



Minnesota TRM 5.1 Update

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Housekeeping



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Lauren will be the primary point of contact for the below items. Can also copy Jenna on TRM inquiries, we will work together to address most items.

- TRM Suggestions/Questions
- CARD research inquiries/results
- Modifications to the TRMAC distribution list

- Housekeeping
- TRM Schedule and Process
- MN Conservation Applied Research and Development (CARD) Projects
- TRM v5.1 Updates – Priority List
 - Circle Back Items
 - Edits Made to Date
 - Open Discussion Items
 - Pending Updates

Housekeeping – TRMAC Members

Name	Organization	Name	Organization	Name	Organization
Kim Lillyblad	Avant Energy	Adam Groenhuyzen	Frontier Energy	Kevin Hatcher	Minnkota Power Cooperative
Elyse Malherek	Big Ladder Software	Amy Martin		Darlene Weber-Scott	Missouri River Energy Services
Noah Cordoba	Building Decarbonization Coalition	Derek Neumann		Jason Haupt	
Andy Baeten	Center for Energy and Environment	Doug Eli		Jesse Robertson	
Ben Schoenbauer		Nick Campbell		Lisa Fischer	Otter Tail Power Company
Carl Nelson		Matt Haley		Betty Balegana	
Isaac Smith		Steve Coleman		Cristina Zuniga	
Kristen Funk		Tanuj Gulati		Jason Burns	
Mariko Yatsuhashi		Travis Hinck	GDS Associates, Inc.	Jason Grenier	
Rabi Vandergon		Kathy Baerlocher	Great Plains Natural Gas Company	Jon Fabre	Pacific Northwest National Laboratory
Ranal Tudawe		Larry Oswald		Luke Meech	
Ritika Kumbharkar		Zach Klabo		Allegra Steenson	
Will Nissen		Amelinda Hendrickx	Great River Energy	Annie Hu	
Eric Johansen	CenterPoint Energy	Jamie Stallman		Junke Wang	Power TakeOff
Ethan Warner		Jeff Haase		David Siddiqui	
Joel Lynch		Kelsey Kopp		Erin Kempster	
Marty Kapsch		Rodney De Fouw		Lucas Born	
Tyler Glewwe		Victoria Browning	ICF	Peter Widmer	Resource Innovations
Cory Hetchler	Connexus Energy	Glen Eigo	ICF - ECO Potential Study	Cory Luker	
Zach Nyst		Chris Trembley	Madelia Municipal Light & Power	Josh Mason	
Joel Zook	Dairyland Power Cooperative	Grey Staples	Mendota Group	Laurie Cook	Rochester Public Utilities
David Reinke	Dakota Electric Association	Joel Pertsch	Michaels Energy	Olivia Prieto	Rocky Mountain Institute
Patrick Mathwig		Morgan Nordby	MN Chamber of Commerce - Energy Smart	Andy Lick	Slipstream
Deb Dynako	Energy Infrastructure Partners	Jen Kimmen	Minnesota Energy Resources	Ben Ipsen	Southern Minnesota Municipal Power Agency
Gary Swanson	Energy Management Solutions	Huei Wong	Minnesota Energy Resources - ICF	Joe Hoffman	
Dean Laube	Franklin Energy Services	Julian Graybill Brubaker		Nick Heid	
Luke Gehrke		Katie O'Rourke		Katy Janda	University of Oxford; UMN
Nick Dombrosky		Katy Koon		Chris Baker	VEIC
Caitlin Eichten	Fresh Energy	Zach Froio		Andrew Macho	Xcel Energy
Nick Haeg		Cassie Theisen	Minnesota Power	Danny Price	
Sam Friesen		Chad Trebilcock		Karl Shlanta	
		Wyatt Miller			

TRM Schedule

Date	Event	Description
6/23/2026	Meeting 1	Kick-Off Meeting
7/20/2026	Meeting 2	Measure Workpapers Discussion Cont.
7/24/2026	Feedback Due	TRMAC v5.1 Feedback on Priority List Due
8/12/2026	Optional Presentation	Discussion on RECS and CBECS with John Staub
8/17/2026	Meeting 3	Measure Workpapers Discussion Continued
8/20/2026	New Construction Working Group - Main Topic: Develop a prescriptive process to address modeled building EFS projects	
9/21/2026	Meeting 4	Measure Workpapers Discussion Conclusion
Sep-26	Likely Working Group on M&V Protocols	
10/9/2026	Redlined TRM v5.1 Issued	Redlined TRM v5.1 Issued for TRMAC Review
10/19/2026	Review Period Concludes	TRMAC Non-Regulatory Comments Due on TRM v5.1
10/23/2026	Letter + TRM v5.1 posted on eDockets	TRM v5.1 Regulatory Process*
11/2/2026	Written Comments	
11/17/2026	Reply Comments	
12/17/2026	Decision	

