



NY GEOTHERMAL ENERGY ORGANIZATION

VIA E-MAIL

Hon. Kathleen H. Burgess
Secretary to the Commission
New York State Public Service Commission
Three Empire State Plaza
Albany, New York 12223

July 16, 2018

Re: Case 18-M-0084 – in the matter of a Comprehensive Energy Efficiency Initiative New Efficiency, New York – Comments from NY-GEO

Dear Secretary Burgess:

Please accept NY-GEO's comments in support of Governor Coumo's New Efficiency, New York initiative with recommendations we feel will strengthen the initiative.

Sincerely,

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The New York Geothermal Energy Organization (NY-GEO) is a non-profit trade association representing geothermal heat pump (GHP) installers, manufacturers, distributors, drillers, consultants and industry stakeholders from throughout New York State and beyond.

Comments on *New Efficiency, New York*

**NYS Department of Public Service
Case Number 18-M-0084**

**In the Matter of a Comprehensive Energy
Efficiency Initiative**

**NY-Geothermal Energy Organization
(NY-GEO)**

July 16, 2018

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The NY-GEO Board thanks Mark F. Thielking of the Energy Improvement Corporation for his help with our PACE recommendation, as well as Billii Roberti of Green Choices Consulting for her editing help and Bob Wyman of the IGSHPA Advocacy Committee for his enormous contributions to the ongoing understanding of the implications of the renewable heating transition.

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Executive Summary

NY-GEO Recommends the following steps to be taken within case 18-M-0084:

1. Hold utilities harmless for added beneficial electrification load and count the energy efficiency impacts of beneficial electrification toward in the 185 TBtu goal
2. The preparation and adoption of a glide path for energy and carbon reduction in the heating and cooling sector that includes distinct annual targets for ground source and air source heat pump penetration in New York State;
3. The integration of the likely impact of projected heat waves on demand for air conditioning and development of a plan to minimize the impact of increased AC demand on peak summer electricity demand and the health of low and moderate income (LMI) New Yorkers;
4. The adoption of a process to re-examine methane greenhouse gas emissions including the time frame used and leakage rates assumed;
5. The adoption of a rate structure for heat pump customers that eliminates the current subsidy they pay in the form of excessive volumetric delivery rates;
6. The formation and execution of a plan to integrate the initiatives adopted under 18-M-0084 in current rate cases as well in adopted rate cases through a reopening mechanism;
7. The identification and execution of the tasks necessary to institute residential PACE financing in New York State;
8. The development of a worker training program whose key elements are IGSHPA training, education for building professionals and wage supplementation for on the job training;
9. The adoption of substantial support subsequent to the current NYSERDA rebate program for addressing upfront costs for GSHP installations, including strong incentives, 3rd party ownership and ways to bring installations to the LMI market;
10. The development of a detailed glide path to a net zero carbon emission building code for New York State;
11. The development of a statewide online pre-screening tool so building owners can easily access data on the geothermal potential of their properties, building on models developed for New York City's Local Law 6 and the NYPA/NYSERDA Geothermal Clean Energy Challenge;

12. The adoption of kWh as opposed to Btus as the unified Energy Efficiency unit of measurement to bring NYS in line with the rest of the world as well as with a post-electrification future dominated by electrical energy use as opposed to fossil fuel burning;
13. The adoption of a process to prepare for decapitalization of the natural gas utility industry that minimizes the exposure of ratepayers; and
14. The adoption of an incentive structure that balances the importance of locational and other granular factors with the importance of encouraging market penetration by virtue of being easy for property owners to understand.

Integrating Beneficial Electrification with Energy Efficiency:

RECOMMENDATION 1: Hold utilities harmless for added beneficial electrification load and count the energy efficiency impacts of beneficial electrification toward in the 185 TBtu goal

NY-GEO supports Governor Cuomo's *New Efficiency, New York* (NENY) Initiative (18-M-0084). Past energy efficiency efforts, while producing positive results, were limited by a silo regime where program funds could be used only on electrical measures that reduce electricity use or gas measures that reduce gas use. Consequently, fuel switching measures were discouraged. The Governor's initiative clearly recognizes the need to change this approach.

Today, New York's fuel related greenhouse gas (GHG) emissions roughly break down to +-20% from electric generation, +-33% from heating buildings and +-40% from transportation. There are huge opportunities to save energy and reduce emissions by switching from fossil fuel burning devices to efficient electric devices in the heating and transportation sectors. This is known as beneficial electrification – a topic that is seeing ballooning interest among those seeking solutions in the energy field¹.

It is no longer enough to limit support for renewable energy to the electricity generation field when renewable energy stored in the ground or the air can be harvested to heat and cool buildings with equal or better paybacks in energy savings, GHG emission reduction and total energy bill savings.

It is no longer appropriate to focus measures in the heating sector on relatively small increases in efficiency for the on-site burning of fossil fuels, capped below 100% by the laws of physics, when heat pumps can attain efficiencies of 200% to 600% depending on the specific circumstances of a project.

¹ *US National Electrification Assessment* by the Electric Power Research Institute https://www.epri.com/#/pages/sa/us_national_electrification_assessment?lang=en accessed 7/5/18
Also – *Electrification Futures Study: A Technical Evaluation of the Impacts of an Electrified U.S. Energy System*, National Renewable Energy Laboratory, <https://www.nrel.gov/analysis/electrification-futures.html>
Also - Electrification 2018 INTERNATIONAL CONFERENCE & EXPOSITION, August 20-23, 2018 Long Beach, California <http://www.electrification2018.com/>

In this context it is significant that NENY targets all fuels², opening up the heretofore non-regulated sectors of propane and oil heating to count toward energy efficiency goals. This holistic approach is essential to meeting the stated goals

The Governor deserves credit for setting a goal that goes across fuels and is grounded in GHG emission reductions with the 185 TBtu Site Energy Savings target projected to deliver 30% of the GHG emissions reductions needed to meet New York's 40% by 2030 goal³.

This process will be precedent setting, in that the 185 TBtu target includes an annual 3% savings of investor-owned utility sales in 2025 as an electricity sub-target⁴. This means that New York will possibly need to accomplish two innovative ends while working toward these goals:

1. **Finding a way to hold electric utilities harmless for increased electric load that results from beneficial electrification:** As New Yorkers stop burning a large load of gasoline, diesel, natural gas, oil and propane in favor of using a smaller load of electricity, electric utilities will be absorbing this load at the same time they are trying to reduce sales to meet the 3% reduction goal. Without providing a hold harmless mechanism, utilities would have conflicting goals which may discourage beneficial electrification. In the absence of separate metering, the state will need to develop sophisticated estimates of load added from beneficial electrification and subtract that from utility load totals in order to measure progress toward the 3% goal. NY-GEO applauds New York's commitment to hold utilities harmless from beneficial electrification load in meeting the 3% sub target and has offered to help in providing data and perspective to NYSERDA and DPS to help in this process.
2. **Developing ways to measure the contribution of beneficial electrification from the heating sector to reaching the 185 TBtu reduction goal:** This contribution may be embedded in New York's current method of measuring energy use across fuels. If not, NY-GEO also stands ready to help with any data and perspective we're able to provide. In addition to counting toward

² *New Efficiency, New York*, April 2018, NYS Department of Public Service and NYS Energy Research and Development Agency, page 2 <https://www.nyserda.ny.gov/About/Publications/New-Efficiency>

³ Ibid. page 2

⁴ Ibid. page 6

the reduction goal, it is important that beneficial electrification measures be able to access the same funding pools as traditional energy efficiency measures, where appropriate.

Holding utilities harmless for beneficial electrification load and counting the energy efficiency contribution of beneficial electrification measures are clearly supported in NENY and are an essential part of its thrust. NY-GEO applauds this innovation.

Looking Forward

“If you’re not thinking of what comes next, the world will change faster than you do”

Joe Gebbia – founder of Air BNB on “How I Built This” Podcast, NPR July 7, 2018

The Governor is taking on the energy efficiency challenge in a rapidly changing energy environment. NY-GEO would like to point out 3 factors not yet fully understood or defined, which could have a profound impact on the ultimate effectiveness of the NENY initiative. In our view, it would be important to include best estimates of these factors as part of 18-M-0084 and to set up processes to refine those estimates as a part of the ongoing NENY initiative.

The Importance of the Glide Path with Distinct Annual Targets

RECOMMENDATION 2: The preparation and adoption of a glide path for energy and carbon reduction in the heating and cooling sector that includes distinct annual targets for ground source and air source heat pump penetration in New York State.

New York has a defined goal of a 50% reduction in greenhouse gas emissions from the electricity sector by 2030. The glide path to 50 % is not completely defined, but there are several initiatives such as New York’s offshore wind program that flesh out the vision of how to get to 50%.

A strong glide path needs to be developed for energy and carbon reductions in the heating and cooling sectors. Without sub goals and interim targets, progress will be unclear and the ability to meet the larger goals will be compromised. **NY-GEO strongly urges that, as part of the 18-M-0084 process, a glide path be prepared that includes distinct targets for heat pump penetration in New York State**

We contend that it will be impossible to meet the 185 TBtu goal without a substantial transition from fossil fuel burning to electrification in the heating sector. This is referenced in NENY in less definite terms as follows:

Given the magnitude of New York’s GHG emission reductions goals (40% by 2030 and 80% by 2050), the Biennial Report to the 2015 State Energy Plan named electrification of thermal end uses in buildings as a core opportunity for New York State. As a key component of New York’s continued climate leadership, the Biennial Report called for the State to “seek to develop electrification policies and opportunities as steps for early action.”⁵

NY-GEO encourages steps to define the pace of electrification needed to meet both the energy efficiency and carbon reduction goals of this initiative. In the recent NENY webinars it was exciting to hear NYSERDA’s Senior Advisor for Energy Efficiency Markets Greg Hale projecting that New York can get to net zero in its building stock installations very soon. He even envisioned carbon absorbing buildings in New York’s energy future. His point that the denominator – building energy load – needs to be greatly reduced, is well taken.

