Project

Minnesota Power is continuing progress with its first large scale solar project at the Camp Ripley Army National Guard Base near Little Falls, MN. Several key milestones have been completed since the 2014 SES Progress Report was filed, including the successful negotiations of an Engineer/Procure/Construct ("EPC") agreement, an executed project finance agreement and a Camp Ripley Site Land Lease. Under the EPC agreement, procurement of long lead time items such as solar panels and inverters was completed in 2015 and the final site design was issued in March 2016. In January 2016, the Minnesota Public Utilities Commission unanimously approved the project[17] and the construction began in March of 2016 with an expected in-service date of October 2016. Once complete, the 10 MW Camp Ripley Solar Project will produce nearly one third of the energy required for the Company to meet the SES.

B. Small Scale Solar Carve-Out Compliance and Challenges

Community Pillar

Minnesota Power spent considerable time thoughtfully planning its efforts in the Community Pillar in 2015. It is the belief of the Company that a mix of customer-sited installations and community solar garden projects is the best approach to meeting the small scale requirement of the SES in a balanced and cost-effective way. Additionally, taking a comprehensive approach to meeting the SES, particularly the small scale requirement, provides customers that are not able to install a solar PV system on their home or business with the opportunity to participate in solar energy. The Company continues to explore opportunities to educate customers, engage communities and work with stakeholders to raise awareness about solar energy and encourage solar PV adoption throughout Minnesota Power's service territory.

Minnesota Power's Community Solar Strategy

In September 2015, the Company filed a Community Solar Garden Pilot Program ("CSG Pilot Program") for Commission approval.[18] Minnesota Power believes that community solar gardens represent an opportunity for more customers to participate in solar, regardless of whether they own their home or business, have suitable rooftops or sizable upfront capital for investment. As stated in last year's progress report, community offerings are an important part of the Company's overall solar strategy, and Minnesota Power has conducted extensive research to develop a thoughtful program focused on its customers. The CSG Pilot Program will

[17] Docket No. E015/M-15-773.
[18] Docket No. E015/M-15/825.

provide customers with a streamlined experience, consumer protections, increased optionality and a market-based approach to the pricing structure.

Through open and transparent competitive bidding processes, Minnesota Power has contracted for the solar energy needed for its proposed CSG Pilot Program at an attractive, market-based rate for customers and will offer this Pilot Program without any additional administrative or application fees. Minnesota Power's CSG Pilot Program will consist of two solar arrays that will produce the generation for the program. The first is a larger, more cost-effective, 1 MW solar array, owned and operated by a Minnesota-based solar developer, located on Saint Louis County owned land in Duluth, MN. Minnesota Power will purchase the solar generation from the 1 MW array through a Power Purchase Agreement with the solar developer. The second array is a smaller, more visible 40 kW array to be built by an EPC firm and located on Minnesota Power-owned land, also in Duluth, MN. Although the solar generation for the CSG Pilot Program is located in Duluth, the Company has proposed that Minnesota Power customers can participate in the program regardless of where they reside in the service territory.

The Company's proposed CSG Pilot Program offers three convenient ways for customers to participate: a one-time upfront payment option, a fixed monthly subscription fee or a per-kWh charge (also commonly referred to as "pay-as-you-go"). In the CSG Pilot Program docket, Minnesota Power has consistently stated that individual customer subscriptions to the solar garden, capped at 20 KW per service agreement, meet the legislative intent of the Small Scale Carve-Out of the SES and thus should qualify for compliance. Community solar gardens expand individual customer access to solar energy as the Small Scale Carve-Out provision intended.

Minnesota Power intends to scale the program based upon customer demand and has developed a thorough set of evaluation criteria to help ensure successful development and launching of future community solar offerings. The Company believes pilot projects are critical tools to test customer preferences and for utilities to offer new products and services their customers desire. They provide for learning, program adjustments, alignment with customer expectations, and process refinements before broader implementations occur. To that end, the Company looks forward to the Commission's approval of its proposed program so it can offer this option to its customers and further advance community solar based on the practical experience a pilot approach affords.

Solar Market Pathways

Minnesota Power is participating on a cross-functional team led by Ecolibrium3, a local nonprofit agency whose mission is to lead community change toward a sustainable future, as part of their grant award by the U.S. Department of Energy's Sunshot Initiative, under the Solar Market Pathways program. The project focuses on reducing the soft costs of solar PV through community policy implementation and the development of simplified processes for permitting and interconnection.[19] Over three years, the project has established a target of 1 MW of capacity in Duluth, MN through residential rooftop and community solar with a cost reduction goal of 50%. For more information, visit Ecolibrium3's website at http://www.ecolibrium3.org/

[19] The U.S. Department of Energy's SunShot Initiative defines solar soft costs as non-hardware costs related to installing solar, including financing, customer acquisition, permitting, installation, labor and inspection.

Customer Pillar

Figure 3: Minnesota Power's Solar Customer Experience

Minnesota Power has provided customers with tools and resources to make informed decisions about their investments in renewable energy through the Conservation Improvement Program ("CIP") for over a decade. Installing a solar PV system requires collaboration and effective communication between many different parties including customers, solar installers, inspectors, building and city officials, the utility and more. There are numerous components to a successful solar installation, the most important of which is the customer experience, as seen in Figure 3.

In an effort to enhance the customer experience and encourage growth in the current nascent solar market in northern Minnesota, the Company believes that a market-building approach to renewable programs is necessary. This includes a balanced offering of incentive programs, education and outreach, research and development and informational resources. Minnesota Power has proposed to further enhance the tools and resources offered to customers by coordinating these programmatic elements in a portfolio-based solar program.

Minnesota Power's SolarSense Rebate Program

Minnesota Power has a long-standing history of encouraging the adoption of customer-sited renewable energy systems through the SolarSense rebate program. SolarSense was first introduced in 2004 as a capacity-based incentive designed to complement the State of Minnesota Solar Electric Rebate Program and is now a tiered rebate designed to encourage the inclusion of energy efficiency efforts and qualified contractors. Since its initial implementation, the program has continuously evolved in an effort to meet the needs of customers and encourage a sustainable solar market in northern Minnesota.

In 2015, this program evolution continued as Minnesota Power introduced various modifications to the SolarSense program. These modifications included implementing a lottery process to award rebate funds, increasing the amount of incentives available by eliminating administration costs in the program and initiating a solar renewable energy credit contract for compliance with the state SES. These program changes were critical to increasing participation rates, monitoring the pent-up demand for solar energy rebates in northern Minnesota and realigning the SolarSense program to be more in line with the requirements of the state's SES.

The SolarSense program was fully subscribed in 2015 with rebates awarded to 13 customers[20] representing a total of $157,015 in customer rebates.[21] Minnesota Power gathered valuable data in the 2015 program year to further understand the pent-up demand for solar rebates in the region and information about solar installation trends.

[20] Minnesota Power awarded SolarSense funds to 13 customers for solar PV projects in 2015. Due to time constraints, 5 of the 13 total SolarSense projects were granted an extension by Minnesota Power in consultation with the Minnesota Department of Commerce. Those projects will be reported in the 2016 CIP Consolidated filing.
[21] Docket No. E015/CIP-13-409.02, E015/M-16-226.

Minnesota Power's Newly Proposed SolarSense Customer Program

In addition to insights gleaned through the 2015 SolarSense program, Minnesota Power conducted market research of residential and small to mid-sized commercial customers in 2015 to better understand customer preferences and expectations in regards to solar energy. The surveys revealed important information about solar programs including, customer motivations and barriers. The top three customer motivations to install a solar PV system include: renewable energy is good for the environment, renewables are cleaner forms of energy, and renewable energy could represent cost savings. The top three barriers to solar were: upfront cost, lack of information, and lack of energy storage.

Minnesota Power used these insights to inform program design and enhance Minnesota Power's program offerings. On June 1, 2016, Minnesota Power submitted its newly proposed SolarSense customer program with the MPUC. The filing outlined the Company's proposed customer solar programs including a portfolio of incentives, education and outreach, research and development and more. If approved by the MPUC, the proposed program will nearly triple the current amount of solar incentives available to customers and increase the opportunities for customers to participate in solar energy.

Solar Energy Analysis Pilot Program

In 2015, Minnesota Power launched a Solar Energy Analysis ("SEA") Pilot Program to help customers determine if solar energy is the right fit for their home or business. During an SEA, a Minnesota Power representative consults with interested customers about their energy usage and answers questions they have about solar energy, visits their site to analyze how solar may benefit them, and identifies site-specific conditions that may affect a potential installation. A summary of findings is then shared with the customer and they are encouraged to share the information when searching for or working with a solar installer.

Minnesota Power conducted SEAs for 32 customers in 2015, six of which submitted SolarSense applications in 2016. In order to understand the usefulness of the SEA pilot program, Minnesota Power conducted a feedback survey of all participating customers. In general, customers found the SEA experience to be very informative and many reported a strong interest to further their research to determine if solar is the right fit for them.

The Company continues to view this program as an opportunity to educate customers about solar energy and the interconnection process, and sees potential for this program to reduce the soft costs of installing solar by enhancing the customer acquisition process. Throughout the first year of the pilot, Minnesota Power tracked the program costs, customer satisfaction, and conversion rate metrics and identified opportunities to enhance the program by streamlining the process to reduce cycle time and providing additional information to the customer. These program enhancements will be further explored in 2016.

SOLAR EDUCATION AND OUTREACH

IV

IV. SOLAR EDUCATION AND OUTREACH

Minnesota Power views education and outreach as critical efforts in ensuring successful compliance with the SES, particularly with the Small Scale Carve-Out requirement. The Company feels it is important to engage customers about renewable energy applications in northern Minnesota and provide opportunities to educate customers about Minnesota Power's solar programs. This section details the Company's efforts to provide solar-focused education and outreach to both customers and Minnesota Power employees.

Minnesota Power Safety Circuit

Minnesota Power's Renewable Programs team participated in monthly safety presentations for the second consecutive year in 2015. The presentations focused on educating employees about emerging solar industry trends, the Company's interconnection requirements and processes and safety hazards to look for in the field. Employees were encouraged to contact the Renewable Programs team with any questions or suggestions regarding the Company's distributed generation interconnection process or activity.

Informational Tools and Resources

In an effort to provide customers with straightforward, easy to understand information, the Company created tools and resources including a Consumer Guide to Solar Power and an online incentive calculator. These tools are meant to help customers understand different types of solar PV systems and components, the importance of the grid, net energy metering, financial incentives, tax credits, and more. These tools are available on Minnesota Power's website at http://www.mnpower.com/Solar

Energy Design Conference & Expo

Renewable energy is a common theme at the annual Energy Design Conference & Expo ("EDC"). The agenda regularly includes an opportunity to participate in a full day of solar education with a focus on proper installation and design of solar energy systems. Solar presentations are offered by a diverse group of renewable energy experts, including Minnesota Power, the Department of Commerce, solar installers, building professionals and more. In addition to the solar curriculum, the 2015 conference boasted a full day preconference session to provide training to solar installers, general contractors, electricians, students and more about solar energy applications.

