21 Commerce Drive, Suite 202, Cranford, N J 07016
973-467-1400 www.fmanj.org

Fuel Merchants Association of New Jersey

Testimony of:
Eric DeGesero, Executive Vice President
Fuel Merchants Association of New Jersey
Draft New Jersey Energy Master Plan
September 12, 2019
edegesero@fmanj.org

The Fuel Merchants Association of New Jersey (FMA) represents distributors of heating oil, gasoline and diesel fuel. The overwhelming majority of our heating oil distributors are also licensed HVACR contractors.

FMA is opposed to the draft Energy Master Plan (EMP). Our opposition likely comes as no surprise, given that this draft EMP calls for the total elimination of delivered fuels. But advocating the demise of our industry is not even the primary reason for our opposition. More fundamentally, we object to the lazy assumptions that underly this report: the reliance on labels over data; the failure to even attempt a serious calculation of the cost of this report's proposals; the failure to account for existing constraints.

A glib "it costs what it costs" is not serious policy making, but captures the rigor of a report which:

1. Fails to consider fuel alternatives that could *achieve the EMP goals at a lower cost* to homeowners, such as alternative liquid heating fuels – some of which are currently available, and more are under development.
2. Fails to make a serious accounting of the extraordinary cost of converting the existing fossil fuel heated buildings heating oil, natural gas, and propane - 87% of the state's housing stock to electric heat and electric hot water.
3. Fails to recognize the practical limitations of the proposed technologies: the unsuitability of electric heat for the cold of New Jersey's winters, and the shortcomings of electric vehicles.

The heating oil industry has always been a strong advocate for improving energy efficiency. In the 1970s the average home consumed about 1,500 gallons of heating oil. Today that average is under 800 gallons. As my colleague, Rich Sweetser, has explained, our industry has the ability to meet the EMP objective of a net zero carbon liquid fuel. So in the interest of brevity, I echo all of his testimony.

I am not concerned with which type of fossil fuel is used to heat an existing home – heating oil, propane, or natural gas. Though I take exception to the suggestion that heating oil is among the "most polluting" (page 71) – a comment which reveals a 1970s-era understanding of our product. Today's heating oil is on par with natural gas in all criteria pollutant emissions categories.

Rather, my focus is on the *heating systems* of our existing housing stock. While the ostensible goal of the EMP is simply to meet "*Governor Murphy's goal of 100% clean energy by 2050 and the Global*

Warming Response Act (GWRA) state greenhouse gas emissions reductions of 80% below 2006," (p.9) a closer reading of the report reveals a far more intrusive objective. In fact, this draft EMP proposes to electrify the space and water heating systems in every building in the state.

I will set aside the significant challenges of commercial building compliance and focus just on detached single- and two-family homes.

According to the U.S Census Bureau's American Community Survey 2013-2017 5-year estimate [1]

- There are approximately 3.2 million housing units in New Jersey.
- Of the 3.2 million housing units, 2 million - or 64% - are owner occupied.
- 68% of New Jersey's housing was built prior to 1980.

INSTALLATION COST OF ELECTRIC HEAT

The draft EMP's key economic metric to justify transitioning NJ homes to electric heating is the low cost for the homeowner to make this transition: "*…the most significant expenditures will be the one-time capital cost of installing the electric heating system, which costs an average of $4,000-$7,000 for a typical residence.*" (p.71)

The source for these installed-cost estimates is a July 2018 American Council for an Energy Efficient Economy (ACEEE) Study: "*These cost estimates assume that a house has adequate electric service to install a heat pump. For houses that have central air-conditioning, this will generally be the case. But for some old houses without central air-conditioning, upgrading the electric service will be needed. For cold-climate ducted heat pumps, we estimated installed costs at 30% more than a SEER 16 ducted heat pump, based on a suggestion from a major manufacturer that plans to soon introduce a ducted cold-climate heat pump to the US market. For ductless heat pumps, costs come from an ACEEE analysis of a Massachusetts database of installed costs for this equipment. We looked at homes installing <u>two or more multi-head heat pumps</u>, finding an average cost of $7,065 per heat pump. The sample size was 496 homes, nearly all of <u>which purchased two multi-head heat pumps</u> (just six homes installed three).*[2]"

Recent consumer experiences from Massachusetts underscore the costs and constraints of electric systems in cold climates. A Massachusetts liquid fuel dealer recounted:
"I had a customer who was talked into a Mitsubishi Heat Pump system a few years back by Next Step Living. Cost of installation was $16,500 for a small ranch. An oil furnace might have been $6,000 tops. His fuel bill there was under $800/year with oil and the existing furnace. His electric bill the first month with the heat pump increased over $175 month-on-month and he still had to run the oil furnace to handle the peak load because the Mitsubishi mini splits <u>didn't have supply in every room</u>. How do you sell a conversion that costs that much more to install and operate?"

