Mitigation Work Group
Buildings Ad Hoc Group

DISCUSSION DRAFT RECOMMENDATIONS

In order to reach Maryland's Greenhouse Gas Reduction Act (GGRA) goals, including reducing emissions to protect people and places from the effects of climate change, the buildings sector must substantially reduce its direct use of fossil fuels. The Buildings Ad Hoc group recommends the General Assembly, Public Service Commission, State Agencies, and other relevant stakeholders take the following immediate actions to begin reducing emissions from buildings in Maryland while the Commission on Climate Change coordinate the development of a long-range energy transition plan.

Goal 1: Adapt EmPOWER for Beneficial Electrification.

Recommendation 1: Enable Fuel-Switching to let Marylanders Choose Lowest Cost Energy Systems.

Analysis by the U.S. Department of Energy (DOE)[1] found that it is currently less expensive for 99% of homes with propane, 95% of homes with oil, and 20% of homes with natural gas space heating systems in Maryland to switch to an efficient air source heat pump (ASHP) at the point of air conditioning (AC) system replacement. DOE analysis[2] also suggests that for roughly half of Maryland homes with both an AC unit and natural gas furnace near the end of their lives, switching to an ASHP would be cost effective. Currently, EmPOWER Maryland incentives for installing ASHPs are only available to ratepayers who replace existing electric heating systems, consistent with EmPOWER's original mandate to reduce electricity use. Ratepayers with fossil fuel heating systems cannot access incentives to replace their systems with ASHPs that could lower their energy costs and reduce emissions. Various states already provide guidelines for fuel-switching, including Alaska, California, Vermont, and New York.[3]

The General Assembly should amend the Public Utilities Article (PUA) section §7-211 to allow electrification of existing fossil fuel systems through EmPOWER and direct the Public

[1] Mayernik, J. Cost Effectiveness of Electrification with Air-Source Heat Pumps. Presentation to the Maryland Commission on Climate Change's Buildings Subgroup. August 2020.
[2] ibid
[3] ACEEE. State Policies and Rules to Enable Beneficial Electrification in Buildings through Fuel Switching. April 2020.

Service Commission to require the electric utilities to proactively encourage customers with propane or oil heating systems to replace those systems with electric heat pumps, especially for homes with central air conditioning. Enabling electrification also means EmPOWER needs the flexibility to allow some buildings to increase electricity consumption in order to reduce total energy consumption, emissions, and costs. For this reason, this recommendation is linked with the next.

Recommendation 2: Let EmPOWER Facilitate Beneficial Electrification

Electrifying fossil fuel end-uses in buildings is necessary for achieving Maryland's long-term emissions reduction targets,[4] electrified systems can offer the most cost effective solutions for space heating and water heating,[5] and several other states found that electrification-focused scenarios are the lowest cost options for achieving those states' emissions reduction targets.[6] Electrification of buildings and transportation in Maryland is already called for in the State's GGRA Draft Plan.[7] Although EmPOWER's original focus on reducing electricity consumption and peak demand made sense when enacted and served the State well for more than a decade, it is time to adapt EmPOWER to align with the State's many energy related goals, including its GGRA emissions reduction goals.

The General Assembly should amend the PUA section §7-211 to change the core objective of EmPOWER from electricity reduction to greenhouse gas emissions reduction and allow for beneficial electrification, which is when electrification meets one or more of the following conditions without adversely affecting the other two: 1) saves consumers money over the long run; 2) enables better grid management; and 3) reduces negative environmental impacts.[8] The General Assembly should also direct the Public Service Commission to pursue all cost effective energy efficiency and electrification measures based on the value of avoided carbon and on a schedule that meets GGRA emissions reduction targets. The Sacramento Municipal Utility District recently adopted an avoided carbon metric for its efficiency program, which Maryland could use to help guide it through the adoption and implementation of a similar program.[9]

In the meantime, starting with the 2021-2023 EmPOWER program cycle, the Public Service Commission should:

- Require participating utilities to report avoided carbon.
- Include more stringent environmental cost considerations in cost-benefit analysis.
- Maximize efficient retrofit of existing electric end-uses, including by providing higher incentivization for the retirement of electric resistance space heating and hot water heating systems, combined with shell efficiency to reduce loads and improve comfort and satisfaction.
- Authorize technical trainings on electrification technology and design.