Renewable Energy Teacher Workshops

In the summer of 2015, Minnesota Power collaborated with the University of Minnesota Duluth's Boulder Lake Environmental Learning Center for the second year to offer a renewable energy teacher workshop. Teachers of different age groups and subject matters gathered in Duluth to learn about renewable energy applications. Minnesota Power's renewable energy experts presented at the workshops and provided tours of the Company's renewable energy facilities.

Harvest Festival

Minnesota Power worked with partners including the Minnesota Department of Commerce, Comfort Systems, Ecolibrium3, the Midwest Renewable Energy Association, the Minnesota Renewable Energy Society and Clean Energy Resource Teams to revive the energy fair at the 2015 Lake Superior Harvest Festival in Duluth. The energy fair provided an opportunity for Minnesota Power to engage the community and raise awareness of energy efficiency and renewable energy. Festival attendees were able to participate in an energy-themed obstacle course, learn about energy efficiency measures and receive information about Minnesota Power's SolarSense program, the Solar Energy Analysis Pilot Program and the proposed Community Solar Garden Pilot Program.

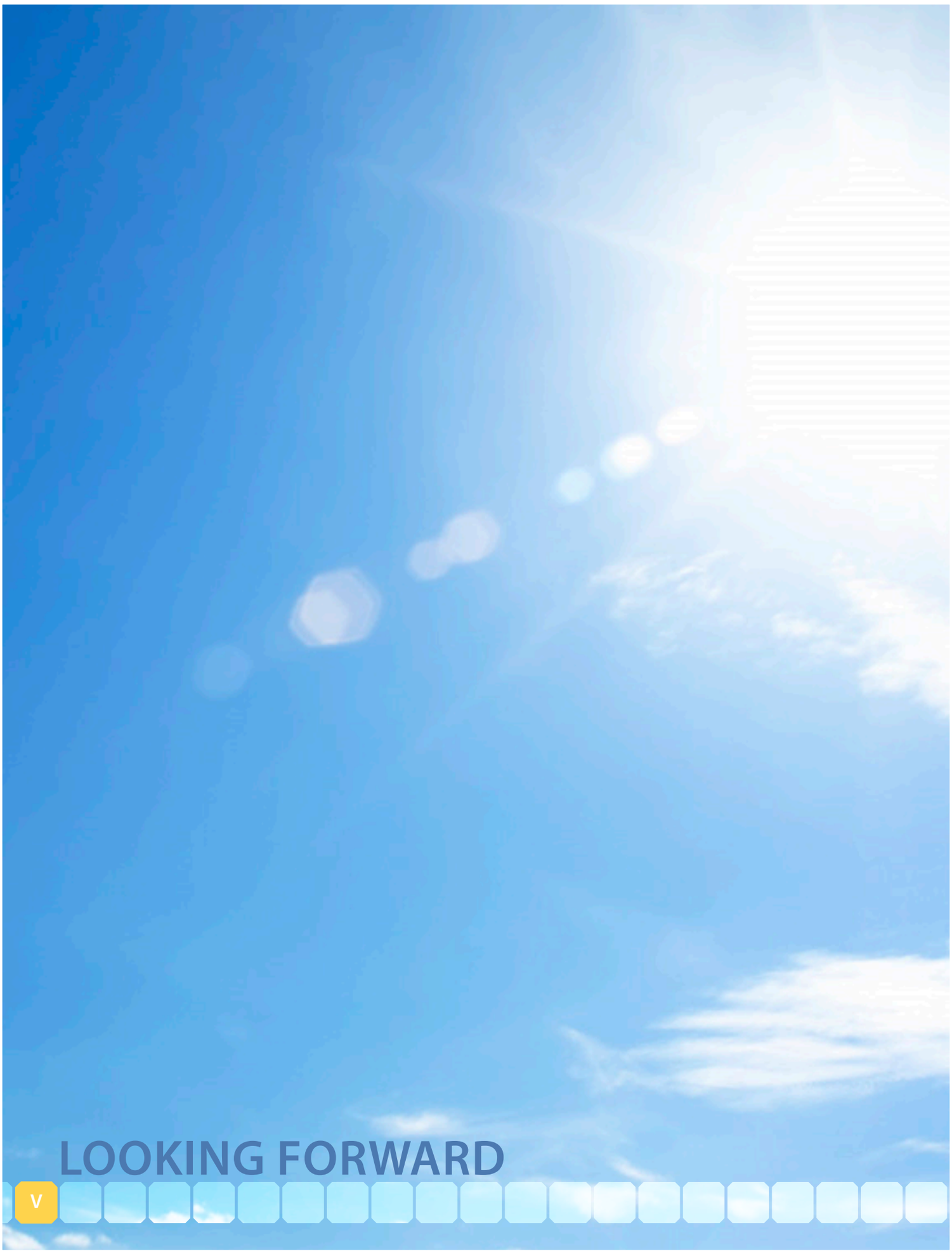
Camp Ripley Events

Camp Ripley hosted a variety of events in 2015 to highlight the Camp's dedication to energy efficiency and renewable energy. Minnesota Power employees joined Camp Ripley soldiers and staff for an Earth Day event to clean up the base and hosted an educational booth at the event which highlighted Camp Ripley's efficiency efforts, how to conserve energy at home, renewable energy and the Company's partnership with Camp Ripley to build a 10 MW solar array on the base.

In the fall of 2015, Camp Ripley also hosted a community appreciation event where Minnesota Power employees staffed a booth to raise awareness of Minnesota Power's energy efficiency and renewable programs. Minnesota Power offered energy-saving kits for individuals who completed an obstacle course to educate the community about recycling and energy efficiency. The booth also boasted a hands-on energy trailer to demonstrate how electricity is produced and used, as well as provide information on Minnesota Power's solar programs.

Lincoln Park Shines

The Lincoln Park Shines project linked senior level engineering students from the University of Minnesota Duluth ("UMD") with local businesses in Lincoln Park to evaluate ways to save energy, minimize water use and review renewable energy options for their sites. In addition to working directly with local businesses, two student teams worked on a proposal for a community solar garden project. Minnesota Power, Comfort Systems of Duluth, UMD faculty, and Ecolibrium3 served as resources for the students and even provided an opportunity for students to attend an energy efficiency analysis and solar energy analysis.



LOOKING FORWARD

V

V. LOOKING FORWARD

Interconnection Trends

Minnesota Power continues to work diligently to clarify and streamline the interconnection process in order to enhance the customer experience of installing a solar PV system or other distributed generation technologies. It is the belief of the Company that collaboration and effective communication between customers, installers, and the Company are critical to aligning expectations with achieved results. In 2015, the Company furthered its efforts to increase the transparency of the interconnection process and requirements by updating the Company website with detailed process documentation along with a user-friendly description of the interconnection process in the Consumer Guide to Solar Power.[22]

As the solar PV installation activity in northern Minnesota increases in the coming years, it will be more important than ever that the interconnection processes and requirements are transparent and diligently followed by all parties involved in the interconnection process including customers, installers and the Company. Minnesota Power will continue its efforts to further streamline the process, develop internal processes and infrastructure, and encourage collaboration between interested parties in 2016.

Cost Recovery for Solar Expenses

In 2015, Minnesota Power proposed a method to meet the legislative requirement to ensure statutorily exempt customers do not incur solar-related costs for projects needed by the Company to meet requirements of the SES. In its initial Camp Ripley Solar Project filing on August 21, 2015,[23] Minnesota Power submitted a proposal to appropriately allocate costs between solar-paying and solar-exempt customers. In its February 24, 2016 Order, the Commission approved the Company's general approach to allocate costs to customers by creating a new Rider for Solar Energy Adjustment ("SEA Rider"), in conjunction with the Company's existing Rider for Fuel and Purchased Energy Adjustment ("FPE Rider"), and a new Solar Renewable Factor as part of the Company's Renewable Resources Rider. The Commission also required the Company to submit a proposed alternative calculation of the SEA Rider which includes, at a minimum, an on-peak energy offset or another method that would better reflect the actual avoided energy costs due to solar additions, and an analysis of the applicability of the Value of Solar methodology components.[24]

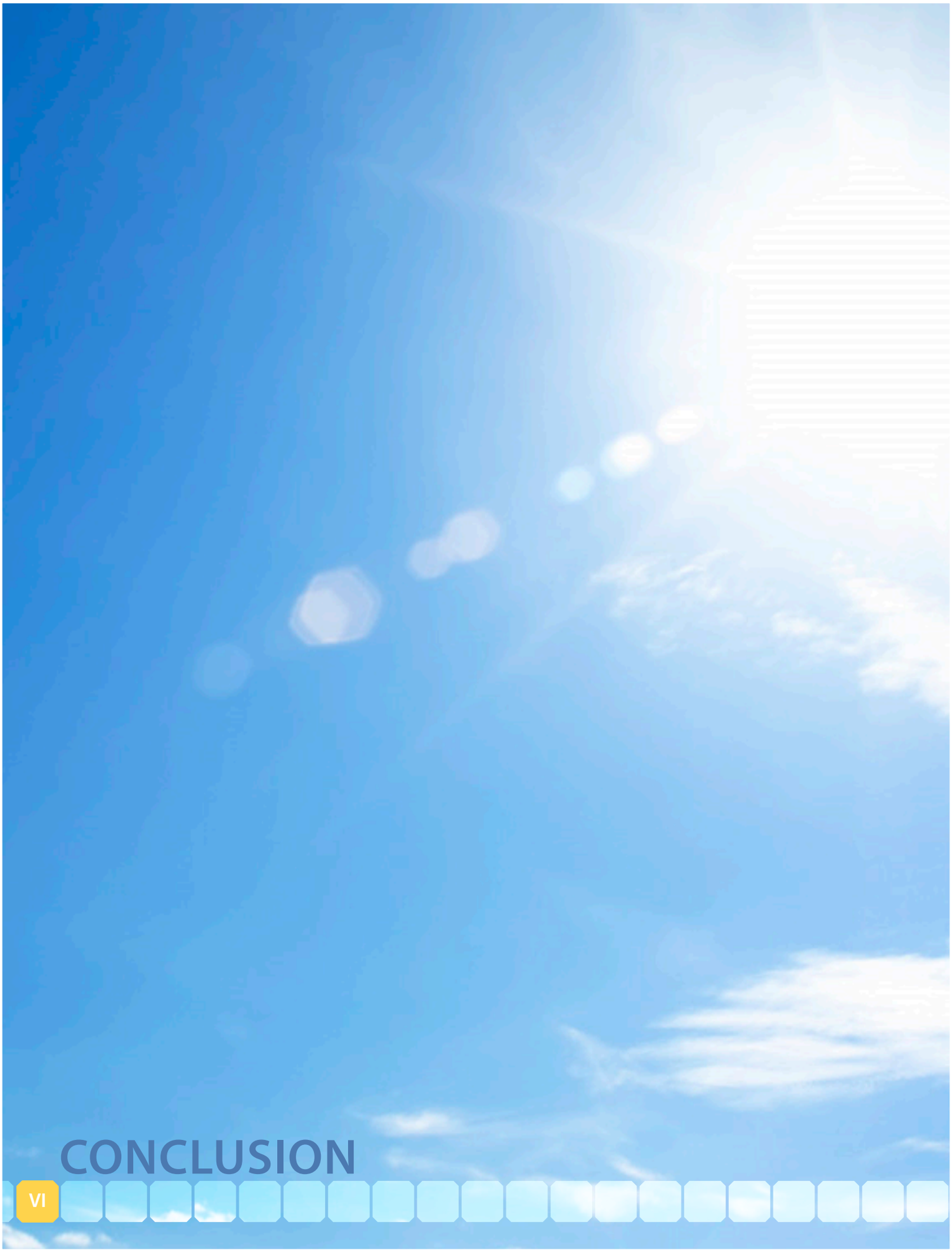
On April 25, 2016, Minnesota Power submitted in a compliance filing in the Camp Ripley docket, an alternative calculation of the SEA Rider, which includes a Time of Generation Adjustment ("TOGA") component in order to reflect the actual avoided energy costs due to solar additions. The steps to calculate the SEA Rider and the TOGA are detailed on pages 4 through 9 in the April 25 compliance filing, and sample calculations are included as Attachment 3 and Attachment 4. The TOGA is the means by which the Company proposes to quantify the value of the time of generation for solar energy, rather than applying a 24-hour average cost, which is the current method for calculating the FPE Adjustment. The TOGA is to be added to the base FPE cost in order to calculate a "TOGA-adjusted FPE Adjustment" which is applied to all customer energy usage. This docket is still open and the Commission's decision will impact the

