Center for Energy and Environment

November 20, 2025

Assistant Commissioner Sydnie Lieb
Minnesota Department of Commerce, Division of Energy Resources
85 7th Place East, Suite 500
St. Paul, MN 55101

RE: Center for Energy and Environment's Comments In the Matter of the Minnesota Technical Reference Manual Version 5.0

Docket No. E,G999/CIP-18-694

Dear Assistant Commissioner Lieb,

Center for Energy and Environment ("CEE") respectfully submits these Comments to the Minnesota Department of Commerce, Division of Energy Resources ("Department) in response to the Proposed Decision regarding the Minnesota Technical Reference Manual ("TRM") Version 5.0, filed by the Department on October 29, 2025.

The Department's Proposed Decision increases the baseline efficiency for single-family residential furnaces from 80 to 90 percent Annual Fuel Utilization Efficiency ("AFUE"). The proposed change would only apply to the Early Replacement and Replace on Failure baselines for furnaces in single-family homes.

The baseline furnace efficiency has wide-reaching impacts on Energy Conservation and Optimization ("ECO") programming, as it determines the amount of energy savings utilities claim for specific measures and, in turn, shapes programming decisions, cost-effectiveness results, and the performance of ECO portfolios. Periodic updates to baseline efficiencies are necessary to ensure the baselines continue to reflect market conditions as accurately as possible.

CEE finds that the sources cited by the Department and additional analysis conducted by CEE suggest a 90 percent AFUE baseline is reasonable. However, CEE recognizes there are exceptions to the baseline and provides several additional recommendations to capture nuances in baseline efficiency. Namely, CEE supports using 80 percent AFUE as the measure baseline when the utility can verify that the existing efficiency is lower than 90 percent AFUE.

Finally, CEE recognizes that although addressing furnace baselines has been discussed in the TRM Advisory Committee ("TRMAC") since June 2025, the Department's specific proposal to increase the furnace baseline was brought to the TRMAC on October 27, 2025, two days before the final proposed TRM was filed on October 29. CEE greatly appreciates the historical efforts by the Department to make the TRM update process methodical, inclusive, and transparent to ensure widespread buy-in from stakeholders on the assumptions and methodologies used to calculate savings impacts and cost-effectiveness of ECO measures and programs. CEE encourages continued commitment to that comprehensive approach in future TRM update processes.

Data Sources Informing the Minnesota Furnace Baseline

To understand whether a 90 percent AFUE baseline would better represent the level of furnace efficiency Minnesotans would adopt in the absence of a utility rebate, CEE reviewed several sources cited by the Department and conducted additional analysis of data collected through Home Energy Squad (HES) visits.[1]

Wisconsin Focus on Energy Study

In the proposed TRM Version 5.0, the Department provides the following justification for increasing the baseline furnace efficiency to 90 percent AFUE:

> In 2023, the US DOE issued amended standards with 95% AFUE baseline to take effect December 2028. Analysis of an HVAC contractor survey issued in 2023 by WI Focus On Energy and published in the WI TRM v2024 supported an increased efficiency baseline to 90% for non-income qualified single family residential customers (applicable to all baseline scenarios including early replacement). Based on this research and signals toward upward movement in code baseline in the coming years, the baseline efficiency for furnaces was modified to 90% in v5.0, applicable to all baseline scenarios.

The Wisconsin study cited by the Department was based on 2023 Focus in Energy HVAC contractor surveys exploring the average furnace efficiency offerings in the state.[2] Contractors were asked to estimate the lowest AFUE offered to customers in different types of homes and how often they replace noncondensing furnaces to confirm the reasonableness of their responses.

[1] Home Energy Squad (HES), implemented by CEE on behalf of CenterPoint and Xcel Energy, conducts energy audits and assessments for CenterPoint and Xcel customers. CEE obtained CenterPoint and Xcel's permission to analyze data from HES visits.

[2] "Heating and Cooling Program: Furnace Baseline Findings and Contractor Survey." Presentation by Cadmus and Focus on Energy. November 29, 2023.

The results of the 2023 survey are shown in Figure 1 and were used in Wisconsin to establish new furnace baselines. For single-family homes, the survey found that the average of the lowest AFUE contractors reported offering to customers was 90.6 percent for market rate customers and 88.3 percent for low-income customers. In response, Focus on Energy set the market rate furnace baseline at 92.8 percent AFUE and kept the low-income furnace baseline at 80 percent AFUE.

Figure 1: Focus in Energy 2023 Survey Results[3]

Home Type	Total Estimated # Furnaces Installed	Weighted Average Lowest AFUE (Proposed Baseline)	MMIDs	Current TRM Baseline AFUE
Single Family Low/Limited Income	1,535	88.3%	4966-4969, 4972-4973	80%
Single Family Standard Income	11,288	90.6%	4962-4965, 4970-4971	92.8%
Multifamily Low/Limited Income	2,261	80.7%	4950-4961	86.7%
Multifamily Standard Income	3,316	81.8%		

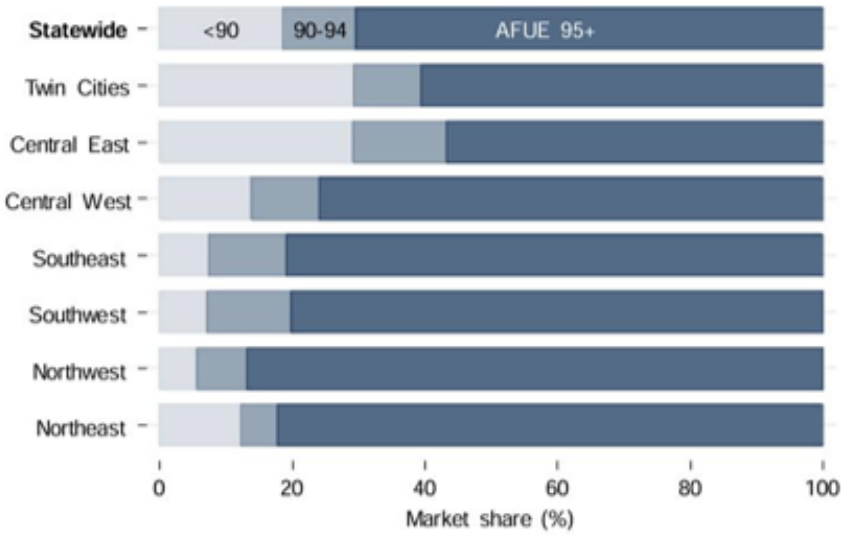
Although the study focuses on Wisconsin rather than Minnesota, the two states share key characteristics that may make the study more applicable in Minnesota. Namely, both states have cold climates and aggressive, long-running efficiency programs.

2018 ECO Potential Study

The 2018 ECO Potential Study found that less than 20 percent of furnaces sold in Minnesota between 2013 and 2016 had an AFUE less than 90 percent.

[3] The rightmost column shows the Wisconsin TRM furnace baseline for each segment. The MMID column lists the identification numbers of affected measures for reference in the Wisconsin TRM.

