



Minnesota TRM 5.1 Update – Meeting 2

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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
 - 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		Matt Haley		Lisa Fischer	Otter Tail Power Company
Carl Nelson		Steve Coleman	GDS Associates, Inc.	Betty Balegana	
Isaac Smith		Tanuj Gulati		Cristina Zuniga	
Kristen Funk		Travis Hinck	Great Plains Natural Gas Company	Jason Burns	
Mariko Yatsuhashi		Kathy Baerlocher		Jason Grenier	
Rabi Vandergon		Larry Oswald		Jon Fabre	Pacific Northwest National Laboratory
Ranal Tudawe		Zach Klabo	Great River Energy	Luke Meech	
Ritika Kumbharkar		Amelinda Hendrickx		Allegra Steenson	
Will Nissen	CenterPoint Energy	Jamie Stallman		Annie Hu	
Eric Johansen		Jeff Haase		Junke Wang	Power TakeOff
Ethan Warner		Kelsey Kopp		David Siddiqui	
Joel Lynch		Rodney De Fouw		Erin Kempster	
Marty Kapsch		Victoria Browning	ICF	Lucas Born	Resource Innovations
Tyler Glewwe		Glen Eigo	ICF - ECO Potential Study	Peter Widmer	
Cory Hetchler	Connexus Energy	Chris Trembley	Madelia Municipal Light & Power	Cory Luker	
Zach Nyst		Grey Staples	Mendota Group	Josh Mason	Rochester Public Utilities
Joel Zook	Dairyland Power Cooperative	Joel Pertzsch	Michaels Energy	Laurie Cook	Rocky Mountain Institute
David Reinke	Dakota Electric Association	Morgan Nordby	MN Chamber of Commerce - Energy Smart	Olivia Prieto	
Patrick Mathwig		Jen Kimmen	Minnesota Energy Resources	Andy Lick	Slipstream
Deb Dynako	Energy Infrastructure Partners	Huei Wong	Minnesota Energy Resources - ICF	Ben Ipsen	Southern Minnesota Municipal Power Agency
Gary Swanson	Energy Management Solutions	Julian Graybill Brubaker		Joe Hoffman	
Dean Laube	Franklin Energy Services	Katie O'Rourke		Katy Janda	
Luke Gehrke		Katy Koon		Chris Baker	University of Oxford; UMN
Nick Dombrosky		Zach Froio		Andrew Macho	Xcel Energy
Caitlin Eichten	Fresh Energy	Cassie Theisen	Minnesota Power	Danny Price	
Nick Haeg		Chad Trebilcock		Karl Shlanta	
Sam Friesen		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 Residential Energy Consumption Survey (RECS) and Commercial Buildings Energy Consumption Surveys (CBECS) with John Staub
8/17/2026	Meeting 3	Measure Workpapers Discussion Cont.
9/21/2026	Meeting 4	Measure Workpapers Discussion Conclusion
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

