Fuel-switching measures in TRMs pave the way for electrification

Understanding the landscape of electrification-enabling measures in current TRMs

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Key takeaways

- There are 82 measures across 10 technical reference manuals (TRMs) that utilities can use to promote switching from gas or heating fuels to electricity.
- HVAC and refrigeration was the most common of the five technology categories with a fuel-switching measure (54% of measures), followed by water heating, at 18%.
- 15 transportation electrification (TE) measures appear across 10 TRMs, although 80% of them are related to EV charging as opposed to actual EVs.
- Including fuel-switching measures in TRMs allows utilities to build electrification programs or add electrification measures to existing programs. This allows them to pursue a beneficial electrification strategy in earnest.

As regulators, legislators, and the utilities they oversee prioritize electrification as a way to meet decarbonization goals, utilities face the task of developing cost-effective programs to meet those goals. An important part of the program development process is choosing the right mix of measures to meet a utility's individual goals and its customers' unique needs.

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TRMs can act as the playbook for utilities and their partners as they develop electrification programs or incorporate fuel-switching measures into existing programs. TRMs tell utilities which measures are approved for program use, what assumptions they can make about these measures, and based on those assumptions, which measures might be the best fit for a new program.

How we track electrification measures

TRMs are notoriously bulky documents full of technical language and formulas that are hard to get a handle on—let alone use effectively to develop effective electrification offerings. E Source Measure Insights is designed to help make TRMs understandable and usable, and a new feature makes it easy to explore fuel-switching measures in TRMs. Measure Insights is our tool that compiles measure-specific data from demand-side management (DSM) TRMs into a structured database.

Measure Insights can support electrification offerings by showing:

- Which electrification measures are in use and where
- Which measures are gaining traction and which jurisdictions are testing out new measures
- What measure assumptions other jurisdictions are using
- How much energy or cost savings the measures can deliver

For this report we've explored the significance of how electrification measures are incorporated into TRMs. And we used Measure Insights data to highlight those measures and what they tell us about the industry as it takes steps toward widespread electrification.

The growth of electrification through TRM measures

With electrification measures in TRMs, utilities can pursue electrification in earnest. Many utilities are already facing more stringent goals around emissions reductions and electrification.

Our 2022 report Trends we're seeing in building electrification programs across the US and Canada found that, in 2021, nine states had beneficial electrification mandates. States and provinces that explicitly allow fuel-switching and promote electrification include:

- British Columbia
- California
- Colorado

- Illinois
- Maine

- Massachusetts
- Minnesota
- New York
- Tennessee
- Vermont

Many states prohibit fuel-switching, and others have no policy on it. But this landscape is ever changing.

Fuel-switching measures allow customers to transition from an existing, nonelectric fuel source (natural gas and other heating fuels) to electricity. Fuel-switching can go in the opposite direction as well, but here, we'll focus on the path toward electricity.

Switching to electricity builds electric load that can be supplied by zero-emissions generation, which can be more flexibly deployed to meet grid needs. There are a range of measures, from heat pumps to electric lawn equipment to EV chargers, that utilities (those with permission to promote fuel-switching) can use to advance electrification.

> **That more of these measures are getting into TRMs reflects the industry's growing recognition that these technologies can support decarbonization.**

Having electrification measures in their TRMs means that utilities have approval to incorporate those measures into their programs and tailor those programs to meet their legislative goals. That more of these measures are getting into TRMs reflects the industry's growing recognition that these technologies can support decarbonization.

So what does the current landscape across TRMs look like, and how can Measure Insights support the development and implementation of electrification programs?

An overview of electrification measures in TRMs

Understanding which measures and which TRMs allow for electrification gives us a clear picture of the measures and sectors leading utilities are prioritizing. And it shows how leading jurisdictions are using their TRMs to facilitate electrification measures in utility programs. These trends can guide other utilities looking to expand their electrification offerings and help them benchmark their TRM against their peers.

10 TRMs have at least one electrification measure

We found 82 measures that utilities use when switching from gas or heating fuels to electricity (we'll refer to these as electrification measures). Here are some of the trends we uncovered:

- There are 10 TRMs with at least one electrification measure. Massachusetts and Illinois had the most measures (20 and 19, respectively), followed by New York and California, both with 11. Maine, Rhode Island, Minnesota, Wisconsin, Connecticut, and Arizona Public Service (APS) also appeared on the list—all of which had five or fewer measures.
- Fifty-four percent were residential measures, 34% were nonresidential, and 12% were specific to restaurants and commercial kitchens.
- The dominant technology category among these measures was HVAC and refrigeration (54% of total). The second-most-common category was water heating, with 18% of total measures.

We identified these measures using the fuel-switching filter in Measure Insights to choose those that allowed for a switch from a nonelectric fuel source to electricity.