[22] The Consumer Guide to Solar Power can be accessed via Minnesota Power's webpage, here: http://www.mnpower.com/Content/Documents/Environment/RenewableEnergy/Solar/consumer-guide-to-SOLAR.pdf
[23] Docket No. E015/M-15-773.
[24] The Commission's Order on May 13, 2016, denied reconsideration of its February 24, 2016 Order in Docket No. E015/M-15-773.

way all solar is valued in the SEA Rider, including both the Camp Ripley utility scale project and the Company's proposed Community Solar Garden Pilot Program.

Minnesota Power also outlined its new SolarSense Customer Program in a recent proposal filed with the MPUC. The Company asserted its belief that a portfolio-based approach, similar to Minnesota Power's CIP, is needed to meet the Small Scale Carve-out of the SES. As such, the Company believes that solar program expenses should be eligible for current cost recovery through the recently approved Solar Renewable Factor within the existing Renewable Resources Rider.[25] Approval of current cost recovery for solar program-related expenses is critical to the success of Minnesota Power's SolarSense Customer Program and the Company looks forward to the Commission's consideration of its proposal.

[25] Docket No. E-015/M-15-773



CONCLUSION

VI

VI. CONCLUSION

Minnesota Power views solar energy as an important and growing part of the renewable energy landscape, and is pleased to report on 2015 progress in each pillar of its solar strategy: Customer, Community and Utility. The Company looks forward to commissioning the 10 MW solar array at Camp Ripley by the end of 2016, as well as Commission approval of its proposed Community Solar Garden Pilot Program and its recently proposed SolarSense Customer Program. Each of these projects will ensure Minnesota Power's holistic approach to providing customers with solar energy options that work best for them and are implemented in a timely manner. The Company has outlined and begun implementation of its solar strategy to meet and exceed the SES in 2020 and will continue to execute its *Energy***Forward** resource strategy to diversify its entire energy mix to ultimately protect affordability, reliability and the environment.

Dated: June 1, 2016

Respectfully submitted,

Jennifer J. Peterson
Policy Manager
Minnesota Power
30 West Superior Street
Duluth, MN 55802
(218) 355–3202
jjpeterson@mnpower.com

APPENDIX

VII

VII. APPENDIX

2015 SOLAR ENERGY STANDARD PROGRESS REPORT APPENDIX:

1. 2015 RENEWABLE ENERGY TEACHER WORKSHOPS

2. 2015 ENERGY DESIGN CONFERENCE AND EXPO BROCHURE

Renewable Energy Workshop 2015

A professional development workshop for teachers / informal educators to design and deliver objective, multi-sided energy education programs

Offered by Boulder Lake Environmental Learning Center – Duluth, MN
Workshop will begin at University of Minnesota Duluth Bagley Classroom
Offering #I June 8-9, 2015 - Offering #2 June 15-16, 2015

Day 1

Start at University of Minnesota Duluth Bagley Classroom

https://mapsengine.google.com/map/edit?mid=zj6QkR6Lmkcw.k2fUE3_hgfco

10:00 a.m. Welcome & Introductions
Workshop leader introductions and participant introductions with icebreaker
Workshop overview & objectives.

10:15 a.m. The Science of Energy & Electric Connections
Learn more about the forms of energy through experiments and Electricity 101 including how electricity is distributed

10:45 – 11:00 Minnesota Power 101 – MP101 – noting how different electric service is in this region than the rest of the country because we serve such a large industrial load (the mines & paper mills) that need constant power (which is a challenge to intermittent renewable resources) as well as our transition from being over 90% coal based to our goal of 33% renewables…

11:00 a.m. Hands-on Solar!
These lessons encourage inquiry into radiant energy and an understanding of the energy transformations from radiant to electrical energy and thermal energy.

11:45 Minnesota Power Solar Presentation

12:15 p.m. Lunch - Provided

1:00 p.m. Tour of Bagley Classroom

2:00 p.m. Wind Energy Basics

2:15 p.m. Hands-on Wind!
These lessons encourage inquiry into wind energy and the transformation of mechanical energy into electricity.

4:00 p.m. Wrap up / Reflect on Day 1 and Lay groundwork for Day 2.

Supper and Lodging on your own…

Day 2

8:00 a.m. Depart UMD Bagley Classroom Parking Lot and travel to Taconite Ridge Energy Center

9:30-11:00 Tour of Taconite Ridge with cost/benefit analysis of wind power in the region.

11:00-12:45 Travel to Jay Cooke State Park – Lunch on Bus

12:45-2:00 p.m Hydropower tour with cost/benefit analysis of hydropower in the region

2:00-2:30 p.m. Travel to Hibbard Energy Center

2:30 -3:30 p.m. Biomass Tour with cost/benefit analysis of biomass in the region

3:30-4:00 p.m. Workshop reflection / wrap-up on bus ride to UMD.

Welcome to the 25th annual Energy Design Conference & Expo

ENERGY DESIGN
conference & expo

Monday, February 23 | Tuesday, February 24
Wednesday, February 25

Duluth Entertainment Convention Center

CELEBRATING 25 YEARS OF EDUCATION

Hosted by:

minnesota power
AN ALLETE COMPANY

power of one
a conservation program

Minnesota Power is pleased to host the 25th annual Energy Design Conference & Expo. Throughout the years, we have partnered with other energy-conscious organizations to expand the conference and ensure a diverse and cutting-edge agenda, and this year is one of the best yet!

PUBLIC DOCUMENT
TRADE SECRET DATA REMOVED

Celebrating 25 years!

Thank you for joining us in Duluth, Minn., for the 25th annual Energy Design Conference & Expo. What started 25 years ago as a one-day builders conference with just 45 attendees has grown to become the premier energy-efficient and high-performance building conference in Minnesota. Our goal is to provide you with educational sessions that are relatable and applicable to your profession and/or interests from experts and professionals who are passionate and knowledgeable in their given fields. We are especially excited about the scope and quality of this year's agenda and look forward to another successful and well-attended event.

The conference and expo provides a unique opportunity to meet and network with individuals, companies and organizations dedicated to the wise use of energy and resources in the building industry. We encourage you to allow ample time to visit with the exhibitors, and we also invite you to attend the Monday and Tuesday night receptions.

Our main goal when planning the conference is to provide you with innovative, credible and quality sessions. Please make sure to fill out our session evaluations and the general conference evaluation—your feedback and input are the driving force of session content.

Wow, 25 years … thank you so much for celebrating this milestone with us!

Enjoy the conference!

Sincerely,

The Energy Design Conference Planning and Session Advisory Committee

2015 Conference Sponsors

SILVER LEVEL SPONSOR	BRONZE LEVEL SPONSOR	EDUCATIONAL SPONSOR	MEDIA SPONSOR
SWL&P, AN ALLETE COMPANY	eTEC The Energy Conservatory; ComfortSystems Serving the City of Duluth; Minnesota Department of Commerce Division of Energy Resources	EEBA; Lake Superior College	Home energy The Home Performance Magazine

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ecolibrium3 LOCAL ENERGY MATTERS

Minnesota Department of Commerce Division of Energy Resources

eTEC The Energy Conservatory

GREAT RIVER ENERGY® A Touchstone Energy® Cooperative

Wagner Zaun ARCHITECTURE

AIA Minnesota A Society of The American Institute of Architects

Monday, February 23

Special Full-Day Preconference Trainings

Harborside 203

8:00 am–4:30 pm

PV 101 Basic Photovoltaics: An Overview of Solar Electric Systems

Are you interested in building solar energy into your business but not sure where to start? This daylong course is the perfect starting point to give you a competitive edge with the increasing demand for solar energy.

This 8-hour course uses a combination of lecture and classroom activities to teach the basics of photovoltaic (PV) systems. Participants will learn how PV systems work, diagram the four PV system types, describe and identify components, understand the best application and limitations of each system type, define the solar window, make energy-efficiency recommendations, estimate system loads and understand the basics of PV site assessment.

Presented by Julie Brazeau, Midwest Renewable Energy Association

$150 separate registration fee for this preconference track (includes lunch)

Harborside 204

8:00 am–4:30 pm

Building and Selling the Zero Energy Ready Home

A Department of Energy (DOE) Zero Energy Ready Home is a high performance home which is so energy efficient that a renewable energy system can offset all or most of its annual energy consumption.

Since 2008, the U.S. Department of Energy Builders Challenge program has recognized hundreds of leading builders for their achievements in energy efficiency—resulting in over 14,000 energy-efficient homes and millions of dollars in energy savings. The DOE Zero Energy Ready Home—formerly the DOE Challenge Home—represents a new level of home performance with rigorous requirements that ensure outstanding levels of energy savings, comfort, health and durability.

This full-day workshop will focus on what a builder needs to know to successfully design, construct, and market the Zero Energy Ready Home.

Note: This session will meet the mandatory builder and rater orientation requirement to participate in the DOE Zero Energy Ready Home program.