*The above Regulatory Process timing represents the Department's intended timing and is subject to change

MN TRM SharePoint (Internal)

- Direct Link: [MN TRMAC Collaboration Site – Documents](#)
- Find information on:
 - Measure Priority List
 - Measure Workpapers – Drafts for review
 - Measure Workbooks
 - Drafts for review
 - Library of finals
 - Measure Resources
 - Recordings and slide decks from related presentations
- You should all have access to this site. Please let Lauren know if you don't have access.

MN TRM Webpage (External)

- Direct Link: [Technical Reference Manual / Minnesota Department of Commerce – Energy](#)
- Find information on:
 - Previous TRM Releases
 - Recordings and slide decks from past meetings and TRMAC meetings related to TRM v5.1

TRMAC Collaboration SharePoint Site



MN TRMAC Collaboration Site

Home

Notebook

Documents

Site contents

Recycle bin

[Return to classic SharePoint](#)

Documents > MN TRM v5.1

All Documents

Name

- Draft Measure Workbooks
- Draft Measure Workpapers
- Draft TRM 5.1
- Final Excel Workbooks by Measure
- Resources and Meetings
- z. archive

TRM v5.1 Priority List - MN TRMAC.xlsx

- Priority List – updated periodically
- Full measure updates will have workpapers – in Draft folder for TRMAC review
- Minor updates to measures in tracked changes within full Draft TRM – updated periodically, live version lives elsewhere
- Excel workbooks for each full measure update – when completed
 - Draft folder for new/modified for TRMAC review
 - Final folder for running library of completed ones (from 5.0 and prior)
- Meeting recordings, other optional meetings and resources

CARD Research (Slide 1 of 2)

Recently Completed or Soon To Be Completed CARD Projects

Completed reports and webinars are within the [TRMAC SharePoint Site \(withing Folder z. CARD Research\)](#) and on the [CARD Website \(under “Research Since 2020”\)](#)

Grantee	Title	Status	Completion Date
MN CEE	Industrial Electrification Through Heat Pump Adoption for Process Loads	Webinar and Final Report posted	10/31/2025
Slipstream	Refrigeration Thermal Storage for Energy Efficiency	Final Report posted	12/31/2025
2050 Partners	Right-Sizing Water Distribution Pipes and Water Heating Systems to Save Energy and Reduce Building Costs	Webinar and Final Report posted	12/31/2025
Slipstream	Field Demonstration of ASHRAE Guideline 36-2018 High-Performance Sequences of Operation for HVAC Systems	Final Report posted	1/6/2026
U of MN - CSBR	The Market for Passive House Multifamily Projects in Minnesota	Final Report posted	1/19/2026
Slipstream	Advanced Connected Diagnostics for Commissioning Residential Heat Pumps and Central Air Conditioners	Webinar and Final Report to be posted in 8/26	3/31/2026
Michaels Energy, Inc.	Ground Source Tech in Urban Buildings	Webinar and Final Report to be posted in 9/26	7/31/2026
Slipstream	Strategic Decarbonization for Larger Utility Customers	Webinar scheduled: 8/26/26	8/31/2026
Cadmus Group	Consistent Load Shapes for Fuel-Switching Tests and Assessing Flexible Load Potential	Email to TRMAC to go out very soon.	10/30/2026
MN CEE	Continuous Exterior Insulation: A cold climate solution for deep savings and a pathway to cost-effective decarbonization	Active	10/31/2026
Michaels Energy, Inc.	Ventilation Control Using Occupancy Counters	Active	11/30/2026
Frontier Energy, Inc.	District Geothermal Site Selection & Feasibility Study	Active	11/30/2026
MN CEE	CO2 Heat Pump Water Heaters for Multifamily Buildings	Active	12/31/2026
MN CEE	Establishing Protocols for a Commercial Energy Recovery Ventilation (ERV) Tune-Up Service	Active	12/31/2026
MN CEE	Packaged Terminal Air Conditioner Replacement Field Study	Active	12/31/2026
MN CEE	Floating Suction Pressure Control in Minnesota’s Existing Grocery Stores	Active	12/31/2026
MN CEE	Heat Pumps with Thermal Storage: Efficient and Resilient Electric Space Heating	Active	12/31/2026
Slipstream	Mapping Electrical Barriers, Motivations, and Perceptions about Efficient Fuel Switching	Active	1/31/2027
Slipstream	Indigenous Communities and Residential Electrification Pathway Demonstration	Active	4/15/2027
U of MN - CSBR	Unlocking the Potential for Safe Energy Retrofits Over Inaccessible Crawlspace	Active	1/30/2029