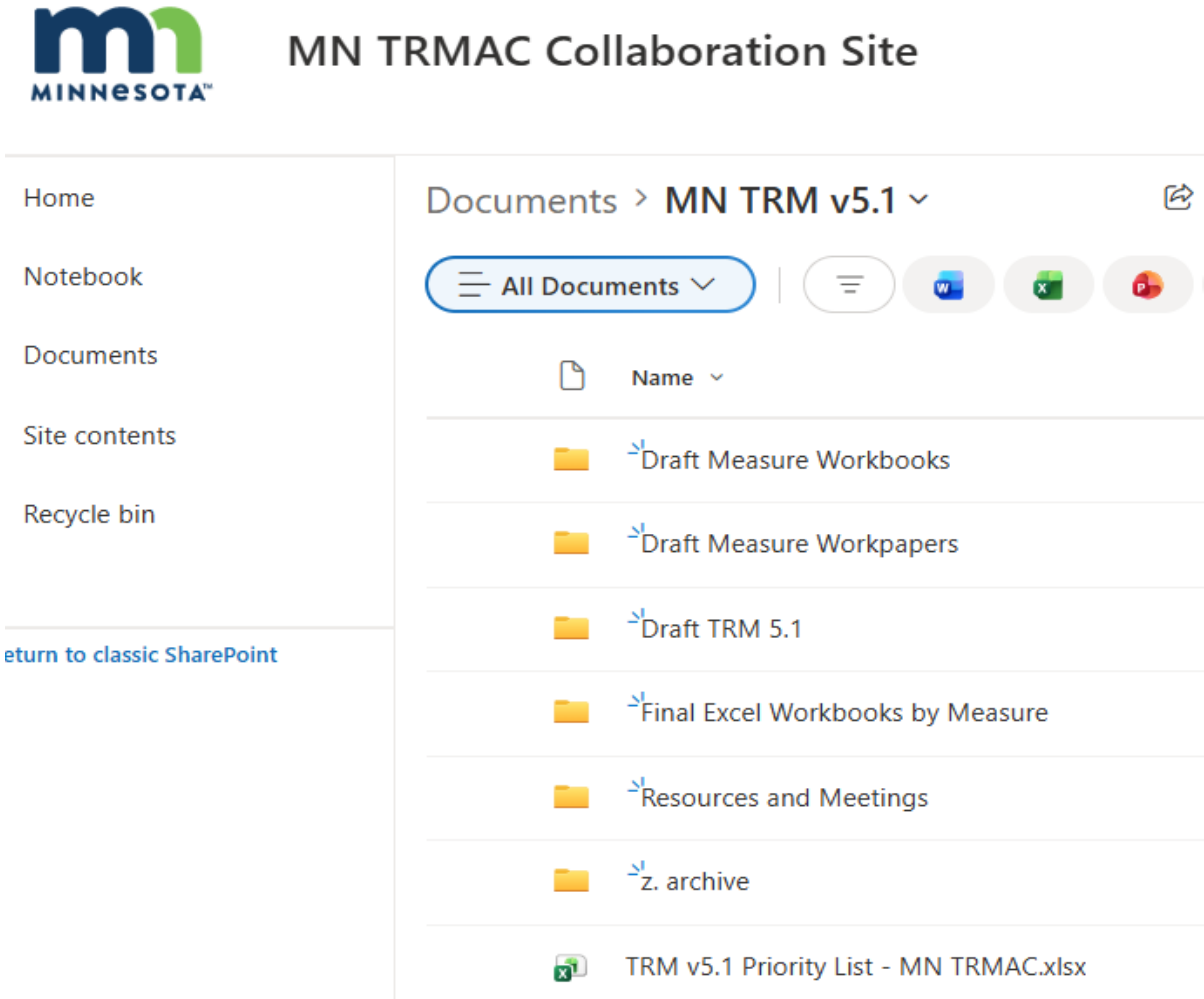
MN TRM SharePoint (Internal)

- 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



- 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

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		Project Expiration 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
Michael's Energy	Ground Source Tech in Urban Buildings	Webinar and Final Report to be posted in 8/26	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
Michael's Energy	Ventilation Control Using Occupancy Counters	Active	11/30/2026
Frontier Energy	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

TRM v5.1 Updates

TRM v5.1 Updates – M1 Edits (Slide 1 of 3)

- M1 driven efficiency metrics

- M1 metrics in algorithm and input list. Direction for baseline efficiency given in M metric is to utilize the forward conversion table to M1
 - *For Upgrades (Compares old equipment efficiency to new): M1 metrics given in the algorithm and input definitions. For baseline, instructed to use forward conversion if not already in M1 metric (older unit actuals). “Note that if baseline is existing and given in SEER (M Metrics), convert to SEER2 using the M to M1 Forward Conversion table below.”*
 - *For Existing (not a comparison, using existing system efficiency only): Really just a note added, no changes to algorithm or inputs. “Note that if M1 metrics are given (SEER2) instead of SEER, consistently use all M1 metrics for all efficiency inputs (SEER2, EER2, HSPF2) within the savings algorithm.” Really just a note added, no changes to algorithm or inputs*
 - *For New (not a comparison, using new system efficiency only): Just modified to M1 metrics in algorithm and inputs, some of these already formatted this way.*
- Backward conversion table removed throughout, Forward remains where applicable
- Removed baseline and performance metrics given in M metric from reference tables – removes unnecessary conversion confusion