Presented by Sam Rashkin, R.A., Chief Architect for the Department of Energy's Building Technologies Office

$150 separate registration fee for this preconference track (includes lunch)

Monday, February 23

Special Full-Day Preconference Trainings

8:00 am–4:30 pm

Gooseberry

Existing Asset Optimization for Commercial Buildings

Join us for this full-day training designed to help you optimize the energy efficiency of your commercial facility. This day will include:

Advanced RTU Control Strategies
Presented by Ryan Hoger, Director of Corporate Training at Temperature Equipment Corporation

- This session will explain the RTU related requirements of the International Energy Conservation Code (IECC)
- You will learn the appropriate RTU accessories to maximize performance and efficiency
- An overview will be provided on technologies such as economizers, demand controlled ventilation and energy recovery ventilation
- We will explore the newest energy-saving RTU options of multi-speed fan controls

Steam to Hot Water Conversion
Presented by Joe Mozeika, Technical Applications Specialist, Mulcahy Company

All aspects of the steam conversion process will be covered, including:

- Efficiency gains when using hot water vs. steam
- Piping considerations
- Reduction in chemical costs
- Basic control strategies for modern high efficiency hot water boilers

Facility Optimization via Energy Management Systems
Presented by Tom Tainter, Optimization Services Manager, ICS Consulting, Inc.

Learn how to get the most out of your control system. As a result of this session, participants will:

- Understand the importance of Energy Management Systems (EMS)
- Gain a better understanding of optimization opportunities within their facilities
- Understand the differences in costing and the range of optimization opportunities
- Understand the importance of complete and accurate commissioning after the installation of energy-efficient systems

$150 separate registration fee for this preconference track (includes lunch)

Join us for the Monday evening welcome reception!

Join us at the DECC for complimentary refreshments, music and networking. 4:30 pm to 7:00 pm in the French River room.

Don't miss out on Tuesday's luncheon keynote speaker!

How far have we come in building science? Where are we today? What does the future hold? Learn these answers and more from Sam Rashkin, Chief Architect of the Building Technologies Office in the U.S. Energy Department's Office of Energy Efficiency and Renewable Energy. Don't miss this opportunity to learn from one of the country's leading experts in building science!

Sam Rashkin, R.A.

As Chief Architect for the Department of Energy's Building Technologies Office, Sam's primary role is leading deployment of proven innovations for new and existing high performance homes. This includes helping lead DOE's world-class research program, Building America, and overseeing the DOE Zero Energy Ready Home voluntary labeling program for leading-edge builders. In his prior position, he managed ENERGY STAR® for Homes since its start in 1996. Under his leadership, ENERGY STAR for Homes grew exponentially to more than 8,500 builder partners, over one million labeled homes, and over 25 percent market penetration nationwide. Mr. Rashkin was most recently recognized for his contributions to sustainable housing with the 2012 Hanley Award. He received his Bachelor of Architecture from Syracuse University; completed Masters of Urban Planning studies at New York University; and is a registered architect in California and New York. During his 20-plus years as a licensed architect, he specialized in energy-efficient design and completed over 100 residential projects. He has served on the national Steering Committees for USGBC's LEED for Homes, NAHB's Green Builder Guidelines, and EPA's Water Sense label, and on the development team for EPA's Indoor airPLUS label. Sam has authored a new book titled "Retooling the U.S. Housing Industry: How It Got Here, Why It's Broken, and How to Fix It" that presents a comprehensive strategy for transforming the home ownership experience. Sam has also prepared hundreds of articles, technical papers, reports and seminars, and contributed to other books on energy-efficient and green construction.

MBPA Reception—Tuesday, February 24, 6:00 pm–8:00 pm

MINNESOTA BUILDING PERFORMANCE ASSOCIATION

After the Tuesday evening reception, please join Minnesota Building Performance Association (MBPA) in the St. Louis River Room for drinks, pizza, and the opportunity to network with other professionals from across the building performance industry!

MBPA is a non-profit organization committed to promoting safe, comfortable, durable and energy-efficient homes. They adhere to the belief that a "Home is a System" where all systems interact with each other. Changing the characteristics of one system can affect another so it is important to understand how they interrelate. Their industry-wide members are vital to this understanding and include home performance consultants, certified home energy raters, home builders, remodeling contractors, manufacturers of energy-efficient building materials, mortgage companies, and realtors interested in providing energy-efficient housing.

University of Minnesota Race to Zero Exhibit

Make sure to check out the University of Minnesota's award-winning "Race to Zero" student competition project. This corner section of the exhibit will clearly display the novel building enclosure technologies and integrated Heating, Ventilation and Air Conditioning (HVAC) + Domestic Hot Water (DHW) system developed by the Team Opti-MN students for their Zero Energy Ready Home design. The creative and innovative students who worked on this project will be staffing the display and available for questions.

Tuesday, February 24

Please see the following pages for detailed course descriptions.

6:30–7:00 am • Early Session Registration

Complete seven hours of your MN Builder credit CEU requirements per day (pending approval from the Minnesota Department of Labor and Industry). You must attend the 7:00 a.m. session to receive all seven credits.

	Harborside 302	Harborside 204	Gooseberry	French River	Harborside 203
7:00–8:15 am	**Great Balls of Fire (Solar)** Solar 101 *Jason Edens, Rural Renewable Energy Alliance*	**Our House (High Performance Housing)** Lead Safe *Bob Rogalla and Bob Massey, Lake States Environmental, Ltd.*	**Home on the Range (Materials and Methods)** Cantilevered Floor Research—Comfort and Moisture Findings at 6 months *Dick Stone, Sawtooth Ridge Woodcraft*	**Taking Care of Business (The Business of Energy Efficiency)**	**Building Science—High Performance Housing—EEBA Houses That Work™**
7:30–8:30 am • Registration • Exhibit Hall Opens					
8:30–10:00 am	Planning for Solar: Building Solar Ready *Jack Kluempke, Minnesota Department of Commerce; Doug Manthey, Conservation Technologies*	Getting to Net Zero: Setting and Achieving Goals with an Integrative Process *Rick Carter and Becky Alexander, LHB*	Low-Cost Construction for High Energy Savings *Brian Wimmer, Rochester Area Habitat for Humanity*	Paying for Energy Improvements: The Next Step *Alex Cecchini, Minnesota Department of Commerce (Panel Discussion)*	Houses that Work: A Full-Day Building Science Course on New Construction (Part 1 of 4) *Justin Wilson, Construction Instruction Inc.*
10:00–10:30 am • Break • Exhibits					
10:30 am–12:00 pm	Solar Electric System Design *Chris LaForge, Great Northern Solar*	Are You Ready for the DOE Zero Energy Ready Home? *Pat Huelman, University of Minnesota Extension*	Blower Door Testing of Multifamily Buildings *Paul Morin, The Energy Conservatory*	Get Results With Your Energy Work: Engage People Effectively *Alexis Troschinetz, Clean Energy Resource Teams*	Houses that Work: A Full-Day Building Science Course on New Construction (Part 2 of 4) *Justin Wilson, Construction Instruction Inc.*
12:00–1:00 pm • **Keynote Lunch with Sam Rashkin** (served in Ballroom O) • Exhibits					
1:00–2:30 pm	2014 National Electrical Code (NEC) Update for Photovoltaic Systems *Julie Brazeau, Midwest Renewable Energy Association*	High Performance, Low Energy Details in the Field (Part 1 of 2) *Rachel Wagner, Wagner Zaun Architecture*	Foundation Wall Insulation Retrofit–Excavationless *Rolf Jacobson, University of Minnesota; Steve Schirber, Cocoon*	Buying and Selling Energy Efficiency *Chad Smith, Residential Science Resources*	Houses that Work: A Full-Day Building Science Course on New Construction (Part 3 of 4) *Justin Wilson, Construction Instruction Inc.*
2:30–3:00 pm • Break • Exhibits					
3:00–4:30 pm	Selling Solar in the Current Market *Chris LaForge, Great Northern Solar*	High Performance, Low Energy Details in the Field (Part 2 of 2) *Rachel Wagner, Wagner Zaun Architecture*		Growing Efficiency with the Seeds of Conservation: Applied Research and Development *Jessica Burdette, Minnesota Department of Commerce, Division of Energy Resources (Panel Discussion)*	Houses that Work: A Full-Day Building Science Course on New Construction (Part 4 of 4) *Justin Wilson, Construction Instruction Inc.*
4:30–6:00 pm • Reception • Door Prizes • Refreshments • Exhibits					

Wednesday, February 25

Please see the following pages for detailed course descriptions.

6:30–7:00 am • Early Session Registration

Complete seven hours of your MN Builder credit CEU requirements per day (pending approval from the Minnesota Department of Labor and Industry). You must attend the 7:00 a.m. session to receive all seven credits.

Harborside 204	Harborside 304	Harborside 302	French River	Harborside 203	
The Times They Are A' Changing (Updates on Codes)	**Home Sweet Home (Mechanical Systems)**	**Living in a Material World (Materials and Methods)**	**Homeward Bound (Case Studies)**	**Building Science—High Performance Housing—EEBA Houses That Work™**	7:00–8:15 am
Asbestos: Yes It's Still Around *Bob Rogalla and Bob Massey, Lake States Environmental, Ltd.*	**Energy-Efficiency Options for Residential Water Heating** *Dave Bohac, Center for Energy and Environment*	**Cantilevered Floor Research—Comfort and Moisture Findings at 6 months** *Dick Stone, Sawtooth Ridge Woodcraft*			
7:30–8:30 am • Registration • Exhibit Hall Opens					
An In-Depth Look at Insulation, Air Sealing and Testing for the New Minnesota Energy Code *Ross Anderson, Cocoon*	**Heat Recovery Ventilation: Meeting ASHRAE 62.2** *Barry Stephens, Zehnder America, Inc.*	**Recommended Clad Wood Window Installation Technologies** *Erick Filby and Eric Klein, Marvin Windows*	**Home Performance Diagnostics: Extreme Peeling Paint Case Study** *Sam Greene, Residential Science Resources*	**Insulation & Air Sealing: High Performance Walls and Exterior Insulation (Part 1 of 2)** *Andrew Oding, Building Knowledge Canada*	8:30–10:00 am
10:00–10:30 am • Break • Exhibits					
How the Energy Code Will Affect the HVAC Trade *Mike Wilson, Dakota Supply Group*	**Saving Energy in Existing Multifamily Buildings** *Corrie Bastian, Center for Energy and Environment*	**Lighting Optimization** *Jay Marshall, ON2 Solutions*	**When Building Codes Aren't Followed** *Andy Thielen, Crane Engineering*	**Insulation & Air Sealing: High Performance Walls and Exterior Insulation (Part 2 of 2)** *Andrew Oding, Building Knowledge Canada*	10:30 am–12:00 pm
12:00–1:00 pm • Lunch (served in Ballroom O) • Exhibits					
New Minnesota Energy Code, HERS Rating and Green Certification *Sam Greene, Residential Science Resources*	**Modern Hydronic Designs, Controls and Condensing Boilers (Commercial)** *Matthew Kiemen, Ryan Company Inc.*	**Of Building Science, Control Layers, and High Performance Enclosures** *Pat Huelman, University of Minnesota Extension*	**Solar Energy for Affordable Housing and Low-Income Energy Programs** *Jason Edens, Rural Renewable Energy Alliance*	**Cost-Effective HVAC for the High Performance Home** *Andrew Oding, Building Knowledge Canada*	1:00–2:30 pm
2:30–3:00 pm • Break • Exhibits					
Implementation of the New Energy Code *Paul Morin, The Energy Conservatory*	**Duct/Ductless Mini Split Heating and Cooling Application and Case Study** *Mike Wilson, Dakota Supply Group*	**Low-Cost Construction for High Energy Savings** *Brian Wimmer, Rochester Area Habitat for Humanity*	**The Root River House: Net Zero Project in a Cold Climate** *Christi Weber, Design Coalition Architects*	**Sales: Extracting the True Value Out of High Performance, Energy-Efficient Homes** *Andrew Oding, Building Knowledge Canada*	3:00–4:30 pm

