So Close, But Yet So Far

MA 2025/2030 Clean Energy & Climate Plan

July 20, 2022

Acadia Center

Advancing the Clean Energy Future

On June 30th, 2022, the Massachusetts Executive Office of Energy and Environmental Affairs (EOEEA) released the final Clean Energy and Climate Plan for 2025 and 2030 (CECP). This final report represents an update to the Interim CECP that was released in December of 2020 and a more fleshed out version of the Updated Interim CECP released in April of 2022. It builds off of the analysis in the 2050 Massachusetts Decarbonization Roadmap that was released in December of 2020 – but, unfortunately, does not add much detail. Acadia Center has been an active participant in this process from the start, submitting multiple sets of comments along the way, testifying at several hearings, and meeting with administration officials. The final CECP represents a critical step forward for the Commonwealth in its efforts to decarbonize and hit net zero emissions by 2050, though it suffers from a number of critical flaws.

As Acadia Center believes it should, the CECP emphasizes that a combination of energy efficiency and electrification will be the primary strategy for reducing GHG emissions from the building sector, as opposed to a heavy reliance on so called "decarbonized fuels". The CECP also acknowledges the high risk associated with continuing to invest in a gas system that could soon prove to be largely obsolete.

But, disappointingly, the final CECP falls short in several key areas. The plan 1) favors near-term deployment of "hybrid" heating systems rather than full electrification of buildings 2) slow plays the transition away from gas pipelines 3) does not outline a clear path to the deployment of EV charging infrastructure at the scale needed to match the projected level of EV adoption required and 4) does not address how Massachusetts is going to fund the reforms necessary to achieve economy-wide emissions reductions.

Most troublingly, the analysis continues to repeat flawed assumptions present in the Massachusetts Greenhouse Gas Inventory that underplay the climate damage caused by gas leaks and fail to acknowledge the lifecycle GHG impacts of biofuels.

Massachusetts is Still Letting Flawed Assumptions Get in the Way of Impartial Analysis

When reviewing the conclusions of the CECP modeling effort, which ultimately inform the report's policy recommendations, it's important to note that the modeling continues to rely on flawed, outdated assumptions that are much too favorable to natural gas and biofuels. These flawed assumptions stem from the Massachusetts Greenhouse Gas Inventory and continue to be repeated – both in the CECP modeling and the D.P.U. Docket 20-80 (Future of Gas) modeling as Acadia Center described in more detail here. These problematic assumptions include:

- **Dramatically underestimating the GHG impacts of methane leaks from the gas system in Massachusetts.** A recent study from Harvard estimated that gas leaks in the Boston metro are *six times* worse than estimates from the Massachusetts Department of Environmental Protection (DEP) and U.S. Environmental Protection Agency (EPA).[1]

[1] Sargent et al., 2021 "Majority of US Urban Natural Gas Emissions Unaccounted for in Inventories." https://www.pnas.org/doi/10.1073/pnas.2105804118

- **Using an outdated global warming potential (GWP) value for methane and failing to consider methane emissions on the 20-year timescale that is most relevant to the state's net zero emissions goal.** Simply switching to the most recent 20-year GWP, as New York State has done, would alone increase the estimated GHG damage from methane leaks *over three-fold*.[2]
- **Not accounting for out-of-state GHG emissions from the production and transmission of both fossil fuels and biofuels ultimately consumed in-state.** After updating to a 20-year GWP and accounting for out-of-state emissions, New York State found that the GHG emissions associated with using natural gas are 84% higher than the state had previously estimated.[3]
- **Making the blanket assumption that all biofuels (including 'renewable natural gas' and biodiesel) are GHG-neutral.** Ignoring lifecycle emissions associated with biofuels dramatically overestimates the potential role for these fuels as we move towards net zero emissions.[4]

The CECP makes it clear that one of the central debates in building sector decarbonization over the next decade will be around whether the Commonwealth should embrace full electrification of building heating or partial electrification of building heating via "hybrid" systems that rely on a combination of electricity and fossil fuel- or biofuel-based heating systems. Using CECP modeling assumptions, buildings served by hybrid heating systems would generate about half of their heat from an electric air-source heat pump (ASHP) and half of their heat from a fossil fuel- or biofuel-powered boiler or furnace.

