MEMORANDUM

To: PG NSG Team

From: AEG Team

Date: January 6, 2022

Re: Fuel-Switching/Electrification Research Memo

Introduction

AEG was tasked with researching the rules for states that allow fuel-switching/electrification through utility energy efficiency programs.

AEG reviewed the 2022 ACEEE policy brief regarding state policies and rules to enable beneficial electrification in buildings through fuel switching.[1] This policy brief broke out state policies into six different categories. At least twelve states strictly forbid or discourage fuel-switching measures, while there are still twenty-three states without any applicable policies in place. Therefore, we focused our research on states with supportive policies. We reviewed the different state legislations to extract the rules and document them in this memo. If the state did not explicitly have legislation on this topic, we then moved to alternative sources such as technical reference manuals, policy manuals, integrated resource plans, etc.

We compiled the information based on two commonalities within state legislation, the rules and definitions associated with fuel-switching/electrification process. The table below provides an overview of state policy and their respective position on fuel-switching.

[1]ACEEE State Policies and Rules to Enable Beneficial Electrification in Buildings through Fuel Switching (July 2022) https://www.aceee.org/sites/default/files/pdfs/state_fuel-switching_policies_and_rules_7-21-22.pdf

Policy Class	Description	States in Policy Class
1	**Fuel switching is addressed through guidelines or fuel-neutral goals.** A state in this category may have set goals, but it may not yet have adjusted other factors such as cost-effectiveness testing and potential studies.	AK, CA, CO, DC, IL, MA, MN, NJ, NY, TN, VT, WI
2	**Supportive policies are in place, with additional specific guidance/rules pending.**	CT, MD
3	**Utility regulations limit use of ratepayer funds for energy-efficient fuel switching, but the state has funded such programs through the Regional Greenhouse Gas Initiative (RGGI).**	ME, RI
4	**No policy is in place, but utilities or program administrators have received approval for fuel-switching or substitution programs in certain cases.**	AL, DE, GA, MI, NH
5	**Fuel switching or substitution is prohibited or discouraged.**	AZ, AR, KS, LA, OK, OR, PA, SC, TX, WA, WV
6	**No fuel-switching or substitution policies or programs are in place.**	FL, HI, ID, IN, IA, KY, MS, MO, MT, NE, NV, NM, NC, ND, OH, SD, UT, WY

Summary and Trends

As we looked through state legislation, there were commonalities in the states' electrification criteria.

- **Cost-Effectiveness**
  - Most states require that the program must have benefit-cost ratio greater than one.
  - Some states[2] also require the inclusion of the social cost of methane and other GHG emissions in the benefit-cost analysis.

- **Reduction in GHG Emissions**
  - Many states require a reduction in GHG emissions as part of their electrification state rules.
  - Some states specify that this reduction needs to be over the lifetime of the conversion[3], others do not.

[2] CO, MA, NY

[3] CO, VT

- **Reduction of Energy Costs**
    - The reduction of energy costs was often a requirement in many states'[4] criteria for electrification.

The section below provides further details on the key states, including the way each state defines cost-effectiveness as well as what rules they have associated with fuel-switching/electrification.

Key States

California

Definition

Fuel Substitution Measure: Project where all or a portion of the existing energy use is converted from one California Public Utility Commission (CPUC) regulated fuel to another CPUC-regulated fuel. Equipment powered by electricity and/or natural gas fuels and provided by a CPUC-regulated investor-owned utility or municipal utility are eligible.

Fuel Switching Measures: distinct from fuel substitution measures and involve non-utility fuels such as propane or fuel oil.[5]

Rules

California relies on the Fuel Substitution Test[6] to evaluate fuel-switching options for cost-effectiveness. In order to include a fuel substitution measure in a portfolio, a program administrator must demonstrate that the proposed fuel-switching measure passes the Fuel Substitution Test and establish that an existing building measure does not:

1) Increase total source consumption.
2) Adversely impact the environment when compared with the baseline measure using the original fuel.

Environmental harm for the Fuel Substitution Test is measured in CO2 emissions. Therefore, to be included in the portfolio, fuel substitution measures must not increase source energy or CO2 emissions compared to the baseline technology.

