



June 22, 2021

Massachusetts Energy Efficiency Advisory Council
Commissioner Patrick Woodcock, Chair
Massachusetts Department of Energy Resources
100 Cambridge Street, Suite 1020
Boston, MA 02114

Re: April 30 Draft of the 2022-2024 Massachusetts Energy Efficiency Plan

Dear Commissioner Woodcock and Members of the Energy Efficiency Advisory Council:

On behalf of the MIT Environmental Solutions Initiative, I would like to thank the EEAC for the opportunity to provide these suggestions for your consideration in a final Plan that prioritizes equity, and meets the requirements of the recent Climate Roadmap Law as economically as possible.

I also put these comments forward as a long-time practitioner in the energy efficiency field, including in leadership roles in Xenergy in the 1980's and 1990's, Nexus/Aclara in 2000's, and MIT's Energy Efficiency Strategy Project in the prior decade. Also, I'll note with appreciation the conversations with the state's utilities, and especially EEA Undersecretary Chang regarding our nascent [MIT Sloan Heating Climate Pathways Project](#).

As an outline, here is a list of the paragraphs below, regarding our topics for comment:

1. Let's Put "Climate and Equity on Top, *not a tip at the end.*"
2. Two Heating Systems are Better than One:
 - Program Proposal: When replacing an AC, *always buy the Heat Pump model.*
 - Program Proposal: *Size Matters.*
 - Program Proposal: *Demand Response Matters a Lot.*
 - Program Proposal: *Air Conditioning should be a Right, not a Privilege.*
3. Looking ahead: Let's work towards a Mass-Save that 1) *is community-centric*, and 2) is not paid for with an electric bill surcharge.
 - Future Goal: *Community-centric Mass Save.*
 - Future Goal: *A Buildings-and-Climate Initiative (BCI).*

1. Let's Put "Climate and Equity on Top, *not a tip at the end.*"

I acknowledge [Gina McCarthy](#), who I paraphrase here. As noted in other comments, including those from the Conservation Law Foundation, the draft plan, while having many improvements to address climate and equity, *does not rise to the need for our time*. I say this with deference for Mass Save's accomplishments, especially since passage of the MA Green Communities Law of 2008.

Climate is under-represented - the plan needs to capture the *Climate Emergency* as documented in the [2018 IPCC Special Report on 1.5C](#). This science underpins the recent MA Climate Roadmap Law requirement of 50% carbon mitigation by 2030. It is urgent what we apply our strong energy efficiency program *towards creating an effective example that others can follow* – showing the world a pathway that is achievable, in a manner that serves our citizens’ health and economic situations well.

Equity is also under-represented. The Resource Efficiency benefit-cost structure that my generation of energy efficiency professionals helped put in place is seriously flawed for our time. The money flows toward the most savings per utility dollar spent, which makes sense but also inevitably the money goes disproportionately to well-heeled suburban homes and large commercial and institutions. Meanwhile, the funds are derived from a system benefits charge on every consumer. The new climate law allows these economically-able consumers to be *pushed forward* – via BERDO and other disclosures, standards, cap-and-trade; so therefore now the money needs to address underserved populations as its first priority, such as older urban low income rental housing.

Again quoting Ms. McCarthy: *When people understand that the climate solution is Good for Them, they will Run Towards It*. Mass Save is the largest, strongest tool we have to make this case. We have the ability to innovate more than this current draft plan represents.

2. Two Heating Systems are Better than One.

Expanded use of *Heat Pumps* is a pathway frequently cited for low-carbon heat, but in cold climates, their deployment at scale results in unmanageably high demands on peak electricity supply. We don’t support those who say “when replacing heat, buy a heat pump”. This simply doesn’t work for our goals. An all-winter heat pump will draw four times the power on winter peak than it does on summer peak. And considering the true cost of electricity during periods of congestion, it is not economic at present. We do need to develop and test solutions for all winter electric heat for the next decade, such as network geothermal systems and low carbon tanked backup fuels.