Building on that vision it will be important to have a glide path for getting to the building sector’s contribution to the 40% goal. The Alliance for a Green Economy (AGREE) has recently filed testimony⁶ in the Orange and Rockland rate case where Complex Systems Engineer Jerry Acton projected that to reach New York’s GHG goals an average of 226,953 heating systems must be moved from fossil fuels to efficient electric heat annually between 2018 and 2030.

⁵ New Efficiency, New York, April 2018, NYS Department of Public Service and NYS Energy Research and Development Agency, page 53 <https://www.nyserda.ny.gov/About/Publications/New-Efficiency>

⁶ Alliance for a Green Economy – AGREE - OR – Testimony – Jerry Acton <http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=18-E-0067&submit=Search> (accessed 7/5) 2nd page of exhibits list, conversion table in on page 16 in this testimony

7 **A22.** Table 1 shows an overview of the pace of heating systems transition necessary to meet 40% by
 8 2030 and 80% by 2050 goals plus a 100% challenge pace.

	Average # Housing Unit Transitions								
	Average Per Year			Average Per Work Week			Average Per Work Day (250/Year)		
Emissions Reduction	2005-2015	2018-2030	2030-2050	2005-2015	2018-2030	2030-2050	2005-2015	2018-2030	2030-2050
80%	16,204	226,956	150,446	312	4,365	2,893	65	908	602
100%	NA	226,956	202,945	NA	4,365	3,903	NA	908	812

10 Table 1: Average Housing Unit Transitions to Electric Powered Heat Pumps

11 Three timeframes are shown 2005-2015, 2018-2030, and 2030-2050. Three intervals are shown: yearly,
 12 weekly and by work day. The pace of needed yearly conversions has increased dramatically from
 13 numbers cited in testimony filed in a rate case last year because of lack of meaningful progress to date.
 14 The longer rapid progress is delayed, the more difficult the challenge will be to meet the goals. Once the

Breaking his calculations down further, Acton noted:

“2.7 million housing units must be using efficient electric heating systems (geothermal heat pumps or air source heat pumps) by 2030 and 6.5 million by 2050. Between 2015 and 2030, these systems will replace 2.1 million remaining uneconomical heating oil systems ...4 million existing natural gas systems ... and be installed in new construction housing units. Between 2030 and 2050 an additional 2.6 million natural gas systems must be replaced. More rapid emission reductions could also be achieved with increased weatherization and other efficiency efforts, contributing to a reduction in overall heating demand.”⁷

We commend AGREE for supplying a base and point of comparison for a consensus glide path. We note that independently, NRDC also called for the adoption of a strong target for heat pumps similar to the recently adopted storage target in Donna DeCostanzo’s comments at the June 18th NENY Technical Webinar.

⁷ Ibid. page 15

Accounting for Air Conditioning and Peak Load in a Warming World

RECOMMENDATION 3: The integration of the likely impact of projected heat waves on demand for air conditioning and development of a plan to minimize the impact of increased AC demand on peak summer electricity demand and the health of low to moderate income (LMI) New Yorkers

NY-GEO urges the state to encourage the largest possible penetration of ground source heat pumps (GSHP) to avoid what could become massively expensive summer peaks as hotter summers ramp up the use of cooling equipment across the state.

The International Energy Agency recently released the report *The Future of Cooling*⁸ The May 15, 2018 release announcing the report on the IEA website included the following quote:⁹

“Growing electricity demand for air conditioning is one of the most critical blind spots in today’s energy debate,” said Dr Fatih Birol, the Executive Director of the IEA

New York Times covered the release of the report in an article titled *“The World Wants Air-Conditioning. That Could Warm the World.”* which included the following text:¹⁰

The number of air-conditioners worldwide is predicted to soar from 1.6 billion units today to 5.6 billion units by midcentury, according to a report issued Tuesday by the International Energy Agency. If left unchecked, by 2050 air-conditioners would use as much electricity as China does for all activities today.

Greenhouse gas emissions released by coal and natural gas plants when generating electricity to power those air-conditioners would nearly double, from 1.25 billion tons in 2016

⁸ *The Future of Cooling*, by the International Energy Agency, May 2018 <https://www.iea.org/cooling/> accessed 2018 07 10

⁹ <https://www.iea.org/newsroom/news/2018/may/air-conditioning-use-emerges-as-one-of-the-key-drivers-of-global-electricity-dema.html> accessed 2018 07 10

¹⁰ *The World Wants Air-Conditioning. That Could Warm the World*, Kendra Pierre-Louis, New York Times, 2018 05 15, <https://www.nytimes.com/2018/05/15/climate/air-conditioning.html> accessed 2018 07 10

to 2.28 billion tons in 2050, the report says. Those emissions would contribute to global warming, which could further heighten the demand for air-conditioning.

NY-GEO asserts that it is crucial for the State to continually refine its understanding the role of air conditioning in New York's energy system as the impacts of climate change take hold over the next decades.

According to the NYS Department of Environmental Conservation (DEC) website on the Impacts of Climate Change in New York ¹¹

- *The annual average temperature statewide has **risen about 2.4°F since 1970**, with winter warming exceeding 4.4°F.*
- *This equates to an increase of about 0.25°F per decade since 1900.*
- *Annual average temperatures have increased in all regions of the state*

and

Modelling shows that New York should anticipate more warming. Compared to the 1971-2000 period, average temperature will be

- *up to 3°F warmer by the 2020s.*
- *up to 6°F warmer by the 2050s.*
- *up to 10°F warmer by the 2080s.*
- *The most warming is expected to occur in northern NYS.*
- *By 2100, our growing season could be about a month longer, with intense summers (extreme heat and heat waves) and milder winters.*

While these passages note that warming has been strongest in the winter, it is important to look at projected impacts of climate change on summer heat intensity.

¹¹ <https://www.dec.ny.gov/energy/94702.html> accessed 2018 07 07

The DEC Climate Action Plan Interim Report ¹² is a rich source of information on this topic. Searching on the word “extreme” through *Chapter 2 - Climate Projections and Vulnerabilities*, yields the following highlights relative to projected temperature changes:

“The current climate in New York State can be described as humid and continental. Key features of New York State’s climate include the following:

- *Temperature varies widely across the state. Average annual temperature varies from 40°F in the Adirondacks to near 55°F in the New York City metropolitan region. ...*
- *A variety of extreme events occurs throughout the state:*
 - *Heat waves, defined as three consecutive days with maximum temperatures above 90°F, are common in urban areas, especially in the southern parts of the state.”¹³*

And...

“Observed Climate Trends

Temperature and Precipitation

Temperatures in New York State have risen over the course of the 20th century, with the greatest warming coming in recent decades. There has also been an increase in the number of extreme hot days (days at or above 90°F) and a decrease in the number of cold days (days at or below 32°F).”¹⁴

¹² DEC Climate Action Plan Interim Report, Chapter 2, Climate Projections and Vulnerabilities
<https://www.dec.ny.gov/energy/80930.html> accessed 2018 07 07

¹³ Ibid page 2-8

¹⁴ DEC Climate Action Plan Interim Report, Chapter 2, Climate Projections and Vulnerabilities
<https://www.dec.ny.gov/energy/80930.html> accessed 2018 07 07 page 2-9 (precipitation data cropped)

Table 2-1. 1900-1999 Temperature and Precipitation Trends in New York State

Temperature (°F / decade)					
	Annual	Spring	Summer	Fall	Winter
Albany	0.18**	0.25**	0.13*	0.06	0.29**
Elmira	0.01	- 0.02	- 0.09	0.00	0.17
Indian Lake	0.15**	0.13	0.05	0.14*	0.29*
NYC	0.39**	0.45**	0.33**	0.28**	0.53**
Port Jervis	0.06	0.09	0.02	- 0.08	0.20*
Rochester	0.20**	0.26**	0.19**	0.10	0.25*
Watertown	0.17**	0.17*	0.15**	0.08	0.31**

* Significant at the 95% level; ** Significant at the 99% level

The report further states:

“Higher average annual temperatures and sea level rise are extremely likely for New York State. For temperature and sea level rise, all climate models analyzed project continued increases over the coming century, with a high likelihood of more rapid temperature increases and sea level rise than occurred over the 20th century”¹⁵

“Extreme climate events, such as heat waves and heavy rainstorms, significantly impact New York’s communities and natural resources and often have disproportionate effects on urban and rural systems. Probabilities of the future occurrence of extreme events in New York State were developed, based on climate models. The following are likely to occur during the 21st century:

- *Heat waves are expected to become more frequent and intense.¹⁶...*

How much more frequent will days of extreme heat become? The table below projects the increase in extreme temperatures for Central New York:¹⁷

¹⁵ Ibid page 2-10

¹⁶ DEC Climate Action Plan Interim Report, Chapter 2, Climate Projections and Vulnerabilities
<https://www.dec.ny.gov/energy/80930.html> accessed 2018 07 07 page 2-13

¹⁷ Ibid page 2-14

Table 2-4. Projections of changes in extreme events: minimum/maximum; central range* for Central New York (Region 3)

	Extreme Event	Baseline	2020s	2050s	2080s
Heat waves & Cold Events	# of days per year with max temperature at or above:				
	90°F	10	11/25; 14 to 19	15/45; 21 to 33	19/70; 26 to 56
	95°F	1	2/7; 2 to 4	2/18; 4 to 10	4/38; 7 to 24
	# of heat waves per year ²	1	1/3; 2 to 3	2/6; 3 to 4	2/9; 3 to 8
	average duration (in days)	4	4/5; 4 to 5	4/5; 4 to 5	4/7; 5 to 5
	# of days per year with min temperature at or below 32°F	152	116/145; 122 to 124	86/168; 106 to 122	68/124; 87 to 114