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[4] E3. Building Electrification in Maryland. Presentation to the Maryland Commission on Climate Change's Buildings Subgroup. July 2020.

[5] Mayernik, J. Cost Effectiveness of Electrification with Air-Source Heat Pumps. Presentation to the Maryland Commission on Climate Change's Buildings Subgroup. August 2020; NREL. Electrification Futures Study. 2017; RMI. The Economics of Electrifying Buildings. June 2018; U.S. DOE. Energy Efficiency Potential in the U.S. Single-Family Housing Stock. December 2017.

[6] California Energy Commission. Deep Decarbonization in a High Renewables Future: Updated Results from the California PATHWAYS Model. June 2018; Evolved Energy Research. Deep Decarbonization Pathways Analysis for Washington State. December 2016; Evolved Energy Research. Exploring Pathways to Deep Decarbonization in Portland General Electric Service Territory. April 2018; New Jersey. Energy Master Plan. 2019.

[7] MDE. 2019 GGRA Draft Plan. October 2019.

[8] Regulatory Assistance Project. Beneficial Electrification: Ensuring Electrification in the Public Interest. June 2018. https://www.raponline.org/knowledge-center/beneficial-electrification-ensuring-electrification-public-interest/

[9] SMUD. SMUD first in US to change efficiency metric to "avoided carbon." February 2020. https://www.smud.org/en/Corporate/About-us/News-and-Media/2020/2020/SMUD-first-in-US-to-change-efficiency-metric-to-avoided-carbon

- Authorize demonstration projects and pilot programs for all-electric buildings of various types, including in the residential and commercial areas.
- Authorize, to the maximum allowable limit of the existing statute, utilities to incentivize replacement of existing oil and propane heaters with electric heat pumps.
- Ensure that low to moderate income Marylanders are not left behind in these programs.
- Develop all-electric new construction and renovation tiers.
- Recognize the need to electrify fossil fuel end-uses in order to meet the State's GGRA goals and prohibit incentives or subsidies for new fossil fuel infrastructure.
- Recalculate climate benefits so they are consistent with GGRA goals.

Recommendation 3 [Option A]: Set a Target for 50% of Space Heater Sales to be Heat Pumps by 2025.

Maryland Department of the Environment's (MDE's) greenhouse gas modeling consultant, E3, estimates that even if all new buildings were all-electric by 2025, energy efficiency targets were increased, and space heater sales reached 50% heat pumps in 2030 and 90% in 2050, then Maryland's building sector emissions would decrease only 41% by 2050.[10] Faster adoption of electric heat pumps is necessary for the buildings sector to achieve deep decarbonization in line with Maryland's GGRA targets. Currently, around 20% of space heater sales are electric heat pumps (air source or ground source).[11] Enabling fuel-switching and beneficial electrification (Recommendations 1 and 2) should improve that rate. Incentivizing builders to install heat pumps in new buildings (Recommendation 4) would further improve it. Still, a sales target alongside stronger financial incentives would help ensure that incentives are sufficient to encourage building owners and HVAC installers to accept heat pump technology and would help the State achieve its emissions reduction targets. Aggressive adoption of heat pumps could also help more Marylanders save money. As noted above, DOE analysis suggests that for roughly half of Maryland homes with both an AC unit and natural gas furnace near the end of their lives, switching to an ASHP would be cost effective.

The General Assembly should set a target for 50% of space heater sales to be electric heat pumps (air source or ground source) by 2025 and direct the Public Service Commission to ensure that EmPOWER incentives are sufficient to meet that target. Incentives should be robust enough to achieve a simple payback period of less than five years for all ASHP retrofits and less than one year for retrofits in homes for low to moderate income Marylanders.

