

## **Strawman Proposal Comments**

3/18/2022

I'd like to thank DOER staff for for considerable time and effort they have put into this [Strawman Proposal](#), and for the opportunity to comment.

### **Allow towns to 'Opt in' to Passive House Certification for large Multifamily**

#### **Let's be sure this remains in the final code !**

On slide 42 of the Specialized Opt-In Code Commercial I strongly support Passive House Certification, the only building energy standard designed specifically to address Climate Change, as the only path to which cities and towns can 'Opt-into' for larger multifamily buildings. This because, as you note on slide 46, many dozens of Passive House Multifamily buildings actually constructed in PA have an average first cost lower than building code, and in addition, deliver greatly reduced energy consumption, and greatly improved Indoor Air Quality, Thermal Comfort and 'passive survivability' in the event of a grid failure, or the need to modify the grid load due to a reduction in renewable energy generation, for example, by Offshore Wind, and for peak load mitigation, e.g. PV doesn't produce at night when the new 'winter peak electricity demand' will eventually occur. Give cities and towns 'freedom of choice' to simply do that which makes sense, and provides enhanced compatibility with the renewable energy grid of the future.

### **Allow cities and towns to 'Opt in' to All Electric homes**

Give cities and towns 'freedom of choice' to make the commitment that all new homes are all electric, the demand for this option is obvious from the public hearings.

### **Existing Home Retrofit - Market Transformation Requires Market Education and Engagement**

To be able to deliver an average of 100,000 homes per year transitioned to electric heating with improved thermal enclosures for peak grid load mitigation, there must be a massive public engagement, education and support program to make 100,000 sales to actually do this work each year. Nothing like this exists, moreover, we keep adding to the number of homes requiring retrofit with each new home that uses fossil fuel heating, or which has a 'business as usual' code minimum, thermal enclosure.

To avoid mandates that will be very unpopular, as well as incentives that are higher than we would otherwise need, we can instead educate the public on the need for, and advantages of, electrification of new homes constructed with improved thermal enclosures to reduce the number of new homes that add to the problem, rather than to the solution. Let's make a 'graceful transition to all electric buildings. Safety, Indoor Air Quality and the accompanying health benefits of non-fossil fuel buildings should be emphasized.

There exists no widely known program to do this, nor am I aware of any such plan, so DOER should take the lead.

We need a credible, statewide public outreach, education and engagement campaign that reaches every citizen in the Commonwealth to achieve a shared understanding and agreement on what must be done before we can realistically expect implementation at scale. The COVID vaccination publicity is an example of the magnitude and ‘market penetration’ of the initial outreach that should be undertaken immediately. That should have been undertaken when the GWSA Implementation Advisory Committee’s Buildings Working Group published [their October 23, 2018 Recommendations](#), in particular see the last paragraph on the first page.

I see this as **the single most challenging aspect of the current approach to GHG mitigation** in the state, for a number of reasons, but foremost is the number of ‘customer interactions’ necessary to make this many sales of ‘2050 Compatibility retrofit’ in an incredibly short period of time. Picking the ‘low hanging GHG reduction fruit can result in problems that are too challenging to solve in the remaining time. I believe the Commonwealth will not meet the 2025 and 2030 GHG mandates without addressing this issue.

### **New Home Market Transformation Requires Market Education and Engagement**

Large numbers of homes in Mass are constructed, not for a specific individual, but are ‘speculative,’ that is, they are constructed for a market demanding those attributes of a home. If a broad based program to engage the public and obtain ‘buy-in’ for homes with electric space heat does not happen, those purchasing new homes will not ask for electrically heated homes, and so will continue to drive market demand for fossil fuel heated homes, which builders will construct, in order to make a profit.

Sec. Theoharides and Gov. Baker could break this cycle by making clear public statements that ‘homes with electric heating are the way Mass plans to address the climate change issue in buildings.’ That has not happened, nor am I aware of any plan to do so.

We need strong building codes, but even more we need the public to understand why we need strong building codes or there will be much greater resistance to change. We need strong, forward looking leadership.