Another graphic from the Interim Report projects the likelihood of extreme events in the New York City/ Long Island with “heat index” – a measure of likely harm from temperature and humidity after prolonged exposure or strenuous activity – leading the list. ¹⁸

Table 2-6. Qualitative changes in extreme events for New York City and Long Island (Region 4)

Extreme Event	Probable Direction Throughout 21 st Century	Likelihood ¹
Heat index ²	↑	Very likely 
Ice storms/ freezing rain	Unknown	
Snowfall frequency & amount	↓	Likely 
Downpours (precipitation rate/hour)	↑	Likely 
Lightning	Unknown	
Intense hurricanes	↑	More likely than not 
Nor'easters	Unknown	
Extreme winds	↑	More likely than not 

¹ Likelihood definitions found in Table 2-5

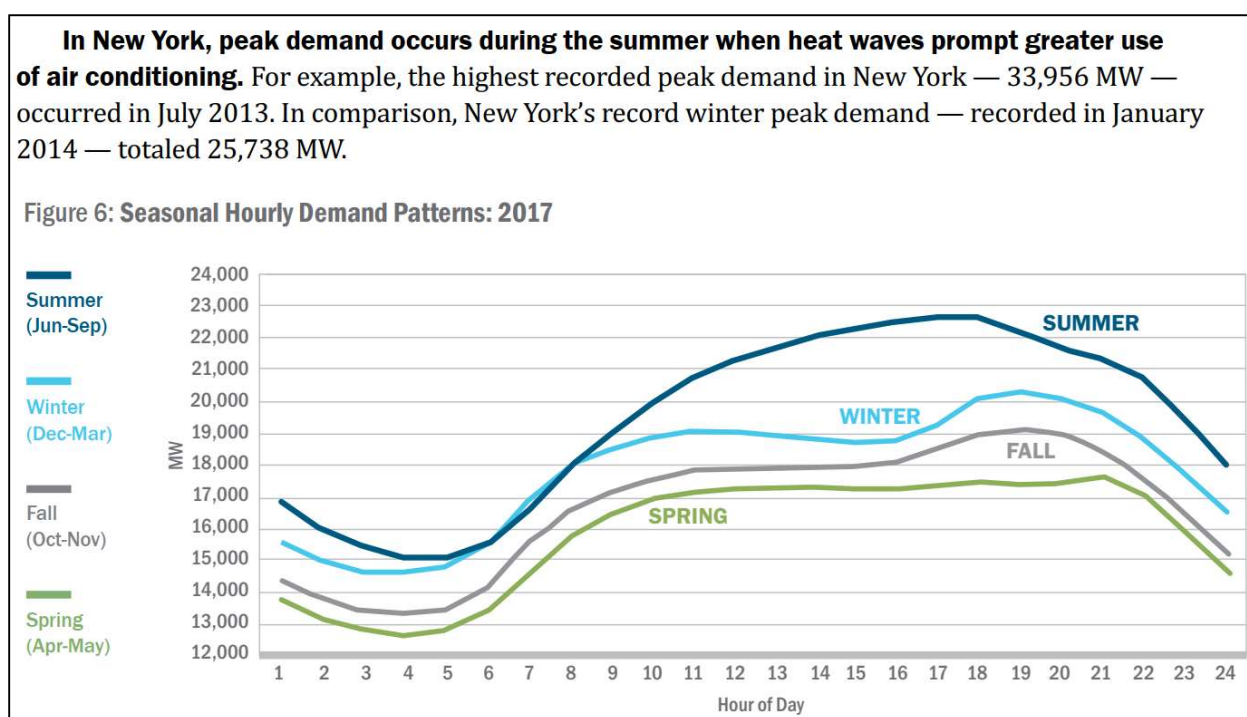
² The National Weather Service uses a heat index related to temperature and humidity to define the likelihood of harm after “prolonged exposure or strenuous activity” (<http://www.weather.gov/om/heat/index.shtml>).

¹⁸ Ibid page 2-15

The report also looked at the impact of climate change on New York's the energy system: ¹⁹

"Climate change is anticipated to impact the energy sector in several ways: First, energy demand will change due to a changing combination of heating and cooling needs, stressing power supplies and increasing peak demand loads. With higher mean temperatures and increased numbers of extremely hot days, the cost of maintaining a reliable supply of electricity is likely to increase in all parts of the state. In particular, climate change will place additional pressures on New York City, where the system is already taxed during very hot summer days..." ²⁰

Given these well documented projections, it is clear that summer cooling will become an increasingly important factor in New York's energy system. It is currently the key factor in summer peak as stated in the figure below from the NYISO Gold Book ²¹.

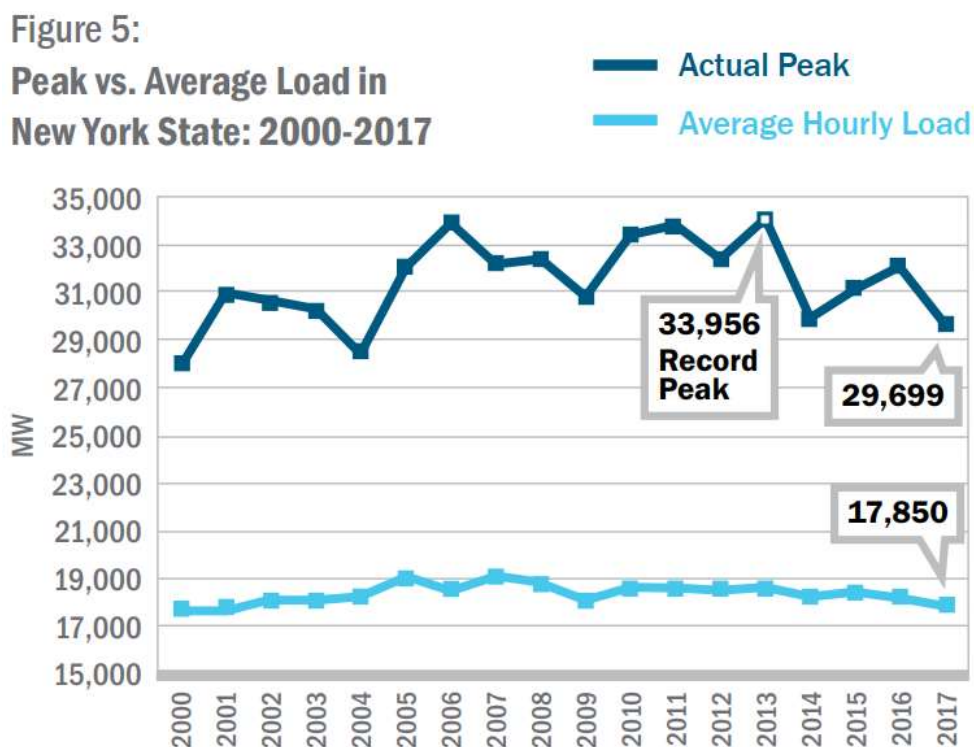


¹⁹ DEC Climate Action Plan Interim Report, Chapter 2, Climate Projections and Vulnerabilities <https://www.dec.ny.gov/energy/80930.html> accessed 2018 07 07 Page 2-20

²⁰ Ibid. Page 2-20

²¹ Power Trends 2018, New York Independent System Operator, page 15 https://home.nyiso.com/wp-content/uploads/2018/05/2018-Power-Trends_050318.pdf accessed 2018 07 08

The figure below demonstrates the considerable difference between average hourly load and peak load in New York State over the 21st century to date ²². This means that roughly half of New York’s generating capacity sits idle on a typical day – capacity for which ratepayers pay to maintain.



There is limited data regarding the current penetration of air conditioning in New York State. NYSDERDA studied the air conditioning market and stated the following in a report released in 2015²³:

“Central air conditioning is the most prevalent primary cooling system type in new construction homes representing about 75 percent of the cooling equipment types. For existing homes with new air conditioning equipment, central air conditioning represents about one-third (32 percent) of the units, and room air conditioning is close at 28 percent of the new cooling equipment installed in the past two years. Existing homes replacing or installing new systems are typically limited by availability of ductwork in the home, which may account for the greater number of mini-split systems present. Mini-split systems

