



POTENTIAL VALUE OF LOAD SHAPE RESEARCH FOR THE MEMD

Presented by Cadmus and TRC
On behalf of Consumers Energy and DTE Energy
June 15, 2021

DTE

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AGENDA

Introduction and Context

Potential Value of Load Shapes to the MEMD

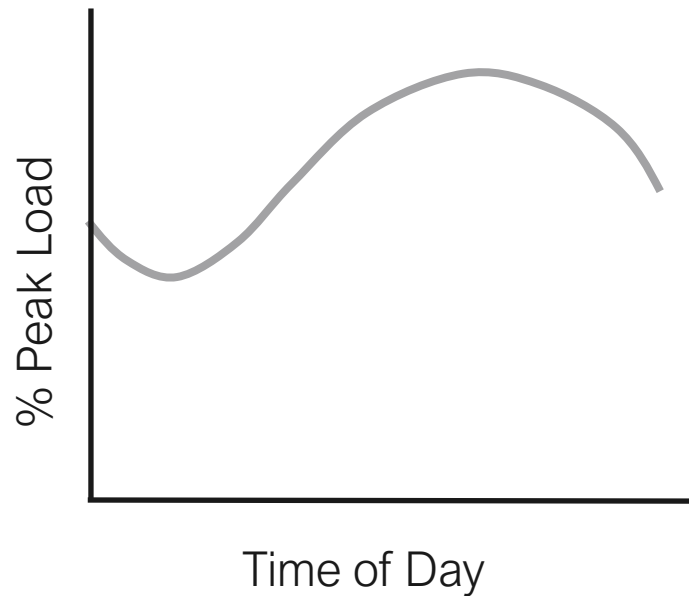
DTE and CE Load Shape Update – Res and C&I