An alternative is *Hybrid Heat* (quality heat pumps with fossil backup). Many homes and buildings can cost-competitively upgrade from air conditioning equipment to heat pumps on replacement; this practice is entering the market and should result in at least 50% site carbon mitigation if only used above 37f, while reducing the annual heating cost substantially as compared with gas (every hour above 37f); and more compared with oil or propane (every hour above 32f). The cost premium at replacement time of an existing AC system can be small; typically \$300-\$400. Hybrid heat has no contribution to electric system peaks, although at scale it may increase natural gas unit costs. We believe the program proposals below are important, urgent, and doable for the next cycle Mass Save program:

Program Proposal: When replacing an AC, *always buy the Heat Pump model*.

We recommend strong market transformation initiatives *to make this transition ubiquitous*; such as a *negotiated cooperative promotion* with upstream suppliers and service companies to stock, recommend, install, and set up the dual heating capability properly. Doing so should result in at least 50% of all central air systems converting to heat pump by 2030. Ductless mini-split AC systems are in fact all heat pumps; but again we need a solid market transformation program, including effective Mass Save audit services, to help consumers achieve their choice of minimum annual heating cost (at least 50% site decarbonization), or maximum decarbonization without an increase in annual heating cost (at least 60% site decarbonization).

Program Proposal: Size Matters.

When the consumer is purchasing a heat pump version of their AC system at replacement, the tendency is to buy one with the same BTU cooling capacity. With recent cold-weather heat pump technology improvements (now ubiquitous in ductless mini-splits), the variable speed drive permits purchasing up to twice the maximum BTU capacity without a performance drop in summer, while having additional capacity for the heating season. Double-size systems have a relatively small cost premium, and will allow the heat pump to meet the building heating needs down to about 17f, increasing the potential site decarbonization from 50% to 75%. We propose that the Mass Save incentives cover this cost.

Compared with natural gas, there is an average cost penalty of about 25% in the temperature band between 37f and 17f; against oil or propane the penalty is smaller. One can look at this upsizing as a *future-proofing* for if/when the Clean Heat Commission proposes policies to change the costs of heating fuels based on carbon content. But with the next proposal, the cost penalty *can be removed entirely right now*:

Program Proposal: Demand Response Matters a Lot.

Utility heating demand response control with dual systems has *no impact on consumer comfort*. When there are two systems in place, it is easy to have a demand response program shut down the heat pumps, and the home rely instead on the backup fossil system. Most simply done, the gas system thermostat can be set a few degrees below the heat pump system, so that it automatically activates with the heat pump is off. The potential benefits of such a program for decarbonization are remarkable. While the heat pump is generally economic against all fuels above 37f, in the many hours between 17f and 37f the less expensive system varies, when true time-dependent electric (and gas) system costs are considered on an hourly basis. The majority of the hours in this temperature range have NE ISO spot prices below \$.05/kwh, while a handful of hours are at \$.50/kwh or more. Avoiding congested periods and high prices results in economic heat pump use at least 80% of the time in this temperature range.

The consumer should be able to receive a large-enough reward for allowing the utility to shut down their heat pump to make it worthwhile for them, along with consumer understanding that they will have more hours of economic heat pump use, and are doing more for their part to reduce climate emissions.

Our estimates right now indicate that using the heat pump between 37f to 17f only when economic based on true system costs, will increase the annual site carbon emissions reduction from 50% to 70%, provide an electric system financial benefit that should be passed on to the consumer, and incur only a program cost for device communication. Clearly, no AMI is needed to do this; web connectivity of the device is all that's required. Perhaps our new appliance standard programs can require such communications to be built-in. Again, at scale, there may be a natural gas system unit price increase; we are beginning to examine this.

Program Proposal: Air Conditioning should be a Right, not a Privilege.

I'm paraphrasing Bernie Sanders out of context, but the equity concern here is obvious: this remarkably carbon-impactful strategy presumes the customer is making a purchase decision at an AC end-of-life transition point. What about consumers without AC or only window ACs?