TRM v5.1 Updates – M1 Edits (Slide 2 of 3)

Measure	ID	Edit to Review	Wkbk	Edit Made
Res HVAC – Efficient AC/ ASHP	1.02.01	W/in Draft TRM	New	Upgrade type measure. Additionally, split the references for AC and ASHP given different specifications in ENERGY STAR with introduction of v6.2 for heat pumps and sunset of v6.1 for ACs.
Res HVAC - ASHP	1.02.03	W/in Draft TRM	Not yet created	Upgrade type measure. Examples reworked with different efficiency metrics.
Res HVAC – AC/ASHP QI	1.02.06	W/in Draft TRM	New	New type measure.
Res HVAC – AC/ ASHP TU	1.02.07	W/in Draft TRM	Existing, modified	Existing type measure.
Res HVAC - ERV	1.02.12	W/in Draft TRM	Existing, modified	Existing type measure.

Other measures included, but all existing type measure, just notes added, no workbook existed for these measures, so not noted above, small editing changes within TRM document.

TRM v5.1 Updates – M1 Edits (Slide 3 of 3)

Measure	ID	Edit to Review	Wkbk	Edit Made
C/I HVAC – Heat Pump Systems	2.02.10	W/in Draft TRM	Not yet created	Upgrade type measure. Complicated by several different types of systems and different sizes with different efficiency metrics, some M1. Motivated to break this measure up into equipment types, have been waiting to do this until we can incorporate EFS with some primary data on switch over temps.
C/I HVAC – HP RTU	2.02.11	W/in Draft TRM	Existing, modified.	Upgrade type measure. Note more changes coming to this measure in TRM v5.2 or later. Waiting on cc data from MN ETA to incorporate.
C/I HVAC – Mini Split	2.02.12	W/in Draft TRM	Existing, modified	Upgrade type measure.
C/I HVAC – Cooling Unit and split	2.02.13	W/in Draft TRM	New	Upgrade type measure.
C/I HVAC – DCV	2.02.13	W/in Draft TRM	New	Existing type measure. Other changes made to this measure, see next section
C/I HVAC - ERV	2.02.32	W/in Draft TRM	Existing, modified	Existing type measure.

Other measures included, but all existing type measure, just notes added, no workbook existed for these measures, so not noted above, small editing changes within TRM document.

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	Updated CEF Baseline to Federal standard reference to equipment with manufacture date on or after March 1 2028 given v5.1 TRM goes into effect 1/1/2028. Specified that combination units, laundry centers, all in one units and heat pump units are eligible for this measure. Combination units and all in one units instructed to use both the dyers and washers measures.
DHW – Showerhead Electric	1.04.09	W/in Draft TRM	New	Clarify example inputs, update to some input values based on updated reference values, and update references
DHW Showerhead Gas	1.04.10	W/in Draft TRM	New	Clarify example inputs, update to some input values based on updated reference values, and update references
HVAC - Thermostats	1.02.17	W/in Draft TRM	New	very minor mod - example output recalculated
HVAC - Dehumidifier	1.02.09	W/in Draft TRM	New	Updated ENERGY STAR criteria (6.0). Added whole home type and criteria values associated. Modifications to EUL by type and incremental cost based on ENERGY STAR data released in v6.0.

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

Measure	ID	Edit to Review	Wkbk	Edit Made
HVAC - ASHP	1.02.03	W/in Draft TRM	Not yet created	Split the references for AC and ASHP given different specifications in ENERGY STAR with introduction of v6.2 for heat pumps and sunset of v6.1 for ACs. Propose updating the HSPF2 performance threshold to align with the cold climate equipment specifications in ENERGY STAR v6.2, projected to also align with HER program requirements. Was ≥ 7.8 HSPF2, would now be ≥ 8.1 (single packaged HP) and 8.5 (split HP) HSPF2.