Questions and Next Steps

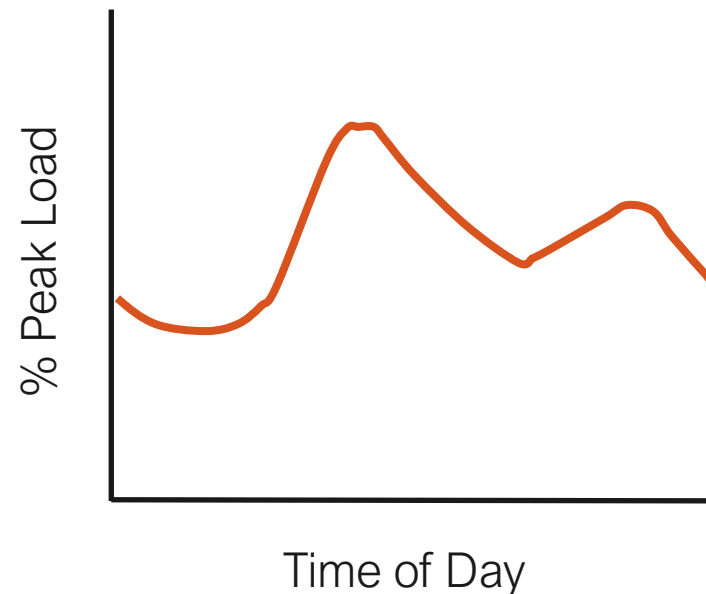


LOAD SHAPES TERMS

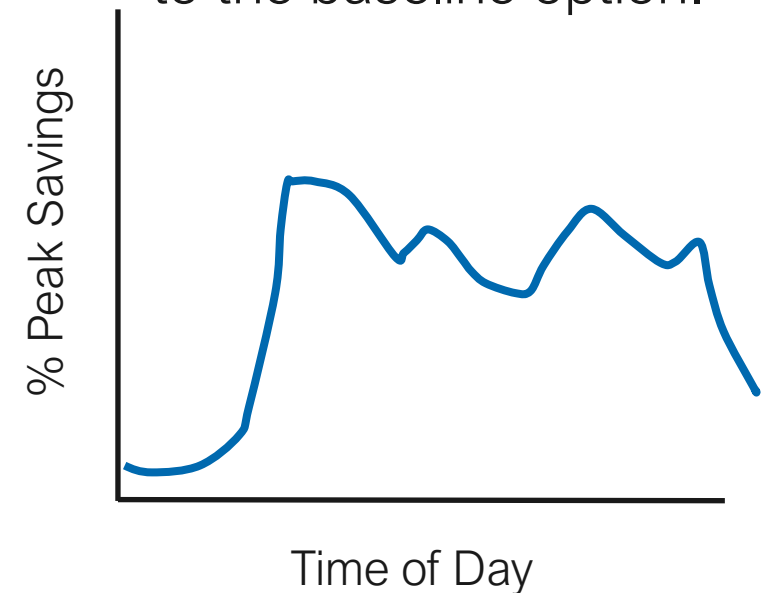
A utility load shape shows the time-of-day variation in energy demand for a utility. Loads shapes may vary by month and season.



An **end use load shape** shows the time-of day variation in consumption from a particular end use – like lighting or water heating.



A **savings load shape** shows the time-of day variation in consumption from an efficient piece of equipment compared to the baseline option.





WHY END USE LOAD RESEARCH?

In a study supported by the MPSC and contributed to by DTE, Consumers Energy & Morgan Marketing Partners, Lawrence Berkeley National Labs (LBNL) found there **is no Michigan-specific load shape data**, which limits the characterization of the time-varying value of efficiency savings, especially as **some load shapes have low transferability across regions**.

- Current modeling processes used in the Integrated Resource Plan (IRP) and DSMore rely on load shape and coincidence factor data from other regions, which may not be completely suitable for Michigan.



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- Current modeling processes used in the Integrated Resource Plan (IRP) and DSMore rely on load shape and coincidence factor data from other regions, which may not be completely suitable for Michigan.
- Currently Michigan utilities are limited in their ability to accurately estimate the time-varying value of their EWR programs. Using non-Michigan load shapes or those that are scaled from whole house demand may not always align with the Michigan system peak and appropriately value a program or measure impact.



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- How Load Shapes can be used
 - Energy efficiency program planning
 - Demand response planning
 - Improved energy modeling and coincidence factors
 - Integrated resource planning
 - Distributed energy resource planning
 - Capacity markets
 - Emissions and electrification planning



- How Load Shapes can be used
 - Energy efficiency program planning
 - Demand response planning
 - **Improved energy modeling and coincidence factors**
 - Integrated resource planning
 - Distributed energy resource planning
 - Capacity markets
 - Emissions and electrification planning

How it works: Improved accuracy of the MEMD as modeling is based on updated coincidence factors and Michigan specific savings shapes.



THE START OF THE LOAD SHAPE CONVERSATION

Study Approach

- ◆ Document time-varying energy (TVE) and demand impacts of five measures in Michigan
 - Exit sign (flat load shape)
 - Residential lighting
 - Residential water heating
 - Residential central air conditioning
 - Commercial lighting
- ◆ Use publicly available avoided costs and a combination of hourly avoided energy cost and coincidence factors (CF) derived from:
 - DSMore hourly load shapes and CFs derived from DSMore
 - DSMore hourly load shapes with CFs derived from Michigan Energy Measures Database (MEMD)
 - Hourly load shapes from metered data from the Pacific Northwest (PNW) or building simulation modeling
- ◆ Compare Michigan TVE results to four locations in prior study