Figure 2: MN Statewide and Regional Furnace Market Share by AFUE Category (2013-2016)



Source: 2020-2029 Energy Efficiency Potential Study, Appendix M

The Potential Study findings indicate that, roughly ten years ago, the majority of furnaces sold in Minnesota had an AFUE greater than or equal to 95 percent AFUE. Considering the ongoing efforts of ECO programs to increase the adoption of high-efficiency furnaces, it is reasonable to assume that the share of furnaces with AFUEs of at least 90 percent has remained the same or increased since 2016.

The 2018 ECO Potential Study focuses on the market share of each furnace efficiency tier, rather than the existing furnaces currently in customers' homes. This source provides an indication of which levels of efficiency are available to customers when they are seeking a replacement furnace and, therefore, may indicate the level of efficiency they are likely to choose without a utility incentive.

However, data reflecting the efficiency of each customer's current equipment may be more representative of the level of efficiency customers would choose, especially for customers with non-condensing furnaces. The transition from a non-condensing furnace to a condensing furnace can be costly and invasive, meaning, even if condensing furnaces make up a larger share of the market, these customers may be more inclined to choose another non-condensing furnace as their replacement.

Home Energy Squad (HES) Audit Data

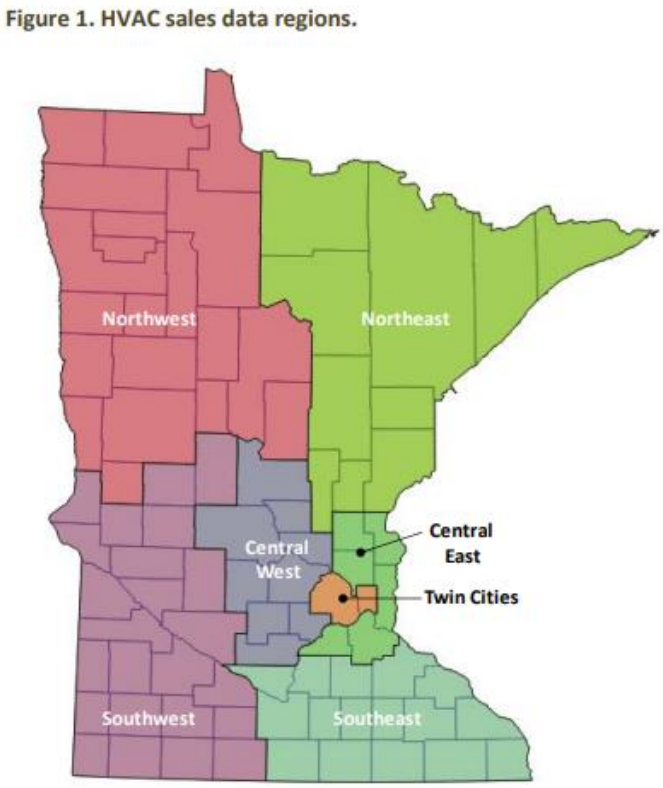
With the permission of CenterPoint and Xcel Energy, CEE analyzed data collected during Home Energy Squad (HES) visits between January 2020 and October 2025 to estimate the average

efficiency of existing furnaces in visited homes. CEE selected visits where the primary heating system was a forced air gas furnace and excluded data from homes with gravity furnaces and visits with no reported AFUE.[4] A total of 21,876 homes visited by HES between 2020 and 2025 had forced air furnaces and included a recorded AFUE in the HES dataset.

Geographic Limitations

The HES data only includes homes visited by HES and therefore overrepresents certain regions of Minnesota. Using the county recorded for each HES visit, CEE identified the percentage of HES visits that fell within each region of Minnesota. CEE used the same seven regions as defined by the 2018 ECO Potential Study furnace sales data, shown in Figure 3, which defines the Twin Cities region as just Hennepin and Ramsey Counties.[5] Appendix A includes a list of each Minnesota county and the corresponding region.

Figure 3: Regions Used in the 2018 ECO Potential Study Sales Data



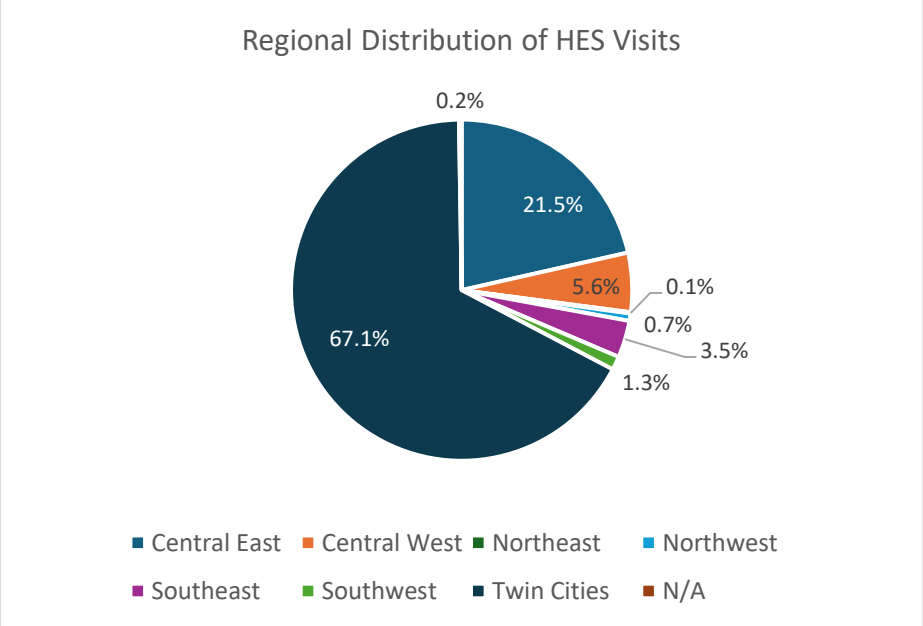
[4] 7,060 of the homes with forced air furnaces did not report an AFUE and were excluded from the analysis.
[5] 2018 Minnesota ECO Potential Study, Appendix M. Page 5. https://www.mncee.org/sites/default/files/2021-06/Appendix-M_Minnesota-HVAC-Sales-Data_2019-03-27_FINAL.pdf

Table 1 and Figure 4 show the regional distribution of the HES visits, with 67.1 percent of visits occurring in Hennepin and Ramsey counties (the Twin Cities region) and 21.5 percent of visits occurring in the Central East region.[6]

Table 1: Regional Distribution of HES Visits

Region	Total	% of Total
Central East	4695	21.5%
Central West	1227	5.6%
Northeast	28	0.1%
Northwest	152	0.7%
Southeast	767	3.5%
Southwest	282	1.3%
Twin Cities	14671	67.1%
N/A	54	0.2%
Total	**21,876**	**100.0%**

Figure 4



Key Findings

The average furnace AFUE in homes visited by HES between 2020-2025 was 89.2 percent. The average was calculated by summing the AFUE reported for each HES visit included in the

[6] The Central East region consists of Anoka, Chisago, Dakota, Isanti, Scott, and Washington counties.