The CPUC has also established energy efficiency goals that include new fuel substitution goals that must be expressed using a total system benefit (TSB) metric[7]. The TSB reflects the life-cycle energy, capacity, and GHG benefits of a measure in dollar terms, and will become the primary basis for goal setting beginning in 2024.

[4] MA, NY, VT

[5] Fuel Substitution Technical Guidance for Energy Efficiency, https://www.cpuc.ca.gov/about-cpuc/divisions/energy-division/building-decarbonization/fuel-substitution-in-energy-efficiency

[6] Decision 19-08-009, https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M310/K159/310159146.PDF

[7] D. 21-09-037, https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M411/K177/411177185.PDF

TSB Metric Calculation[8]

Calculating TSB is a two-step process which includes calculating benefits then subtracting the value of increased supply costs resulting from the energy efficiency activities. This value is then multiplied by the net-to-gross (NTG) ratio to determine the net benefits of energy efficiency:

Total System Benefit = NTG Ratio (Sum of All Benefits – Sum of All Increased Supply Costs)

The benefits portion of the TSB calculation includes the sum of all measure avoided costs reduced by the measure's net to gross ratio.

- **Non-Avoided Cost benefits**: The TSB calculation does not include non-avoided cost benefits, such as customer rebates, bill savings, or non-energy benefits unless specified by CPUC decision.
- **Avoided kW**: Benefits associated with avoided kW are only accrued in peak hours, and these benefits flow into the measure benefits assessed in the cost-effectiveness model.
- **Refrigerants**: Refrigerant benefits which are not applied on a kWh or therm basis must be calculated externally and applied to the TSB calculations. The avoided cost of refrigerant leakage applies only to measures which change the type of and/or quantity of refrigerant compared to the baseline.
- **Gas Infrastructure Costs**: CPUC staff adopted interim values for the avoided cost of gas infrastructure for use in energy efficiency cost effectiveness assessments. Avoided cost of gas infrastructure only applies to gas efficiency measures/programs and fuel substitution programs.

There are also three types of supply cost increases that are subtracted in the TSB metric based on current guidance:

- **Lighting Interactive Effects**: As efficient lighting can result in a higher heating load, the value of that load from the measure energy efficiency benefits should be subtracted when calculating TSB.
- **Fuel Substitution Load Increases**: The increases resulting from fuel substitution occur when a technology utilizing one regulated fuel is replaced by a technology utilizing a different regulated fuel.
- **High GWP Refrigerant Leakage**: Costs occur when energy efficiency measures utilize more refrigerants, or a different type of refrigerant compared to the measure baseline.

Colorado

Definition

Beneficial electrification: The conversion of the energy source of a customer's end use from a nonelectric fuel source to a high-efficiency electric source, or avoiding the use of nonelectric fuel sources in new construction or industrial applications.[9] The result of the conversion or avoidance must adhere to the rules below.

Cost-effective: A program having a benefit-cost ratio greater than one.[10]

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[8] Further information for the TSB calculation is included in the Total System Benefit Technical Guidance v1.2, October 2021. Available at the following URL: https://pda.energydataweb.com/api/view/2560/FINAL%20TSB%20Tech%20Guidance%20102521.pdf

[9] Senate Bill 21-246 (2021) https://leg.colorado.gov/sites/default/files/2021a_246_signed.pdf

[10] Section 3. Statute 40-1-102. Pages 3-4.

Beneficial electrification plan: A utility's plan to increase beneficial electrification in the residential, commercial, and industrial sector for purposes other than transportation.

Rules

1. Measure must reduce net greenhouse gas emissions over the lifetime of the conversion or avoidance.
2. Measure must reduce societal costs or provide for more efficient utilization of grid resources.