CARD Research (Slide 2 of 2)

Recently Annouced CARD Projects

Grantee	Title	Status	Completion Date
MN CEE	Navigating the North: A Practical Guide to Successful Residential HPWH Implementation in Minnesota	Active	6/30/2027
Slipstream	Energy Savings from Dual Fuel Controls Optimization across Minnesota	Active	10/31/2027
Elevate Energy	Increasing the participation of naturally occurring affordable housing in energy efficiency programs through market characterization and mapping	Active	11/1/2027
MN CEE	Recommendations for Minnesota Residential Electrical Services to Enable Electrification	Active	11/30/2027
MEEA	Readying Minnesota for Distributional Equity Analysis	Active	12/31/2027
West Monroe	Market Assessment of Next-Generation Commercial and Industrial Refrigeration Controls for Energy Efficiency and Load Management	Active	2/28/2028
Cadmus Group	Reassessing Residential Efficiency Measure Life in Minnesota	Active	3/31/2028
Michaels Energy, Inc.	Thermal Energy Storage for Industrial Heating	Active	3/31/2028
MN CEE	Heating Load Estimates and Duct Performance Diagnostics for Successful ASHP Retrofit Installations	Active	4/30/2028
MN CEE	Paths to HVAC Electrification: Evaluating Retention of Existing Radiator Distribution Systems for Cost-Effectiveness	Active	4/30/2028
MN CEE	Beneficial Electrification for Better Barns: Where Can Heat Pumps Help on the Farm?	Active	4/30/2028
Frontier Energy, Inc.	Residential Deep Maintenance for Persistent Energy Savings and Comfort	Active	4/30/2028
Slipstream	Phasing Out Industrial Compressed Air Systems	Active	5/31/2028
West Monroe	Data Center Energy Efficiency Strategies: Codes, Programs, and Cost-Effective Measures for Minnesota	Active	6/30/2028
MN CEE	Modern Air Source Heat Pump Performance in the Coldest Conditions: Savings, Peak Demand, and Design Impacts	Active	12/31/2028
Slipstream	Heat Pump Water Heaters (HPWHs) for Retrofits with Space and Electrical Constraints	Active	4/30/2029
Slipstream	Partial Displacement of Commercial Boiler Space Heating with Air-to-Water Heat Pumps	Active	4/30/2029
MN CEE	Vertical Packaged Heat Pump Field Study in Multifamily and Hospitality Buildings	Active	4/30/2029
Resource Innovations Inc.	Field Validation of PWHs in Cold-Climate Multifamily Buildings	Active	5/30/2029
Slipstream	Improving Manufactured Home HVAC Performance and Sizing	Active	5/31/2029
MN CEE	Smart Control Valve Energy Savings for Chilled Water HVAC Systems	Active	5/31/2029

TRM v5.1 Updates

TRM v5.1 Updates – Circle Back Items (Slide 1 of 3)

- Res ASHP HSPF2 Performance Metrics

- Initially proposed modification to align with HEAR program, HSPF2 performance metric divergence, proposed update to our HSPF2 performance threshold last meeting.
- However, HEAR program launch date not set, undercuts primary driver to modify our performance metrics at this time.
- Now propose no changes to MN TRM Res ASHP measure performance metrics at this time. Revisit when more clear HEAR program projected launch timeframe available, and when final performance metrics set (might change between planned metrics now and set metrics at launch)

TRM v5.1 Updates – Circle Back Items (Slide 2 of 3)

• Electric Vehicle Measure - Updates

- 2026 PUC registration data – Reanalyze foundational metrics
 - Demonstrates reduced kWh/mile, i.e. more efficient mix of EVs) = results in lower electric penalty, effect more prominent on EVs than PHEVs given higher charging load
 - Demonstrates that commercial vehicles remain a small portion of the registered vehicles (<1%) and while the kWh/mile has been factored out of our analysis, the margin or error is low if these are included unintentionally in a utility's count
- Have new MN department of Transportation VMT value (increased 40% from 2022 analysis) – effects both sides of equation (electric and gas) – majority of impact
- Net result is an increase in EFS savings over current measure by 42% for EVs. Slight reduction in net savings for PHEVs due to an error in the gallons of gasoline consumption value attributed to PHEVs in v4.0 carried through. On average EVs 71% of PUC list, blended net increase 32% across types.
- The electric values are carried into the EV Charging Sales measure, gas side and EFS not applicable. Net increase 34% on EVs, and 18% on PHEVs on the electric side.
- Additionally considering Urban versus Rural split of this measure – too cumbersome to have different set of deemed values? Rural would be higher due to higher mileage