Energy Technologies Area Lawrence Berkeley National Laboratory

Michigan Public Service Commission Time Value of Energy Savings in Michigan

Tom Eckman and Natalie Mims

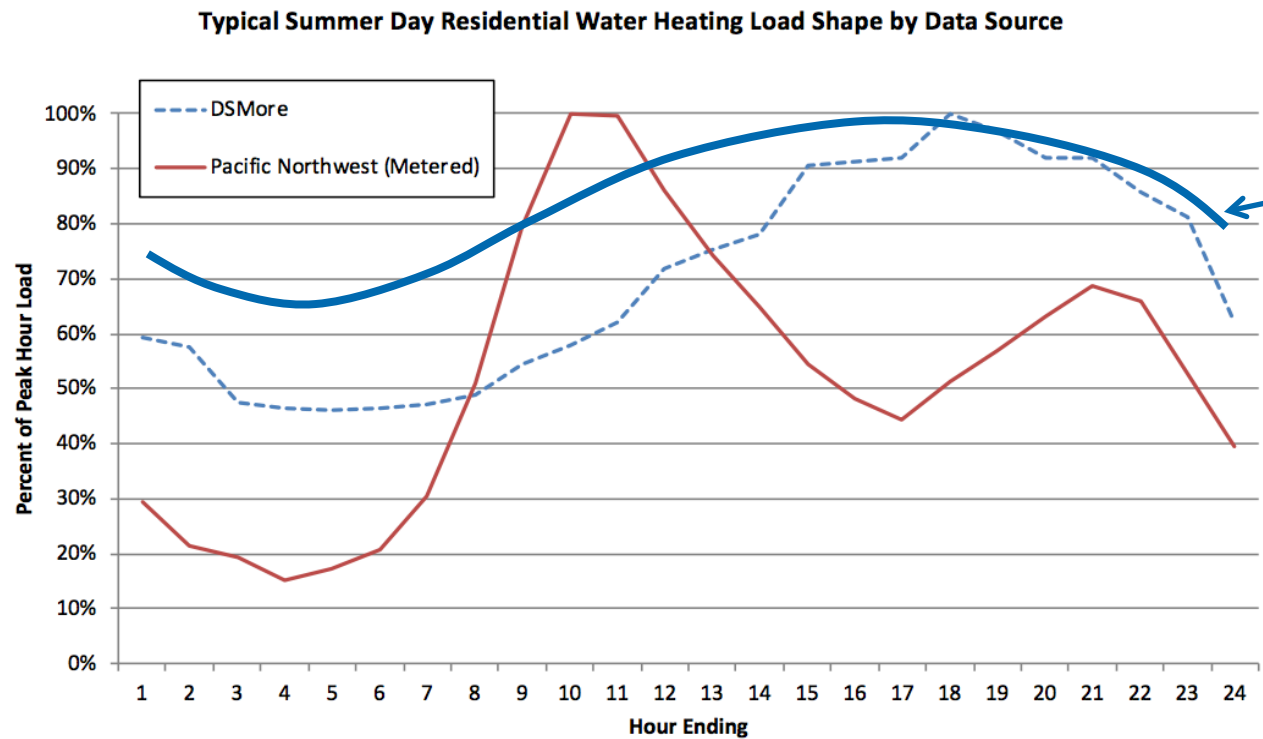
April 17, 2018

This work was supported by the U.S. Department of Energy's Office of Electricity Delivery and Energy Reliability - Transmission Permitting and Technical Assistance under Lawrence Berkeley National Laboratory Contract No. DE-AC02-05CH11231



EXAMPLE 1: RESIDENTIAL WATER HEATING

In this example, the assumptions in DSMore and metered data from the Pacific Northwest (PNW) are dissimilar. The DSMore shape is scaled from whole house demand in Michigan.