This legislation denotes labor standards[11] as well as requirements[12] for beneficial electrification projects/plans. Listed below are some key rules for the plans:

- Cost-effective and voluntary customer adoption of BE measures
- Plans must be filed with the Commission at least every 3 years and activities to be regulated
- Proposed programs to advance BE
- At least 20% of BE program funding must go to low-income households or disproportionately impacted communities
- Budgets; targeted number of installations; projected fuel savings; projected reductions in GHG emissions; cost-benefit analysis, including social cost of methane and carbon emissions
- Programs targeted towards new and existing building markets. Incentives for products in certified programs (such as Energy Star)
- Documentation and data to show that BE plan is consistent with maintaining the reliability of the electric grid

Massachusetts

Definition

Cost-effective: Programs with a benefit-cost ratio greater than one, meaning the benefits outweigh the costs. If a program fails the cost-effectiveness test, it either needs to be modified so it satisfies the test, or the program must be terminated.[13]

The 2021 Act adds additional language to the 2018 definition of cost-effectiveness. When determining program benefits, calculations are now to include the social value of greenhouse gas emissions reductions.[14]

Rules

Strategic electrification measures must:

1. Be cost-effective
2. Reduce greenhouse gas emissions through expanding electricity consumption

[11] Section 5. Statute 40-3.2-105.6. Page 5.

[12] Section 5. Statute 40-3.2-109. Pages 7-9.

[13] H.4857 An act to advance clean energy (2018) https://malegislature.gov/Laws/SessionLaws/Acts/2018/Chapter227

[14] S.9 An act creating a next-generation roadmap for Massachusetts climate policy (2021) https://malegislature.gov/Bills/192/S9/BillHistory

3. Minimize ratepayer costs

New York

Definition

Environmentally beneficial electrification: A replacement of direct fossil fuel use with electricity such that the replacement adheres to the rules below.

Cost-effective: Benefits outweigh costs in the Commission's benefit-cost analysis. This must also include the social cost of methane, and non-energy benefits as described in the "Rhode Island Test" (RI. Test). Or, another benefit-cost analysis that more completely accounts for externalized benefits of energy efficiency spending.[15]

Rules

Beneficial electrification projects must:

1. Reduce overall emissions.
2. Reduce overall energy costs.
3. Be cost-effective.[16]

The Climate Leadership and Community Protection Act (CLCPA)[17]

The CLCPA requires New York to reduce economy-wide greenhouse gas (GHG) emissions 40 percent by 2030 and no less than 85 percent by 2050 from 1990 levels. As part of the Act, a New York State Climate Action Council is established to recommend ways to achieve the goals states within the plan. One of these methods described in the Act are GHG emission offset projects, which can include beneficial electrification/fuel-switching projects. The Act requires the following rules for GHG emission offset projects:

1. Any greenhouse gas emission offset project approved by the department shall:
    a. Be designed to provide a discernable benefit to the environment rather than to the source;
    b. Be located in the same county, and within twenty-five linear miles, of the source of emissions, to the extent practicable.
    c. Enhance the conditions of the ecosystem or geographic area adversely affected; and
    d. Substantially reduce or prevent the generation or release of pollutants through source reduction.
2. Greenhouse gas emission offset projects shall not be approved by the department where the project:
    a. Is required pursuant to any local, state, or federal law, regulation, or administrative or judicial order;
    b. Contains measures which the source would have undertaken anyway within the next five years;
    c. Contributes to environmental research at a college or university; or

[15] Assembly Bill A10640 (2020) https://www.nysenate.gov/legislation/bills/2019/a10640 Section 1. § 66-Q. Page 1.

[16] Section 1. § 66-Q. Page 2.

[17] Senate Bill S6599, https://www.nysenate.gov/legislation/bills/2019/S6599

d. Is a study or assessment without a commitment to implement the results.

Vermont

Definition

Energy transformation project: An undertaking that provides energy-related goods or services but does not include or consist of the generation of electricity. The results must satisfy the rules that follow.[18]

Rules

Energy transformation projects must:

1. Be implemented starting on or after January 1, 2015.
2. Have a net reduction of fossil fuel and greenhouse gas emissions over its lifetime.
3. Have the lowest present value lifecycle cost, including environmental and economic costs.
4. Cost less per MWH than the applicable alternative compliance payment rate.
5. Have 2% of electric distribution utilities' annual sales beginning in 2017, increasing by an additional $\frac{2}{3}$ % every year, until reaching 12% in 2032.[19]
6. Be screened for cost-effectiveness[20], with tests developed under subsections 209(d) energy efficiency[21] and 2018c(a) least-cost integrated planning.[22]

Other State Information

Alaska

Definition

Fuel-switching: the replacement of existing fuel-consuming equipment using a particular fuel with equipment that uses another fuel that satisfies the following rules.[23]

Rules

Fuel switching projects must:

1. Not increase greenhouse gas emissions.
2. Be more fuel efficient or result in lower fuel expenses.

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[18] No. 56. An act relating to establishing a renewable energy standard. (2015) https://legislature.vermont.gov/Documents/2016/Docs/ACTS/ACT056/ACT056%20As%20Enacted.pdf Pages 4-5.