TRM v5.1 Updates – Circle Back Items (Slide 3 of 3)

- **Electric Vehicle Measure - EFS savings modification proposed:**
 - Originally stated as: Reduce EFS savings within the Res Transportation EVs measure by a portion (61%) put remaining EFS savings (39%) on public chargers (as a new measure).
 - Clarification: The EFS calculation is not directly connected between the two measures.
 - The charger measure EFS savings would be based on kWh metered data at the charger, all of which are EFS savings.
 - The theory is that between the two, the EFS savings of individual EVs is fully accounted for, but the math we are proposing doesn't directly connect them.
 - New public charger measure – have yet to develop, but intent is to analyze kWh consumption data from installed chargers from a set of several MN utilities – for this version, just determine an average kWh per charger. The theory is 100% of the kWh consumed by the charger is offsetting gasoline 1:1. Acknowledge that some of the charger consumption serves EVs registered to other areas or even other states, TBD if we will elect to discount some of the kWh for that element, would like some data to support it.

TRM v5.1 Updates – Res Edits Made to Date (Slide 1 of 2)

Measure	ID	Edit to Review	Wkbk	Edit Made
Appliances – Clothes Dryers	1.09.02	W/in Draft TRM	Existing, modified	Some additional mods made since last meeting – clarified what baselines to use for what equipment, clearer definitions of all in one units as combination versus laundry centers (separate drums). Cleaned up references unused or unlinked.
Appliances – Clothes Washers	1.09.01	W/in Draft TRM	Existing, modified	Cleaned up references unused or unlinked. Reverted back to Energy Star v8.1, as v9.0 never went into effect as expected, back under review, potential for revising values presented.
HVAC – ASHP	1.02.03	W/in Draft TRM And Appendix G	New – incorporated into a tab of Appendix G	M1 driving mods to Appendix G calculation (model was already in M1), updates to deemed savings where calculated from calculator instead of model. Those deemed savings updates along with deemed savings updates from furnace baseline mod transferred into written measure
Envelope – Insulation and Air Sealing	1.03.01 & 1.03.02	W/in Draft TRM	Not created	Additions to measure description and references to provide more clear alignment with installation practices, scope and standards of other Minnesota incentive programs (NREL standard work specifications). WAP program includes exterior wall and attic insulation, air leakage reduction, furnace, boiler, DHW repair and replacement, and programmable thermostats

TRM v5.1 Updates – Res Edits Made to Date (Slide 2 of 2)

Measure	ID	Edit to Review	Wkbk	Edit Made
Transportation – EVs	1.10.02	W/in Draft TRM	Existing, modified	Revised metrics with 2025 EV vehicle registration dataset. Alignment with Appendix F emissions for grid losses and state grid emissions values. Applied a Charging Ratio metric to the EFS savings algorithm to apportion part of the EFS savings for an individual vehicle to this measure. TBD further modifications related to %Charging ratio discount metric – will circle back in meeting 4
Transportation – EV Charging Sales	1.10.01	W/in Draft TRM	Would be duplicative, all metrics come from EV measure	Revised metrics with 2025 EV vehicle registration dataset. Alignment with Appendix F emissions for grid losses and state grid emissions values. Clarified required program components to claim savings to align with legislation.

TRM v5.1 Updates – C/I Edits Made to Date

Measure	ID	Edit to Review	Wkbk	Edit Made
HVAC – Programmable Thermostats - Gas	2.02.37	W/in Draft TRM	Existing, modified	Error in algorithm corrected, aligned with same input metrics as C/I Programmable T Stat Electric. Clarified algorithm inputs.
HVAC – Switched Reluctance Motors	TBD 2.02.38	New measure - workpaper	New	Mostly from IL TRM, removed the HVAC cooling portion of algorithm (zeroed out anyway, will consider it when data available)
Agriculture – High Efficiency Grain Dryers	3.11.04	W/in Draft TRM	New	Clarification to inputs, expansion of input default values by equipment type. Update to references. kWh saving algorithm as optional if electric driven grain dryer.
Appendix F		W/in Draft TRM	Existing, modified	Added heat rates for electricity generation. MROW subregion existing, added MROW MN state level
HVAC – Steam Trap Repair	2.02.17	Workpaper, enough mods to warrant a workpaper broken out for the time being	New	Modified algorithm to align with other TRM adjustment factors, specifically added condensate return factor and flow factor and removed the control multiplier to be consistent with other TRM methodology. Clarified inputs, revised and added references and additional default tables.