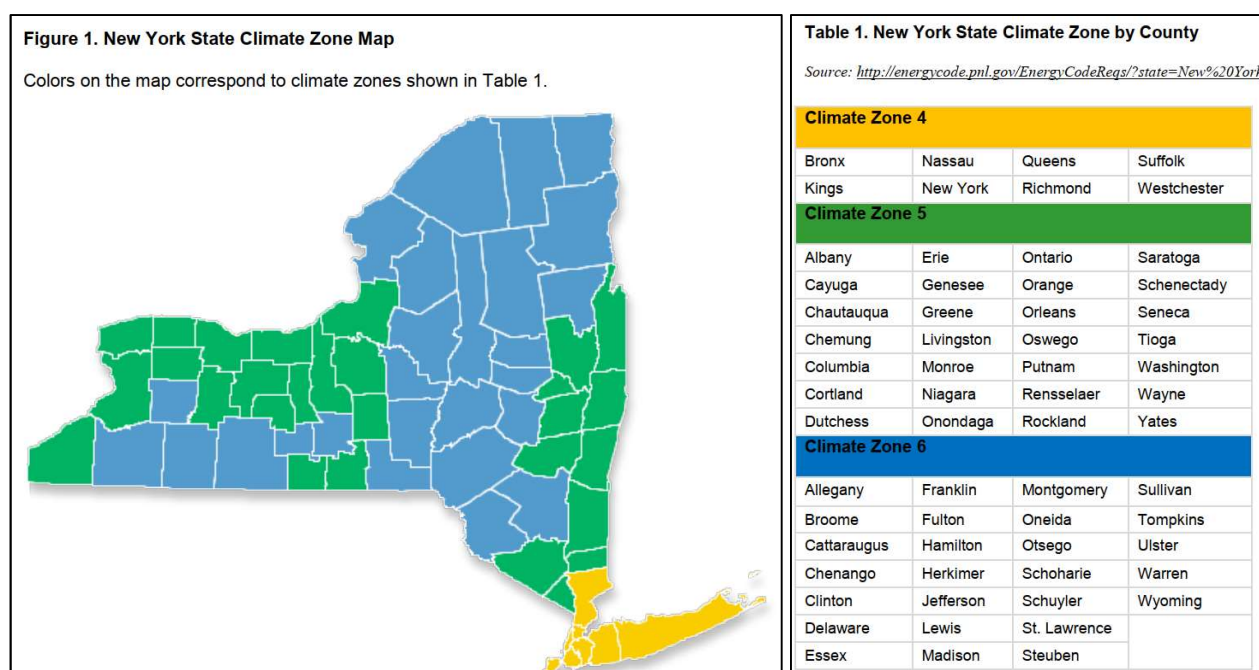
²² Ibid. Page 14

²³ NYSDERDA Residential Statewide Baseline Study Volume 3: HVAC Market Assessment Final Report, July 2015, ReportNumber 15-07, page 9
<https://www.nyserda.ny.gov/About/Publications/Building%20Stock%20and%20Potential%20Studies/Residential%20Statewide%20Baseline%20Study%20of%20New%20York%20State> accessed 2018 07 09

represent 12 percent of new cooling systems in existing homes versus less than one percent of new construction cooling equipment.

There appears to be considerable energy efficiency potential in the central air conditioning market. Data from multiple sources consistently reported that more than 80 percent of the central air conditioning systems statewide were not high efficiency. (less than 14.5 SEER [Seasonal Energy Efficiency Rating] ”.

The map and chart below show New York’s Climate Zones according to the International Energy Conservation Code (IECC)²⁴.



The figure below illustrates the data in the NYSERDA report:²⁵ Note the relatively small sample sizes in zones 4 and 6 (n=11 and n=27).

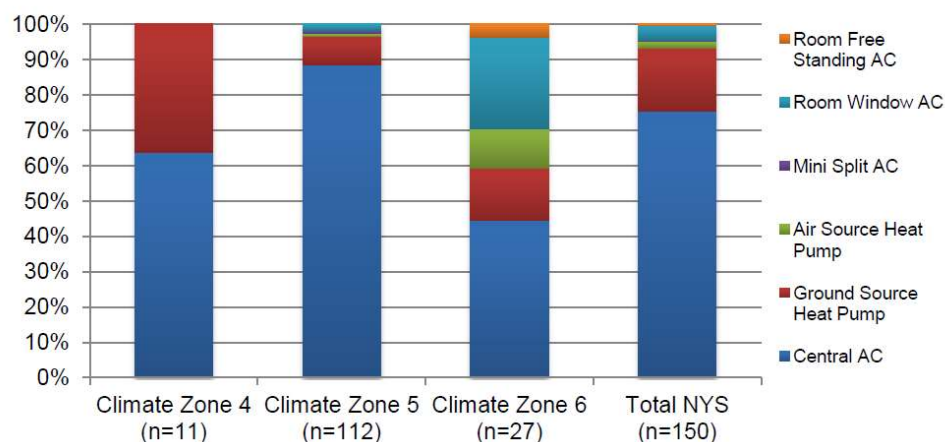
²⁴ NYSERDA Residential Statewide Baseline Study Volume 3: HVAC Market Assessment Final Report, July 2015, ReportNumber 15-07, page 3 and 4
<https://www.nyserda.ny.gov/About/Publications/Building%20Stock%20and%20Potential%20Studies/Residential%20Statewide%20Baseline%20Study%20of%20New%20York%20State> accessed 2018 07 09

²⁵ Ibid. page 24

Figure 6. Type of Cooling Equipment in New Homes (Built 2012 or after)

Note that climate zone 4 should not be considered representative due to the small number of sample points at 80/20 confidence/precision, climate zone 6 is close to 90/15 confidence/precision.

Source: Single-family On-site Inspection Data for New Homes



In existing housing, New York’s consumers who don’t currently have an adequate cooling system can respond in three ways – using fans or installing window air conditioners or central air conditioning. As new cooling hardware is added, it will add to the load that contributes to peak load on the hottest days of summer.

It is important that DPS and NYSERDA have data that is accurate as possible to project which of these media will be added at what rate.

As noted at the beginning of this recommendation, NY-GEO urges the state to encourage the largest possible penetration of ground source heat pumps (GSHP) to avoid what could become massively expensive summer peaks as hotter summers ramp up the use of cooling equipment across the state. GSHPs are far and away the most efficient way to provide central cooling. This is so because in hot weather, GSHPs exhaust heat to the absorbing, cool ground as opposed to hot outdoor air. In contrast, conventional window air conditioners and other forms of air source heat pumps (standard air-source heat pumps, ductless mini-split heat pumps and absorption heat pumps.²⁶) exhaust warm air into even warmer outdoor air. Reversing the natural flow of heat from the warmest air to less warm air amps up

²⁶ Heat & Cool: Heat Pump Systems, Energy.gov website, <https://www.energy.gov/energysaver/heat-and-cool/heat-pump-systems>, accessed 7/15/18

the amount of fan power needed to accomplish this task. Increased fan power from thousands or hundreds of thousands of AC systems can add significantly to peak load.

In considering the impact of different air conditioning technologies, it is important to consider good comparative data. One relevant study was carried out by Western Farmers Electric Co-operative (WF) and reported in 2012.

WF has been operating for nearly 70 years as a generation and transmission cooperative that provides essential electric service to 19 member cooperatives and the Altus Air Force Base in Oklahoma, and 4 cooperatives in New Mexico. WF supplies the electrical needs of more than two-thirds of the geographical region of Oklahoma, part of New Mexico, as well as small portions of Texas and Kansas.

WF's study, authored by Mark Faulkenberry, Manager, Marketing & Communications and Kalun Kelley, Commercial and Industrial Marketing Manager, both with WF found: ²⁷

WF established a rebate program for both air source and ground source equipment. They looked at program development like sighting in a rifle. They would load it ... start shooting ... and zero in as they went. Their initial rebate effort relied on EER for ground source and SEER for air source. However, it didn't take them long after evaluating the results of their 2010 program to understand that they had to drastically modify their program if they hoped to achieve their peak reduction goal. Their original savings projections per ton of equipment installed are shown below:

<i>Original results projections</i>	<i><u>ASHP</u></i>	<i><u>GSHP</u></i>
<i>Projected kW reduction per ton rebated</i>	<i>0.33 kW</i>	<i>0.66 kW</i>
<i>2010 results kW reduction/ton rebated</i>	<i>0.16 kW</i>	<i>0.65 kW</i>

Their 2010 program results analysis also revealed the following:

- Approximately 80% of rebates were on Air Source equipment and 20% were on Ground Source*

²⁷ *ASHP vs GSHP and The Importance of SEER and EER in Utility Air Conditioning Demand Side Management Programs*, HeatSpring Magazine
<https://blog.heatspring.com/ashp-vs-gshp-and-the-importance-of-seer-and-eer-in-utility-air-conditioning-demand-side-management-programs/>

- 92% of rebates were on replacements (equipment failure) and new construction
- 8% of rebates were on planned retrofits (pre-failure)
- The original rebate program had an extremely long ROI on Air Source rebates compared to a relatively short ROI on Ground Source rebates. In several cases the ROI on air source installations exceeded the expected life expectancy of the air source equipment
- In many cases the new (rebated) air source equipment had decreased energy sales without reducing peak capacity requirements

As WF probed to understand why their air source demand reductions fell so short of the expected results in 2010, it became apparent that the negative result was due to the difference between the equipment's actual Energy Efficiency Ratio (EER) on peak load days when compared to the published Seasonal Energy Efficiency Ratio (SEER). What really opened their eyes was that the EER on even the higher SEER systems was horrible compared to those on Ground Source systems, which met their expected EER on peak load days. The WF analysis, based on a sample of measured data, showed that the high SEER rated equipment had a poor EER during the record breaking heat of the 2010 Oklahoma summer when temperatures were over 100 degrees for days on end and hit 110 degrees in the middle of August. This got them to adjusting their program design rifle scope!

For 2012 (and beyond) WF thought about completely eliminating their Air Source rebates due to the low peak contribution obtained from this type of cooling equipment, but opted instead to abandon SEER as a program rebate metric and to increase the EER requirement of rebate eligible air source equipment. While they would have preferred to have this EER based on 100 + degree (f) outside air to reflect peak load conditions, the inability to find this data forced them to continue to look at EER at 95 degrees. They will reevaluate this decision based on 2012 unit performance under the new EER requirement. WF also came to the conclusion that if it were to achieve their 30 MW peak demand reduction goal, they would have to focus on flipping the 80/20 Air Source to Ground Source installation ratio experienced in 2010 to 80% Ground Source.