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

Measure	ID	Edit to Review	Wkbk	Edit Made
HVAC – DCV	2.02.13	W/in Draft TRM	New	Clarification edits to inputs, example, assumptions, and references. Question – The measure description and savings algorithm is set up for only Dx water cooled air systems with natural gas heating. Would we have any use for this to be expanded to incorporate other conditioning systems (electric heating)?
Food – Kitchen DCV	2.07.17	W/in Draft TRM	New	Updates measure description, example, algorithm streamlining, input clarification, and references.
Lighting – LED Grow Lights	2.01.15	W/in Draft TRM	Existing, Modified	Reflector efficiency deemed metric added to baseline and efficient. The impact of the add is included in the workbook for review.

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

- Stakeholder Clarification Requests / Additions:
 - Res HVAC - AC/ASHP Quality Install - %Primary addition to algorithm?
 - Feedback suggests we leave this as is without the %Primary addition to algorithm in the interest of not introducing more complexity for small gain in accuracy
 - Res HVAC - GSHP/AWHP – Add to Quality Install measure related to this equipment?
 - Feedback suggests we leave QI measure as is without adding GSHP and AWHP given specialty equipment with limited specialized contractors to install at present.
 - Res HVAC - GSHP – NC baseline of ASHP, revisit.
 - There does seem to be a need to revisit this baseline to blend with electric resistance
 - Related topics to the priority topic of forming a guidance document for pursuing EFS in EDA NC projects.
 - Propose forming a working group on NC topics – Respond to Lauren by 7/22 to be included

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

- EV EFS savings modification proposed:
 - Reduce EFS savings within the Res Transportation EVs measure (to 80%), put remaining EFS savings (20%) on public Level 2 chargers (as a new measure)
 - Online sources all quote 80% charging at home (agnostic to L1 or L2) and 20% out at public stations. However everything quotes back to the same DOE source, and actual data behind that value is not available: <https://www.energy.gov/topics/national-ev-charging-network#/find/nearest>
 - Other DOE source on projected number of private and public charging sources indicates 80% of charging occurs on L1 and L2 chargers (but agnostic to private/public type). <https://www.energy.gov/cmei/vehicles/evgrid-assist-charts-and-figures>
 - Other data in this link demonstrates charging mix by location
 - Rural (20% of EVs) charge via private L1/L2 (82%), remainder split public DC and L2
 - Suburban (60% of EVs) charge via private L1/L2 (64%), remainder split public DC and L2
 - Urban (20% of EVs) charge via private L2/L2 (~33%), remainder split public DC and L2
 - Could utilize this data to form weighted average based on these ratios: 61% of EFS savings on the EV, as the charging occurs at home, and 39% on public chargers. Note that a little more than half are on DC and the remainder on L2.

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

- Res
 - Electric Vehicle Sales Charging Consumption – Clarity documentation requirements
 - Storm Windows Air Sealing – CARD
 - Air Fryers – Franklin Energy and Minnesota Power research due ~9/7/2026
 - Align on min performance stds for measures that overlap with the Weatherization Program
 - Secondary changes needed related to Res Furnaces baseline change
 - Res ASHP – see updates to Appendix G and deemed savings based on 90%
 - Res Low E Storm Windows - modeled
 - Res Cellular Shades - modeled
 - Other areas?
- C/I
 - Grain Dryers
 - Grocery Refrigeration Equipment Op – CARD
 - Switched Reluctance Motors
 - Steam Traps – revisit deemed metrics and algorithm inputs
 - Circulator pumps Eff Index – incorporate into existing or new
 - LLC updates – MN ETA research
 - C/I Lighting – New Construction – Table 1
 - ECM Fan Motors – question on algorithm to pose in Meeting 3

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
- 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 based
 - Propose forming a working group on NC topics – Respond to Lauren by 7/22 to be included
- 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](#)
- 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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