As it stands, the CECP modeling is biased in favor of hybrid heating and against full electrification because of the flawed assumptions described above. Hybrid heating pathways looks a lot better when you're underestimating gas leaks and assuming combustion of biofuels results in zero GHG emissions. As such, the findings of the CECP that hybrid heating as a first-choice option would be a reasonable pathway for the Commonwealth must be taken with a large grain of salt.

The CECP is Less Ambitious than the Massachusetts Roadmap When it Comes to Full Electrification of Buildings by 2030

One of the main narratives of the CECP report is that the "Phased" Scenario, which emphasizes deployment of hybrid heating systems over the next eight years, and beyond, is the best path for the Commonwealth. This is a significant departure from the most cost-effective "All Options" Scenario in the Massachusetts 2050 Decarbonization Roadmap ("Roadmap"), which emphasized the importance of full electrification of buildings as rapidly as possible. Although there are some significant differences between the two scenarios, particularly as it relates to their post-2030 vision, the All Options Scenario from the Roadmap is more directly comparable to the "High Electrification" Scenario in the final CECP, which places an emphasis on full electrification of building heating over the next eight years.

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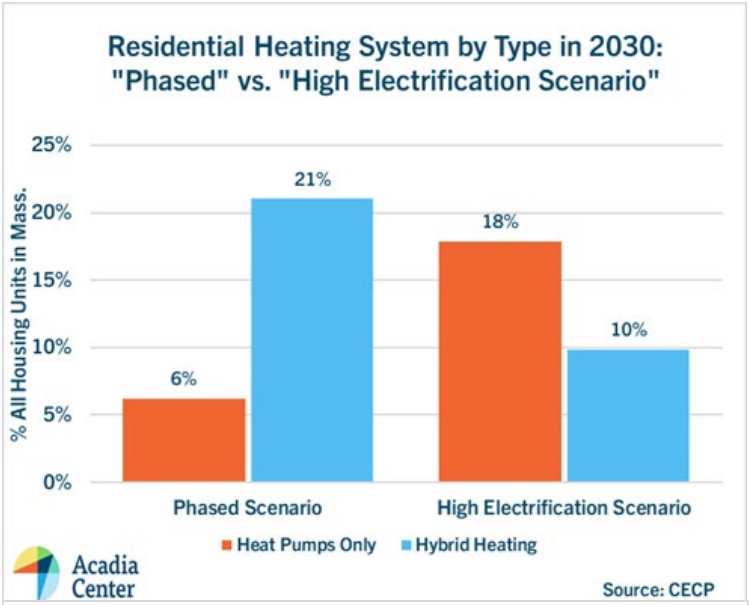
[2] The IPCC 4th Assessment Report 100-year GWP for methane of 25 used in the CECP analysis is over 3.36 times lower than the more appropriate IPCC 4th Assessment Report 20-year GWP for methane of 84.

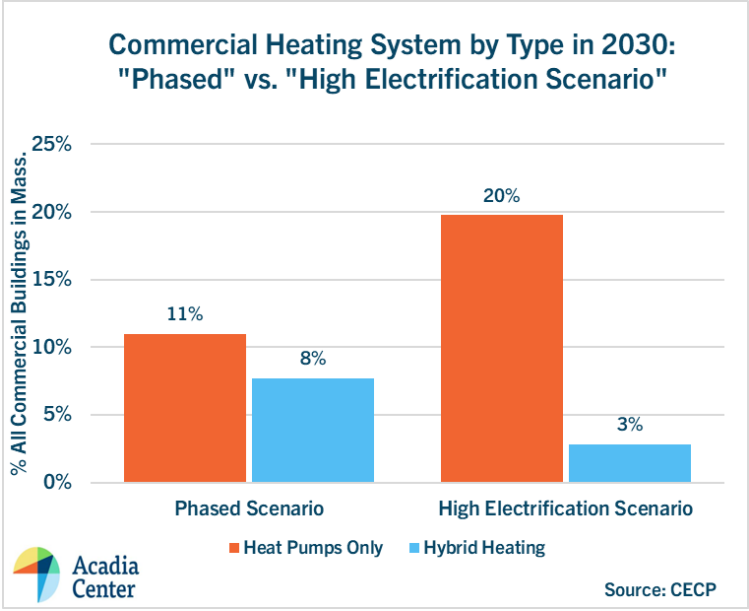
[3] New York State Department of Environment Conservation 2021 Statewide GHG Emissions Report, Appendix A, Table A1, page 17. https://www.dec.ny.gov/docs/administration_pdf/ghgsumrpt21.pdf