While this study is valuable, it does take place in a warmer climate zone than New York's. NY-GEO has compiled peak day EER GSHP data from several installations in New York that include the WaterFurnace

Symphony monitoring system. Relative to a comparison air conditioning system with a peak EER of 10, the 17 ground source systems studied had a peak reduction of .40 kW per ton of installed heating capacity. .40 per ton matches well with the .65 per ton result in the Western Farmer, given that peak day temperatures are higher in the Western Farmer service territory. The .40 kW result for New York means 1.6 kW peak reduction per average New York 4 ton system and 1.2 kW for a 3 ton system. The comparison system peak day EER of 10 might be generous. The New York State Technical Resource Manual notes:

*The baseline efficiency level for a 3-ton GSHP with existing equipment in a normal/end-of-life replacement scenario in New York State (and where more stringent code is not enforced) would be: 1) For electric equipment, a split-system air conditioner with a SEER of 13 or an air-source heat pump with a SEER of 14...*²⁸

It is by no means clear that AC systems with a SEER of 13 or 14 would meet an EER of 10. NY-GEO is unaware of any New York peak day field data compiled for ASHP systems or conventional AC systems.

NY-GEO is developing a proposal under which two identical houses would be built on adjacent properties. With input from both the ground source and air source industries, each house would be outfitted with both air source and ground source systems and would alternate days using each system. We believe the resulting data would be extremely valuable in understanding the impact of electric HVAC systems on grid peak demand in New York State. NY-GEO urges consideration of New York State sponsorship of this experiment under case 18-M-0084

In the future, in how much of New York State will central air conditioning be virtually required to insure the health of residents as the climate warms? Fan power or a window air conditioner in a select room or two has been adequate to keep many New Yorkers comfortable on the hottest days across much of the State. To what degree will that change? An argument can be made that the demand impact of a fan cooling part of a living space is less or equivalent to the demand impact that a very efficient GSHP

²⁸ *New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs – Residential, Multi-Family, and Commercial/Industrial Measures - Version 6*, Issue Date – April 16, 2018 Effective Date – January 1, 2019, New York State Joint Utilities, pages 132-133
<http://www3.dps.ny.gov/W/PSCWeb.nsf/All/72C23DECFF52920A85257F1100671BDD?OpenDocument> accessed 2018 07 10

system makes in cooling the whole space. In how much of the State will partial cooling remain a viable option during the summer heat waves that are projected to increase?

These questions are particularly relevant to New York's Low and Moderate Income (LMI) communities. LMI New Yorkers are less likely to currently have installed central air conditioning, yet they are more likely to have health problems that could be exacerbated by excessive heat and humidity.

According to the DEC Climate Action Plan ²⁹

"...Climate-related risk factors include heat events, extreme storms, disruptions of water supply and quality, decreased air quality, changes in timing and intensity of pollen and mold seasons, and alterations in patterns of infectious disease vectors and organisms. Demand for health services and the need for public health surveillance and monitoring will increase as climate continues to change.

As a result of these climate risks, some climate-related health vulnerabilities have emerged. Heat-related illness and death are projected to increase, while cold-related death is projected to decrease. Increases in heat-related death are projected to outweigh reductions in cold-related death. Cardiovascular and respiratory-related illness and death will be affected by worsening air quality, including possibly more smog, wildfires, pollens, and molds."

New York has shown a commitment to LMI residents in its energy programs. As the climate warms, the impacts of inadequate air conditioning will fall disproportionately on LMI residents. It is crucial that New York develops a detailed program that both ensures an adequate level of air conditioning on the hottest days of summer and protects LMI ratepayers from the costs of an unnecessary generating capacity build out to meet peak demand.

²⁹ DEC Climate Action Plan Interim Report, Chapter 2, Climate Projections and Vulnerabilities
<https://www.dec.ny.gov/energy/80930.html> accessed 2018 07 07 Page 2-20

Finally, as a real time observation we offer reference to a Watertown Daily Times article titled *St. Lawrence-County May Be Out of Air Conditioners - At the Worst Time So Far This Summer*³⁰.

“Try finding an air conditioner on sale in St. Lawrence County. All the usual locations seem to be sold out after a wave of overheated residents traveled from store to store in search of respite from the rising temperatures.

The humidity and 90-degree temperatures have been constant for the past week. It was advertised the week before on local media that starting July 1, the heat and humidity would soar to unbearable heights. Many heeded the warning.

‘I don’t think there are any air conditioners left for sale in the county,’ a worker at Lowe’s in Potsdam, who preferred to go nameless, said.

Price Chopper in Canton was sold out of air conditioners on June 30, according to Mitch Marolf, store manager. Stores in the rest of the county quickly ran out as well.

The Walmart in Potsdam ran out of air conditioners that same weekend, as did Lowe’s Home Improvement in Ogdensburg and Potsdam.

Aaron’s in Harte Haven Shopping Center in Massena also ran out as soon as the heat hit.

On Monday night, there was a glimmer of hope for shoppers in search of some relief. Home Depot in Massena received two emergency shipments of air conditioners totaling between 220 to 225 units. This included window units and stand-alone units. The first shipment arrived at 8:30 p.m. on Monday. The second shipment arrived at 3:30 a.m. on Tuesday, according to store manager Adrian Seymour. By 11:30 p.m. on Tuesday every unit had been sold.

³⁰ <http://www.watertowndailytimes.com/news05/st-lawrence-county-may-be-out-of-air-conditioners---at-the-worst-time-so-far-this-summer-20180705>

'The demand is just so high. There's no guarantee we'll get another shipment of them after this one,' Mr. Seymour said.

For those without an air conditioner, it is possible to buy one online, although by the time it arrives the heat wave may be over. "

Decisions are being made every day in the marketplace on the future of air conditioning in New York State, without much in the way of a state policy to ensure those decisions have a collective minimal impact on electric rates.

Accounting for Methane

RECOMMENDATION 4: The adoption of a process to re-examine methane greenhouse gas emissions including the time frame used and leakage rates assumed

The Governor has taken a giant step forward by tying the success of this energy efficiency initiative to its impact on New York's goal of reducing GHGs by 40% by 2030. The executive summary of NENY notes that the targeted Energy Efficiency gains will result in an "Equivalent Cumulative Annual CO₂e Reduction" ...of..."22 million metric tons ...delivering 30% of the GHG emissions reductions needed to meet 40 by 30." ³¹ Along with reducing peak demand and saving money for ratepayers, reducing pollutants, particularly greenhouse gases, is a prime benefit of energy efficiency.

The real world effectiveness of New York's greenhouse gas reduction efforts is very dependent on the accuracy of how it accounts for the GHG impact of natural gas use. More than half of New York households heat with natural gas. ³² In 2017, 39% of New York's electricity came from natural gas plants or plants that generally use natural gas but are capable of switching to oil, making natural gas the leading source of electricity generation in the State. ³³ According to the New York State Energy Plan, adopted in 2015, natural gas is the leading contributor to GHG emissions in New York State. ³⁴

Natural gas accounted for 37 percent of fuel combustion emissions, with emissions occurring in all five fuel combustion sectors (transportation, electricity generation, residential, commercial and industrial).

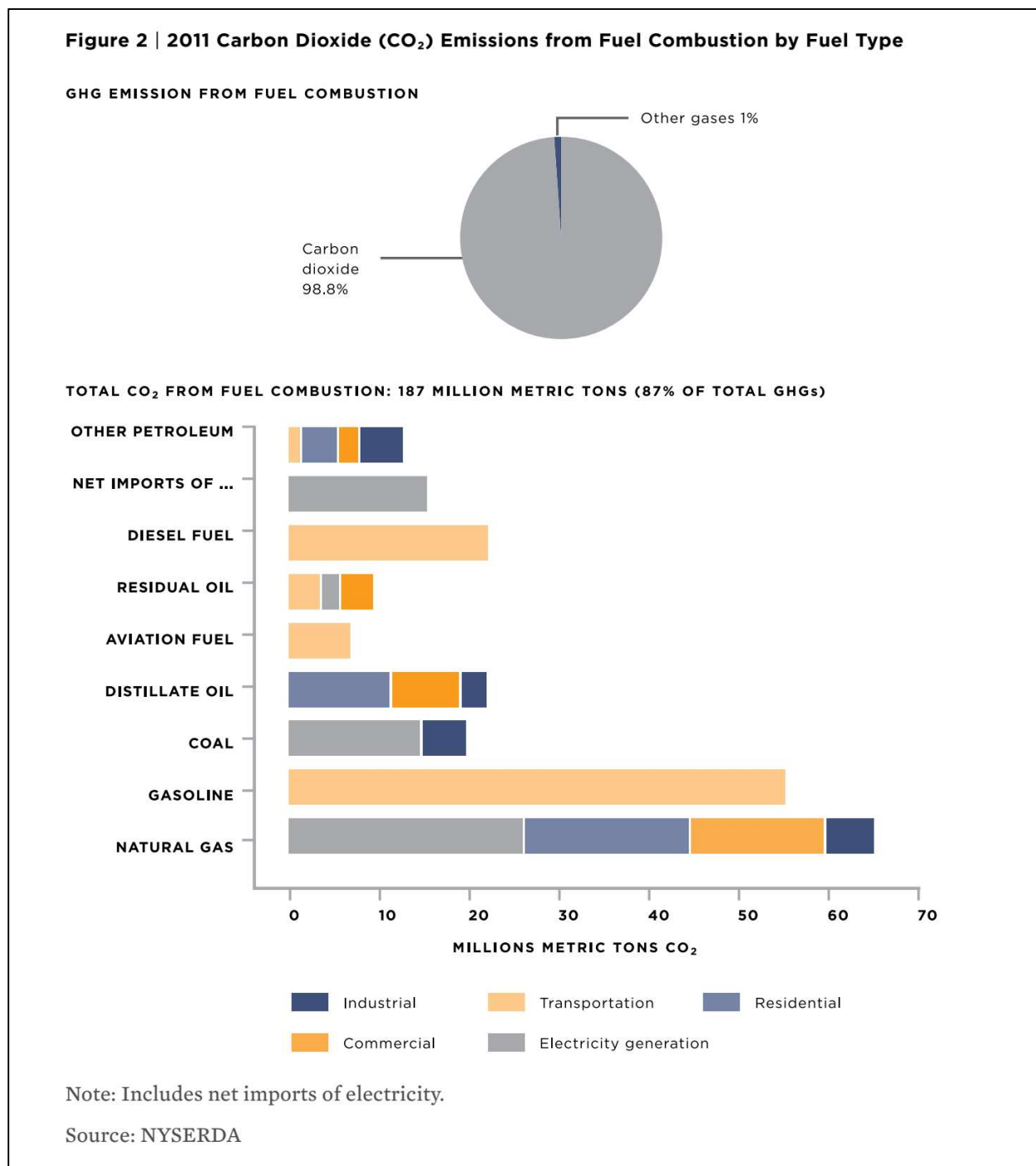
³¹ *New Efficiency, New York*, April 2018, NYS Department of Public Service and NYS Energy Research and Development Agency, Executive Summary, page 2 <https://www.nyserda.ny.gov/About/Publications/New-Efficiency> accessed 2018 07 16