Electrification measures by technology category

We used the Measure Descriptions report in Measure Insights to view these measures' specifications and intended uses. While not included in this analysis, we could also use the Measure Values report to view every value (e.g., incremental cost, fossil fuel savings, efficiency factors) associated with those measures.

Technology category	Percentage of total electrification measures	Examples of common measures in category
HVAC and refrigeration	54%	Heat pumps (ductless mini split, air source, ground source, packaged terminal), variable refrigerant flow
Water heating	18%	Heat pump water heater, heat pump pool heaters, storage tank water heater
Commercial and industrial equipment	15%	Convection oven, induction cooktop, specialized industrial equipment
Plug loads	9%	Clothes dryers, induction cooktops, small equipment electrification

Technology category	Percentage of total electrification measures	Examples of common measures in category
Transportation electrification (nonroad)	5%	Electric forklifts, outdoor equipment (e.g., lawn mower)

These are some of the highlights we found in the data:

- Massachusetts had the most measures within the HVAC and refrigeration category (34% of all HVAC measures), and Illinois had the most commercial and industrial equipment measures (50% of the category).
- 9 out of the 10 jurisdictions had a heat pump measure, although there was variation in which types of heat pumps were included. Ductless mini split heat pumps were the most common type (27%), followed by air-source heat pumps (9%). Only Illinois, New York, and Wisconsin had ground-source heat pump measures.
- In the water-heating category, the most common technology type was heat pump water heater (53%). Unique measures in this category include several pool heat pump water heaters and a storage tank water heater.
- Only 3 jurisdictions (Massachusetts, New York, and Illinois) had induction cooktop measures. And only Minnesota and Massachusetts included “outdoor” and “small equipment” electrification measures, which would cover technologies like electric lawn equipment.

What counts as electrification?

The measures we’ve captured are only measures that could be used for electrification. It’s not the case that every measure is meant for electrification. There are also some jurisdictions that have a measure in their TRM that could be used for fuel-switching but that don’t have clear policies around fuel-switching or that only allow it in specific contexts. For more details on specific state policies, see the American Council for an Energy-Efficient Economy report State Policies and Rules to Enable Beneficial Electrification in Buildings through Fuel Switching (PDF).

Several TRMs include transportation electrification measures

TE measures don’t fall under the standard definition of fuel-switching we’re using (gas or heating fuel to electricity), but they’re a key piece of the electrification puzzle. So we also looked at current TRMs to see how TE was incorporated. While not a traditional energy-savings measure, 15 EV-related measures still made their way into 10 TRMs:

- Arkansas
- Illinois
- Maine
- New Mexico
- Michigan

- Minnesota
- Texas
- The Regional Technical Forum
- APS
- CPS Energy's utility-specific TRMs

Eighty percent of these measures were related to EV charging, as opposed to actual EVs. For example, Michigan's TRM has networked and nonnetworked ENERGY STAR Level 2 EV supply equipment (EVSE) measures. Only Maine and Minnesota included measures for the vehicles themselves.

One notable TE measure was APS's airport ground support equipment (GSE) measure, which "encourages the adoption of electric GSE to replace the conventional fuel GSE that are used at airports. The categories of equipment included in this measure are airport baggage tugs, belt loaders, pushbacks, and forklifts."

It seems that while some jurisdictions with robust TE activity are including the infrastructure piece (chargers and other EVSE) in their TRMs, most exclude EVs. Other jurisdictions, like Colorado, are pursuing TE, but they don't have any TE measures in their TRMs. This is likely because TE measures are the furthest removed from traditional energy efficiency activities—more so than heat pumps and other building electrification measures—and aren't typically included in utilities' DSM portfolios. It's more likely that these utilities are pursuing these initiatives using measures approved outside of TRMs.

How do EVs fit in with DSM?

For more information about utilities that are incorporating EV offerings into their DSM plans, and current approaches for planning, designing, and reporting on utility EV offerings, see our report Do EVs belong in demand-side management plans?

Watching the transition to "all electric" in TRMs

As more appliances and equipment switch to electric, efficiency will play a crucial role in moderating new load and ensuring the grid can provide reliable, clean, and equitable energy for all. For more discussion about how electrification can meet climate, grid, and social goals, see our 2020 white paper The electrification framework that benefits customers, the grid, and the planet.

Measure Insights can shed light on how electrification measures are evolving in TRMs. For example, you could track new measures that are added to TRMs, see which jurisdictions pick up or drop certain measures, compare technical assumptions, and more.

This is just a snapshot of the data and insights we can pull from Measure Insights to help utilities, implementers, evaluators, consultants, and others develop electrification (and general efficiency) offerings. If you'd like to learn more about the tool and how to subscribe to it, please contact us.