[4] Emily Grubert, 2021. "At Scale, Renewable Natural Gas Systems Could be Climate Intensive: The Influence of Methane Feedstock and Leakage Rates." https://iopscience.iop.org/article/10.1088/1748-9326/ab9335

The CECP Phased Scenario calls for about 6% of Massachusetts homes to rely solely on heat pumps for space heating and 21% of homes to rely on a hybrid heating system by 2030.[5] This is in stark contrast to the High Electrification Scenario, which calls for about 18% of homes in the Commonwealth to rely solely on heat pumps for space heating by 2030, with an additional 10% of homes relying on hybrid heating systems.[6] **In other words, the Phased Scenario envisions about *one third* as many homes heated solely by heat pumps in 2030 and *twice* as many homes relying on hybrid heating systems in 2030.**



The Phased Scenario is also much less bullish on near-term full electrification of commercial buildings when compared to the High Electrification Scenario. The Phased Scenario calls for about 11% of commercial buildings to rely solely on heat pumps for space heating by 2030, with about 8% of commercial buildings relying on hybrid heating. The High Electrification Scenario calls for about 20% of commercial buildings to be heated solely by heat pumps in 2030, with about 3% of commercial buildings relying on hybrid heating.[7] **In other words, the Phased Scenario envisions about *half* as many commercial buildings heated solely by heat pumps in 2030 and *over twice* as many commercial buildings relying on hybrid heating systems in 2030.**



The CECP's Own Analysis Demonstrates that the "Phased" Scenario Being Promoted is Not the Most Cost Effective

The key differences between these two scenarios are important to understand, because although the CECP promotes the "Phased" scenario as the best path forward throughout the report, their own analysis shows that the

[5] See Table E.3 on page 159 of Appendix E: CECP Benchmarks and Metrics.

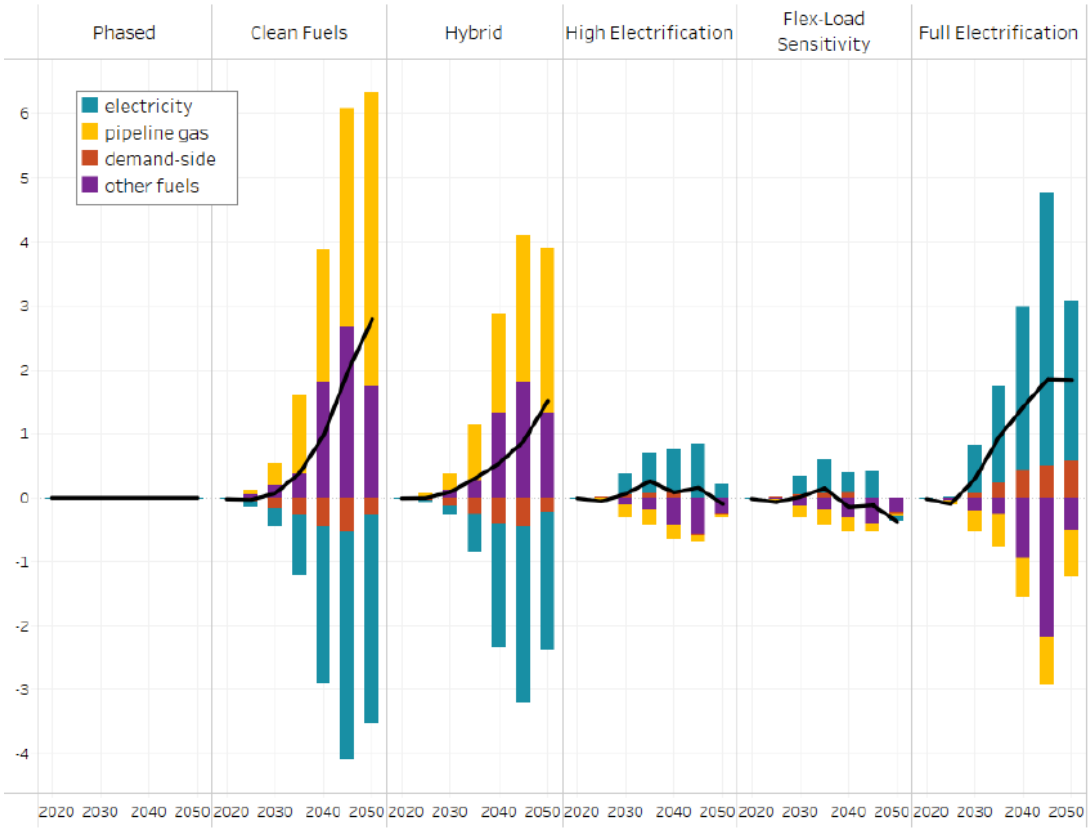
[6] See Figure A.6 on page 13 of CECP Appendix A: Technical Pathways Modeling. Note: Percentages estimated by Acadia Center measuring graph in CECP. Exact numbers not provided in CECP.