Recommendation 3 [Option B]: Establish Residential Heat Pump Retrofit Goals

[Same first paragraph as the recommendation above. Replace subsequent text with:]

[10] E3. Building Electrification in Maryland. Presentation to the Maryland Commission on Climate Change's Buildings Subgroup. July 2020.
[11] ibid

The Mitigation Work Group should establish annual heat pump retrofit targets for existing buildings sufficient to meet Maryland's 2050 decarbonization goals as part of an Energy Transition Plan described in Recommendation 6.

[This may make more sense as an item under the study, rather than a standalone recommendation.]

Goal 2: Construct Carbon Neutral New Buildings.

Recommendation 4 [Option A]: Require All-Electric New Buildings by 2025 with Cost Controls.

Maryland should continue to be a national leader in adopting the newest construction codes, including appendices for net zero energy/carbon pathways, to ensure that all new buildings meet stringent energy efficiency standards and have low energy costs. However, installation of new fossil fuel infrastructure is counterproductive to meeting GGRA targets and creates significant risk of increased cost and stranded assets, especially when natural gas rates are expected to increase faster than electricity rates[12] and fossil fuel alternatives (such as renewable natural gas, power-to-gas, and biodiesel) are in limited supply and much more expensive than their fossil fuel counterparts.[13] There is now evidence that all-electric new buildings can have lower or equivalent capital and operating costs compared with mixed-fuel buildings.[14] In fact, 76% of new homes in the Census region that includes Maryland were built with electric heat pumps as their primary heating systems in 2018.[15] Maryland should join the other jurisdictions that are requiring all-electric standards for new buildings.[16]

The Maryland Building Codes Administration should follow Washington DC's lead by adding at least one line to its construction codes for all new buildings, "on-site combustion of fossil fuels shall not be permitted for the provision of thermal energy to the building,"[17] and determine if any other parts of the codes would need to change in response to this amendment. Compliance with the all-electric requirement should begin by 2025 but publicly-owned buildings should meet the standard earlier to save taxpayers money and have Maryland government lead by example. Electric vehicle charging, solar-ready, smart grid, and demand response-ready amendments should also be added to codes as soon as possible.

While the all-electric code amendment is meant to encourage builders to pursue design choices that reduce capital costs, energy costs, and emissions for new buildings, there should be flexibility to allow builders to install combustion equipment when the elimination of that equipment would unnecessarily increase costs. As such, the Maryland Building

[12] Mayernik, J. Cost Effectiveness of Electrification with Air-Source Heat Pumps. Presentation to the Maryland Commission on Climate Change's Buildings Subgroup. August 2020.

[13] E3. Biofuels Modeling and Assumptions. Presentation to MDE. November 2019.

[14] RMI. The Economics of Electrifying Buildings. June 2018.

[15] National Association of Home Builders. Air Conditioning and Heating Systems in New Homes. December 2019. http://eyeonhousing.org/2019/12/air-conditioning-and-heating-systems-in-new-homes-4/

[16] Henchen, M. Why States Need to Ban New Gas Hookups in Buildings (in 5 Charts). February 2020. https://www.greentechmedia.com/articles/read/5-charts-that-show-why-states-need-to-eliminate-fossil-fuels-from-buildings

[17] District of Columbia Construction Codes Supplement of 2017, 12-I[CE] and 12-I[RE] DCMR - Energy Conservation Codes Supplement of 2017. Appendix Z. 2017.

Codes Administration should allow on-site combustion of fossil fuels if energy models, specific to the project, show that an all-electric building would have a significantly higher lifecycle cost than a mixed-fuel building.

A. If the lifecycle cost of the all-electric option is **less than or equal to** the lifecycle cost of the mixed-fuel option without subsidies, then the all-electric requirement would be upheld.
B. If the lifecycle cost of the all-electric option is **up to X% greater than** the lifecycle cost of the mixed-fuel option without subsidies, then funding from EmPOWER, tax credits, or other sources should be available (without delaying the project schedule) to reach lifecycle cost parity between the all-electric and mixed-fuel options and uphold the all-electric requirement.
C. If the lifecycle cost of the all-electric option is **X% greater than** the lifecycle cost of the mixed-fuel option without subsidies, then the all-electric requirement may be waived.