Some NJ homes have central air conditioning and may have adequate electric service. But many do not, and will require an additional $2,000 to $5,000 of work – expenses which are not included in the draft EMP cost estimate for electric service upgrade, new breakers, wiring and disconnects.

[1] https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml
[2] https://aceee.org/research-report/a1803

Additionally, the alleged $7,000 ceiling for the "*one-time installation cost*" is based on a study of addon heat pumps with two heads. Two heads can supply heat to largely two rooms and, in some cases, with additional air distribution an additional adjacent room. But this is hardly adequate for NJ homes.

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Note: *The below electric heat installation cost assumptions do not take into account the replacement of the existing fossil fueled furnace/boiler with a new high efficiency fossil fueled furnace/boiler at a cost of $5,000 to $10,000. The net additional cost above replacement cost that the EMP imposes on the 87% of New Jerseyans who heat with fossil fuels can be found at the end of this document.*

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INSTALLATION COST OF ELECTRIC HEAT - Furnace to air-to-air heat pump

Looking at actual installations for multi split heat pumps applied to oil heated homes with a furnace we find heating cost between $13,500 and $19,000. The draft EMP's express intention is to eliminate fossil fuels, including as backup for heat and domestic hot water heat as well. So, for small homes this means:

Installed Costs	Small Home and Low-Income Row House	Large Home
Heating System	$13,500 – $19,000	$20,000 - $26,000
Potential Electric Upgrade	$2,000 – 3,000	$3,000 – $5,000
HP Water Heater	$3,000 - $4,000	$3,000 - $4,000
Total	$18,500 - $26,000	$26,000 - $35,000

This brings the true "*the one-time capital cost of installing the electric heating system*" to approximately $16,500 to $35,000 per existing home, provided that it already has a furnace. The cost of back up heat will be discussed later.

The authors of the draft EMP are not only wrong about the average cost for the installation of electric heat in a home with a furnace. They also reveal a dramatic ignorance regarding the significance of New Jersey's prevalent boiler systems.

INSTALLATION COST OF ELECTRIC HEAT - Boiler to air-to-water heat pump

According to the American Housing Survey[3] boilers make up 9% of heating systems nationwide. In Northern New Jersey boilers make up 43% of all heating systems and in the Philadelphia MSA (including all of South Jersey) boilers make up 23% of all heating systems.

The installation of a heat pump in a home with a boiler is significantly more complex and expensive than the installation of a heat pump in a home with a furnace. And if the home has a steam boiler, as opposed to a hydronic (base board hot water) boiler, the installation of a heat pump is even more complex and expensive.

[3] https://www.census.gov/programs-surveys/ahs/data/interactive/ahstablecreator.html#?s_areas=a00000&s_year=n2017&s_tableName=Table1&s_byGroup1=a1&s_byGroup2=a1&s_filterGroup1=t1&s_filterGroup2=g1&s_show=S

The most obvious difference between a home with a furnace and one with a boiler is that a furnace by definition has duct work, a home with a boiler might not. In New Jersey 93% of homes use air conditioning, but of that total, only 63%, use central air conditioning.[4]

So how do you use electric heat in a home with a boiler?

If the house has existing air conditioning duct work, you could install an air to air heat pump for the $16,500 to $35,000 estimated above. But to that you would need to add the cost of draining and removing the existing boiler and the existing baseboard radiators which will cost another $4,000.

However, if you have a boiler you may likely prefer the comfort of the radiant heating a boiler provides as opposed to the *hot, warm, cool, cold, repeat*, cycle of forced hot air. In that case, you could install an air to water heat pump. However, you will not be warm when it's cold.

Existing hydronic boilers heat water to 180 °F, regardless of ambient conditions, and circulate it through baseboards which radiate the heat into the room providing comfort. An air to water heat pump can heat water to 140 °F at 47° F ambient air temperature and circulate it through baseboards which radiate the heat into the room providing comfort by running a lot longer that the hydronic boiler with 180° F hot water. The problem is 140° F water may be acceptable to maintain your thermostat's desired setting on early November day, but will not keep you warm at night in the middle of January when the ambient temperature has dropped to near 0° F. The only solution is to provide more heat transfer service in the home, either by adding additional radiant heating devices to each room, adding new hydronic fan coil units to blow heat into the rooms or adding a fan coil unit in an attic and or basement to duct additional heated air into the rooms. Any of these solutions, of course, add significant additional cost to the project.