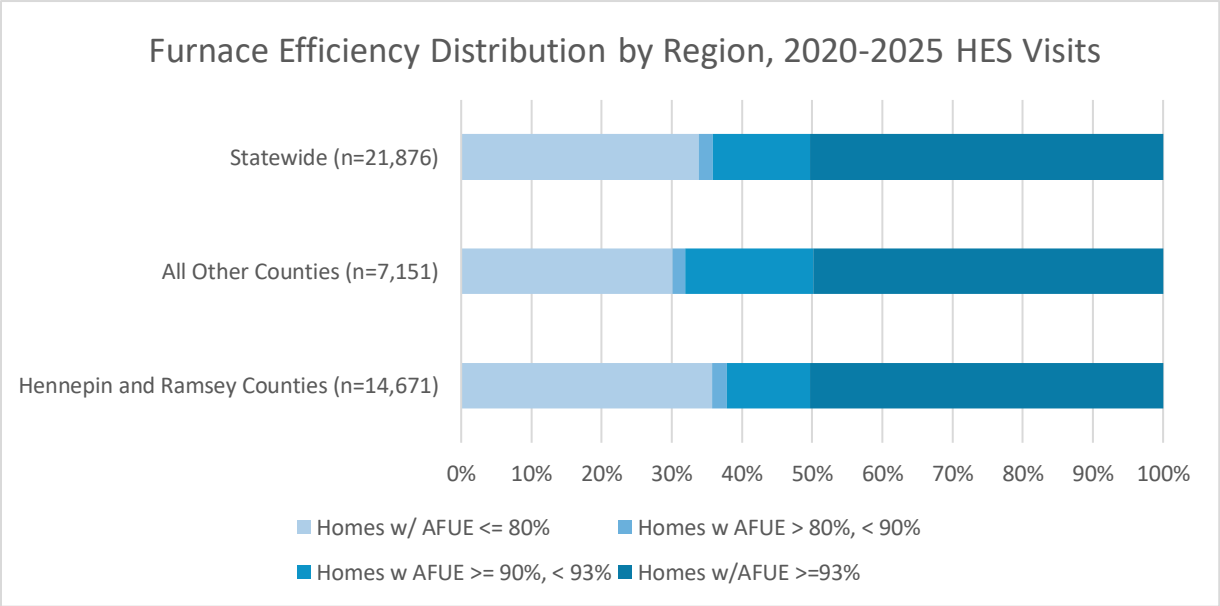
analysis and dividing by the total count, 21,876. Of the homes with forced air furnaces visited by HES from 2020 to 2025, 7,060 did not have a recorded AFUE and were excluded from this average.

CEE also grouped the furnace efficiencies into broader efficiency ranges, as shown in Table 2 and Figure 5. The percent of furnaces that fell within each range of efficiency are reported in three geographic categories: 1) Statewide, 2) Hennepin and Ramsey Counties, and 3) All Other Counties excluding Hennepin and Ramsey. There were 54 HES visits in the dataset with no recorded county which were included in the Statewide category but excluded from the Hennepin and Ramsey Counties and All Other Counties categories.

Table 2: Existing Furnace Efficiencies, 2020-2025 HES Visits

	Percent of Homes (n = 21,876)		
	Statewide (n = 21,876) [7]	**Hennepin and Ramsey Counties (n = 14,671)**	**All Other Counties (n = 7,151)**
Homes w/ AFUE <= 80%	34%	36%	30%
Homes w/ AFUE > 80%, < 90%	2%	2%	2%
Homes w/ AFUE >= 90%, < 93%	14%	12%	18%
Homes w/ AFUE >=93%	50%	50%	50%

Figure 5



[7] Includes 54 homes with no recorded county. These homes are excluded from the Hennepin and Ramsey Counties and All Other Counties categories.

Although the HES data disproportionately represents homes in the Twin Cities and Central East regions, as shown above in Figure 5, the Twin Cities region appears to have a higher proportion of furnaces with AFUEs below 90 percent compared to the rest of the state. The 2018 ECO Potential Study sales data similarly found that the Twin Cities and Central East regions had the highest share of furnaces with AFUEs lower than 90 percent.

Income-Qualified vs Market Rate

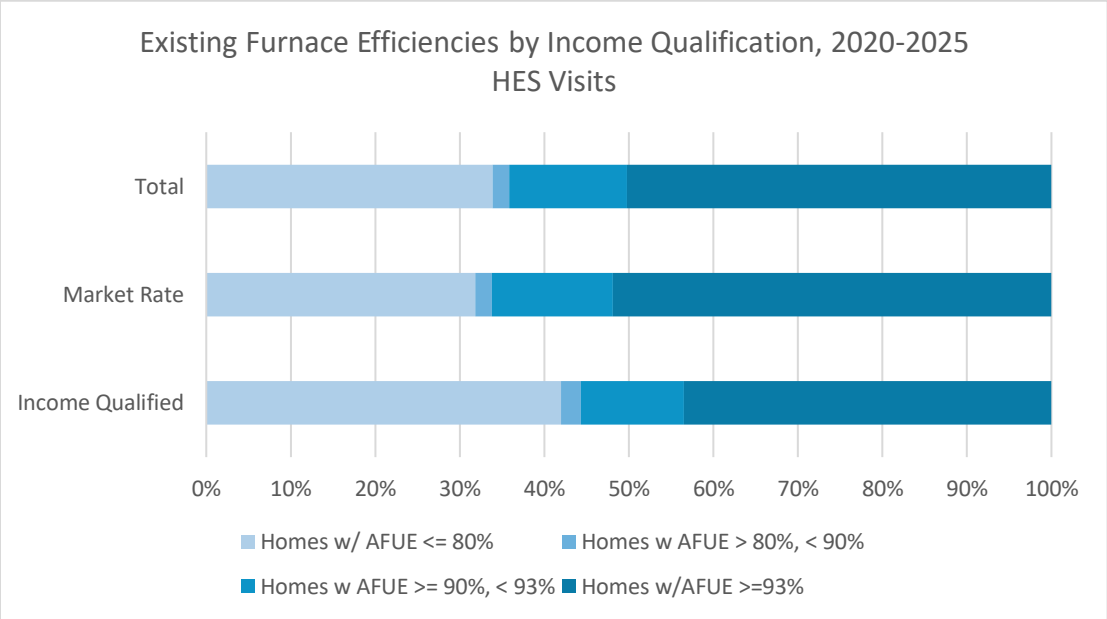
Additionally, approximately 19.6 percent of the HES visits with forced air furnaces were recorded as being for income qualified customers. HES uses self-identification for income-qualified customers, which could result in over- or under-reporting of income qualified customers. The income qualified definition also changed between 2020 and 2025, which could create discontinuity in which customers were included in the income qualified segment.

To explore differences between the income qualified and market rate segments, CEE categorized the AFUEs for each into broader ranges of efficiency, as shown in Table 3 and Figure 6.