Session Descriptions—Tuesday, February 24

7:00–8:15 am

Solar 101 (Harborside 302)
Solar energy is rapidly becoming a significant part of our energy generation mix in the Midwest and throughout the world. This session will provide an overview of the suite of solar technologies suitable for the residential and commercial market including solar air heat, solar water heat, and solar electricity or photovoltaics. Various applications of each technology type will be explored as well as the site assessment and system sizing process. In addition, we'll discuss the economics of solar energy systems and available financial incentives.
Jason Edens, Rural Renewable Energy Alliance

Lead Safe (Harborside 204)
Our interactive display involves establishing a bedroom cutaway 12 feet wide and 6 feet deep where we will demonstrate methods to establish a lead-safe work area per the EPA and Wisconsin lead rules applying to remodeling, repair and/or painting in dwellings and child occupied facilities. Even though this rule has been in effect since May 2010, many contractors may not be proficient in compliance methods since special considerations are only required in structures built prior to 1978. If such situations are not a contractor's regular type of activity, they may not have had an opportunity to explore or develop strategies that are efficient both in time and financial resources to conduct their project in a lead-safe fashion. However, in the energy-efficiency business, it is common for contractors to be involved periodically with a project that falls under the lead-safe renovation rules. Our "bedroom" and accompanying demonstrations will explore different methods that are used in different situations to accomplish one of the major objectives of the lead rules, which is minimizing the chance of poisoning a child by minimizing the most likely cause of poisoning from a contractor's activities; dust that contains lead from layer(s) of older paint.
Bob Rogalla and Bob Massey, Lake States Environmental, Ltd.

Cantilevered Floor Research—Comfort and Moisture Findings at 6 Months (Gooseberry)
This session includes an investigation of a cantilevered floor in an existing Minnesota home and measures and compares the thermal comfort and moisture behavior of three insulation and air-sealing strategies. Cantilevered floor background, past and current insulation and air-sealing practices, research methods, results, and recommendations based on this ongoing study will be examined.
Dick Stone, Sawtooth Ridge Woodcraft

8:30–10:00 am

Planning for Solar: Building Solar Ready (Harborside 302)
The design and construction phase of building a home provides the best opportunity to optimize future solar energy system performance and to minimize system cost. This session will offer builders and architects the necessary tools to plan for solar including Solar Ready Building Design Guidelines and Construction Specifications developed in partnership with the U.S. Department of Energy for Minnesota's cold climate. The goal of this session is to educate builders and designers on how to assess and equip new homes with the necessary minimum structural and system components that make it easier and less expensive for homeowners to retrofit home solar energy systems after the home is constructed—and to do so at a very low cost.
Jack Kluempke, Minnesota Department of Commerce and Doug Manthey, Conservation Technologies

Getting to Net Zero: Setting and Achieving Goals with an Integrative Process (Harborside 204)
Minnesota's Sustainable Buildings 2030 (SB 2030) is a progressive energy conservation program that helps design teams and owners significantly reduce the energy usage and carbon footprint of their building projects. SB 2030 outlines specific performance targets for energy use in buildings to achieve the goal of carbon-neutrality by 2030. Session attendees will learn from B3 project leaders how to leverage the use of an integrative process. They'll also learn about energy modeling, utility assistance programs, commissioning, and actual performance tracking to set and achieve SB 2030 targets.
Rick Carter and Becky Alexander, LHB

Low-Cost Construction for High Energy Savings (Gooseberry)
Before considering expensive, complicated or high-tech energy-saving solutions for new construction, start with the basics and build up. Using completed and monitored Habitat for Humanity homes, this session will detail low-cost and easy-to-incorporate methods and materials that result in highly efficient homes, as well as using programs like ENERGY STAR® for Homes as a guide. Material will cover tested tactics in framing, air sealing, duct tightening, moisture control, performance verification and energy monitoring.
Brian Wimmer, Rochester Area Habitat for Humanity

Paying for Energy Improvements: The Next Step (Panel Discussion) (French River)
The benefits of energy-related building improvements are becoming well known to homeowners and the owners and operators of businesses and public buildings. Whether measured by increased business efficiency or dollars saved, improved comfort and safety, or carbon reductions, many people agree with the value of energy-efficient building improvements. The hurdle for many people is figuring out how to pay for the identified energy improvements. This panel discussion, moderated by Alex Cecchini of the Minnesota Department of Commerce, Division of Energy Resources, will provide an overview of financing options available to residential homeowners, businesses, public entities, and non-profits seeking to finance energy-efficiency projects. Representatives from the Minnesota Housing Finance Agency, the St. Paul Port Authority, Center for Energy and Environment, Neighborhood Energy Connection, and the Minnesota Department of Commerce will discuss how their programs, coupled with utility and tax incentives, can provide budget neutral financing for energy-efficiency improvement projects.
Alex Cecchini, Minnesota Department of Commerce (Panel Discussion)

Houses That Work: A Full-Day Building Science Course on New Construction (Part 1 of 4) (Harborside 203)
In this daylong session, learn how complex changes in home design, building materials, mechanical systems, appliances, code compliance and consumer lifestyles and expectations make every builder, supplier, and trade contractor's job more demanding. This design workshop will cover the fundamentals of building science and how it is applied to create many different types of high performance walls and assemblies. The session will address critical home performance elements that exist as a system and are part of energy-efficient homes. The fundamentals of building science—air, heat and moisture flow—along with HVAC systems, will be outlined and applied to help participants make better choices with respect to construction materials and methods. Participants will also learn important information about indoor air quality and cost-effective strategies to be able to offer healthier indoor environments. Case studies will also be covered.
Justin Wilson, Construction Instruction Inc.

Session Descriptions—Tuesday, February 24

10:30 am–12:00 pm

Solar Electric System Design (Harborside 302)
This session will review the basic designs of PV systems with details on recent developments. We will cover system components, integration and deployment along with the latest design developments including "secure power supply" and AC coupling of batteries in existing PV systems. Sufficient background of nomenclature and technique will be provided for proper understanding of the material. Time will be allotted for questions and discussion.
Chris LaForge, Great Northern Solar

Are you Ready for the DOE Zero Energy Ready Home? (Harborside 204)
This introductory course on high-performance houses will include an overview of the DOE Zero Energy Ready Home. It will focus on the critical design and construction elements needed for an efficient, durable and healthy home. In addition to the value proposition for high-performance homes, the session will conclude with the program metrics and requirements for achieving a DOE Zero Energy Ready Home.
Pat Huelman, University of Minnesota Extension

Blower Door Testing of Multifamily Buildings (Gooseberry)
The 2012 International Energy Conservation Code requires blower door testing of residential multifamily buildings of three stories or less. This session will cover the variety of ways multifamily buildings are being tested around the country and the advantages and disadvantages of each method. There will also be an introduction to the free TECLOG3 software that allows you to control multiple blower doors using one slide bar.
Paul Morin, The Energy Conservatory

Get Results with Your Energy Work: Engage People Effectively (French River)
Are you interested in learning how to become more effective in getting people engaged in your energy work? Join Clean Energy Resource Teams (CERTs) to learn how they leverage behavior change science to help Minnesotans take action on energy efficiency and renewable energy. Learn about three examples of CERTs campaigns designed to increase adoption of energy-efficient lighting (with turkey farmers, service stations, and households). These campaigns showcase the role of technology research and behavior change strategies in program development and implementation. Attendees will walk away with a short list of easy-to-implement techniques to increase engagement and effectiveness.
Alexis Troschinetz, Clean Energy Resource Teams

Houses That Work: A Full-Day Building Science Course on New Construction (Part 2 of 4) (Harborside 203)
In this daylong session, learn how complex changes in home design, building materials, mechanical systems, appliances, code compliance and consumer lifestyles and expectations make every builder, supplier, and trade contractor's job more demanding. This design workshop will cover the fundamentals of building science and how it is applied to create many different types of high performance walls and assemblies. The session will address critical home performance elements that exist as a system and are part of energy-efficient homes. The fundamentals of building science—air, heat and moisture flow—along with HVAC systems, will be outlined and applied to help participants make better choices with respect to construction materials and methods. Participants will also learn important information about indoor air quality and cost-effective strategies to be able to offer healthier indoor environments. Case studies will also be covered.
Justin Wilson, Construction Instruction Inc.

1:00–2:30 pm

2014 National Electrical Code (NEC) Update for Photovoltaic Systems (Harborside 302)
This 90-minute course will discuss changes to the 2014 National Electrical Code. We will discuss changes in article 690, including methods of meeting the new "Rapid Shutdown" requirement for PV systems, changes for field-applied labeling, allowable wiring methods and evolving grid interconnection requirements in article 705.
Julie Brazeau, Midwest Renewable Energy Association

High Performance, Low Energy Details in the Field (Part 1 of 2) (Harborside 204)
High performance design and construction effectively manages energy, moisture, durability, comfort and health. This session highlights cold climate details for new construction, used repeatedly and successfully in single-family homes. Specific assemblies and approaches are discussed within the context of designing and building homes to use less than half the energy of comparable homes built to code. Examples include assemblies for double stud walls, single stud walls with rigid foam sheathing, insulated slab foundations, insulated basements, air sealing details, window installation, and rainscreen cladding systems. Discussion addresses the importance of integrated design with regard to materials, systems and assemblies. Drawings and photos of built examples are plentiful and detailed.
Rachel Wagner, Wagner Zaun Architecture

Foundation Wall Insulation Retrofit–Excavationless (Gooseberry)
This session will begin with a discussion of the building science of basement walls in cold climates: heat, air, and moisture flows through the seasons and the unique challenges they pose for basement walls. An understanding of these topics will support a further discussion on common insulation retrofit strategies, including interior and exterior approaches. The advantages and disadvantages of each approach will be discussed. The session will conclude with a look at a new "excavationless" exterior foundation insulation technique that has been developed by researchers at the University of Minnesota's Building America research team, NorthernSTAR, and employed by Cocoon Home Performance Solutions on a number of basement insulation projects.
Rolf Jacobson, University of Minnesota; Steve Schirber, Cocoon

Buying and Selling Energy Efficiency (French River)
Whether you are building a new home or remodeling your existing home, the opportunities for long-lasting, energy-efficient measures are endless, and only some of them are cost effective. We will look at the potential for energy savings and the costs involved. We will also discuss how incorporating energy efficiency affects the resale of homes.
Chad Smith, Residential Science Resources

1:00–2:30 pm cont'd.

