INSTITUTE FOR ENERGY AND ENVIRONMENTAL RESEARCH

6935 Laurel Avenue, Suite 201
Takoma Park, MD 20912
Phone: (301) 270-5500
FAX: (301) 270-3029
e-mail: info@ieer.org
http://www.ieer.org

Comments of the Institute for Energy and Environmental Research on the NYSERDA report "Renewable Heating and Cooling Policy Framework: Options to Advance Industry Growth and Markets in New York" (February 7, 2017)[1]

Arjun Makhijani, Ph.D.
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New York has taken a giant step towards a fully renewable energy system by addressing the issue of the use of fossil fuel use for space heating, and making heating and cooling renewable. This is perhaps the most neglected sector in terms of the requirements for a transition to an efficient and renewable energy system. The New York State Energy Research and Development Administration (NYSERDA) is to be congratulated not only for providing transitional rebates for geothermal heat pumps but even more for publishing the Renewable Heating and Cooling Policy Framework (hereafter referred to as "Framework").

IEER has studied the economics of conversion of residential heating and cooling in New York State to efficient electric systems.[2] We provide comments based on that research as well as more intensive research since 2012 that IEER has done on a roadmap for a renewable energy system in Maryland.[3]

1. **Key technologies at present**: We agree that cold climate heat pumps and geothermal heat pumps are the key technologies that will make heating and cooling much more efficient and also make heating and cooling renewable-grid-ready.
2. Policy Framework Pillars: The Framework proposes three pillars "(i) **reducing technology costs and lowering barriers"; "(ii) RH&C [Renewable Heating & Cooling] mandates**"; and "**(iii) incentives."** We agree that all three are critical to success. There should be even greater emphasis on training as part of lowering barriers when it comes to geothermal heating systems. NYSERDA might also consider making available design expertise for difficult situations, including those where space for ground loops is tight.

[1] NYSERDA 2017
[2] Makhijani 2017
[3] Various publications of the Renewable Maryland Project can be downloaded at http://ieer.org/projects/renewable-maryland/.

3. **Cost reduction - mandates**: Mandates will reduce cost by creating demand. New York should require all new state buildings (including university buildings) to be highly efficient and to use geothermal heat-pumps. It should also help local governments to do the same.
4. **Cost reduction – heat pumps**: At present the heat pumps associated with geothermal systems are typically significantly more expensive than cold climate heat pumps (apart from the ground loop cost). The likely cause is that the manufacture, supply, and installation of geothermal heat pumps is still an immature industry, largely because of the small number of total installations. Scaling up the industry should bring the cost of geothermal heat pumps to be about the same (or lower?) than high-end cold climate heat pumps. Special attention should be paid to this cost reduction aspect given its potential magnitude.
5. **Incentives – upfront rebates**: Since a principal barrier to adoption is the higher first cost of geothermal and, to a lesser extent, cold climate heat pumps. Incentives should therefore be geared to reducing first cost. Sustainable incentives should be estimated based on the social benefits created by the investment in efficient heat pumps. Among other things, efficient heat pumps reduce CO_2 emissions, methane emissions (when natural gas heating is replaced by efficient electric systems), as well as peak load. These benefits are spread out over the life of the equipment. The present value of these and other benefits (such as reduction of air pollution and related health costs achieved by reducing direct fossil fuel use for heating) should be estimated based on the life of the equipment. A cash rebate should be provided to reduce first cost. A cash rebate is much better than a tax credit for a number of reasons, including the fact that a variety of institutions such as schools, private non-profits, and governmental agencies can benefit from rebates. Tax credits force such institutions to share the benefits with third parties that are in it only for the financial gain. It lengthens the payback time and increases overall cost. Since climate disruption has the potential of truly disastrous consequences, a zero social discount rate (in constant dollars) for social benefits is appropriate and should be used.
6. **Thermal renewable energy credits (T-RECS)**: Allotting thermal renewable energy credits to heat pumps is an alternative method of estimating benefits and calculating rebates. We strongly recommend, if this approach is chosen, that the cumulative value of the T-RECS should be estimated and provided as a rebate. We strongly recommend against marketable T-RECS that would result in variable annual revenues. This approach would not address the first cost reduction unless the T-RECS are sold at a discount to a third party, reducing benefits to the owner. It also subjects the market for heat pumps to unnecessary volatility that should be avoided.
7. **Low-income household non-energy benefits**: Low heating bills can reduce homelessness and emergency room visits – and therefore the social costs associated with providing shelter and medical care. These non-energy benefits should be included in calculating the rebates for low-income households.[4] In the New York context, the decision has been made to limit energy payments of low-income households to 6 percent of income, with the rest coming from assistance. The savings resulting from the investment in efficient heat pumps for low income households would accrue mostly or completely to ratepayers and taxpayers, since lower bills would reduce the assistance required on a dollar-for-dollar basis in most cases.