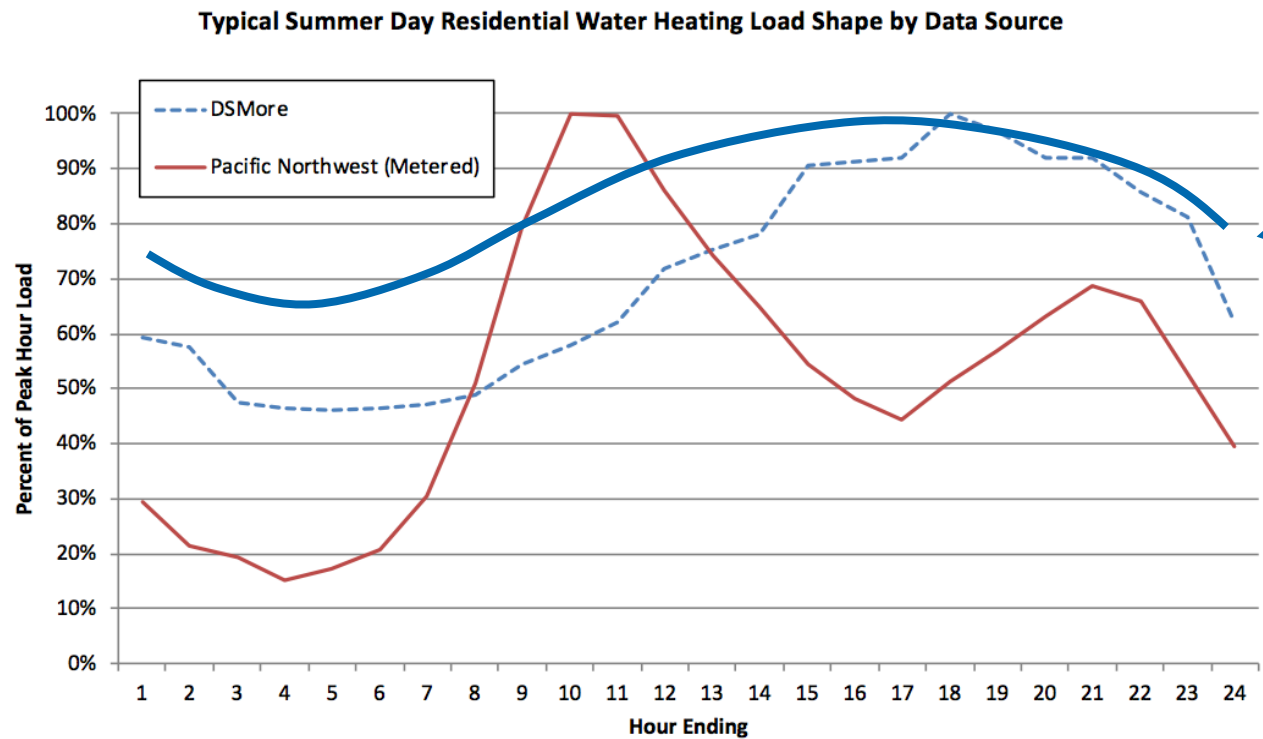


ILLUSTRATIVE
**Michigan summer
statewide system
shape**



EXAMPLE 1: RESIDENTIAL WATER HEATING

But, if actual Michigan usage is closer to the PNW metered data, using DSMore may overpredict the summer coincident peak demand reduction impact of residential water heating.