[7] See Figure A.7 on page 14 of CECP Appendix A: Technical Pathways Modeling. Note: Percentages estimated by Acadia Center measuring graph in CECP. Exact numbers not provided in CECP.

net costs of the Phased and High Electrification scenarios are nearly identical, with the "Flexible Load Sensitivity"[8] version of the High Electrification Scenario actually being the lowest cost of any scenario analyzed, and about $0.2 billion cheaper than the Phased Scenario.[9] When looking at the figure below, note the black lines in both the High Electrification Scenario and Flex-Load Sensitivity of the High Electrification Scenario – when the black line is above zero on the y-axis, the particular scenario is cheaper than the Phased Scenario. Conversely, when the black line is below zero on the y-axis, the particular scenario is more expensive than the Phased Scenario. As you can see, both High Electrification and Flex-Load Sensitivity scenarios have slightly higher net costs in the early years, but show overall net cost savings as we get closer to 2050.

The CECP report appears to skirt around the finding that High Electrification with Flex-Load Sensitivity has the lowest net costs of any scenario. It's also noteworthy that the "Clean Fuels" and "Hybrid Fuels" scenarios, more closely aligned with the proposals of the local gas distribution companies in DPU 20-80, were found to be astronomically more expensive than either the Phased or High Electrification Scenarios.

Net Cost Compared to Phased Scenario (Billions of $2020)[10]



[8] The "Flex-Load Sensitivity" modification of the "High Electrification" Scenario is similar to the base "High Electrification" Scenario but it assumes *"…modest flexible loads for space heating and cooling systems, and electric vehicle charging. Flexible loads are modeled as shifting some percentage of load from peak hours to non-peak hours."* (CECP Appendix A, page 10).

[9] See Figure A.17 on page 24 of CECP Appendix A: Technical Pathways Modeling. Note: Net cost savings of the "High Electrification" Scenario with "Flex -Load Sensitivity" estimated by Acadia Center measuring graph in CECP. Exact numbers not provided in CECP.

[10] Figure A.17 on page 24 of CECP Appendix A: Technical Pathways Modeling

Why not embrace the more ambitious High Electrification scenario that better meets the Commonwealth's decarbonization goals, and for which Acadia Center has argued for years? If the costs are nearly identical, why put off full electrification of buildings now when we have the technology at our fingertips to fully electrify buildings? Given that the analysis is underestimating GHG emissions from the gas system leaks – likely by significant amounts - we must fully electrify as many buildings as quickly as possible. Doing so will enable the Commonwealth to strategically prune branches of the gas distribution system as quickly as possible to minimize these leaks and avoid continued investment in stranded gas system assets.