### **A ‘2050 Compatible’ Renovation Building Code**

To be able to deliver an average of 100,000 homes per year transitioned to electric heating with improved thermal enclosures as stipulated in the Interim 2030 CECP, we need to capture all opportunities in the periodic improvements and maintenance of a building’s lifecycle to add improvements when it costs the least to add them – during work done for other reasons. Each lost opportunity will likely be lost for decades, we’ve no time to waste.

This ‘retrofit building code’ should *not* be just for major renovations.

We need to actually implement, not just talk about, the ‘no regrets’ actions stipulated in the 2050 Roadmap (see pg 14). For example, when siding is removed and replaced, an excellent

opportunity exists to add both an air barrier and external insulation, both of which can save a substantial amount of space heating energy. During regular window replacement, for a small incremental cost, triple glazed window can be used which both save energy and add substantially to occupant comfort. When a renovation is done to a building, there are often numerous opportunities to improve the thermal enclosure and/or mechanical systems.

When a heating or cooling system is added to a building it can often be a heat pump rather than a fossil fuel or an air conditioning only system. With current MassSave heat pump incentives, this may be at zero additional cost. Still, Air Conditioning only installations persist 'in the real world.' There are other examples, the point is that whenever a building permit is taken, there is an opportunity for a lower cost intervention while that work is being done to improve the energy efficiency that results from the work. Let's use the code to leverage these opportunities to help achieve our GHG mandates.

We need a practical, enforced code to minimize to the extent possible the 'emergency' replacement of fossil fuel heating systems with fossil fuels, which could use equipment age to trigger proactive electrification planning or action, or a requirement to install some ASHP capacity to displace some of the fossil fuel heating immediately, and making this ASHP have a lower operating cost so it is used by homeowners to minimize their energy bills when they 'do the right thing,' while making friends with their ASHP.

It's long past time to start 'walking the talk.' See this from 2050 Roadmap pg. 52: "Transitioning from fossil fuel equipment to an electric system is most cost-effective at the time of initial installation or replacement." Let's put that in the building code for both new and existing homes.

DOER should coordinate the implementation details of a new **Renovation Building Code** with the GWSA Implementation Advisory Committee / Final 2025, 2030 CECP to insure the state achieves the legally mandated GHG reduction commitments. I do not see how it can possibly reach our goals otherwise.

### **What do we really mean by - or want from - Zero Net Energy ?**

In the March 3, 2022 and subsequent Strawman public hearings there were many calls for a Zero Net Energy building code, but it was apparent there is not a clear, shared definition of Zero Net Energy. Perhaps most importantly, conventional 'business as usual' builders have little to no familiarity about how to go about designing and constructing such a building.

I see the phrase 'Zero Net Energy' as the language people use to ask for a building they think is 'good enough' to be part of the solution, rather than part of the problem, as '2050 Compatible.'

However there is no clear method, process or organization supporting the design, construction and verification of 'zero net energy' homes – 'zero net energy' is a vague concept, not a concrete process or standard. There are no organizations providing training on how to design,

construct and verify net zero energy homes in an integrated, practical, standards-based process.

The majority of today's Business As Usual builders have no background, expertise or support structures to help them realize Zero Net Energy homes. This could be a 'show stopper' problem.

We are very fortunate to have a local, tried and true solution: We have in Passive House Massachusetts a group of time tested, experienced practitioners who are working on state of the art new construction and retrofits of existing buildings to the Passive House standard. These talented and highly motivated individuals have the expertise and experience to do the job. To make a truly Zero Net Energy single family home, all that is needed is to design and build a Certified Passive House, then add a modest amount of rooftop PV to generate all the energy the home needed on annual basis. Done.

PH Mass comprehends the 'whole system implications' and [provides the way forward to Zero Net Energy at scale](#). Passive House is THE 'platform' to use to realize Zero Net Energy delivered performance. [Passive House Institute US – PHIUS](#) – has a complete and multifaceted program leveraging state of the art design tools, training programs for Certified Passive House Consultants, Builders and Verifiers, as well as design review and building certification services that leverage the US DOE ENERGY STAR and Zero Energy Ready programs as well as EPA Indoor Air Quality Plus programs to create safe, comfortable, durable homes with superior Indoor Air Quality. Certified Passive House are the new homes we *should* be building, and PHIUS is also developing programs like [REVIVE](#) for realizing deep energy reductions in existing buildings, as well as considering the all important topic of embodied carbon, so we do not do 'more harm than good' in our transition to a much improved built environment.