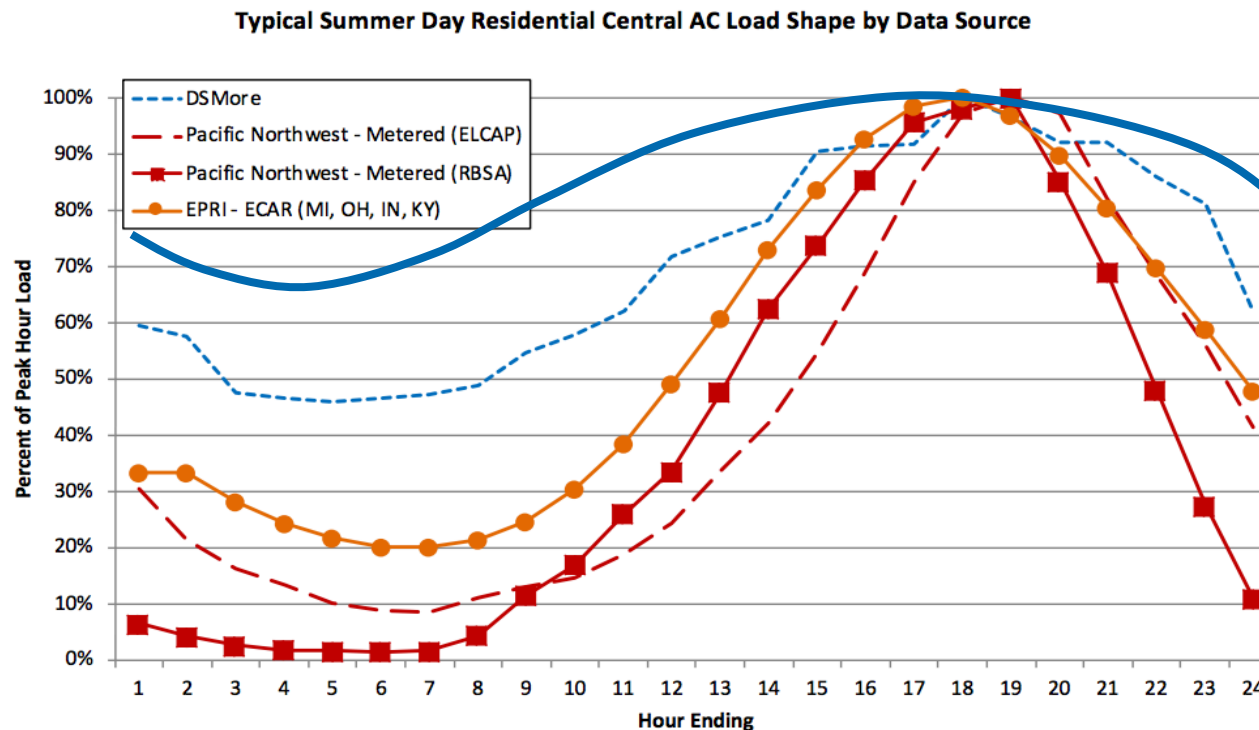


ILLUSTRATIVE
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EXAMPLE 2: RESIDENTIAL CENTRAL AC

In this example, the load shapes assumed in DSMore and those metered elsewhere are similar in that they show residential air conditioning demands are coincident with statewide system peak.