[19] Section 2. 30 V.S.A. § 8004. Pages 17-18.

[20] Section 2. 30 V.S.A. § 8004. Pages 20-21.

[21] 30 V.S.A. § 209 https://legislature.vermont.gov/statutes/section/30/005/00209

[22] 30 V.S.A. § 218c https://legislature.vermont.gov/statutes/section/30/005/00218c

[23] Alaska Statute 42.05.756 (2021) https://www.akleg.gov/basis/statutes.asp#42.05.756

District of Columbia

Definition

Cost-Effective: The District of Columbia Sustainable Energy Utility (DCSEU) defines a cost-effective fuel switching measure as one that passes the Societal Cost Test (SCT). Specifically, the avoided costs of reducing natural gas consumption must outweigh the costs associated with increased electrical consumption. The SCT must also account for the benefit of reduced CO2 associated with electric generation and fossil fuel burning.

Rules

The DCSEU supports fuel switching measures as long as the project passes the SCT. As part of the SCT, the calculations must account for the benefit of reduced CO2 associated with electric generation and fossil fuel burning.[24] If a project is cost-effective under the SCT, the utility can claim the fossil fuel savings, but also has to claim the penalty from the increased electric use. The DCSEU has established goals related to reductions in energy consumption (measures in BTUs) and greenhouse gas emissions (measures in metric tons of CO2 equivalent).

Maine

Definition

Beneficial electrification: electrification of a technology that would otherwise require energy from a fossil fuel that provides a benefit to a utility, a ratepayer, or the environment by improving the efficiency of the electricity grid or reducing consumer costs or emissions, including carbon emissions.[25]

Conservation programs: programs designed to reduce inefficient electricity use or to increase the efficiency with which electricity is used.

Rules

Conservation programs must:

1. Increase consumer awareness of cost-effective options for conserving energy.
2. Create more favorable market conditions for the increased use of energy-efficient products and services.
3. Promote sustainable economic development and reduce environmental damage.
4. Reduce the price of electricity over time for all consumers by achieving reductions in demand for electricity during peak use periods, including by the implementation of beneficial electrification.
5. Reduce total energy costs for electricity consumers in the State by increasing the efficiency with which electricity is consumed.

[24] Modification No. 14 to Contract No. DOEE0002, https://doee.dc.gov/sites/default/files/dc/sites/ddoe/service_content/attachments/DCSEU%20Multiyear%20Contract%20-%20Mods%201-14.pdf

[25] LD 1464, HP 1071 (2019) https://www.mainelegislature.org/legis/bills/bills_129th/billtexts/HP107101.asp

Maryland

Definition

Climate Catalytic Capital Fund: the purpose of the fund is to promote geographical impact remedies and to leverage increased private capital investment in technology development and deployment.[26]

Building Energy Transition Task Force: established to study certain matters and develop a plan for funding the retrofit of certain buildings. The Public Service Commission and the Building Codes Administration must study and make recommendations on the electrification of buildings in the State as well as anything generally related to climate change impacts and the measures to combat climate change impacts.[27]

Rules

The following is included in the fund's project planning:

1. To reduce greenhouse gas emissions and enable the adoption of measures to combat climate impacts.
2. Enable improvements in energy management and efficiency to reduce greenhouse gas emissions from the building sector.
3. The fund may not be used for a project to install new equipment that uses fossil fuels or improve the efficiency of existing equipment that uses fossil fuels.