Table 3: Existing Furnace Efficiencies by Income Qualification, 2020-2025 HES Visits

	Percent of Homes (n = 21,876)	
	Income Qualified (n = 4,296)	**Market Rate (n = 17,580)**
Homes w/ AFUE <= 80%	42%	32%
Homes w/ AFUE > 80%, < 90%	2%	2%
Homes w/ AFUE >= 90%, < 93%	12%	14%
Homes w/ AFUE >=93%	43%	52%

Figure 6



About 44 percent of the furnace AFUEs recorded for income qualified households were less than 90 percent, compared to 34 percent of the AFUEs recorded for market rate customers. The average AFUE for income qualified households was about 87.9 percent, which was lower than the average AFUE for market rate households, which was about 89.2 percent. This suggests that income qualified households may be more likely to have a low efficiency furnace, which aligns with the Focus in Energy study finding that Wisconsin contractors offered a lower average AFUE to low-income customers than to market rate customers.

Limitations of the HES Data Analysis

CEE highlights the following limitations of the HES data and CEE's analysis:

- *Geographic limitations*: the HES data disproportionately represents Hennepin and Ramsey Counties.
- *Sampling bias*: the homes represented in the HES data chose to undergo an HES visit, which could imply that the households are more energy-conscious and willing to install a high efficiency furnace. The sample bias could skew the other direction as well, as homes with lower efficiency furnaces may be more motivated to take initiative to conserve energy.
- *Inconsistent income qualification:* the HES data relies on self-attestation to identify income-qualified households. The ECO definition for income-qualified households also

changed from being based on 60 percent or less of the state median household income to 80 percent or less of the area median household income in 2021.[8]

- *Exclusion of data points*: the HES dataset excludes 7,060 forced air furnace homes that did not have a reported AFUE, which may influence the results.

Due to the time available to develop and analyze HES data for these comments, CEE was unable to account for or address these limitations, and we recognize that different interpretations of the data could come to reasonably different conclusions.

Anticipated Changes to the Federal Minimum Furnace Efficiency

In addition to the data sources and studies cited above, the U.S. Court of Appeals recently upheld a DOE rule that will increase the federal minimum efficiency for gas furnaces to 95 percent AFUE, set to go into effect on December 18, 2028.[9] Once the new federal minimum is implemented, new gas furnaces manufactured in or imported to the United States will be required to have an efficiency of at least 95 percent AFUE.

Estimated First-Year Savings Impact

The TRM furnace baseline directly affects the amount of savings that can be claimed by a utility for certain ECO measures. The 90 percent AFUE furnace baseline proposed in TRM Version 5.0 would alter the per-unit savings each utility can claim not only for furnace rebates, but also other measures that use the furnace baseline efficiency in savings calculations. In the Department's October 29, 2025 Proposed Decision, the Department clarifies that the change in the furnace baseline would affect the savings claimed for the following measures in Version 5.0:

- Residential HVAC, Furnaces and Boilers
- Residential Envelope, Insulation and Air Sealing
- Residential HVAC, ECM Blower Motors
- Residential HVAC, Furnace Quality Installation/ Maintenance
- Residential HVAC, Ground Source Heat Pumps (GSHP)[10]

The Department also states that the new baseline will apply to Residential HVAC Air Source Heat Pump Systems (ASHP), Residential Envelope Low-E Storm Windows, and Residential Envelope Cellular Shade Window Coverings in the next version of the TRM, Version 5.1.

[8] Minn. Stat. § 216B.2402, subd.16.

[9] "Energy Conservation Program: Energy Conservation Standards for Consumer Furnaces; Final rule." Energy Efficiency and Renewable Energy Office. December 18, 2023. https://www.regulations.gov/document/EERE-2014-BT-STD-0031-4107

[10] Docket No. E,G999/CIP-18-694

CEE recommends that, if possible, all measures in the Minnesota TRM that use the furnace baseline as an input for savings calculations be updated at the same time to ensure consistent assumptions are used throughout utility portfolios, including the measures above scheduled for an update in Version 5.1.

CEE understands that the changes to per-unit savings for these measures will affect each utility's ECO portfolio and programming decisions for the 2027-2029 Triennial. To begin exploring the potential impacts of the proposed change, CEE estimated the change in per-unit dekatherm (Dth) savings for furnace and insulation and air sealing measures that would result from an increase to a 90 percent AFUE furnace baseline. CEE also explored the per-unit ASHP savings utilities could expect if the new furnace baseline were implemented for ASHPs.

CEE limited our analysis to furnace, insulation air sealing, and ASHP measures, and therefore did not capture any change in savings for the other potentially affected measures. CEE also used the default TRM Version 4.2 methodology and inputs, meaning the estimates do not capture any utility-specific inputs and methodologies. The actual savings claimed for these measures by each utility likely differ from those estimated below.

Furnace Savings

For furnace measures, CEE calculated the per-unit Dth savings for different efficient furnace measures with an 80 percent and 90 percent AFUE baseline efficiency. Table 4, Table 5, and Table 6 show the estimated per-unit savings before and after the furnace baseline change when using the default TRM methodology. CEE included per-unit savings for furnace measures ranging from 92 to 97 percent AFUE and for each of the three climate zones included in the TRM.

Table 4: Per-Furnace Dth Savings, 80% vs 90% AFUE Furnace Baseline

80% AFUE Furnace Baseline				
Measure	**Climate Zone 1**	**Climate Zone 2**	**Climate Zone 3**	**Average of Climate Zones**
92 % AFUE Furnace (Dth/ Furnace)	8.75	7.63	7.86	8.08
94 % AFUE Furnace (Dth/ Furnace)	10.51	9.19	9.47	9.72
95 % AFUE Furnace (Dth/ Furnace)	11.38	9.97	10.27	10.54
96 % AFUE Furnace (Dth/ Furnace)	12.25	10.75	11.07	11.36
97 % AFUE Furnace (Dth/ Furnace)	13.13	11.53	11.87	12.18
90% AFUE Furnace Baseline				
Measure	**Climate Zone 1**	**Climate Zone 2**	**Climate Zone 3**	**Average of Climate Zones**
92 % AFUE Furnace (Dth/ Furnace)	1.53	1.36	1.39	1.43

94 % AFUE Furnace (Dth/ Furnace)	3.05	2.72	2.79	2.85
95 % AFUE Furnace (Dth/ Furnace)	3.82	3.40	3.49	3.57
96 % AFUE Furnace (Dth/ Furnace)	4.58	4.08	4.18	4.28
97 % AFUE Furnace (Dth/ Furnace)	5.34	4.76	4.88	4.99

Table 5: Change in Per-Furnace Dth Savings, 80% vs 90% AFUE Furnace Baseline

Measure	Climate Zone 1	Climate Zone 2	Climate Zone 3	Average of Climate Zones
92 % AFUE Furnace (Dth/ Furnace)	(7.23)	(6.27)	(6.47)	(6.66)
94 % AFUE Furnace (Dth/ Furnace)	(7.45)	(6.47)	(6.68)	(6.87)
95 % AFUE Furnace (Dth/ Furnace)	(7.56)	(6.57)	(6.78)	(6.97)
96 % AFUE Furnace (Dth/ Furnace)	(7.67)	(6.67)	(6.88)	(7.08)
97 % AFUE Furnace (Dth/ Furnace)	(7.79)	(6.77)	(6.98)	(7.18)