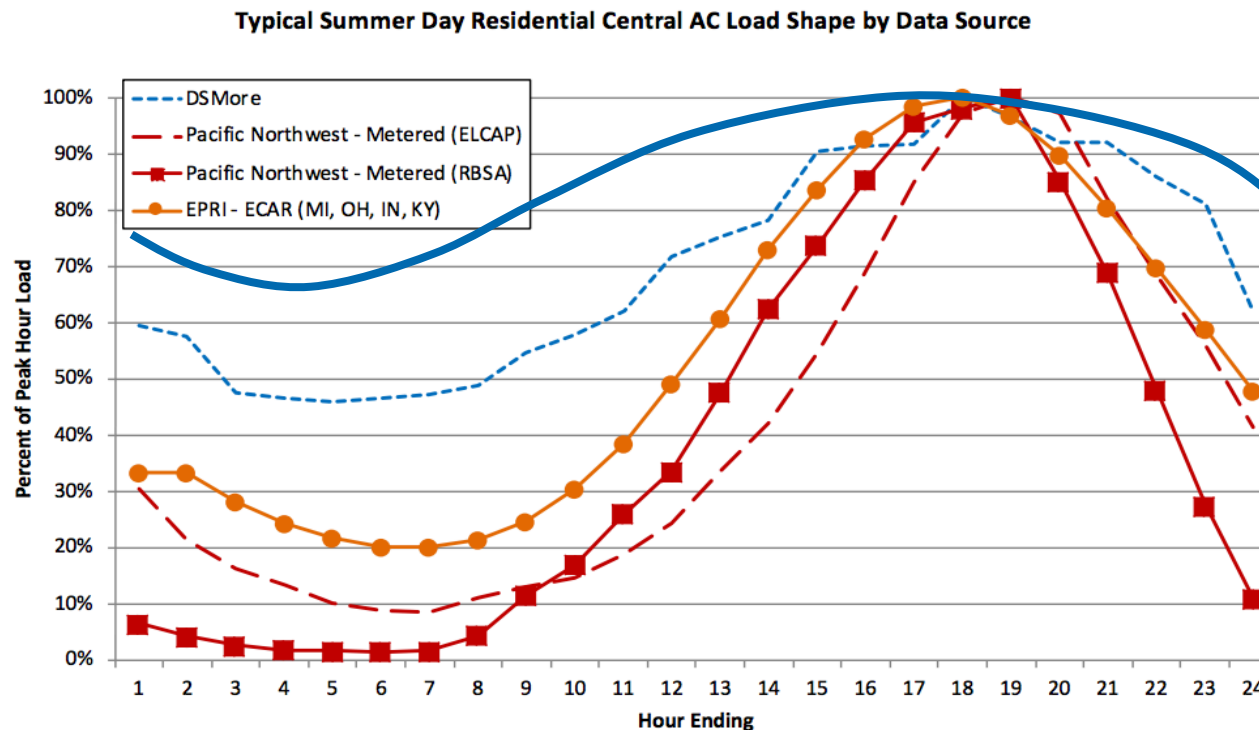


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EXAMPLE 2: RESIDENTIAL CENTRAL AC

The DSMore load shape assigns more of the energy savings to other times of the day than do the other air conditioning load shapes.



ILLUSTRATIVE
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TIME VARYING EXAMPLE RESULTS

Resource Benefit	Res. Hot Water (MEMD) \$/MWH	Res. Hot Water (PNW) \$/MWH
Energy	\$65	\$58
Energy-Related Value Subtotal	\$65	\$58
Generation Capacity	\$13	\$6
Reserves/Ancillary Services	\$1	\$0
Transmission	\$14	\$7
Distribution	\$0	\$0
Capacity-Related Value Subtotal	\$27	\$13
Total Value	\$92	\$70

DSMore load shape total value is higher than metered (\$92 vs \$70)

DSMore load shape capacity value is more than double than the PNW shape (\$27 vs \$13)



TIME VARYING EXAMPLE RESULTS

Resource Benefit	Res. Air Conditioning (MEMD) \$/MWH	Res. Air Conditioning (PNW) \$/MWH
Energy	\$108	\$127
Energy-Related Value Subtotal	\$108	\$127
Generation Capacity	\$39	\$60
Reserves/Ancillary Services	\$2	\$3
Transmission	\$44	\$67
Distribution	\$0	\$0
Capacity-Related Value Subtotal	\$84	\$129
Total Value	\$192	\$256

DSMore load shape total value is substantially lower than metered (\$192 vs \$256)

DSMore load shape value of energy is greater than value of capacity (\$108 vs \$84)

PNW shape shows value for capacity is roughly equivalent to energy (\$129 vs \$127)