Houses That Work: A Full-Day Building Science Course on New Construction (Part 3 of 4) (Harborside 203)
In this daylong session, learn how complex changes in home design, building materials, mechanical systems, appliances, code compliance and consumer lifestyles and expectations make every builder, supplier, and trade contractor's job more demanding. This design workshop will cover the fundamentals of building science and how it is applied to create many different types of high performance walls and assemblies. The session will address critical home performance elements that exist as a system and are part of energy-efficient homes. The fundamentals of building science—air, heat and moisture flow—along with HVAC systems, will be outlined and applied to help participants make better choices with respect to construction materials and methods. Participants will also learn important information about indoor air quality and cost-effective strategies to be able to offer healthier indoor environments. Case studies will also be covered.
Justin Wilson, Construction Instruction Inc.

3:00–4:30 pm

Selling Solar in the Current Market (Harborside 302)
This session will focus on issues surrounding the current market for solar systems and how contractors can work to address them. While solar electric systems have never been more cost effective, many elements of the system operation and use are still not clear to the average consumer. With changing incentives and several key misunderstandings of the technology (e.g., do the systems need batteries?), it is key to have clear presentations and create accurate marketing tools to achieve sales and have satisfied clients. Time will be allotted for questions at the end of the presentation.
Chris LaForge, Great Northern Solar

High Performance, Low Energy Details in the Field (Part 2 of 2) (Harborside 204)
High performance design and construction effectively manages energy, moisture, durability, comfort and health. This session highlights cold climate details for new construction, used repeatedly and successfully in single-family homes. Specific assemblies and approaches are discussed within the context of designing and building homes to use less than half the energy of comparable homes built to code. Examples include assemblies for double stud walls, single stud walls with rigid foam sheathing, insulated slab foundations, insulated basements, air sealing details, window installation, and rainscreen cladding systems. Discussion addresses the importance of integrated design with regard to materials, systems and assemblies. Drawings and photos of built examples are plentiful and detailed.
Rachel Wagner, Wagner Zaun Architecture

Growing Efficiency with the Seeds of Conservation: Applied Research and Development (Panel Discussion) (French River)
This interactive panel will highlight five ongoing Conservation Applied Research and Development (CARD) projects, providing an overview of research goals, novel research approaches, how this research is relevant to energy-efficient building and responsible design in Minnesota and, when available, preliminary results of the most interesting and applicable outcomes to date. The principal investigators from each of the projects will participate in the panel. Through short presentations, descriptions, images, discussion and an opportunity to ask questions directly of the researchers, participants will learn about new ways to target residential and multifamily buildings with innovative energy-efficient technologies or approaches.
Jessica Burdette, Minnesota Department of Commerce, Division of Energy Resources (Panel Discussion)

Houses That Work: A Full-Day Building Science Course on New Construction (Part 4 of 4) (Harborside 203)
In this daylong session, learn how complex changes in home design, building materials, mechanical systems, appliances, code compliance and consumer lifestyles and expectations make every builder, supplier, and trade contractor's job more demanding. This design workshop will cover the fundamentals of building science and how it is applied to create many different types of high performance walls and assemblies. The session will address critical home performance elements that exist as a system and are part of energy-efficient homes. The fundamentals of building science—air, heat and moisture flow—along with HVAC systems, will be outlined and applied to help participants make better choices with respect to construction materials and methods. Participants will also learn about indoor air quality and cost-effective strategies to be able to offer healthier indoor environments. Case studies will also be covered.
Justin Wilson, Construction Instruction Inc.

Session Descriptions—Wednesday, February 25

7:00–8:15 am

Asbestos: Yes, It's Still Around (Harborside 204)
Hear the latest information about asbestos, including where it is encountered in residential remodeling and how to handle it. Our interactive display involves a bedroom cutaway 12 feet wide and 6 feet deep where we will show several locations and applications where asbestos can be found in residential remodeling and reconstruction. Even though the Minnesota Department of Health rules have been in place for some time, and the current Wisconsin asbestos rules have been in effect since 2009, many contractors may not be aware of the instances and materials that the rules apply to. Our model "bedroom" and accompanying demonstrations will explore different materials and locations where asbestos can be found and explain how these situations should be handled.
Bob Rogalla and Bob Massey, Lake States Environmental, Ltd.

Energy-Efficiency Options for Residential Water Heating (Harborside 304)
High performance home building and remodeling is reducing the space conditioning loads in Minnesota and across the country. This trend has increased the importance of domestic water heating as a percentage of the whole home energy use. Many residential buildings still use minimum efficiency products. This presentation will look at the current state of residential water heaters and the high performance options available, including new research on hybrid condensing water heaters designed for the retrofit market and heat pump water heaters in cold climates. This presentation is based on several projects, including the measurement and analysis of over 35 high efficiency water heaters installed in real homes. The presentation will highlight the performance and energy savings potential of both electric and gas water heaters.
Dave Bohac, Center for Energy and Environment

Cantilevered Floor Research—Comfort and Moisture Findings at 6 Months (Harborside 302)
This session includes an investigation of a cantilevered floor in an existing Minnesota home and measures and compares the thermal comfort and moisture behavior of three insulation and air-sealing strategies. Cantilevered floor background, past and current insulation and air-sealing practices, research methods, results, and recommendations based on this ongoing study will be examined.
Dick Stone, Sawtooth Ridge Woodcraft

8:30–10:00 am

An In-Depth Look at Insulation, Air Sealing and Testing for the New Minnesota Energy Code (Harborside 204)
Minnesota's new energy code is changing how we approach insulation and air sealing. This session will identify the foundation wall, rim joist, exterior wall and attic insulation requirements of the code and also describe the air tightness testing requirements. In addition, we will discuss options to meet the minimum requirements and also instances where going beyond code has advantages.
Ross Anderson, Cocoon

Heat Recovery Ventilation: Meeting ASHRAE 62.2 (Harborside 304)
Ventilation in tight, well-insulated homes is becoming increasingly important. This session will discuss what the conversation is about and define how whole-house, balanced ventilation systems meet and exceed code requirements while also providing energy efficiency and outstanding health and comfort.
Barry Stephens, Zehnder America, Inc.

Recommended Clad Wood Window Installation Technologies (Harborside 302)
This hands-on demonstration will feature a mock-up construction wall with a rough opening, along with an attached weather-resistive barrier. The instructors will use these materials to illustrate presentation content regarding installation concerns, noting level, plumb, square, and true, and to explain the barrier system. The demo materials will also be used to present methods of installation, and to discuss substrates and material choices for sealants and flashings and how they interface with the wall.
Erick Filby and Eric Klein, Marvin Windows

Home Performance Diagnostics: Extreme Peeling Paint Case Study (French River)
We will put building science to the test against common "solutions" offered by various companies. In 2011, a Minneapolis homeowner called to get help with chronic peeling paint on the exterior siding and eaves of a 1940s home. In this unique case study, we will give you all the facts so you can determine the cause yourself. Then, we will show you how a partial house fire from three years earlier played a key role. Finally, we will share the results from a follow-up just a few months ago to see how our recommendations played out. You won't want to miss this!
Sam Greene, Residential Science Resources

Insulation & Air Sealing: High Performance Walls and Exterior Insulation (Part 1 of 2) (Harborside 203)
This session will outline the ever-increasing challenges presented to the industry from increased air tightness and R-values of wall assemblies, from making a connection to material and design choices to creating high performance walls that lead to improved water and airflow performance. We will examine key connection points—foundation to wall and wall to attic. We will also look at new and existing insulation techniques to safely increase the thermal effectiveness of wall assemblies and identify the increased importance of key air and weather barrier details to maintain long-term durability.
Andrew Oding, Building Knowledge Canada

Session Descriptions—Wednesday, February 25

10:30 am–12:00 pm

How the Energy Code Will Affect the HVAC Trade (Harborside 204)
This session is focused toward the HVAC trade, but builders will also find useful information in the presentation. There will be discussion about deciding when duct work is within thermal boundary and when you will need to do a duct blaster test. The session will demonstrate different duct mastics and a duct blaster test will be conducted live on a full-size duct system. Load calculation and equipment sizing will be part of the session.
Mike Wilson, Dakota Supply Group

Saving Energy in Existing Multifamily Buildings (Harborside 304)
This session will explore challenges and opportunities in achieving energy savings in multifamily buildings from an "on the ground" perspective. Using case studies and examples from recent Center for Energy and Environment (CEE) research and energy-efficiency programs, this session will provide an overview of technologies and strategies that have proven to be effective and marketable energy-efficiency measures in Minnesota multifamily buildings, including: ventilation system retrofits, optimizing boiler control systems, optimizing condensing boilers, retrofitting trash chutes, and adding demand-based controls to domestic hot water recirculation pumps. Learn from CEE's field experience and gain an understanding of what works and what doesn't work in retrofitting energy-efficiency measures in multifamily buildings.
Corrie Bastian, Center for Energy and Environment

Lighting Optimization (Harborside 302)
This lighting seminar explores the latest advancements in lighting technology, how different technologies drive greater value over others in specific applications, and the importance of professional lighting design in achieving a positive lighting experience. The presentation will also address the challenges and achievements in lighting applications and highlight the good, the bad, and the ugly associated with actual case studies.
Jay Marshall, ON2 Solutions

When Building Codes Aren't Followed (French River)
Building codes describe the minimum standard by which all buildings in the state of Minnesota are constructed. If the minimum standard of care outlined in the building codes is not followed, energy can be wasted, the building can be damaged and occupants can be harmed. This presentation focuses on real-life situations where the building code was not followed and ways you can avoid the same mistakes.
Andy Thielen, Crane Engineering

Insulation & Air Sealing: High Performance Walls and Exterior Insulation (Part 2 of 2) (Harborside 203)
This session will outline the ever-increasing challenges presented to the industry from increased air tightness and R-values of wall assemblies, from making a connection to material and design choices to creating high performance walls that lead to improved water and airflow performance. We will examine key connection points—foundation to wall and wall to attic. We will also look at new and existing insulation techniques to safely increase the thermal effectiveness of wall assemblies and identify the increased importance of key air and weather barrier details to maintain long-term durability.
Andrew Oding, Building Knowledge Canada

1:00–2:30 pm

New Minnesota Energy Code, HERS Rating and Green Certification (Harborside 204)
Now that 3ACH50 or better, 4 cfm/sq ft total duct leakage, and better R values and U values are required for new homes built in Minnesota, how can a builder set themselves apart from the rest? It doesn't impress anyone if you put a sign in the window saying "Now built to new code!" How can you show a potential home buyer good reasons why this house now costs more to build? In addition to explaining how this new code works, we will show you how the HERS Rating and Green Certifications can help set you apart from the pack.
Sam Greene, Residential Science Resources

Modern Hydronic Designs, Controls and Condensing Boilers (Commercial) (Harborside 304)
There is a new way to design your hydronic systems that maximizes the efficiency of condensing boilers. This session will compare the old way (primary/secondary) of designing these systems to the new way (variable primary). We'll show the advantages of variable primary and how this maximizes the condensing boilers efficiency, which ultimately leads to increased energy savings and cost savings on a yearly basis. A case study will be shared to support the information. This session also explores what your controls should do to make sure condensing boilers are running at their optimal range to increase the efficiency of the equipment.
Matthew Kiemen, Ryan Company Inc.