TRM v5.1 Updates – Discussion Items (Slide 1 of 2)

- C/I - Steam Traps
 - Measure hasn't been revisited since creation, comparing algorithms across utility programs and TRMs for inputs, references and relative scale of savings
 - MN TRM coming in a bit on the high side comparatively, some of that is default values offered
 - Likely elect to incorporate an additional adjustment factor to align with other measure algorithms
 - Provide further clarification around typical system pressures by application, hours of use by application, and default options for steam rate loss values by application
- Secondary changes needed as a result of Res baseline furnace change:
 - Res ASHP – see updates to Appendix G and deemed savings based on 90% - Completed
 - Res Low E Storm Windows – modeled, dated. Will look at triennial plans to determine the impact of this measure currently and will put on list of research need, remodeling to modify in future
 - Res Cellular Shades – modeled, dated. Will look at triennial plans to determine the impact of this measure currently and will put on list of research need, remodeling to modify in future
 - Other areas?

TRM v5.1 Updates – Discussion Items (Slide 2 of 2)

- Stakeholder Clarification Requests / Additions:
 - C/I HVAC – ECM Fan Motors – get rid of sub algorithm within measure?
 - Feedback indicated some algorithm elements not incorporated into algorithm
 - Element were present but within sub algorithm. No modification made during v5.0 regulatory process
 - Have elected not to modify existing algorithm (or sub algorithm) at this time, but open for feedback if the algorithm is unclear as written
 - ENERGY STAR qualification required/not
 - Had modified ENERGY STAR labeled measures in v5.0 to drop the “ENERGY STAR” from title
 - Also clarified that equipment needed to meet performance criteria but not necessary to be qualified through the program to be eligible for measure
 - Above appears to have unintentionally created lack of streamlined approach to these measures
 - First two bullets above remains in place, but have additionally modified all measures where ENERGY STAR is the performance standard to indicate that utilities may elect to streamline compliance with the measure by requiring that eligible products are ENERGY STAR qualified

TRM v5.1 Updates – Still Pending Updates (Slide 1 of 2)

- Res

- Electric Vehicles – public chargers – and continue to explore the relationship between this new measure and existing EV measure
- Storm Windows Air Sealing – CARD
- Air Fryers – Franklin Energy and Minnesota Power research due ~9/7/2026

- C/I

- Grocery Refrigeration Equipment Op – CARD
- Circulator pumps Eff Index – incorporate into existing or new
- LLC updates – awaiting MN ETA research
- C/I Lighting – New Construction – Table 1

TRM v5.1 Updates – Still Pending Updates (Slide 2 of 2)

- EFS Guidance Incorporation into TRM EFS measures and Custom ECO projects
 - EFS Excel Template development – To guide Steps 1,2,3.1 and 3.2 eligibility testing
 - CARD meeting shortly – will invite TRMAC distribution as optional, will report back to this group regardless
 - For TRM integration, likely contained in a new Appendix of load shape distribution data by applicable EFS measure
- Prescriptive process/guidance resource for modeled EFS new construction projects.
 - Develop standardized guidance for:
 - The division of savings between EFS and EDA
 - The baseline and performance comparisons and break points between comparisons
 - General discussion of EFS within new construction, prescriptive versus custom, modeled versus equipment
 - Working Group meeting 8/20 – contact Lauren to be included, will report back in meeting 4
- Finalize update to M&V Protocols for large custom ECO projects
 - Current Protocols 2008: [Measurement and Verification Protocols for Large Custom CIP Projects](#)
 - Draft in process: [M&V Protocols](#)
 - Propose Working Group - contact Lauren to be included
- ^{8/17/2026} Incremental Costs – Res HVAC

Discussion and Next Steps

General Discussion Points:

- What are measures/topics that you would like to see included within the TRM?
- Current pain points or interest areas TRM can help to flesh out or explore?
- Do you have questions or concerns regarding this list?

Next Steps:

- Please reach out to Lauren if you do not have access to the SharePoint Site.
- You'll receive a follow up email soon with the
 - Slide deck
 - Updated TRM v5.1 Priority List, and
- Today's slide deck and recording will be posted on the [MN TRM Webpage](#)

Thank You



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