Installed AC market share is likely to increase rapidly in the years ahead due to the strong forces of 1) the trend towards higher temperatures, 2) the relatively lower cost of AC equipment compared to our

increasingly high total housing costs, and 3) the availability of the lower cost option of ductless mini-splits. Therefore many purchase decisions for new AC are coming up – *these are also hybrid heat capture points*.

However, especially in lower income urban housing, this upgrade may be out of reach, and often since (even with a mini-split) there is some construction involved, it might be difficult for a renter, or a condo owner, to get permission to put one in through an exterior wall.

We need to acknowledge, and value, the health benefits of providing air conditioning for vulnerable populations. And for fairness, we can't fail to address this population while providing benefits to all other consumers who can afford air conditioning. Therefore, a program of *direct install* for such populations I think is called for. A service that can assess the circumstances of individual buildings, and provide the installation of ductless mini-splits, bundled with appropriate urban housing thermal efficiency measures such as radiator controls, should be given a higher priority for funding.

A mini-split will increase electric use for air conditioning in a non-air-conditioned home, of course; but at the same time, a utility -controlled hybrid system will avoid 70% of the site carbon emissions for heat economically, and higher if thermal measures are bundled in. Properly valuing the health, carbon, and equity benefits should result in a worthwhile program. For those with moderate income, there can be financing and cost-sharing.

3. Looking ahead: Let's work towards a Mass-Save that 1) is community-centric, and 2) is not paid for with an electric bill surcharge.

Admittedly these transitions may take some time and additional legislation. But I think it is worthy to consider their merit now, and consider future program designs with pilots, and adjustments where possible, in how current programs are evaluated, prioritized, administered, and paid-for.

Future Goal: Community-centric Mass Save. As the Solarize experience demonstrated, the benefits of locally managed campaigns can overcome some of the toughest market barriers of trust, time, and risk and also improve the economics. Studies have shown that Solarize was responsible for at least three times the penetration in a broad study. The Commonwealth Solar experience indicated a 10x increase in the early rounds. In the future, cities and towns should have the option of configuration, choice of contractors, and oversight of many elements of Mass Save, based on local needs and building stock.

We note specifically that today, [All In Energy](#) is a non-profit that is effectively focusing on the needs of low income people in urban areas to increase their benefit from the Mass Save program. Also, a new non-profit [MassEnergize](#) has a community portal and some support services that help extend the Solarize experience to Mass Save and other sustainability measures. Community groups such as [Energize Wayland](#) use the portal to extend their Solarize experience in the direction.

We should provide more support to such entities, beginning now, for the promise of a more effective marketing channel, and the potential of local vetting, customization, coaching, and campaign management. As well, towns when having such a vehicle should be in the position to choose *preferred* Mass Save banks and service providers now. And they should be given some funds to support their local services such as coaching, rather than relying on the uneven availability of volunteer services.

Future Goal: A Buildings-and-Climate Initiative (BCI). The problem with the System Benefits Surcharge (SBC) as the primary funding source for Mass Save should be obvious –it in effect taxes electricity, the fuel we need consumers to rely on more for climate goals, which are now tantamount.

The MA House version of the Roadmap Bill contained a provision supportive of phasing in a building sector carbon cap-and-trade program, similar in form to the *Transportation and Climate Initiative (TCI)*. The proposal we're putting forward for consideration: *to make Mass Save the primary use of funds for a Buildings and Climate Initiative (BCI)*, so that the cost added to oil and gas results in a corresponding drop in the cost of electricity for all consumers. We're hopeful that the Clean Heat Commission will propose something like this; however planning now for the potential impact of cross-fuel price-sensitive program elements such as hybrid heat, should be considered in the priorities for this program cycle.

We would be happy to discuss any of these suggestions with you. Thank you for moving the Commonwealth forward towards a model climate solution.

Respectfully submitted,



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