The Building Energy Transition Implementation Task Force shall:

1. Study and make recommendations regarding the development of complementary programs, policies, and incentives aimed at reducing greenhouse gas emissions from the building sector.
2. Make recommendations on targeting incentives to electrification projects that would not otherwise result in strong returns on investment for building owners.
3. Develop a plan for funding the retrofit of covered buildings to comply with building emissions standards.[28]

In alignment with the Commission on Climate Change's recommendation to transition to an all–electric building code in the State:

1. The General Assembly supports moving toward broader electrification of both existing buildings and new construction as a component of decarbonization.
2. It is the intent of the General Assembly that the State move toward broader electrification of both existing buildings and new construction. The Building Codes Administration shall develop recommendations regarding efficient cost–effectiveness measures for the electrification of new and existing buildings.[29]

[26] Climate Solutions Now Act, SB 528, Page 8 (2022) https://mgaleg.maryland.gov/2022RS/bills/sb/sb0528e.pdf

[27] SB 528, Page 3

[28] SB 528, Page 99

[29] SB 528, Page 101

New Hampshire

Definition

Energy Optimization: a strategy to minimize energy use and maximize customer benefits that considers efficiency and the mix of fuels used.

Beneficial/Strategic Electrification: powering end uses with electricity instead of fossil fuels in a way that increases energy efficiency and reduces pollution, while lowering costs to customers and society.[30]

Rules

Currently, the New Hampshire Public Utilities Commission (PUC) has not approved fuel switching under its efficiency rules. This means utilities may support electric measures that replace fossil fuel measures but may only claim electric savings from such measures. Further, fuel-neutral savings such as reduced use of oil, propane, kerosene, or wood may contribute to program cost-effectiveness, but do not currently contribute to savings goals.

The PUC has continued to look into energy optimization by completing a study through its EM&V working group and proposing an Energy Optimization pilot in its 2021-23 New Hampshire Statewide Energy Efficiency Plan.

New Jersey

The 2019 New Jersey Energy Master Plan: Pathway to 2050 aims to reduce energy consumption and emissions from the building sector through two primary goals: 1) focus on new construction to be net zero carbon 2) the conversion of electric baseboard heating and oil- and propane-fueled buildings.[31] This includes incentives for electrified heat pumps, hot water heaters, and other appliances.

New Jersey's Clean Energy Program allows for fuel switching and accounts for oil/propane savings achieved.[32] Additionally, the program provides incentives for fuel-switching measures, such as heat pumps.[33] The BPU, with the Rutgers Center for Green Building, are analyzing cost-effective amendments to several New Jersey energy subcodes to encourage beneficial electrification measures in both new and existing buildings.[34]

Rhode Island

The National Grid originally allowed incentives to replace or displace their existing oil, propane or electric resistance heat with electric heat provided by air source heat pumps.[35] National Grid acknowledged that there are no electric savings associated with replacing or displacing existing oil or propane heat with electric heat

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[30] NH WM&V Working Group's Energy Optimization through Fuel Switch Study, https://www.puc.nh.gov/%5c/Regulatory/Docketbk/2017/17-136/LETTERS-MEMOS-TARIFFS/17-136_2019-10-31_STAFF_NH_ENERGY_OPTIMIZATION_STUDY.PDF

[31] 2019 New Jersey Energy Master Plan: Pathway to 2050, Page 157 https://nj.gov/emp/docs/pdf/2020_NJBPU_EMP.pdf

[32] NJCEP Protocols to Measure Resource Savings, Page 84 (2020) https://njcleanenergy.com/files/file/Draft%20NJCEP%20Protocols%20to%20Measure%20Resource%20Savings%20UPDATED%20for%20FY21%2009-09-2020.pdf

[33] NJCEP 2020 Summary of Proposed New Initiatives and Program Changes, Page 4 https://www.njcleanenergy.com/files/file/FY%2020%20Summary%20of%20Changes%20-%20Draft%20for%20Public%20Comment.pdf

Docket No. Q019050645, Page 7 (2019) https://njcleanenergy.com/files/file/Library/6-21-19-8B.pdf

[34] State Brief: New Jersey, Page 7 (2022) https://cnee.colostate.edu/wp-content/uploads/2022/10/State-Brief_NJ_September_2022.pdf

[35] Docket No. 4979, Page 5 (2020) https://ripuc.ri.gov/sites/g/files/xkgbur841/files/eventsactions/docket/4979-NGrid-Ord23937-%2810-29-20%29.pdf

provided by air source heat pumps. Conversely, National Grid asserted that there are electric savings associated with replacing electric resistance heat with electric heat provided by air source heat pumps.