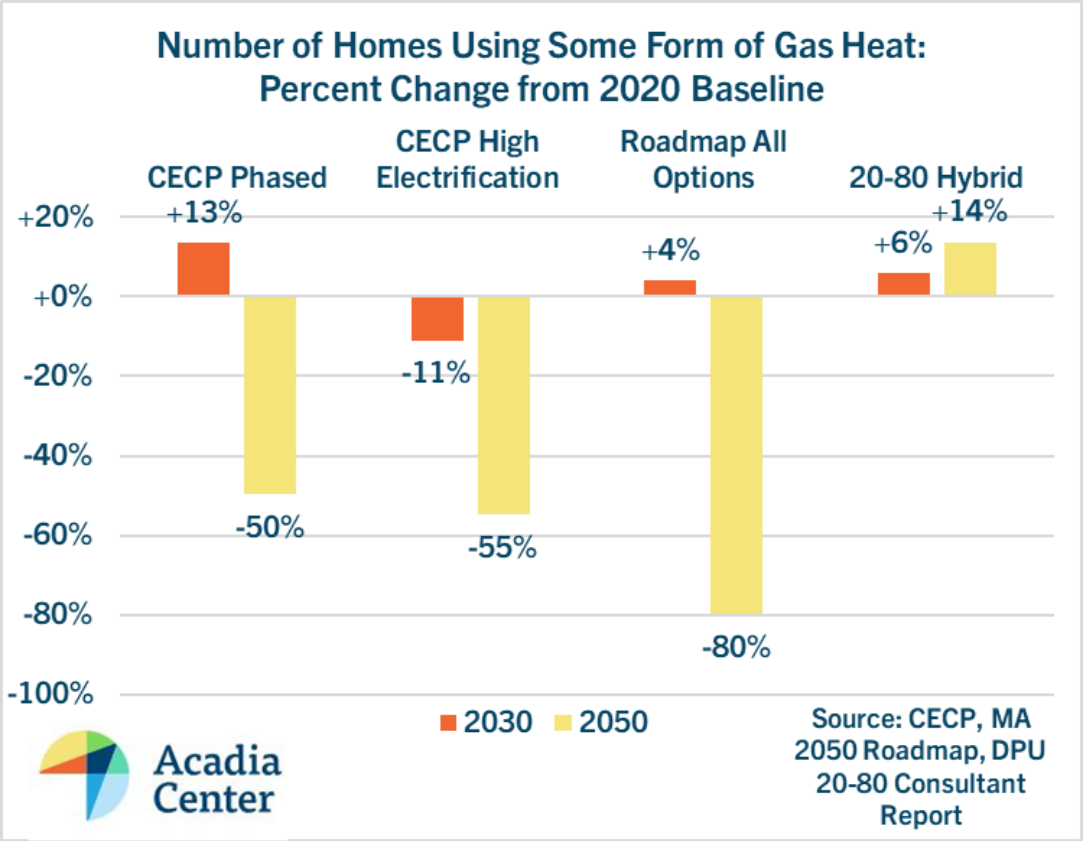
Wide-Scale Electrification of Buildings, But No Clear Plan for Decommissioning of the Gas System

The final CECP prescribes a radical transformation of the building sector, calling for wide-scale partial or total electrification of homes and casting doubt on the efficacy of so-called renewable natural gas or other "clean fuels." But it does not explicitly address EEA's vision for the future of the gas system, seemingly deferring to D.P.U. Docket 20-80, also known as the Future of Gas's evaluation of "the role of Massachusetts gas local distribution companies in helping the Commonwealth to achieve its 2050 climate goals." It is likely that the DPU 20-80 investigation will end with a number of recommendations from the DPU concerning electrification, biofuels, and other decarbonization pathways. The decisions in DPU 20-80 should be based upon the final CECP, but because EEA has largely abstained from taking a position on whether decommissioning of the gas distribution system will be necessary to achieve climate goals, the opportunity to influence this docket was missed.

The CECP instead makes inconclusive statements like, "Although Docket 20-80 has not yet been finalized, targeted decommissioning of the gas distribution system may be necessary to support a just and equitable transition toward electrified heating".[11] There are, for example, no metrics in the CECP regarding miles of gas distribution pipes decommissioned. One reason for this could be that that, despite the elevated rhetoric of the need for wide-scale electrification throughout the CECP, the Phased Scenario and High Electrification Scenario offer two very different alternatives for the near-term future of the gas system. **The Phased Scenario envisions the number of homes relying on some level of natural gas heating *increasing* 13% by 2030 compared to 2020 levels, while the High Electrification Scenario envisions the number of homes relying on some level of gas heating *decreasing* about 11% by 2030 compared to 2020 levels.[12]**

[11] CECP for 2025 and 2030, page 78

[12] See Figure A.6 on page 13 of CECP Appendix A: Technical Pathways Modeling. Note: Percentages estimated by Acadia Center measuring graph in CECP. Exact numbers not provided in CECP.