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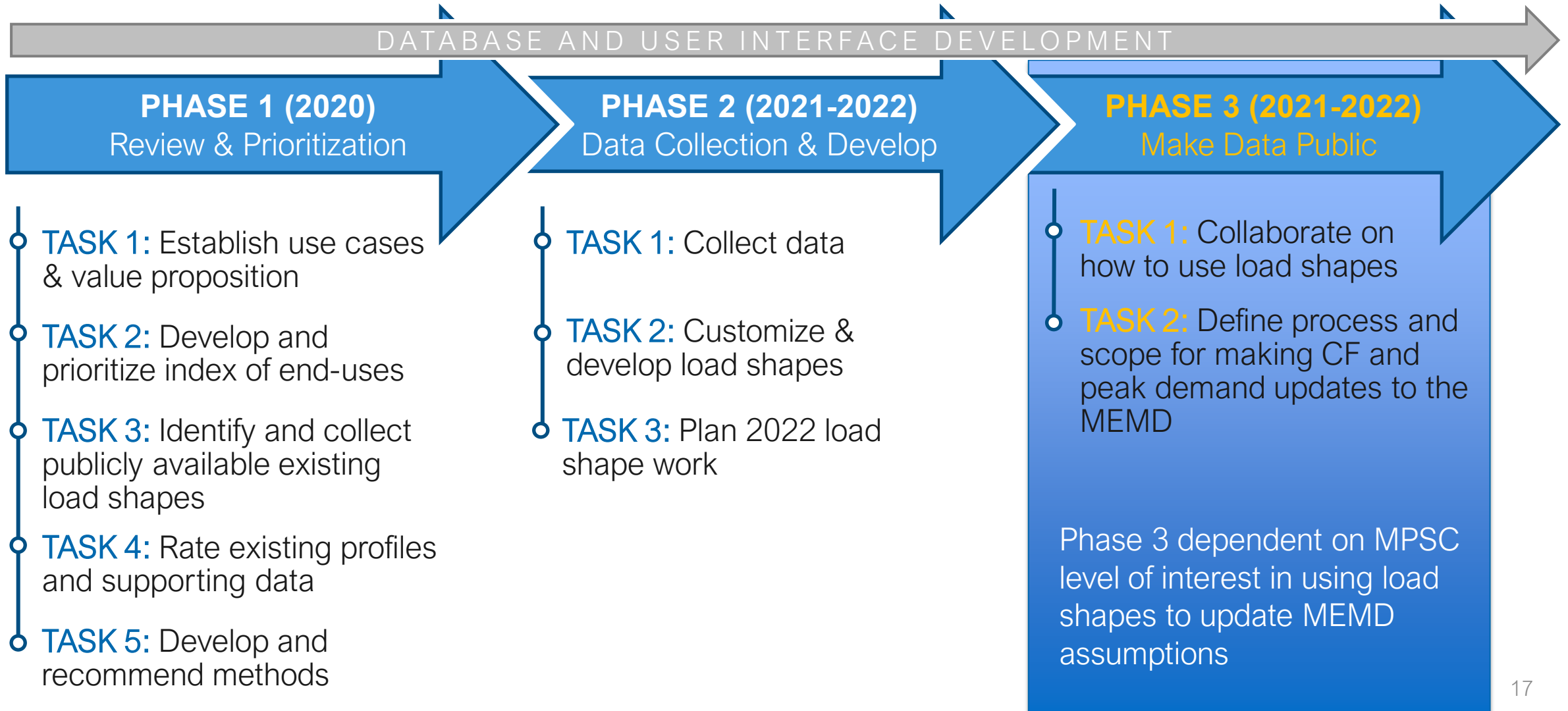
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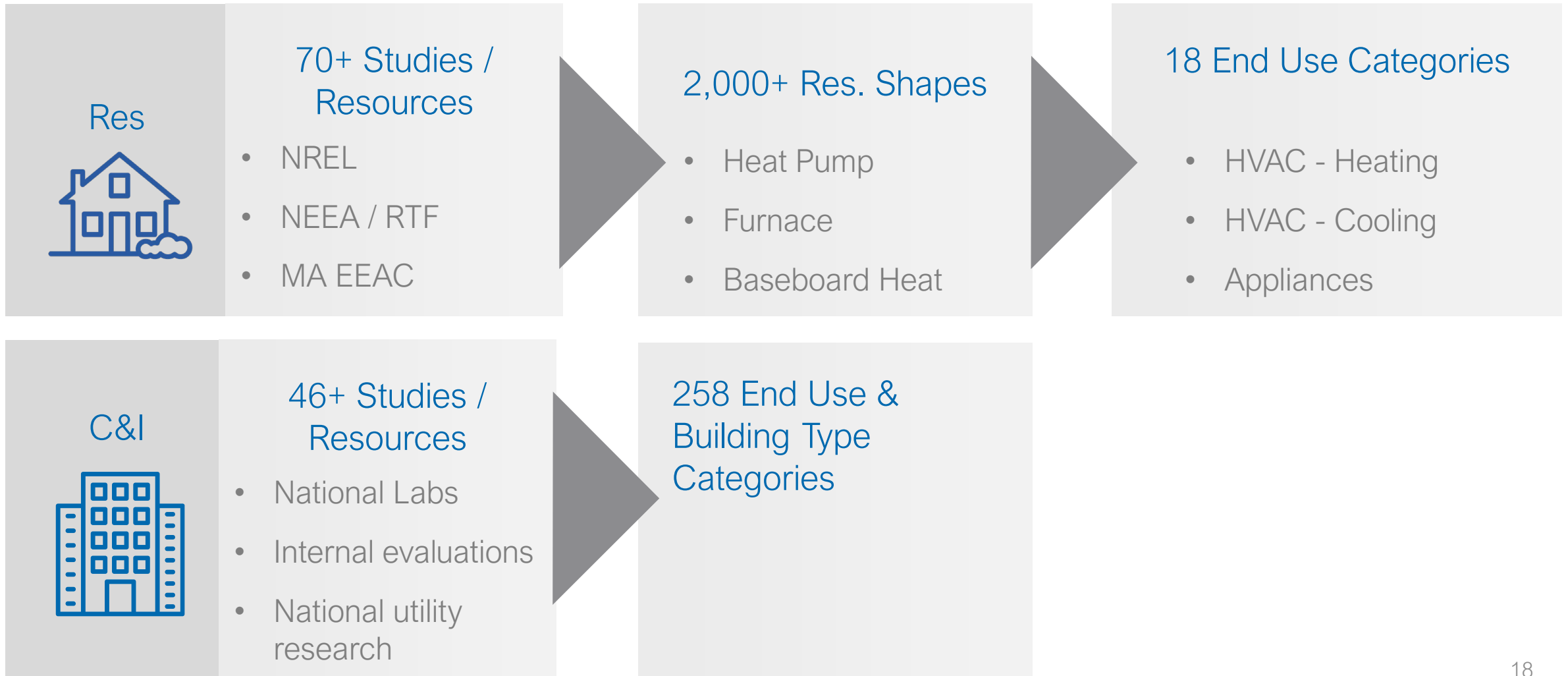