Table 6: Change in Per-Furnace Savings (%), 80% vs 90% AFUE Furnace Baseline

Measure	Climate Zone 1	Climate Zone 2	Climate Zone 3	Average of Climate Zones
92 % AFUE Furnace (Dth/ Furnace)	-83%	-82%	-82%	-82%
94 % AFUE Furnace (Dth/ Furnace)	-71%	-70%	-71%	-71%
95 % AFUE Furnace (Dth/ Furnace)	-66%	-66%	-66%	-66%
96 % AFUE Furnace (Dth/ Furnace)	-63%	-62%	-62%	-62%
97 % AFUE Furnace (Dth/ Furnace)	-59%	-59%	-59%	-59%

Table 8 shows the 2024 Dth furnace measure savings calculated with an 80 percent AFUE furnace baseline compared to the savings recalculated using a 90 percent baseline. The total savings estimates were calculated by multiplying the utility's reported 2024 participation for each furnace measure by the corresponding per-unit savings, calculated using the TRM default methodology and the average of the three climate zones. In practice, the utilities may diverge from the default TRM savings calculation methodology, so the total savings calculated with an 80 percent AFUE baseline and shown in Table 8 may vary from the actual reported 2024 savings.

Table 7: 2024 Furnace Rebate Participation, Single Family and Existing Homes[11]

	CenterPoint[12]	Xcel Energy[13]	MERC[14]
92% AFUE Furnace	909	-	44
94% AFUE Furnace	-	-	1977
95% AFUE Furnace	-	324	-
96% AFUE Furnace	8317	3726	1
97% AFUE Furnace	6119	3037	1305

Table 8: Change in Total 2024 Savings from Furnace Measures (Dth), 80% vs 90% AFUE Baseline[15]

	CenterPoint	Xcel Energy	MERC
80% Furnace Baseline (Dth Savings)	176,322	82,716	35,476
90% Furnace Baseline (Dth Savings)	67,469	32,278	12,228
Change in Savings (Dth)	(108,853)	(50,438)	(23,248)
Change in Savings (%)	-62%	-61%	-66%
Total 2024 ECO Portfolio Savings (Dth)	1,890,592	1,298,040	395,470
Change in Savings (as a % of Total 2024 ECO Portfolio Savings)	-5.76%	-3.89%	-5.88%

According to these estimations, when using the default TRM methodology, utilities could see anywhere from a 59 to 83 percent decline in per-unit Dth savings depending on the efficiency of the rebated furnace and climate zone. When applied to 2024 participation levels for each utility, CEE estimates that the decreases in per-unit savings from furnace measures alone would result in a 5.67 percent reduction in total 2024 Dth savings for CenterPoint, a 3.89 percent reduction for Xcel Energy, and a 5.88 percent reduction for MERC.

Insulation and Air Sealing Savings

For homes that heat primarily with a natural gas furnace, insulation and air sealing measures also include the TRM furnace baseline as an input for savings calculations. Using the TRM

[11] 2024 ECO Status Reports. Docket Numbers E002/G002/CIP-23-92, G008/CIP-23-95, and G011/CIP-23-98.
[12] Participation in CenterPoint's Home Efficiency, Low-Income Weatherization, LIRE, HERO, and NPAH retrofit furnace measures.
[13] Participation in Xcel Energy's gas Residential HVAC (existing homes) and HESP furnace measures.
[14] Participation in MERC's Low-Income Weatherization and Residential Rebate furnace measures.
[15] The estimations use the default TRM inputs and methodology to calculate per-furnace Dth savings before and after a baseline change.

default savings calculation for insulation and air sealing measures, CEE estimates a roughly 11 percent decline in per-unit Dth savings for each insulation and air sealing measure. Table 9 shows the change in insulation and air sealing savings before and after an increase to a 90 percent furnace baseline, with the assumption of an 11 percent decline in savings.

Table 9: Change in 2024 Total Insulation and Air Sealing Savings (Dth), 80% vs 90% AFUE Baseline

	CenterPoint	Xcel	MERC
Savings with 80% Furnace Baseline (Actual Reported Dth Savings)[16]	68,780	29,706	10,634
Change in Savings with a 90% Furnace Baseline (assumed to be an 11% decline)	-11%	-11%	-11%
Change in Savings (Dth)	-7566	-3268	-1170
Total 2024 ECO Portfolio Savings (Dth)	1,890,592	1,298,040	395,470
Change in Savings as a % of Total 2024 ECO Portfolio Savings	-0.40%	-0.25%	-0.30%

Although the per-unit savings for insulation and air sealing measures would see an estimated 11 percent reduction with a 90 percent AFUE furnace baseline, the change is less dramatic than that for furnace measures.

Air-Source Heat Pump (ASHP) Savings

Although the Department's guidance does not propose implementing the furnace baseline change until Version 5.1 of the TRM, CEE recommends applying the new furnace baseline to all affected measures in Version 5.0 to maintain consistency in the technical guidance. CEE calculated the estimated decrease in per-unit net energy savings for dual-fuel ASHP measures that would occur with an increase in the furnace baseline.

CEE used the Department's TRM Version 4.1-2 Appendix G to calculate the per-unit net energy savings from an ASHP with gas furnace backup, first using an 80 percent AFUE furnace baseline and then using a 90 percent AFUE furnace baseline.[17] For ASHP measures with gas furnace backup and rebated by a gas utility, the net energy savings represent the Dth gas savings produced by the ASHP net of the kWh electric load it adds to the electric system. The switchover temperature determines the proportion of the home's load served by the ASHP versus the natural gas furnace and therefore impacts the savings generated by the ASHP measure.

[16] The 2024 insulation and air sealing savings are estimated as the sum of the attic insulation, wall insulation, and envelope air sealing measure Dth savings reported in each utility's 2024 ECO Status Report. Docket Numbers E002/G002/CIP-23-92, G008/CIP-23-95, and G011/CIP-23-98.
[17] TRM 4.1-2 Appendix G. February 16, 2024. Docket No. E,G999/CIP-18-694.

Table 10 shows the estimated per-unit savings with both a 15-degree and 30-degree switchover temperature, and Table 11 shows the change in per-unit savings after increasing the furnace baseline from 80 to 90 percent AFUE. In practice, the utilities may diverge from the default TRM savings calculation methodology and calculate different per-unit net energy savings for ASHP measures.