³² *U.S. Census Bureau, American FactFinder*, New York, Table B25040, House Heating Fuel, 2010-14 American Community Survey 5-Year Estimates

³³ *2018 Load and Capacity Data*, a Report by the New York Independent System Operator, Inc. "Gold Book", page 72 http://www.nyiso.com/public/webdocs/markets_operations/services/planning/Documents_and_Resources/Planning_Data_and_Reference_Docs/Data_and_Reference_Docs/2018-Load-Capacity-Data-Report-Gold-Book.pdf accessed 2018 07 11

³⁴ *2015 New York State Energy Plan*, Volume 2 Technical Appendix – Impacts and Considerations, page 12 <https://energyplan.ny.gov/Plans/2015> accessed 2018 07 11

NYSERDA provided the following chart that illustrates this point ³⁵



Natural gas is composed of more than 90% methane (CH₄). ³⁶

³⁵ Ibid page 12

³⁶ <https://www.uniongas.com/about-us/about-natural-gas/chemical-composition-of-natural-gas> accessed 2018 07 11

In this context, it is important that New York uses the correct time frame for measuring global warming potential of methane as well as an accurate estimate of the amount of methane that leaks in the process of delivering heat to a building.

Methane, or CH₄, is a significantly more potent greenhouse gas than carbon dioxide CO₂, and programs seeking to reduce climate change impacts need to accurately recognize the impact of leaked methane throughout the process of drilling, harvesting, transporting and using natural gas.

Methane's Global Warming Potential or GWP ³⁷ (also known as CO₂ equivalency or CO₂e) is rated at 84 times that of CO₂ over 20 years, according to the table below from the International Panel on Climate Change (IPCC). ³⁸ Methane has a relatively short lifetime of 12.4 years. In the atmosphere, when methane breaks down it is converted into CO₂ and water, and is a precursor to ozone (O₃), all of which continue to contribute to the greenhouse effect. Because it is short lived, methane's 100 year Global Warming Potential is rated at 28 – significantly less than its 20 year GWP.

Box 3.2, Table 1 | Examples of emission metric values from WGI ^a.

	Lifetime (yr)	GWP		GTP	
		Cumulative forcing over 20 years	Cumulative forcing over 100 years	Temperature change after 20 years	Temperature change after 100 years
CO ₂	^b	1	1	1	1
CH ₄	12.4	84	28	67	4
N ₂ O	121.0	264	265	277	234
CF ₄	50,000.0	4880	6630	5270	8040
HFC-152a	1.5	506	138	174	19

Notes:

^a Global Warming Potential (GWP) values have been updated in successive IPCC reports; the AR5 GWP₁₀₀ values are different from those adopted for the Kyoto Protocol's First Commitment Period which are from the IPCC Second Assessment Report (SAR). Note that for consistency, equivalent CO₂ emissions given elsewhere in this Synthesis Report are also based on SAR, not AR5 values. For a comparison of emissions using SAR and AR5 GWP₁₀₀ values for 2010 emissions, see Figure 1.6.

^b No single lifetime can be given for CO₂. [WGI Box 6.1, 6.1.1, 8.7]

³⁷ See USEPA's webpage: *Understanding Global Warming Potentials* for more on this topic <https://www.epa.gov/ghgemissions/understanding-global-warming-potentials> accessed 2018 07 11

³⁸ 2014 *Climate Change Synthesis Report*, International Panel on Climate Change (IPCC), page 87 <http://ar5-syr.ipcc.ch/>

In the table above GWP or Global Warming Potential is the commonly used term for the potency of greenhouse gases.

NY-GEO contends it is incorrect to use methane's 100-year CO₂ equivalency in New York's regulatory framework as opposed to using a shorter term equivalency, as New York is targeting a 40% GHG reduction in a 12 year time frame (to 2030) and 80% in a 32 year time frame (to 2050). The 20-year CO₂e is has been calculated by the IPCC and we propose that it should be used in calculations that relate to New York's greenhouse gas emission reductions targets.

The issue of the correct time frame to use is one that is under dispute – as exemplified in the article *"How Bad of a Greenhouse Gas Is Methane? The global warming potential of the gaseous fossil fuel may be consistently underestimated"*³⁹ published on the Scientific American website.

On this topic, a 2013, IPCC report states:⁴⁰

"There is no scientific argument for selecting 100 years compared with other choices (Fuglestad et al., 2003; Shine, 2009). The choice of time horizon is a value judgement since it depends on the relative weight assigned to effects at different times."

New York's policy targets are set at 12 and 32 year terms, NY-GEO proposes that New York adopt the 20 year CO₂e as opposed to the 100 year CO₂e. There are several irreversible tipping points which could conceivably be reached in the next 20 years after which mitigation measures will be far less useful.

The Cambridge Dictionary defines tipping point as follows. Interestingly, they use global warming as an example⁴¹

³⁹ *How Bad of a Greenhouse Gas Is Methane, The global warming potential of the gaseous fossil fuel may be consistently underestimated?* Gayathri Vaidyanathan, 2015 12 21
<https://www.scientificamerican.com/article/how-bad-of-a-greenhouse-gas-is-methane/> accessed 2018 07 11

⁴⁰ Anthropogenic and Natural Radiative Forcing. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (page 711) <http://www.climatechange2013.org/> accessed 2018 07 11

⁴¹ <https://dictionary.cambridge.org/us/dictionary/english/tipping-point> accessed 2018 07 11

“the time at which a change or an effect cannot be stopped: The earth has already passed the tipping point in terms of global warming.”

In this context we are using tipping point as a GHG caused phenomenon which sets in motion larger climate impacts. It is true, as Cambridge points out, that GHG emissions have already tipped us into an era where climate change is happening. However, there are crucial processes in play, which threaten to reach a threshold point after which they will gravely compound some of the most dangerous impacts of climate change.

The Environmental Defense Fund (EDF) makes the following analogy on their webpage *Everything You Need to Know About Climate Impacts*.⁴²

“Imagine cutting down a tree. Initially, you chop and chop ... but not much seems to change. Then suddenly, one stroke of the hatchet frees the trunk from its base and the once distant leaves come crashing down.”

EDF points to the following as **“The most immediate and most worrisome threats**”⁴³

- **“Disappearance of Arctic Summer Sea Ice** – As the Arctic warms, [sea ice melts](#) and exposes dark ocean waters that reflect sunlight much less efficiently. This decreased reflectivity causes a reinforcement of Arctic warming, meaning that the transition to a sea-ice free state can occur on the rapid scale of a few decades. Some scientists have suggested that we have already passed this tipping point, predicting that Arctic summers will be ice-free before mid-century.
- **Melting of the Greenland Ice Sheet** – The Arctic warming feedback described above may one day render [Greenland ice-free](#). Research predicts that the tipping point for complete melt can occur at a global temperature rise of less than two degrees Celsius – a threshold that may be surpassed by the end of this century. While the full transition to an ice-free Greenland will take at least a few hundred years, its impacts include global sea level rise of up to 20 feet.

⁴² Everything You Need to Know About Climate Impacts, Environmental Defense Fund, <http://blogs.edf.org/climate411/2017/11/01/everything-you-need-to-know-about-climate-tipping-points/> accessed 2018 07 11

⁴³ Ibid

- **Disintegration of the West Antarctic Ice Sheet** – The bottom of this ice sheet lies beneath sea level, allowing warming ocean waters to slowly [eat away at the ice](#). There is evidence that this tipping point has already been surpassed – possibly as early as 2014. Like the Greenland Ice Sheet, full collapse would require multiple centuries, but it could result in sea level rise of up to 16 feet.
- **Collapse of Coral Reefs** – Healthy corals maintain a symbiotic relationship with the algae that provide their primary food source. As oceans warm and become more acidic, these algae are expelled from the corals in an often fatal process called coral bleaching. Research predicts that most of our remaining coral systems [will collapse](#) even before a global temperature rise of two degrees Celsius.”

Given these severe threats, some of which have already started and which we can’t afford to reinforce, the 20 year time frame seems far more appropriate.

NY-GEO also urges DPS and NYSERDA to take a second look at the leakage rate used to calculate methane’s GHG contribution, using the latest science.

New York’s treatment of methane is established in the 2015 Greenhouse Gas Inventory ⁴⁴. It utilizes a 100 year CO₂e time frame and the EPA sanctioned leakage rate. The report notes

“A recent study found that measured emissions of methane are approximately 1.5 times greater than those published in the U.S. Environmental Protection Agency national GHG inventory. A commensurate scaling of this analysis would increase the emissions from natural gas leakage to 5.4 MMTons CO₂e or 2.5% of total emissions. Source: Brandt, et al. 2014. “Methane Leaks from North American Natural Gas Systems.” Science 343, February.”