Post-2030 Building Electrification Less Aggressive Than Recommended in the 2050 Roadmap

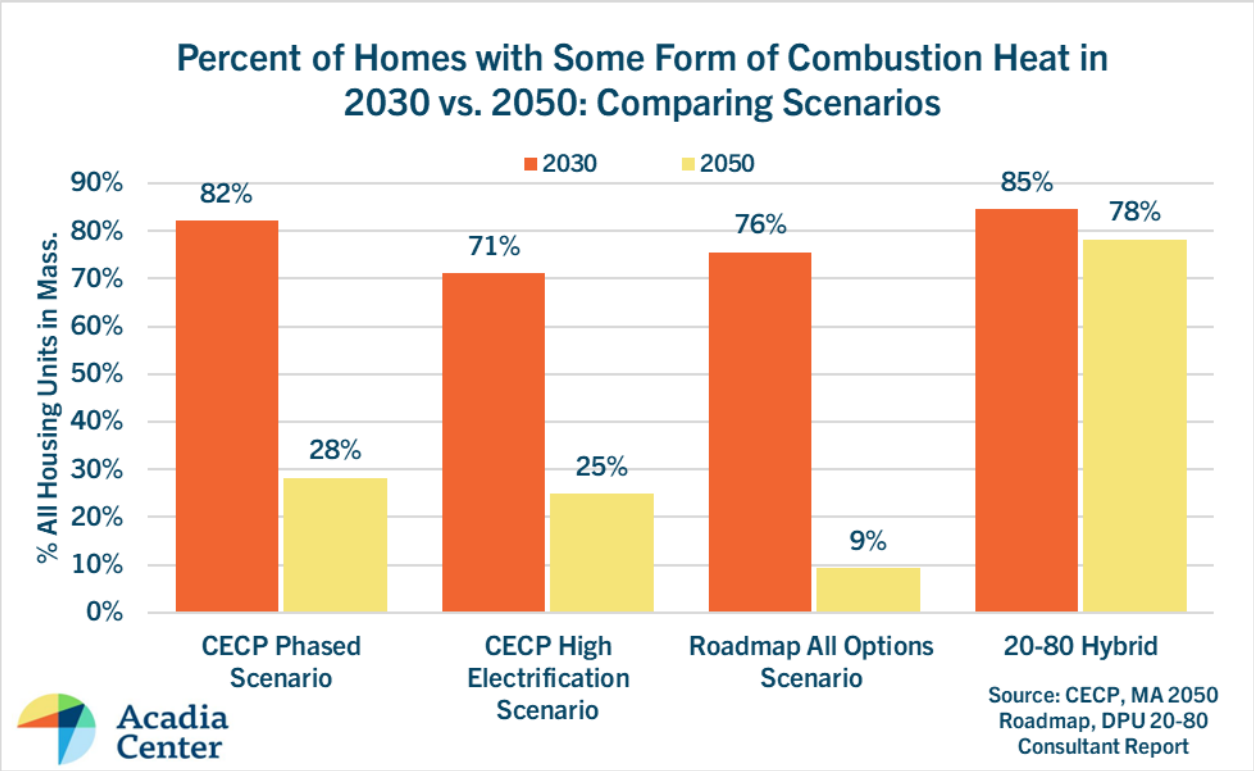
Although the primary focus of the CECP is not 2050, the scenarios analyzed in the CECP extend to 2050 and the report compares costs between scenarios by looking at net costs of each scenario through 2050. This is notable because the vision for the gas system in 2050, both in the CECP's Phased and High Electrification scenarios, is wildly different than what the Roadmap's All Options Scenario envisioned, as demonstrated in the figure above. **The Phased Scenario envisions the number of homes relying on the gas system for heating decreasing 50% by 2050 compared to 2020 levels, while the High Electrification Scenario envisions a 55% decrease by 2050.[13] Both scenarios are much less aggressive than the Roadmap's All Options Scenario which envisions an 80% decrease by 2050 in the number of homes relying on the gas system for heating.** However, as demonstrated above, both CECP scenarios and the Roadmap scenario are much more aggressive than the "Hybrid Electrification" Scenario, praised in the D.P.U. 20-80 Future of Gas Report as the most cost-effective decarbonization scenario, which envisions a 14% increase by 2050 in the number of residential customers reliant on the gas system for heating.

According to the CECP: "After 2030, the Phased scenario emphasizes the continued deployment of whole-home heat pumps alongside the conversion of all partial systems to fully electric buildings…".[14] However, the actual data in the CECP paints a very different picture. In both the Phased and High Electrification Scenarios, for

[13] See Figure A.6 on page 13 of CECP Appendix A: Technical Pathways Modeling. Note: Percentages estimated by Acadia Center measuring graph in CECP. Exact numbers not provided in CECP.