Table 10: Per-Unit Net Energy Savings (Dth) for Dual-Fuel ASHP Measures

80% Furnace Baseline				
	Climate Zone 1	Climate Zone 2	Climate Zone 3	Average of Climate Zones
ASHP (30-degree F switchover)	23.4	22.7	27.9	24.7
ASHP (15-degree F switchover)	42.6	38.2	46.7	42.5
90% Furnace Baseline				
	Climate Zone 1	Climate Zone 2	Climate Zone 3	Average of Climate Zones
ASHP (30-degree F switchover)	19.6	19.0	23.6	20.8
ASHP (15-degree F switchover)	35.1	31.4	39.1	35.2

Table 11: Change in Per-Unit Net Energy Savings (Dth) for Dual-Fuel ASHP Measures, 80% vs 90% AFUE Furnace Baseline

Change in Per-Unit Savings (Dth)				
	Climate Zone 1	Climate Zone 2	Climate Zone 3	Average of Climate Zones
ASHP (30-degree F switchover)	-3.8	-3.7	-4.3	-3.9
ASHP (15-degree F switchover)	-7.4	-6.8	-7.6	-7.3
Change in Per-Unit Savings (%)				
	Climate Zone 1	Climate Zone 2	Climate Zone 3	Average of Climate Zones
ASHP (30-degree F switchover)	-16%	-16%	-15%	-16%
ASHP (15-degree F switchover)	-17%	-18%	-16%	-17%

The per-unit net energy savings show that, even when accounting for increased electric load, savings are greater with a lower switchover temperature since the ASHP offsets more natural gas. Using the average results of the three TRM climate zones, ASHP savings decrease by about 16 percent under a 30-degree switchover temperature scenario and 17 percent under a 15-degree switchover temperature scenario. Although not insignificant, the impact of the furnace baseline change on ASHP measure savings is much smaller than that on furnace measures. ASHPs continue to provide sizable per-unit net energy savings even after the furnace baseline change.

Since, of the gas utilities, only CenterPoint and Xcel Energy offered ASHP rebates in 2024 and each used unique assumptions in their savings calculations, CEE did not apply the TRM-based per-unit savings shown above to 2024 participation levels and therefore do not provide an estimation of a total decline in ASHP Dth savings for 2024.

Summary of Possible Impacts of the Furnace Baseline Change

ECO Portfolio Impacts

With an increase to the furnace baseline, per-unit savings for measures which use the furnace baseline as an input in savings calculations would decrease, meaning utilities would earn less first-year savings for the same levels of participation. When applied to 2024 participation levels, the decrease in per-unit savings for furnace and insulation and air sealing measures alone results in an estimated 2024 savings decrease of 116,419 Dth for CenterPoint, 53,706 Dth for Xcel Energy, and 24,418 Dth for MERC. This represents roughly 6 percent of CenterPoint's total 2024 ECO savings, 4 percent of Xcel Energy's, and 6 percent of MERC's.[18] As explained above, these estimates do not include estimated lost savings for the other measures noted by the Department as impacted by the furnace baseline change. The estimates also use the TRM default methodology and do not capture any variations in methodology used by utilities.

The change in per-unit Dth savings from each measure also impacts the cost-effectiveness of each measure and therefore the rebate amount a utility can offer. Especially for furnace measures, where per-measure savings are expected to decline significantly, utilities may have to reduce the size of their rebates to maintain cost-effectiveness.

The overall change in Dth savings that would result from an increase in the furnace baseline would also directly affect the net benefits generated by each portfolio and the size of the

[18] See CEE's estimates and explanation in the *Estimated First-Year Savings* Impact section of these comments.

utility's performance-based financial incentive, since the incentive is dependent on first-year savings and net benefits.

ECO Utility Performance Incentive Impacts

CEE notes there is an ongoing regulatory process to establish the utility performance-based financial incentive framework for the 2027-2029 Triennial in Docket No. E,G999/CIP-08-133. CEE, along with the Department and Fresh Energy, proposed a multi-factor incentive mechanism that, for gas utilities, would incorporate performance metrics for insulation and air sealing first-year savings and low-income spending. CEE recognizes that the proposed baseline change in the TRM differs from the assumptions used to develop the proposed financial incentive mechanism, given the anticipated decrease in Dth savings and net benefits. First-year energy savings and net benefits would continue to be important metrics in the proposed 2027-2029 incentive mechanism if it is approved.

Distributor and Contractor Impacts

The furnace baseline change could shape the rebates utilities offer for efficient furnaces, which would have meaningful impacts on HVAC contractors and distributors. If the change to the furnace baseline is approved, the Department and stakeholders should proactively prepare for any impacts to the market and clearly communicate with contractors and distributors.

CEE Recommendations

After reviewing the data provided by the Wisconsin Focus on Energy study, the 2018 ECO Potential Study, and the HES dataset, CEE believes the Department's proposal to increase the TRM furnace baseline from 80 to 90 percent AFUE is reasonable.

However, in cases where the utility can verify the actual efficiency of an existing furnace, and that efficiency is lower than 90 percent, the utility could propose to use the federal minimum standard of 80 percent AFUE as the measure baseline. The replacement of any remaining furnaces with AFUEs less than 90 percent should be a priority for ECO programming moving forward, as they have the highest savings potential. Allowing utilities to use the federal minimum standard of 80 percent for these situations would more accurately capture these savings and enable utilities to continue prioritizing and offering larger customer rebates for the replacement of low efficiency, non-condensing furnaces. Careful consideration should be given to ensure the utility and the Department can accurately verify the reported efficiency of the existing furnace.

Additionally, in 2023, Wisconsin chose to keep the low-income furnace baseline at 80 percent AFUE for income qualified households after the Focus in Energy survey found a slightly lower

weighted average AFUE for these households than for market rate customers. The Department could explore a similar approach for Minnesota to more accurately capture the savings of the low-income segment.

Stakeholder Considerations for Mitigating Savings Impacts

CEE recognizes that any increase to the furnace baseline efficiency would result in a reduction in each gas utility's per-unit savings across several areas of programming. To maintain historic savings levels, utilities would have to adapt their portfolios and ECO planning approach.

CEE provides several recommendations for how utilities can seek to offset some of the resulting loss in savings in the event of a 90 percent AFUE furnace baseline.

Multi-Family and Low-Income Furnace Measures

The Department's proposed baseline change does not affect the furnace baseline for multi-family households, which is proposed to remain at 80 percent AFUE for Early Replacement and Replace on Failure measures in TRM Version 5.0. Utilities should pursue additional furnace measures for multi-family properties as they would still yield the same per-unit savings as in the previous triennial.

As suggested by the results of the Wisconsin study and HES data, low-income households may be more likely to have a furnace with an AFUE less than 90 percent. Especially if utilities are allowed to use the 80 percent federal minimum as the baseline when the existing efficiency is less than 90 percent, utilities may wish to pursue furnace replacements for low-income customers more aggressively, as they would result in greater per-unit savings.

ASHP and Insulation and Air Sealing Measures

Although savings from ASHP and insulation and air sealing measures may decrease slightly with a 90 percent AFUE furnace baseline, they do not decrease as dramatically as furnace savings. Both measures would continue to produce significant savings. Utilities could explore methods for increasing participation in their ASHP and insulation and air sealing measures, such as offering larger rebates or additional rebate tiers.