The Passive House approach will also help when we eventually get to the 'winter peak load' problem which will be exacerbated by the fact it occurs when PV is not producing – if we do not reduce hourly peak load, as well as annual demand, we will be spending huge sums for peaking power, batteries and other energy storage mechanisms, rather than doing the intelligent thing and minimizing the peak load, and providing the possibility of 'demand shifting' via Passive House Quality Thermal Enclosures.

### **The Critical Importance of New Construction Thermal Enclosure Quality**

For larger multi-family buildings, Passive House certification is a 'no brainer' as DOER has noted in the 'Opt-in' proposal with their cost data from PA

For single family homes, if Passive House certification is too much of a stretch for this code cycle (but hopefully not for the next !), let's not rely solely on the HERS system, which, while excellent for Quality Assurance, has a serious shortcoming due to the fact it allows 'trade-offs' between mechanical systems and Thermal Enclosure quality that are no longer appropriate for our ambitions.

The Thermal Enclosure is the most long lived and expensive component to improve after initial construction, and therefore the most important to 'get right' at initial construction. Let's end the era of making excessively 'leaky buckets' into which we pour expensive heating energy year after year. Let's fix most of those 'tall poles in the tent' with low cost, easy to implement 'guardrails.'

So I recommend 'backstopping' a HERS 42 maximum threshold for all single family homes with some prescriptive requirements: a minimum of R30 walls, R49 roof, R5 windows and 1.5 ACH@50 Pa airtightness (decreasing to 1.0 ACH@50 Pa during the next code cycle, as air barrier design and implementation expertise is gained) to be sure we 'get the Thermal Enclosure right the first time', so retrofit is unnecessary down the road. This stipulation, along with all electric space and water heating, should be available to "Opt-in" by the cities and towns who wish it, and should be not optional in the next code cycle.

### **Facilitate an easy upgrade path from Fossil Fuel Heating to ASHP Heating**

If for some reason I don't understand, fossil fuels for heating become possible in the final version of the code, it must be clear that 'wiring for electrification' **is insufficient** to provide an easy conversion path to heat pumps later on.

There are a number of reasons for this, but at least we must at a minimum clearly stipulate in the code that any ducts used for space conditioning must be sized, not just for fossil fuel heating which provides higher temperature air, but for the much lower temperature air provided by current Air Source Heat Pump technology to provide an easy upgrade path from fossil fuels to ASHP that does not involve ripping up drywall to replace inadequately sized ducts, at a considerable expense and inconvenience.

### **New - and eventually Retrofit – Construction Embodied Emissions Accounting**

We need to immediately start down the road of learning about Embodied Emissions accounting and the design implications of considering this new variable. Embodied Emissions are generated as a result of producing something. We must first learn how to use a simple accounting method, and with that experience in hand, to regulate Embodied Emissions in the next code cycle.

We should require Embodied Emissions accounting without any specified limit in this code cycle using a simplified mechanism such as a spreadsheet to introduce the concept.

In the next code cycle, the experience gained from this accounting exercise should be used to set a cap on embodied emissions for enforcement. Note that the Stretch Code in effect in 299 cities and towns in Mass uses the HERS rating system, and the Northeast HERS Alliance recently advanced a proposal to use the HERS Index energy model which has already been created for Stretch Code compliance to generate a HERS Index as a mechanism to generate an embodied emissions accounting for the home - so we are close to having that 'turnkey' capability available, greatly simplifying implementation. DOER should issue a simple spreadsheet with GHG emissions per unit volume, area or weight as appropriate of each common building

material or component, e.g. concrete, wood, windows (by area) etc. ASHP (machine & refrigerant separately) so everyone is using the same CO2 emissions factor in their calculations, for fair comparisons and eventual implementation as a code requirement the next code cycle. It doesn't have to be 'perfect,' just good enough to facilitate learning.

I'd like to thank the hard working staff of DOER for all of their efforts on the new Stretch Code, I realize the challenges of trying to make up for much lost time and opportunity over the previous years, and the political challenges that lie ahead.

But we are almost out of time, so we must act now.

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