[4] For a discussion of non-energy benefits in the low-income household context, see Makhijani, Mills, and Makhijani 2015, pp. 83-94.

8. **Discount rate for customer benefits**: The individual discount rate is highly variable depending on circumstance of the household or private business. For a low-income household, the low, predictable bill, not subject to the volatility of fuel oil or natural gas prices, provides added security not only of affordable heating in the winter. Food-medicine-rent/mortgage-energy bill conflicts are very common for low income families. Eviction and foreclosures occur even among families that receive assistance for paying energy bills. The costs to the household in such circumstance is astronomical, and in some ways incalculable. The Framework notes the benefits of reduced volatility of efficient heat pumps. Yet this is not reflected in the discount rate used for such benefits. We believe that the 16 percent discount rate for customer benefits is far too high for any customer; the more so for residential and small business customers. Given the many benefits of reduced price volatility for all customers, including for low-, moderate-, and middle-income households and small businesses, a social discount rate of 3 percent should be applied to customer benefits, especially as many non-energy benefits, such as better attendance at school and work by members of low-, moderate-, and middle-income households, cannot be easily captured quantitatively and monetized.
9. **Fuel oil and propane systems**: Retrofitting of buildings that use fuel oil and propane for heating is generally economically justified. It should be given priority, especially for low-income households.
10. **New construction**: Geothermal heating systems should be mandated for new construction, which should be to passive standards, starting in 2020 for residential construction and 2025 for commercial construction (in order to provide time for the industry to scale up).
11. **Natural gas infrastructure**: The Framework notes that "there is a compelling opportunity to defer natural gas pipeline upgrades and extensions through use of renewable heating and cooling options, leading to a more cost-effective outcome." We recommend that new natural gas infrastructure not be built. Building it today locks in emissions and undercuts the drive for renewable heating and cooling; it also invites stranded costs. New York should make renewable heating and cooling a major element in definitively obviating the need for new natural gas infrastructure. In areas where fuel oil is now used for heating, a direct leap to efficient heat pumps should be made.
12. **Structure of incentives**: Geothermal heat pumps are the most efficient systems and therefore the greatest rebates should be accorded to them. However, cold climate heat pumps should also be encouraged, especially as they are more affordable. We have presented an approach to graded rebates, according to a combined measure of heating and cooling performance and recommend its adoption.[5]
13. **Seasonal thermal storage**: As New York increases variable renewable sources in its electricity system, there will likely be surpluses in the spring and fall. These energy surpluses can be used for seasonal storage of heat and coldness in various ways. New York should implement pilot projects in each climate zone that include seasonable thermal storage. Some of these could be in the context of microgrids, where they would increase the capacity to provide essential services with a given amount of local electricity generation and storage.

[5] Makhijani 2017, Attachment C

14. **New technologies**: New York should implement pilot projects with new technologies. It should evaluate the suitability of the solar-panel assisted heat pump referenced in Makhijani 2017 (pp. 26-27).

References

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