Specifically for ASHPs, utilities could offer rebates that target ASHPs with lower switchover temperatures, namely cold-climate ASHPs. With dual fuel systems, the lower the switchover temperature, the more load is covered by the heat pump rather than the gas furnace back-up. ASHPs with lower switchover temperatures can therefore generate higher energy savings.

Summary of CEE's Recommendations

CEE provides the following recommendations:

1. Based on CEE's review of the available data sources, CEE believes the Department's proposed 90 percent AFUE furnace baseline for single-family, replacement furnaces is reasonable.
2. In cases where a utility can verify the actual efficiency of an existing furnace and the AFUE is lower than 90 percent, the utility could propose to use the federal minimum standard of 80 percent AFUE as the measure baseline. This approach would allow utilities to continue prioritizing and offering larger customer rebates for the replacement of lower efficiency, non-condensing furnaces. It also would accurately reflect the baseline for these customers since a customer replacing a non-condensing furnace would likely not choose a condensing furnace without a market intervention.
3. The Department could consider implementing a low-income specific furnace baseline, as sources show that low-income households may be more likely to have a furnace efficiency lower than 90 percent AFUE.
4. All measures in the Minnesota TRM with the furnace baseline as an input in the savings calculation should be updated at the same time to ensure consistent assumptions are used throughout utility portfolios.
5. If the 90 percent AFUE baseline is implemented, ongoing ECO stakeholder processes for the 2027-2029 Triennial should explore impacts to planned portfolios and strategies for offsetting any decrease in first-year savings and net benefits. Utilities should evaluate opportunities to increase savings from multi-family, low-income, insulation and air sealing, and efficient fuel switching measures to offset losses from the baseline adjustment.
6. If the 90 percent AFUE baseline is implemented, the Department and stakeholders should proactively communicate with contractors and distributors to plan for any market impacts.

CEE appreciates the opportunity to provide feedback and the Department's consideration of our comments. Please contact me at myatsuhashi@mncee.org with any questions.

Sincerely,

/s/ Mariko Yatsuhashi
Regulatory Policy Advocate
Center for Energy and Environment

Appendix A: Region Definitions used in the HES Analysis and 2018 ECO Potential Study

County	Region
Anoka	Central East
Chisago	Central East
Dakota	Central East
Isanti	Central East
Scott	Central East
Washington	Central East
Benton	Central West
Carver	Central West
McLeod	Central West
Meeker	Central West
Morrison	Central West
Sherburne	Central West
Sibley	Central West
Stearns	Central West
Wright	Central West
Big Stone	Southwest
Brown	Southwest
Chippewa	Southwest
Cottonwood	Southwest
Douglas	Southwest
Jackson	Southwest
Kandiyohi	Southwest
Lac Qui Parle	Southwest
Lincoln	Southwest
Lyon	Southwest
Martin	Southwest
Murray	Southwest
Nobles	Southwest
Pipestone	Southwest
Pope	Southwest
Redwood	Southwest
Renville	Southwest
Rock	Southwest
Stevens	Southwest
Swift	Southwest
Todd	Southwest
Traverse	Southwest
Watonwan	Southwest
Yellow Medicine	Southwest
Hennepin	Twin Cities
Ramsey	Twin Cities
Kittson	Northwest
Roseau	Northwest
Lake of the Woods	Northwest
Beltrami	Northwest
Pennington	Northwest
Red Lake	Northwest
Polk	Northwest
Norman	Northwest
Mahnomen	Northwest
Clearwater	Northwest
Clay	Northwest
Becker	Northwest
Hubbard	Northwest
Wilkin	Northwest
Grant	Northwest
Otter Tail	Northwest
Wadena	Northwest
Cass	Northwest
Crow Wing	Northwest
Marshall	Northwest
Koochiching	Northeast
Itasca	Northeast
Aitkin	Northeast
Mille Lacs	Northeast
Kanabec	Northeast
Pine	Northeast
Carlton	Northeast
St. Louis	Northeast
Lake	Northeast
Cook	Northeast
Nicollet	Southeast
Le Sueur	Southeast
Rice	Southeast
Goodhue	Southeast
Wabasha	Southeast
Blue Earth	Southeast
Waseca	Southeast
Steele	Southeast
Dodge	Southeast
Olmsted	Southeast
Winona	Southeast
Faribault	Southeast
Freeborn	Southeast
Mower	Southeast
Fillmore	Southeast
Houston	Southeast

AFFIDAVIT OF SERVICE

DOCKET NUMBER E,G999/CIP-18-694

I, Mariko Yatsuhashi, herby certify that on this 20th day of November 2025, I served *Center for Energy and Environment's Comments In the Matter of the Minnesota Technical Reference Manual Version 5.0* in Docket Number E,G999/CIP-18-694 on the following persons on the attached Service Lists by:

_X_ placing such filing in envelopes, properly addressed, and depositing the same in the Post Office at the City of Minneapolis, for delivery by the United States Post Office as directed by said envelopes.

_X_ electronic filing

/s/ Mariko Yatsuhashi
Mariko Yatsuhashi

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10	Ray	Choquette	rchoquette@agp.com	Ag Processing Inc.		12700 West Dodge Road PO Box 2047 Omaha NE, 68103-2047 United States	Electronic Service		No	ECO SPECIAL SERVICE LIST
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20	Tyler	Glewwe	tyler.glewwe@centerpointenergy.com	CenterPoint Energy		505 Nicollet Mall Minneapolis MN, 55402 United States	Electronic Service		No	ECO SPECIAL SERVICE LIST
21	Jenny	Glumack	jenny@mrea.org	Minnesota Rural Electric Association		11640 73rd Ave N Maple Grove MN, 55369 United States	Electronic Service		No	ECO SPECIAL SERVICE LIST
22	Jason	Grenier	jgrenier@otpco.com	Otter Tail Power Company		215 South Cascade Street Fergus Falls MN, 56537 United States	Electronic Service		No	ECO SPECIAL SERVICE LIST
23	Jeffrey	Haase	jhaase@grenergy.com	Great River Energy		12300 Elm Creek Blvd Maple Grove MN, 55369 United States	Electronic Service		No	ECO SPECIAL SERVICE LIST
24	Joe	Hoffman	ja.hoffman@smmpa.org	SMMPA		500 First Ave SW	Electronic Service		No	ECO SPECIAL