Of Building Science, Control Layers, and High-Performance Enclosures (Harborside 302)
This session will focus on the fundamentals of high performance enclosure systems, especially for cold climates. It will examine the critical functions and attributes of the four key control layers: thermal, air, water, and vapor. It will finish with a look at leading high performance enclosure strategies and applications for foundation, wall, and roof assemblies.
Pat Huelman, University of Minnesota Extension

Solar Energy for Affordable Housing and Low-Income Energy Programs (French River)
Workforce housing developers and low-income housing advocates are increasingly turning to renewable energy to provide stable and low cost energy. Learn about three distinct efforts to provide solar heating and solar electric systems to low-income households. The Lakes Area Habitat for Humanity, the Central Minnesota Housing Partnership and the Rural Renewable Energy Alliance will each share lessons learned, successes and case studies regarding the delivery of solar energy to low-income housing and households.
Jason Edens, Rural Renewable Energy Alliance

Cost-Effective HVAC for the High Performance Home (Harborside 203)
This session will discuss optimizing HVAC in light of the code changes and Minnesota's new 2012 Energy Code. Codes present a unique opportunity to re-think and redo heating, cooling and ventilation options. We'll provide information that will make your HVAC more cost-effective while delivering higher customer satisfaction. One specific topic will be ASHRAE 62.2 and how it affects cold weather housing. This session will also include a review of the need for mechanical ventilation, how it fits into the systems approach of building science, the design and construction of high performance houses, and it will outline and discuss the minimum ventilation requirements.
Andrew Oding, Building Knowledge Canada

Session Descriptions—Wednesday, February 25

3:00–4:30 pm

Implementation of the New Energy Code (Harborside 204)
The new energy code based on the 2012 IECC is set to be enforced in 2015. This session will cover lessons learned by other states that adopted the 2012 IECC, how to improve accuracy and repeatability of blower door tests, suggest options for testing multifamily buildings and discuss how testing requirements might be applied to upgrades and renovations of existing homes. A list of resources that can help the implementation will be discussed and a discussion will help identify what trainings would be helpful to bring everyone up to speed.
Paul Morin, The Energy Conservatory

Duct/Ductless Mini Split Heating and Cooling Application and Case Study (Harborside 304)
This general session will focus on the application of both ductless and ducted mini splits. We will also discuss performance and operation for cooling and heating with a focus on cold weather applications (heat pump). Case studies will show how inverter driven ducted systems are having an impact on low load, high performance homes and remodeling.
Mike Wilson, Dakota Supply Group

Low-Cost Construction for High Energy Savings (Harborside 302)
Before considering expensive, complicated or high-tech energy-saving solutions for new construction, start with the basics and build up. Using completed and monitored Habitat for Humanity homes, this session will detail low-cost and easy-to-incorporate methods and materials that result in highly efficient homes, as well as using programs like ENERGY STAR® for Homes as a guide. Material will cover tested tactics in framing, air sealing, duct tightening, moisture control, performance verification and energy monitoring.
Brian Wimmer, Rochester Area Habitat for Humanity

The Root River House: Net Zero Project in a Cold Climate (French River)
The Root River House, located in southern Minnesota and completed in the summer of 2014, is a net-zero project designed and constructed to use Passive House strategies. This presentation will explain the design process including the application of super-insulation, air tightness, high-performance windows and doors, passive solar design, and energy recovery ventilation. Also included will be a discussion of the construction process, including construction details and project photos, as well as an analysis of the construction costs and performance results.
Christi Weber, Design Coalition Architects

Sales: Extracting the True Value Out of High Performance, Energy-Efficient Homes (Harborside 203)
This session will teach attendees how to outline a sales process that works best specifically for the new home and residential remodel high performance building market. Participants will learn to understand the recent and pending changes to codes, green building programs, and the economics and marketing complexity of the building industry over the last 3-4 years and how to talk to buyers about home performance. Strategies for integrating the building science messages into the sales process of your team will be presented, and participants will be able to use terminology that appeals to homeowners to help them understand the comfort and value of a high performance, energy-efficient home.
Andrew Oding, Building Knowledge Canada

Name that tune and win big!

Notice something a little different about the track titles this year? Each track is the title of a song. All you have to do is name the artist who sings the song of each track name, fill out the quiz sheet (found in your registration packet), and turn it in at the registration desk. Get all the answers right and you'll be entered into a drawing to win a $50 Visa gift card and a free registration to the 2016 Energy Design Conference and Expo!

Join us for these awesome receptions!

Welcome Reception
Monday, February 23
4:30–7:00 pm
French River Room, DECC

Join us for complimentary refreshments, music and networking.

Tuesday Evening Reception
Tuesday, February 24
4:30–6:00 pm
Exhibit Hall, DECC

Don't miss out on this great networking opportunity and your chance to win fabulous prizes! Enjoy complimentary appetizers, a fun environment, and networking with the best in the business!

MINNESOTA BUILDING PERFORMANCE ASSOCIATION

MBPA Reception
Tuesday, February 24
6:00–8:00 pm
St. Louis River Room, DECC

After the Tuesday evening reception, please join Minnesota Building Performance Association (MBPA) in the St. Louis River Room for drinks, pizza, and the opportunity to network with other professionals from across the building performance industry!

MBPA is a non-profit organization committed to promoting safe, comfortable, durable and energy-efficient homes. They adhere to the belief that a "Home is a System" where all systems interact with each other. Changing the characteristics of one system can affect another so it is important to understand how they interrelate. Their industry-wide members are vital to this understanding and include home performance consultants, certified home energy raters, home builders, remodeling contractors, manufacturers of energy-efficient building materials, mortgage companies, and realtors interested in providing energy-efficient housing.

Energy Design Conference & Expo Mission Statement:

It is the mission of the Energy Design Conference & Expo to provide a valuable, educational and innovative conference focused on the core principles of energy-efficient building and responsible design.

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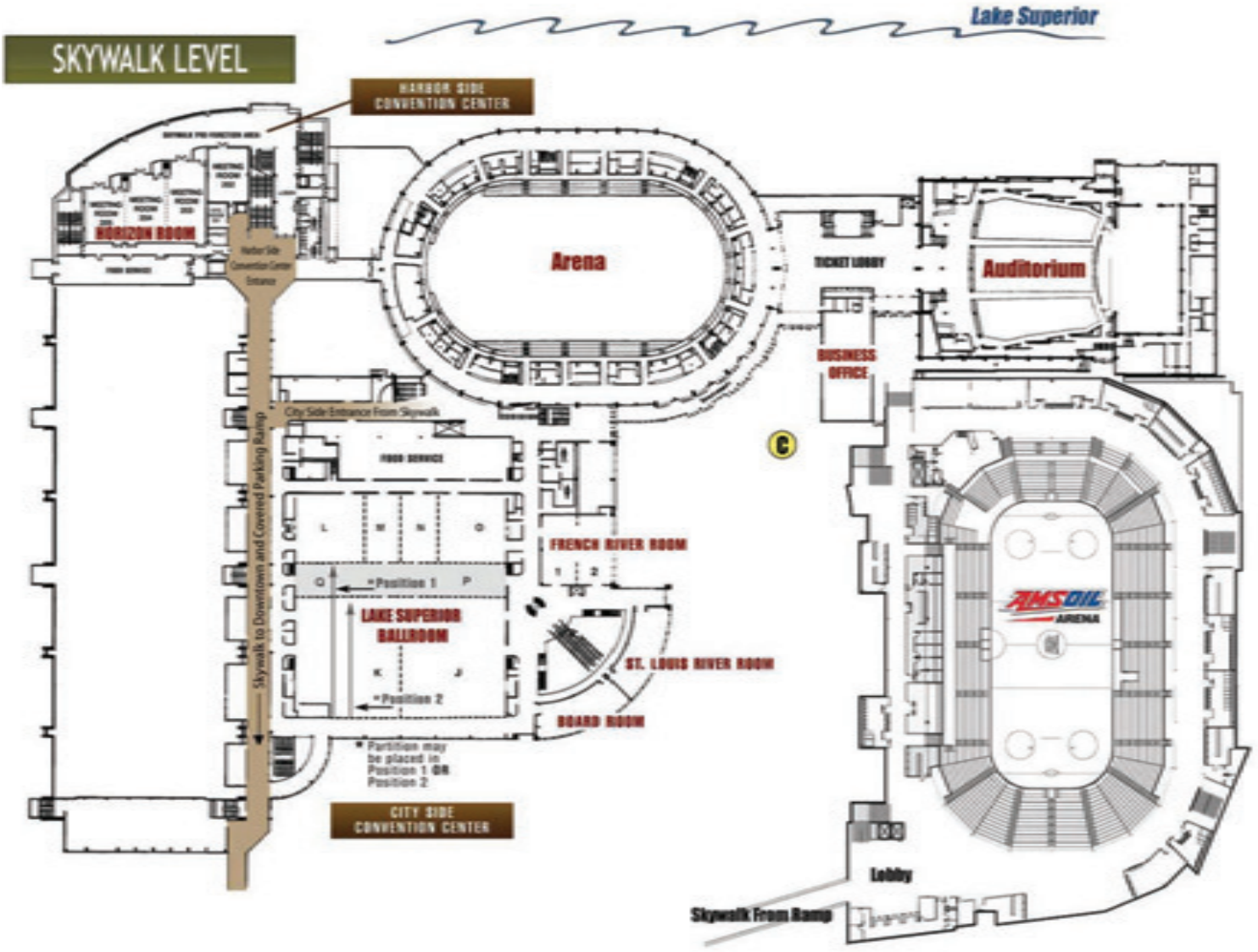