Installed Costs	Small Home and Low-Income Row House	Large Home
Heating System	$13,500 – $19,000	$20,000 - $26000
Potential Electric Upgrade	$2,000 – 3,000	$3,000 – $5,000
HP Water Heater	$3,000 - $4,000	$3,000 - $4,000
Additional Radiant Heating Surface Area for 140 °F Hot Water	$3,000 - $5,000	$4,000 - $6,000
Total	$21,500 - $31,000	$30,000 - $41,000

This brings the true "*the one-time capital cost of installing the electric heating system*" to approximately $21,500 to $41,000 per existing home that has a hydronic boiler plus the cost of adding necessary additional hydronic piping. The cost of back up heat will be discussed later.

INSTALLATION COST OF ELECTRIC HEAT - Steam Boilers

New Jersey not only has far more boilers than the national average, many of these boilers are *steam* boilers, especially in the five large Northeastern counties of Bergen, Passaic, Essex, Union, and Hudson.

[4] https://www.eia.gov/consumption/residential/reports/2009/state_briefs/pdf/nj.pdf

The laws of thermodynamics prevent residential electric heat pumps from creating steam at 212 °F which rises to a cast iron radiator to provide heat for each room. Once the steam cools and condenses back to liquid it returns to the boiler as water. Since the steam supply pipe and the condensate return pipe are different sizes, an air to water heat pump cannot work. So, to keep a backup boiler system to supplement the heat pump during the winter, that steam boiler must be converted to a hydronic boiler. Walls must be ripped open, pipping changed out, drywall patched, and the walls repainted.

If the boiler is simply removed, and the house converted to heat pump as the sole heating source, homes likely will require additional insulation, in order to account for the dramatically reduced heat output from the heat pump. Of course, many of these older homes will have lead paint under many coats of paint that will needlessly need to be disturbed, creating unnecessary risk and expense. Additionally, if the home is an older home and does not have central air conditioning, it may only have a 100-amp service which will need to be upgraded to a 200-amp service, at a cost of approximately $3,500. Additionally, row houses, which are common in many of the urban areas in these five northeastern counties, entail additional costs and limitations for the installation of a heat pump.

Electrification of the heating system will also necessitate a new water heater. The installation of an otherwise-unnecessary heat-pump water heater is an additional $3,000 to $4,000 dollars, almost doubling the "one time cost estimate" for every home that currently makes its domestic hot water from a fossil fueled boiler, and adding an additional $1,500-$2,000 for those replacing an electric water heater.

Installed Costs	Small Home and Low-Income Row House	Large Home
Heating System	$13,500 – $19,000	$20,000 - $26000
Potential Electric Upgrade	$2,000 – $3,000	$3,000 – $5,000
HP Water Heater	$3,000 - $4,000	$3,000 - $4,000
Conversion to hydronic system	$4,000 - $6,000	$5,000 - $7,000
Total	$22,500 - $32,000	$31,000 - $42,000

This brings the true "*the one-time capital cost of installing the electric heating system*" to approximately $22,500 to $42,000 per existing home that has a hydronic boiler, plus the cost of adding necessary additional hydronic piping.

The draft EMP fails to even approach a serious effort to estimate the true cost to install an electric heating system. The least complicated electric heating system is off by a factor of three to six; more complicated scenarios are off by a factor of four to ten. An additional $10,000 *at a minimum* would be required to comply with the EMP proposal. All together, **"*the one-time capital cost of installing the electric heating system*" is not $4,000-$7,000 but $16,500-$42,000.**

INSTALLATION COST - Electric Heat - Back-Up Heat

Now let's discuss backup heat. The ACEEE Study's 496 homes - the source for the draft EMP flawed cost estimate – presumed **that homes' existing heating systems would remain available for supplemental heat on the coldest days,** as most electric heat pumps in NJ will require some form of back-up heat. The draft EMP does not deal expressly address the question of back-up heat, but implies that electric resistance heating can fill this need. Although cheap to install, electric resistance heat is

among the most expensive ways of heating a space. Utility bills will be higher than projected, imposing economic hardship for those who can least afford it.

INSTALLATION - Electric Heat

The draft EMP sets a goal of completely retrofitting every building in the state to electric heat for conditioned space and water, in the next 30 years. Setting aside the implications for commercial buildings, simply as applied to housing stock, such a timeline is breathtakingly ambitious.

Consider the experience in New Jersey with homeowner energy efficiency programs. The Home Performance with Energy Star (HPwES) is the NJ Clean Energy Program's current whole house retrofit offering. It provides incentives for homeowners to install high efficiency HVAC systems and water heaters, as well as air sealing and insulation, as needed.