It is positive that NYSERDA notes possibly underestimated leakage rates, but the table to which the above quoted material is a footnote, lists leakage in the Industrial Process and Manufacturing Sector at

⁴⁴ New York State Greenhouse Gas Inventory and Forecast: Inventory 1990-2011 and Forecast 2012- Final Report, NYSERDA, April 2014, Revised June 2015, offered as a pdf and accessed 2018 07 11

3.58 MMTCO₂e and 1.69% of total emissions and disregards the 5.4 MMTCO₂e and 2.5% of emissions figures.

The Environmental Defense Fund has recently released an in-depth study on leakage rates for natural gas. A review of the study in *Science* notes: ⁴⁵

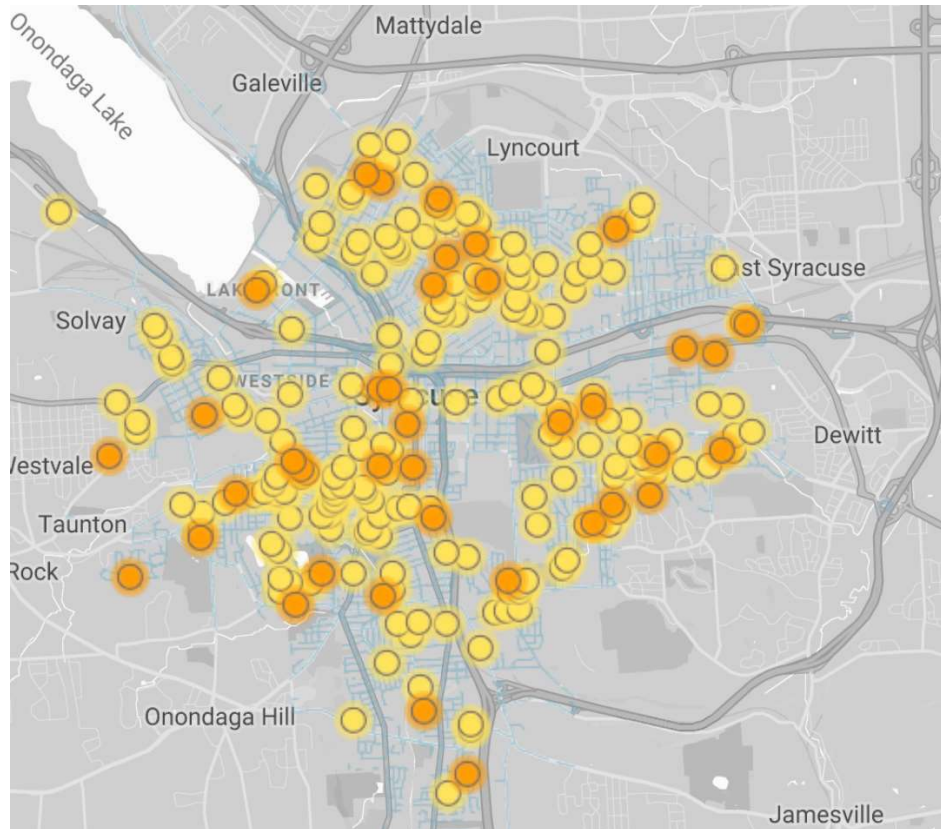
“The new study estimates the current leak rate from the U.S. oil and gas system is 2.3 percent, versus the current EPA inventory estimate of 1.4 percent. Although the percentages seem small, the volume represents enough natural gas to fuel 10 million homes – lost gas worth an estimated \$2 billion. The study was led by Environmental Defense Fund (EDF) researchers, with support from 19 co-authors from 15 other institutions. They conducted new research and integrated more than half a decade of underlying research on methane emissions. This [original body of science](#) was conducted by more than [140 researchers from 40 institutions](#) in cooperation with 50 oil and gas companies that provided site access and technical advice...

The findings reported feature measurements at over 400 well pads in six basins and scores of midstream facilities, data from component measurements, and aerial surveys covering large swaths of U.S. oil and gas infrastructure. ”

The figure below resulted from an EDF survey of Syracuse, NY ⁴⁶

⁴⁵ New Study Finds U.S. Oil and Gas Methane Emissions Are 60 Percent Higher Than EPA Reports 2018 06 21, Science <https://www.edf.org/media/new-study-finds-us-oil-and-gas-methane-emissions-are-60-percent-higher-epa-reports-0> accessed 2018 07 11

⁴⁶ <https://www.edf.org/climate/methanemaps/city-snapshots/syracuse> accessed 2018 07 11



The bright yellow dots indicate a relatively low level of leakage, estimated have the same near term climate impact as driving a car between 100 and 1,000 miles every day. as the equivalent. The darker dots would equal 1,000 to 9,000 miles per day.

EDF's figures are considered too conservative by many clean energy proponents who cite higher leakage figures from Cornell University Professor Robert Howarth ⁴⁷

In addition to the issues of timeframe and leakage rates it would be important to have a discussion of the functional accounting boundary for methane GHG emissions. Some have argued that only emissions taking place in New York State on active transmission and distribution lines should count toward New York's emission totals. This discounts the significant emissions that happen at out of state wellheads and transmission and processing facilities that are induced by demand from New York State buildings

⁴⁷ *Methane emissions and climatic warming risk from hydraulic fracturing and shale gas development: implications for policy*, Robert W. Howarth, Department of Ecology and Environmental Biology, Cornell University, 2015 10 08, https://www.eeb.cornell.edu/howarth/publications/f_EECT-61539-perspectives-on-air-emissions-of-methane-and-climatic-warmin_100815_27470.pdf accessed 2018 07 13

and facilities. It also may discount possibly significant emissions from leaking abandoned wells in New York.

While there are valid points on both sides of a functional boundary debate, the earth's atmosphere doesn't distinguish between them, and leaked methane traps heat regardless of its place in an accounting regime.

NY-GEO urges the Public Service Commission to establish a public, accessible process for debating and resolving the methane accounting questions raised here.

Other Comments

The importance of Equitable Rates

RECOMMENDATION 5: The adoption of a rate structure for heat pump customers that eliminates the current subsidy they pay in the form of excessive volumetric delivery rates

Both NYSERDA and DPS are aware of the subsidy that heat pump customers have provided for other electricity ratepayers. The Geothermal Rate Impact Credit adopted on June 14, 2018 by the Public Service Commission (PSC) in the Central Hudson Rate Case ⁴⁸ recognizes this phenomenon.

The subsidy results from delivery charges that are primarily volumetric. When a customer installs a geothermal system, their electricity use increases substantially, while the more substantial amount of on-site fossil fuel use is reduced to zero. The geothermal system will provide system wide benefits of reduced summer peak through more efficient cooling and better electric system utilization in winter months. Despite these benefits, the geothermal customer takes on a substantial electric bill increase through volumetric delivery payments in spite of the fact that they have increased utility delivery costs in all but rare cases. This unfair charge to geothermal customers needs to be corrected

NY-GEO members have consistently raised this issue within rate cases and the Value of Distributed Energy Resources (VDER) proceeding, and in many cases the response within rate cases can be paraphrased as, “that belongs in VDER”, while the parallel response within VDER has been “we’re busy with replacing solar net metering”.

A separate proceeding on beneficial electrification of the heating sector, similar to, or perhaps combined with the current EV proceeding 18-E-0138 would be appropriate given a number of the questions, NY-GEO is raising throughout this document. We are aware of reluctance to begin another proceeding, but

⁴⁸ [Appendices to Order Adopting Terms of Joint Proposal and Establishing Electric and Gas Rate Plan](http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={13CED81C-066E-48ED-A795-9D7300C4587F}), 2018 06 14, page 72 <http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={13CED81C-066E-48ED-A795-9D7300C4587F}> accessed 2018 0712

there are a number of issues that need resolution and initiatives that need to be developed if New York is to meet its 40% carbon reduction by 2040 and 185TBtu goals.

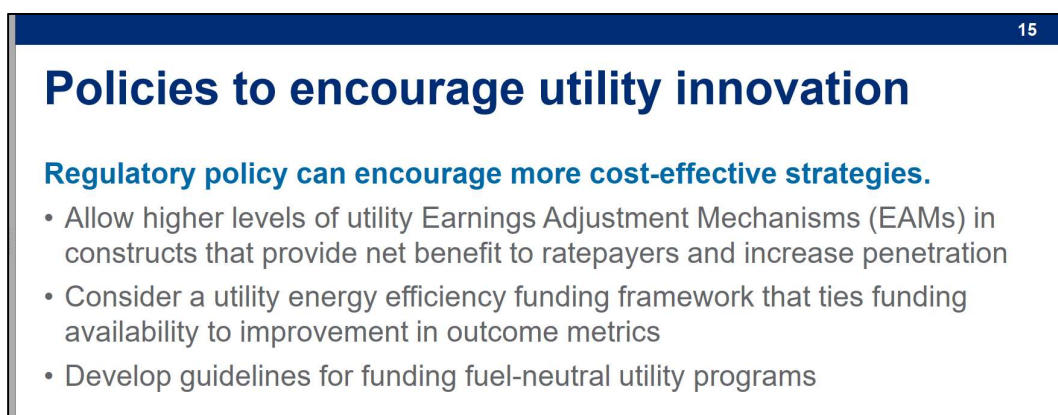
Short of a new proceeding, NY-GEO requests 2 clear statements from the PSC:

- A statement to utility rate case parties that temporary solutions to beneficial electrification customer overpayments must be developed in each case, to be replaced when a statewide solution is determined.
- A clear statement of VDER's purpose relative to beneficial electrification issues, with a definite timetable for establishing beneficial electrification rates that cover grid benefits that are appropriate to credit through rates

Energy Efficiency (18-M-0084) and Utility Rate Cases

RECOMMENDATION 6: The formation and execution of a plan to integrate the initiatives adopted under 18-M-0084 in current rate cases as well in adopted rate cases through a reopening mechanism

At the webinars for 18-M-0084 June 18th and June 29th, the slide below was presented indicating an interest in integrating this initiative with on-going rate cases through higher levels of Earning Adjustment Mechanisms (EAMs).