The PUC disallowed the proposed fuel switching rebates for replacement or displacement of oil or propane heat with electric heat provided by air source heat pumps. The PUC found that the proposed fuel switching rebates were inconsistent with the LCP statute, R.I. Gen. Laws § 39-1-27.7. This statute is to meet Rhode Island's electrical and natural gas energy needs, in a manner that is optimally cost-effective, reliable, prudent, and environmentally responsible. These electrical and natural gas needs are to be met through cost effective energy efficiency; electric heat pumps instead require the acquisition of additional electrical supply.[36]

However, the National Grid utility will support the promotion and installation of air source heat pumps to the extent possible within regulatory guidelines.[37] The utility, along with Rhode Island Office of Energy Resources (OER), is offering enhanced rebates for energy-efficient central and mini-split heat pumps installed in qualifying homes that heat primarily with oil or propane. The Enhanced Heat Pump Rebates for Residential Oil or Propane Heating Customers are supported through Rhode Island's participation in the Regional Greenhouse Gas Initiative (RGGI).[38]

Tennessee

Through the Tennessee Valley Authority 2019 Integrated Resource Plan, we know that fuel-switching and electrification is actively promoted through the TVA and local power companies' EnergyRight Programs.[39]

TVA's Commercial Energy Solutions organization, in partnership with DNV GL, has also created a measure-level net carbon emissions calculator for the electrification portfolio that estimates the carbon impact of certain measures. In calculating agency CO2 emissions inventories, TVA uses the World Resources Institute's (WRI) corporate greenhouse gas accounting protocols to calculate agency CO2 emissions inventories. Generally, if the fuel switching results in actual, measurable efficiency improvements, TVA also claims energy savings.[40]

Wisconsin

Definition

Cost-effectiveness: The modified Total Resource Cost Test (mTRC) is greater than or equal to one.[41]

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[36] Docket No. 4979, Page 13

[37] Current guidelines allow for the replacement of electric resistance heating systems with air source heat pumps and support for customer access to high efficiency heat pumps for accessory heating and cooling. At this time, regulation does not enable the utility to pursue heat pump conversion or displacement for delivered fuels. Docket No. 5076 (2020), Page 69 https://ripuc.ri.gov/sites/g/files/xkgbur841/files/eventsactions/docket/5076-NGrid-2021EEPlan%2810-15-2020%29.pdf

[38] 2021 Rhode Island Enhanced heat pump rebates for residential oil or propane heating customers https://www.nationalgridus.com/media/pdfs/resi-ways-to-save/ngrid-ri-oer-1992092-hc-rebate-form.pdf

[39] B.1.5 Beneficial Electrification (BE) https://tva-azr-eastus-cdn-ep-tvawcm-prd.azureedge.net/cdn-tvawcma/docs/default-source/default-document-library/site-content/environment/environmental-stewardship/irp/2019-documents/tva-2019-integrated-resource-plan-volume-i-final-resource-plan.pdf?sfvrsn=44251e0a_4

[40] Tennessee's Energy Right Program https://lpdd.org/resources/tennessees-energy-right-program/

[41] Public Service Commission of Wisconsin Memorandum, Page 7 (2021) https://apps.psc.wi.gov/DL/document/ViewFile.aspx?id=B9A4F6D1C9CD4C0987257BCCEA25C82D

Rules

Fuel switching projects may qualify for incentives provided the project results in the following:

1. Decrease in overall MMBtu at the customer's site.
2. Is cost-effective.
3. The fuel to which the customer is switching is purchased from a participating Focus on Energy Utility.[42]

Next Steps

AEG will continue to monitor relevant state legislative activity for any updates to fuel-switching policies and/or any of the information included in this memo. AEG can also update this memo with any other states that the PG-NSG team would like further information on.

[42] Focus on Energy Policy Manual, Page 81 (2021) https://s3.us-east-1.amazonaws.com/focusonenergy/staging/inline-files/2022/Focus_on_Energy-Policy_Manual.pdf