There are multiple tiers of financing available, but the most ambitious offers homeowners a $4,000 rebate and a $10,000 loan at 0% with a 7-year maximum term (3-year <$5,000) or 0.99% financing with a 9-year maximum term up to $15,000.[5]

Since 2010, HPwES has completed just under 34,000 jobs, or about 1% of all residential dwellings in the state.[6] At this rate, the ambitious task delineated in the draft EMP might be completed in 1,000 years. But it would likely take longer, as the existing program covers only replacement of existing HVAC and water heating systems and additional air sealing and insulation. The more expansive construction projects, while not *accounted for* in the draft EMP, but *necessary* to the implantation of EMP objectives, would require significantly more work.

We do not know how much ratepayers paid for the 34,000 jobs that were completed over the past nine years. But it will pale in comparison to the cost imposed ratepayers for the 3.2million jobs that are called for in the draft EMP.

OPERATIONAL COST - Electric Heat

The comments to this point address the failure of the draft EMP to make a serious attempt to calculate the true cost of the ***installation*** of electric heat. But this proposal also fails to apply rigorous analysis to the ***operational*** costs of electric heat. The increased operational costs will be on top of the high rates already paid by New Jersey's residential electric rate payers. New Jerseyans currently pay the 10th highest residential prices in the country[7].

Among the questions that remain unanswered:

- How much of the cost of complying with the draft EMP will come from investor owned utility *shareholders'* equity as opposed to investor owned utility *ratepayers'* equity?
- What will be the cost per kWh for all ratepayers to comply with the draft EMP?

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[5] http://www.njcleanenergy.com/residential/programs/home-performance-energy-star/benefits-and-incentives

[6] http://www.njcleanenergy.com/residential/tools-and resources/tradeally/search_results/?company=&city=&state=&zip=&county=&types_business=57&conduct_business=0&services=0&electric_services=&gas_services=&zipradius=08625&radius=100&types_business=57&ziptypes_business=57&sret=&srem=&remi=&ret=&p4p_partner=&p4p_specialty=0&p4p_erpcount=&p4pq=&so=1&start=1 (last visited Sept. 2, 2019)

[7] https://www.eia.gov/electricity/state/

- With the increased demand on the system, what will be the cost per kWh to heat?
- What will be the cost for back up heat when it's too cold for the heat pump to maintain comfortable living temperature?
- What will be the kWh cost for peaking electric demand in the wintertime?

The draft EMP hints at even more new expenses that might be imposed on New Jersey residents, as a means of controlling consumer behavior. On page 63 we are told *"…such control should include new rate designs, such as Time of Use (TOU) rates to incentivize customers to reduce energy use during periods of peak energy use."* California currently imposes costs premiums of 60% for every kWh for peak periods.[8] If proponents of this plan intend to impose similar burdens here, when residents wish to heat our houses, cook our food, heat our water, and dry our clothes, then we deserve to know.[9]

ELECTRIC VEHICLES

FMA also opposes any ratepayer funded electric vehicle fund, such as the $300m program currently pending before the Legislature.[10] FMA believes that the investor-owned electric public utilities should not be given an unfair advantage in any buildout of the recharging system, nor should municipalities be able to require gas stations to have to get a variance if they want to install EV charging by stating that EV charging is not an accessory use for a gas station.

CONCLUSION

Freezing in the dark was not a viable energy policy in the 1970s. To now be bankrupted while freezing in the dark is scarcely an improvement.

Governor Murphy campaigned on energy efficiency, increased utilization of electric vehicles, and generating 100% of the state's electricity from sources other than fossil fuels.[11] He did not campaign on forcing residents to spend tens of thousands of dollars to redesign their homes, when they all they wanted was a new heater.

If the policy objective of the State of New Jersey is to radically and fundamentally transform how we live, then there should be a meaningful process whereby the input of those paying the bill will be considered prior to the *draft* EMP becoming the *adopted* EMP.

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[8] http://regarchive.sdge.com/tm2/pdf/ELEC_ELEC-SCHEDS_TOU-DR1.pdf
[9] https://www.sdge.com/whenmatters
[10] https://www.njleg.state.nj.us/2018/Bills/A5000/4634_I1.PDF
[11] https://www.murphy4nj.com/issue/environment/ (last visited September 4, 2019)

EMP's NET ADDITIONAL NEW COST FOR NEW JERSEYANS

Net additional new cost *per NJ home* imposed by NJ EMP for mandating electric heat and electric hot water and outlawing fossil fuels. Cost does not include upgrade of electric service. If electric service upgrade is needed, add $2,000-$5,000.

- Home with an existing furnace: Net additional $6,500 - $25,000 mandated by EMP.
- Home with an existing boiler: Net additional $11,500 - $32,000 mandated by EMP.