2015 Exhibitors

Architectural Resources, Inc. | Duluth, MN
trayala@duluthmn.gov

Arrowhead Builders Association | Hermantown, MN
chelle@abamn.org

Carpentry Works, LLC | Duluth, MN
carpwork@chartermi.net

Central States Insulation Wholesale, Inc. | Blaine, MN
chad@centralstatesinsulation.com

Comfort Choice Homes | Fargo, ND
lm321elite@aol.com

Comfort Systems | Duluth, MN
eslacks@ci.duluth.mn.us

Dakota Supply Group, Inc | St. Paul, MN
tmcdonald@dsginc.biz

DFC Consultants | Fargo, ND
jodib@dfcconsultants.com

Duluth Energy | Duluth, MN
bret@ecolibrium3.org

Duluth Stove & Fireplace | Duluth, MN
matt@duluthstove.com

Ecolibrium3 | Duluth, MN
jodi@ecolibrium3.org

Energy Panel Structures | Graettinger, IA
lpico@epsbuildings.com

Energy Plus | Duluth, MN
dmanthey@conservtech.com

EP Sales, Inc | Bloomington, MN
dponschok@epsalesinc.com
jsalter@epsalesinc.com

Extreme Panel Tech., Inc. | Cottonwood, MN
perry@extremepanel.com

Goodin Company | Minneapolis, MN
jack.schmiedlin@goodinco.com

Great River Energy | Maple Grove, MN
jselseth@GREnergy.com

H Window Company | Ashland, WI
dcook@hwindow.com
dgleeson@hwindow.com

Hallmark Building Supplies | Minneapolis, MN
lorig@hllmark.com

Heritage Window and Door | Superior, WI
joes@heritagewindow.com

Lake States Environmental, Ltd. | Rice Lake, MN
bob@lakestates.com

Lake Superior College | Duluth, MN
d.amys@lsc.edu

Marvin Windows and Doors | Warroad, MN
dcook@marvin.com

Meteek Supply | Duluth, MN
randy@meteek.com

Midwest Energy Efficiency Alliance | Chicago, IL
iblanding@mwalliance.org

Minnesota Department of Commerce | St. Paul, MN
Terry.Webster@state.mn.us

Minnesota Geothermal Heat Pump Association | Brooklyn Center, MN
cmsakry@northerngroundsource.com

Minnesota Housing Finance Agency | St. Paul, MN
melissa.n.wolfe@state.mn.us

Minnesota Power | Duluth, MN
ctrebilcock@mnpower.com

Minnesota Renewable Energy Society | Minneapolis, MN
dougs@charter.net

Northwest Wisconsin Lead Free Task Force | Superior, WI
drakevl@charter.net

Panelworks Plus, Inc. | St. Francis, MN
curt@panelworksplus.com

Philips | Apple Valley, MN
kelli.lewis@philips.com

Pioneer Sales Group | Minneapolis, MN
bearly@pioneersalesgroup.com

RREAL | Pine River, MN
ryan@rreal.org

Ryan Company Inc. | St. Louis Park, MN
matt@ryancompanyinc.com

Silicon Energy | Mt. Iron, MN
eshea@silicon-energy.com

Solus LED | Maple Grove, MN
jim@solusled-usa.com

The Energy Conservatory | Minneapolis, MN
ktanner@energyconservatory.com

Tri-State Builders Supply | Duluth, MN
tristatemark@aol.com

UE Systems Inc | St Paul, MN
blakec@uesystems.com

Wagner Zaun Architecture | Duluth, MN
jlahti@wagnerzaun.com

Wholesale Insulation Supply | New Hope, MN
barrygraunke@insulationsupplies.com

2015 Presenters

Becky Alexander	LHB | Minneapolis, MN
Ross Anderson	Cocoon | Eden Prairie, MN
Corrie Bastian	Center for Energy and Environment | Minneapolis, MN
Dave Bohac	Center for Energy and Environment | Minneapolis, MN
Julie Brazeau	Midwest Renewable Energy Association | Custer, WI
Jessica Burdette	Minnesota Department of Commerce | St. Paul, MN
Rick Carter	LHB | Minneapolis, MN
Alex Cecchini	Minnesota Department of Commerce | St. Paul, MN
Chris Duffrin	Neighborhood Energy Connection | St. Paul, MN
Jason Edens	Rural Renewable Energy Alliance | Pine River, MN
Henri Fennell	H C Fennell Consulting, LLC | North Thetford, VT
Erick Filby	Marvin Windows | Duluth, MN
Sam Greene	Residential Science Resources | Eagan, MN
Calvin Greening	Minnesota Housing Finance Agency | St. Paul, MN
Ryan Hoger	Temperature Equipment Corporation | Rockford, IL
Patrick Huelman	University of Minnesota Extension | St. Paul, MN
Rolf Jacobson	University of Minnesota | St. Paul, MN
Matthew Kiemen	Ryan Company Inc. | St. Louis Park, MN
Eric Klein	Marvin Windows | Duluth, MN
Pete Klein	St. Paul Port Authority | St. Paul, MN
Jack Kluempke	Minnesota Department of Commerce | St. Paul, MN
Chris LaForge	Great Northern Solar | Port Wing, WI
Doug Manthey	Conservation Technologies | Duluth, MN
Jay Marshall	ON2 Solutions | St. Paul, MN
Bob Massey	Lake States Environmental, Ltd. | Rice Lake, WI
Paul Morin	The Energy Conservatory | Minneapolis, MN
Judi Mortenson	Center for Energy and Environment | Minneapolis, MN
Joe Mozeika	Mulcahy Company | St. Paul, MN
Andrew Oding	Building Knowledge Canada | Ontario, Canada
Lissa Pawlisch	Clean Energy Resource Teams | St. Paul, MN
Scott Pigg	Energy Center of Wisconsin | Madison, WI
Sam Rashkin	Department of Energy's Building Technologies Office Washington D.C.
Eric Rehm	Minnesota Department of Commerce | St. Paul, MN
Bob Rogalla	Lake States Environmental, Ltd. | Rice Lake, WI
Steve Schirber	Cocoon | Eden Prairie, MN
Chad Smith	Residential Science Resources | Eagan, MN
Barry Stephens	Zehnder America, Inc. | Greenland, NH
Dick Stone	Sawtooth Ridge Woodcraft | Roseville, MN
Tom Tainter	ICS Consulting, Inc. | Blaine, MN
Andrew Thielen	Crane Engineering | Plymouth, MN
Alexis Troschinetz	Clean Energy Resource Teams | St. Paul, MN
Rachel Wagner	Wagner Zaun Architecture | Duluth, MN
Christi Weber	Design Coalition Architects | Madison, WI
Justin Wilson	Construction Instruction Inc. | Colorado Springs, CO
Mike Wilson	Dakota Supply Group | St. Paul, MN
Brian Wimmer	Rochester Area Habitat for Humanity | Rochester, MN

General Conference Information

- Remember that the Department of Labor and Industry requires you to be present at the beginning of each session in order to receive credit.
- Please remember to turn off your cell phone during sessions.
- Available presentation materials will be posted the week following the conference at **www.duluthenergydesign.com**
- Questions or concerns: Visit the registration area located on the main floor directly outside the Exhibit Hall.
- We value your feedback! Please make sure to fill out a conference evaluation form and turn it in at the information table.
- Don't miss out on the Monday and Tuesday evening receptions. Make sure to turn in your door prize ticket at the information table to be entered to win (you must be present to win).
- Remember that you must have your lunch ticket in order to receive lunch.

Continuing Education Reminders

- You must be present at the beginning of each session to receive credit.
- For Minnesota Builders, you must write your Qualifying Builder number (QB number) or a Qualifying Remodeler number (QC number) issued by The Department of Labor and Industry (DOLI) on the appropriate sign-in sheet in order to receive credits for your continuing education classes. For Wisconsin Contractors, you must write your Wisconsin Contractor Qualifier Number. Please make sure to use your personal identification number, not the identification number of your business. You must attend the 7:00 am session to receive all seven credits.
- You must sign in on the attendance sheet at the beginning of each session you attend in order to get Continuing Education Credits. Please note that there is a specific attendance sheet for Minnesota Builders, Wisconsin Dwelling Contractors and Building Performance Institute (BPI). Also, if you are seeking BPI credits, you must provide your BPI number.
- Remember to get your Credit Tracking Card stamped at the end of each session. **This card must be turned in at the end of the day.** If you require copies for your own records, they can be made at Registration.
- Minnesota Power will provide Course Completion Certificates after the conference and you will be notified by email. Please keep a copy of your certificates for your own records.

Please direct any questions about the Continuing Education Credit reporting process to:

Al Lian
alian@mnpower.com
(218) 355-3080

Katie Gascoigne
kgascoigne@mnpower.com
(218) 355-3236

Credits Available

The continuing education credits below are available for some sessions. Please refer to the Credit Tracking Card in your registration packet to see which classes offer credits. **Remember, you must get your card stamped at the end of each session and hand in your Credit Tracking Card at the registration desk at the end of the day in order to get credit for the class.**

- MN Builder
- WI Builder
- MN Building Official
- NARI
- BPI
- AIA/CES
- AELSLAGID

Supporting Sustainability

During your conference, the DECC staff is working to create an environmentally low-impact event.

We compost all organic waste, reducing landfill waste.

Second Harvest Food Bank receives any food surplus.

We recycle everything recyclable:

- Cardboard
- Vinyl table covering
- Aluminum and tin
- Glass and plastic containers
- All paper

Energy usage is reduced with our turn-off-the-lights policy and with our conversion to surplus steam for heating and cooling.

We buy locally, reducing the use of fossil fuels and carbon emissions.

Compostable items reduce landfill space.

Biodegradable paper products:

- Wooden coffee stirs
- Milk cartons
- Bulk items reduce packaging
- Sugar packets
- Cream packets

Duluth Energy Challenge

Minnesota Power is supporting the city of Duluth as it competes in the Georgetown University Energy Prize, a national competition that is challenging communities across the U.S. to rethink their energy use. To compete, local governments, residents, utilities and others will need to work together to sustainably reduce energy consumption over a two-year period. The competition ends in December 2016 and the winning community will take home $5 million.

Learn more at **duluthenergy.org**

We are pleased to offer complimentary wireless service to our exhibitors and attendees.

Product exhibits

(Open to the Public)

Tuesday, February 24, 7:30 am–6:00 pm
Wednesday, February 25, 7:30 am–4:30 pm

See a variety of energy-efficient products, services and materials on display:

- insulation materials
- foundation systems
- windows and doors
- geothermal heat pumps
- slab and storage heating
- HVAC systems
- renewable energy
- weatherization materials
- building diagnostic equipment
- innovative products
- solar displays
- and MORE!

Thank you *for attending the* 25th annual Energy Design Conference & Expo

MARK YOUR CALENDARS!

26th annual Energy Design Conference & Expo

February 22–24, 2016
Duluth Entertainment Convention Center

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