Buildings that have uninterruptible energy needs that cannot be met cost effectively with on-site battery storage (using the rules and incentives listed in this recommendation) and buildings that include combined heat and power systems would be exempt from the all-electric requirement. New buildings connected to an existing district energy system would follow the all-electric requirement but the energy source for that district energy system could use fuels other than electricity. New energy sources for new or existing district energy systems should adhere to the all-electric rules and incentives listed in this recommendation.

Recommendation 4 [Option B]: Require All-Electric New Homes by 2025.

[Same first paragraph as the recommendation above. Replace subsequent text with:]

The Maryland Building Codes Administration should follow Washington DC's lead by adding at least one line to its construction codes for all new **homes**, "on-site combustion of fossil fuels shall not be permitted for the provision of thermal energy to the building,"[18] and determine if any other parts of the codes would need to change in response to this amendment. Compliance with the all-electric requirement should begin by 2025.

Concurrent with an all-electric requirement for new homes, Maryland should take measures to advance all-electric new buildings of other types. Publicly-owned buildings should meet an all-electric standard earlier to save taxpayers money and have Maryland government lead by example. Electric vehicle charging, solar-ready, smart grid, and demand response-ready amendments should also be added to codes as soon as possible.

In developing the Energy Transition Plan described in Recommendation 6, the Mitigation Work Group should consider adoption of a broader all-electric requirement for all new buildings, and appropriate exclusions for buildings utilizing district energy systems and combined heat and power system, for buildings with overriding need for uninterruptable energy needs, and for cases where additional costs of all-electric construction would be unacceptably high.

[18] ibid

Recommendation 5: Incentivize Net-Zero Energy All-Electric New Buildings.

All-electric buildings produce zero direct emissions but still have some indirect emissions from conventional electricity supplies until the grid becomes carbon neutral, which could take another 20 years or more in Maryland.[19] All-electric net-zero energy buildings, on the other hand, are carbon neutral immediately because they produce 100% of their annual electricity demand from on-site or, potentially, near-site zero-carbon renewable energy systems.

The Maryland Building Codes Administration should develop optional codes and standards for all-electric net-zero energy buildings, including allowance of near-site renewable energy systems such as community solar projects, and determine how to incentivize builders to design to those standards.

Goal 3: Develop an Energy Transition Plan.

Recommendation 6: Produce an Energy Transition Plan by the end of 2021

The immediate steps in the prior recommendations would begin a 30-year transition toward a decarbonized buildings sector. As those steps begin, the State should develop an Energy Transition Plan to coordinate long-term activities and ensure that the overall buildings sector strategy achieves equitable benefits for frontline communities, anticipates and prevents escalating distribution system costs for shrinking pools of natural gas customers, and takes advantage of opportunities for economic growth, including for the agricultural community from renewable fuel development.

In 2021, the Mitigation Work Group should coordinate a research and planning process that:

- Evaluates cost effectiveness of renewable fuels especially for decarbonizing combined heat ah power (CHP), district energy, industrial process heating, and heavy transport
- Evaluates carbon capture utilization and storage (CCUS) and bioenergy with carbon capture and storage (BECCS) opportunities for medium to large stationary point-sources of emissions including CHPs and industrial facilities
- Evaluates benefits to Maryland's agricultural community from renewable fuel development
- Evaluates exit strategies for gas utilities, heating oil, and propane distributors and their customers, especially LMI customers
- Identifies measures to manage increased electricity use from electrification to minimize impacts on the electricity distribution system, including demand response and integration with distributed generation and energy storage.

[19] MDE. 2019 GGRA Draft Plan. October 2019.

- Establishes statewide targets for building sector greenhouse gas reductions (e.g. X% by 2050) and identifies the most cost-effective mix of reduction measures to achieve those targets.