[14] CECP, page 26

example, hybrid heating systems still represent about 16% of *new residential heating systems sold* in 2050 and about 28% of homes in 2050 still rely on combustion of some fuel for heating. In the Phased Scenario, about 46% of homes combusting fuels for space heating in 2050 have no electric heat at all.[15] In contrast, the Roadmap's All Options Scenario envisioned that only about 9% of homes would still be combusting fuels for heating in 2050.[16] Again, both CECP scenarios and the Roadmap scenario demonstrate much less reliance on combustion for home heating in 2050 than the Future of Gas Hybrid Electrification Scenario, which envision about 78% of home still combusting fuels for heating in 2050.



Ambitious Electric Vehicle Deployment Targets Need to be Matched by Ambitious EV Charging Deployment Plans

The final CECP, paired with the current version of the draft net zero Stretch Code, will require new 1-4 unit homes with off-street parking to provide at least 1 EV-ready parking space, and at least 10% of parking spaces in large apartment buildings and new commercial parking lots to be EV-ready.[17] These figures fall far short of what will be necessary as Massachusetts decarbonizes.

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[15] See Figure A.6 on page 13 of CECP Appendix A: Technical Pathways Modeling. Note: Percentages estimated by Acadia Center measuring graph in CECP. Exact numbers not provided in CECP.

[16] See Figure 3 on page 12 of Buildings Sector Report: A Technical Report of the Massachusetts 2040 Decarbonization Roadmap Study

[17] Compared to the Stretch Code Straw Proposal released in March of 2022, the updated draft code language for the Stretch Code released in late June 2022 appears to have increased the required percent of parking spaces built pre-wired for EV charging from 10% to 20% for low-rise residential, high-rise residential, and office buildings. While this is a step in the right direction that Acadia Center applauds, more aggressive charging requirements in new construction are still needed.

The official transportation sector metrics in the CECP call for the percent of total light-duty vehicles made up by EVs to skyrocket from 4.3% in 2025 to 19.2% in 2030, and this staggering rate of EV adoption is expected to continue into the 2030s.[18] It's widely understood that it's significantly more cost effective to integrate EV charging into new construction, opposed to ripping up existing parking lots to install charging infrastructure. Additionally, having access to EV charging at home is one of the key variables dictating how amenable consumers are to buying or leasing an EV. Requiring only 10% of parking spaces in large apartment buildings to be EV-ready is off by orders of magnitude and will slow adoption of EVs among renters, as Acadia Center described in more detail in our comments on the Massachusetts Stretch Code Straw Proposal.

EOEEA even appears to acknowledge that these new construction EV charging requirements will fall short, stating that it "*anticipates that the private sector will continue to install charging infrastructure and respond to consumer demand following this first phase of deployment.*" The point of the CECP, however, is for EOEEA to fill in gaps from regulations and anticipate the projected rapid shift in EV adoption – not leave it to the building developers. The CECP is also nearly completely silent on what role the state will play in expanding EV charging in existing apartment buildings, a critical piece of the EV adoption puzzle.

Widespread deployment of direct current fast charging (DCFC) infrastructure along key transportation corridors will also be critically important for supporting the level of EV adoption the CECP anticipates. However, the CECP leaves out details on the scale of fast charging needed and how that scale will be achieved. The plan includes a target of 75,000 public charging stations installed by 2030, which will presumably be some mix of fast chargers and slower chargers, but it doesn't include any specific metrics around fast charging deployment. How many of those 75,000 public chargers will be fast chargers? The CECP leaves this question completely unanswered.

Slower, public charging stations in locations like groceries stores are a "nice to have", but fast chargers along key transportation corridors are the infrastructure desperately needed to support widespread EV adoption. The CECP mentions $60 million in funding to support deployment of fast charging provided by the federal Infrastructure and Investment and Jobs Act (IIJA), but does not provide information on whether that is enough to support nearly 20% of cars in the Commonwealth being EVs in 2030.

The CECP mentions that Massachusetts "encourages private sector investments in fast charging infrastructure to support electrification of private vehicles."[19] The EOEEA needs to take a firmer hand on driving EV charging infrastructure. The Commonwealth needs a comprehensive, data-based electric vehicle infrastructure plan to determine precisely how the state can best support the tremendous level of fast charging infrastructure that will be required as EV adoption rapidly scales over the coming decade.

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[18] See Figure A.8 on page 15 of Appendix A: Technical Pathways Modeling and Table E.2 on page 158 of Appendix E: CECP Benchmarks and Metrics.

[19] CECP, page 43