#	First Name	Last Name	Email	Organization	Agency	Address	Delivery Method	Alternate Delivery Method	View Trade Secret	Service List Name
						Rochester MN, 55902-3303 United States				SERVICE LIST
25	Travis	Jacobson	travis.jacobson@mdu.com	Great Plains Natural Gas Company		400 N 4th St Bismarck ND, 58501 United States	Electronic Service		No	ECO SPECIAL SERVICE LIST
26	Dave	Johnson	dave.johnson@aeoa.org	Arrowhead Economic Opportunity Agency		702 3rd Ave S Virginia MN, 55792 United States	Electronic Service		No	ECO SPECIAL SERVICE LIST
27	Martin	Kapsch	martin.kapsch@centerpointenergy.com	CenterPoint Energy Minnesota Gas		505 Nicollet Mall Minneapolis MN, 55402 United States	Electronic Service		No	ECO SPECIAL SERVICE LIST
28	Zach	Klabo	zach.klabo@mdu.com	Great Plains Natural Gas Company			Electronic Service		No	ECO SPECIAL SERVICE LIST
29	Deborah	Knoll	dknoll@mnpower.com	Minnesota Power		30 W Superior St Duluth MN, 55802 United States	Electronic Service		No	ECO SPECIAL SERVICE LIST
30	Kathryn	Knudson	kathryn.knudson@centerpointenergy.com	CenterPoint Energy Minnesota Gas		null null, null United States	Electronic Service		No	ECO SPECIAL SERVICE LIST
31	Tina	Koecher	tkoecher@mnpower.com	Minnesota Power		30 W Superior St Duluth MN, 55802-2093 United States	Electronic Service		No	ECO SPECIAL SERVICE LIST
32	Martin	Lepak	martin.lepak@aeoa.org	Arrowhead Economic Opportunity		702 S 3rd Ave Virginia MN, 55792 United States	Electronic Service		No	ECO SPECIAL SERVICE LIST
33	Corey	Lubovich	coreyl@hpuc.com	Hibbing Public Utilities Commission		1902 6th Ave E Hibbing MN, 55746 United States	Electronic Service		No	ECO SPECIAL SERVICE LIST
34	Christine	Marquis	regulatory.records@xcelenergy.com	Xcel Energy		414 Nicollet Mall MN1180-07-MCA Minneapolis MN, 55401 United States	Electronic Service		No	ECO SPECIAL SERVICE LIST
35	Josh	Mason	jmason@rpu.org	Rochester Public Utilities		4000 E River Rd NE Rochester MN, 55906 United States	Electronic Service		No	ECO SPECIAL SERVICE LIST
36	Scot	McClure	scotmcclure@alliantenergy.com	Interstate Power And Light Company		4902 N Biltmore Ln PO Box 77007 Madison WI, 53707-1007	Electronic Service		No	ECO SPECIAL SERVICE LIST

#	First Name	Last Name	Email	Organization	Agency	Address	Delivery Method	Alternate Delivery Method	View Trade Secret	Service List Name
						United States				
37	David	Moeller	dmoeller@allete.com	Minnesota Power			Electronic Service		No	ECO SPECIAL SERVICE LIST
38	Andrew	Moratzka	andrew.moratzka@stoel.com	Stoel Rives LLP		33 South Sixth St Ste 4200 Minneapolis MN, 55402 United States	Electronic Service		No	ECO SPECIAL SERVICE LIST
39	Carl	Nelson	cnelson@mncee.org	Center for Energy and Environment		212 3rd Ave N Ste 560 Minneapolis MN, 55401 United States	Electronic Service		No	ECO SPECIAL SERVICE LIST
40	Samantha	Norris	samanthanorris@alliantenergy.com	Interstate Power and Light Company		200 1st Street SE PO Box 351 Cedar Rapids IA, 52406-0351 United States	Electronic Service		No	ECO SPECIAL SERVICE LIST
41	Larry	Oswald	larry.oswald@mdu.com	Great Plains Natural Gas Company		105 W Lincoln Ave PO Box 176 Fergus Falls MN, 56538-9001 United States	Electronic Service		No	ECO SPECIAL SERVICE LIST
42	Lisa	Pickard	lseverson@minnkota.com	Minnkota Power Cooperative		5301 32nd Ave S Grand Forks ND, 58201 United States	Electronic Service		No	ECO SPECIAL SERVICE LIST
43	Bill	Poppert	info@technologycos.com	Technology North		2433 Highwood Ave St. Paul MN, 55119 United States	Electronic Service		No	ECO SPECIAL SERVICE LIST
44	Dave	Reinke	dreinke@dakotaelectric.com	Dakota Electric Association		4300 220th St W Farmington MN, 55024-9583 United States	Electronic Service		No	ECO SPECIAL SERVICE LIST
45	Generic Notice	Residential Utilities Division	residential.utilities@ag.state.mn.us		Office of the Attorney General - Residential Utilities Division	1400 BRM Tower 445 Minnesota St St. Paul MN, 55101-2131 United States	Electronic Service		No	ECO SPECIAL SERVICE LIST
46	Jean	Schafer	jeans@bepc.com	Basin Electric Power Cooperative		1717 E Interstate Ave Bismarck ND, 58501 United States	Electronic Service		No	ECO SPECIAL SERVICE LIST

#	First Name	Last Name	Email	Organization	Agency	Address	Delivery Method	Alternate Delivery Method	View Trade Secret	Service List Name
47	Laura	Silver	laura.silver@state.mn.us		Department of Commerce	85 7th Place E, Suite 500 St. Paul MN, 55101 United States	Electronic Service		No	ECO SPECIAL SERVICE LIST
48	Rick	Sisk	rsisk@trccompanies.com	Lockheed Martin		1000 Clark Ave. St. Louis MO, 63102 United States	Electronic Service		No	ECO SPECIAL SERVICE LIST
49	Ken	Smith	ken.smith@districtenergy.com	District Energy St. Paul Inc.		76 W Kellogg Blvd St. Paul MN, 55102 United States	Electronic Service		No	ECO SPECIAL SERVICE LIST
50	Anna	Sommer	asommer@energyfuturesgroup.com	Energy Futures Group		PO Box 692 Canton NY, 13617 United States	Electronic Service		No	ECO SPECIAL SERVICE LIST
51	Russ	Stark	russ.stark@ci.stpaul.mn.us	City of St. Paul		Mayor's Office 15 W. Kellogg Blvd., Suite 390 Saint Paul MN, 55102 United States	Electronic Service		No	ECO SPECIAL SERVICE LIST
52	Kodi	Verhalen	kverhalen@taftlaw.com	Taft Stettinius & Hollister LLP		80 S 8th St Ste 2200 Minneapolis MN, 55402 United States	Electronic Service		No	ECO SPECIAL SERVICE LIST
53	Michael	Volker	mvolker@eastriver.coop	East River Electric Power Coop		211 S. Harth Ave Madison SD, 57042 United States	Electronic Service		No	ECO SPECIAL SERVICE LIST
54	Ethan	Warner	ethan.warner@centerpointenergy.com	CenterPoint Energy		505 Nicollet Mall Minneapolis MN, 55402 United States	Electronic Service		No	ECO SPECIAL SERVICE LIST
55	Robyn	Woeste	robynwoeste@alliantenergy.com	Interstate Power and Light Company		200 First St SE Cedar Rapids IA, 52401 United States	Electronic Service		No	ECO SPECIAL SERVICE LIST
56	Cristina	Zuniga	czuniga@otpco.com	Otter Tail Power Company		215 South Cascade Street PO Box 496 Fergus Falls MN, 56538 United States	Electronic Service		No	ECO SPECIAL SERVICE LIST