CE & DTE LOAD SHAPE PROJECT





ANALYSIS OF AVAILABLE LOAD SHAPES COMPLETED



Cadmus and TRC are collecting, calibrating, and analyzing data to develop Residential, Commercial, and Industrial load shapes for Michigan.

RESIDENTIAL

- 50 residential shapes developed representing 13 end-use categories
- Phase II will include accessing Consumers Energy billing and RASS data to refine shapes (as necessary)
- Monitor NREL and NEEA load shape studies

COMMERCIAL

- Reviewing existing data for several technologies
- Analyzing NREL data upon data availability later in 2021
- Developing submetering plans beginning in 2022

INDUSTRIAL

- Analyzing AMI data to develop industry-level load shapes
- Discussing findings with CE and DTE
- Developing a research plan based on findings from AMI analysis and client needs



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- Would the EWR Collaborative be supportive of making the CE and DTE load shapes accessible for use regarding the MEMD?
- Would Morgan Marketing Partners be able to use load shapes to update peak demand and coincident factors in the MEMD?
- Is there value in standardizing what shapes should be used for MEMD measures?
- Would program planners find load shapes valuable in planning EWR programs and demand response programs?
- If the answer to these questions is YES - what would next steps look like?
 - Meet with Morgan Marketing Partners to determine next steps and timing for inclusion into next MEMD update
 - Outline additional steps that would be needed to make current and proposed load shape work accessible to EWR stakeholders

- Time-Varying Value of Energy Efficiency in Michigan. LBNL. Frick, Natalie and Eckman, Tom. 2018.
- <https://emp.lbl.gov/publications/time-varying-value-energy-efficiency>