The slide is titled "Policies to encourage utility innovation" in a large, bold, dark blue font. Below the title, there is a sub-header in a smaller, bold, dark blue font: "Regulatory policy can encourage more cost-effective strategies." Underneath this sub-header is a bulleted list of three items, each preceded by a dark blue dot. The slide has a dark blue header bar with the number "15" in white in the top right corner. The background of the slide is white.

Policies to encourage utility innovation

Regulatory policy can encourage more cost-effective strategies.

- Allow higher levels of utility Earnings Adjustment Mechanisms (EAMs) in constructs that provide net benefit to ratepayers and increase penetration
- Consider a utility energy efficiency funding framework that ties funding availability to improvement in outcome metrics
- Develop guidelines for funding fuel-neutral utility programs

In addition, the point was raised that meeting the targets in this proceeding could mean reopeners for recent rate cases.

NY-GEO has made the point that parties in rate cases need to have a stronger message from the Commission relayed on the importance of EAMs as a mechanism to meet New York's goals. In the absence of guidance from the Commission, reducing EAMs can too easily be seen by rate case parties as a way to cut rate increase requests. As a new element in rate cases, EAMs require education and guidance to become effective.

As appropriate roles for utilities are developed in response to 18-M-0084, it may well be necessary to revisit rate cases and reopen some of the elements of those cases in order to meet the 185TBtu commitment of this program.

In addition, NY-GEO has been frustrated by the nature of EAMs that have been proposed to date that don't provide credit or funding for heat pumps as a distributed energy resource (specifically excluded in the Niagara Mohawk order), as a resource for cutting peak demand, and as a resource for residential and commercial energy intensity. We request the Commission to instruct DPS staff to find ways where appropriate for beneficial electrification measures to get credit for these benefits and to access funding where possible to increase those measures

In addition, as beneficial electrification measures like EVs and heat pumps penetrate the market, hold-harmless measures may be important to include in reopeners, particularly for EAMs such as energy intensity EAMs that may be calculated on a kWh per customer basis.

Residential PACE

RECOMMENDATION 7: The identification and execution of the tasks necessary to institute residential PACE financing in New York State

Residential PACE (R-PACE) has the potential to transform the residential clean energy market place with the promise of easy access to long term capital that is used to install energy efficiency and renewable energy improvements.

PACE (Property Assessed Clean Energy) finance uses the traditional tools of tax-lien based repayment methods to secure low cost and large volumes of capital. Much like how sidewalks, street lighting and other public benefits are funded, PACE leverages the capital markets' familiarity of tax- based finance to scale improvements to buildings that provide the public benefits of cleaner air, lower carbon emissions, clean energy jobs and improved building stock. New York's enabling statute, Article 5-L allows for counties and cities to offer PACE by determining the public benefit that will be created and then allowing the local government to collect any costs incurred by the provision of the improvements to be repaid on the property tax of the improved building. NYSERDA's role in the provision of PACE is specifically outlined in the Law with responsibility of providing guidelines that will:

1. Certify contractors or approve entities to certify contractors to perform energy audits and system feasibility studies
2. Develop state-wide criteria for municipal corporations and certifying entities desiring to certify contractors to perform energy audits and system feasibility studies:
3. Establish cost-effectiveness criteria for improvements and approve lists of such cost-effective improvements
4. Approve systems in addition to those listed in the PACE Legislation as eligible for PACE financing and
5. Establish the form and manner by which municipal corporations should verify and report on the installation and performance of the improvements and systems.

In addition to the above, and given the recent changes in California to R-PACE laws that will add protections for consumers from inappropriate loans, NYS will have to release consumer protection guidelines for R-PACE financings much like they have for other loan products.

The Energy Improvement Corporation, a not for profit, Local Development Corporation is a municipality controlled, constituted authority created to facilitate the raising of capital and implementation of PACE in its member communities. Once NYSERDA Guidelines are in-place, EIC will secure program administration support, capital and facilitate program implementation in each of its member's communities.

Since the R-PACE Finance product was introduced in California over 10yrs ago, over 220,000 homes have been upgraded totaling \$5.2Billion of investments in homes for clean energy and other improvements that have been deemed as important to the public good. Here in NYS, leveraging PACE will help achieve the new energy efficiency goals of the Governor by making available an accessible, long term and affordable finance product that currently does not have any peer in the residential loan market.

Of course, the continued spread of commercial PACE programs across New York's municipalities will be an important spur to the commercial adoption of renewable heating and cooling.

NY-GEO members have noted the importance of implementing PACE at the widest possible level. In New York State, counties are considered municipalities. Ideally all 56 Counties should adopt PACE. It will be more difficult to market renewable heating if adjacent counties and cities have a different status in relation to PACE and other available financing options.

Worker Training

RECOMMENDATION 8 The development of a worker training program whose key elements are IGSHPA training, education for building professionals and wage supplementation for on-the job training

NY-GEO welcomes the commitment of \$36.5 million for training for 19,500 workers unveiled in NENY. We have reviewed the Workforce Development and Training Chapter of the Clean Energy Fund Investment Plan and agree with much of the approach, outlined there, particularly ⁴⁹ :

“NYSERDA is utilizing an Industry Partnership approach to workforce training (i.e., an ongoing dialogue among industry leaders on common workforce issues and opportunities). This approach is intended to: help identify worker skill needs; inform investments in skills and talent development; support career pathways; and develop the training infrastructure needed to better link supply and demand in the labor market.”

For NY-GEO, there are 3 key elements to an effective geothermal training program. One is training provided by our national sister organization, the International Ground Source Heat Pump Association (IGSHPA). Through various courses, this is important training that provides workers in our industry with a common theoretical understanding of GSHP technology, how design it and how to install it. NY-GEO has worked with NYSERDA bringing IGSHPA training to our annual conferences in innovative and affordable ways. and we look forward to expanding that cooperative initiative, and including partners such as SUNY Farmingdale as we do so.

The second element is training for those who make decisions about what type of HVAC system they will be installing in new builds and retrofits. Lack of knowledge about GSHP among architects, engineers and building owners is a major market barrier for renewable HVAC. In the Fall of 2018 NYSERDA helped fund a NY-GEO organized tour of Poughkeepsie, Albany, New York City, Farmingdale, Buffalo and Syracuse in which geothermal expert Jay Egg trained almost 400 building professionals in one-day sessions. While this tour was a success, its impact needs to be expanded considerably in coming years.

⁴⁹ *Clean Energy Fund Investment Plan, Workforce Development and Training Chapter*, NYSERDA, revised 2018 06 08 , page 2 <https://www.nyserda.ny.gov/About/Clean-Energy-Fund> accessed 2018 07 15

For the third element we recommend that a major portion of the funds be put to on the job training. We offer that the companies which are currently in the market have a well-grounded sense of the training needs to grow the industry. Supplemental on the job wage funding allows existing companies to grow at a more rapid pace and gives trainees real world training that does more than preparing them for a job. It puts them in a job and let's them grow from there.

Substantial support for installations

RECOMMENDATION 9: The adoption of substantial support subsequent to the current NYSERDA rebate program for addressing upfront costs for GSHP installations, including strong incentives, 3rd party ownership and ways to bring installations to the LMI market

PSC Chair John Rhodes is fond of referencing the support that New York State provides for renewables as “training wheels”, that are meant to get various renewable technologies to a state of independence where they can participate in the market without subsidies. NY-GEO agrees with this perspective and offers the following trends to reinforce this idea.

- Some in the GSHP industry have been hard at work developing business models that can reduce upfront costs through standardization. Dandelion Energy made a splash when they came out with a standardized, low price for installations on homes that meet their installation profile in the Hudson Valley. They are currently advertising a typical post-incentive price of \$18,433⁵⁰ The Ground Up Geothermal Alliance of Western New York is offering a similar standardized price option estimated at \$15,075 on their website after the NYS rebate and the federal tax credit.⁵¹
- While standardized pricing is just starting to be tested in the New York market, as that market grows, it is expected that scale, technology improvements, and aggregated projects that allow more efficient and productive use of drilling equipment and other installation factors will have a downward pull on first time costs.
- The soft cost of selling GSHP systems is also expected to lower as the technology becomes familiar and accepted. NYSERDA co-marketing dollars and community clean heating campaigns should be very helpful in this regard.
- Stronger building codes are an important part of the NENY initiative⁵². From a “carrot and stick” perspective, a strengthened, carbon-based NY State building code, calibrated to achieve net zero in a reasonable time frame, could go a long way to balancing out the upfront cost

⁵⁰ <https://dandelionenergy.com/>

⁵¹ <https://www.groundupgeo.org/pricing>

⁵² *New Efficiency, New York*, April 2018, NYS Department of Public Service and NYS Energy Research and Development Agency, age 61 <https://www.nyserdera.ny.gov/About/Publications/New-Efficiency> accessed 2018 07

dilemma for homeowners. Fossil fuel heating would get progressively more expensive and/or less able to meet code under a rigorous calibration. This will be discussed further in recommendation 9 below.

- There is a growing 3rd party ownership trend in the GSHP market with private companies looking to solve the up-front cost dilemma through 3rd party ownership. Examples include pure lease models or power purchase agreement models, and models where the business installs and owns only the loops outside the building, while charging residents for the energy inputs supplied to the indoor heat pump. One prominent example: ⁵³ “At the Whisper Valley development in Austin, homeowners will incur no upfront costs for the geothermal system, as the ground loop infrastructure is pre-installed throughout the community. Homeowners will receive an extended warranty and no maintenance costs for the first three years. Their energy costs will be fixed at approximately \$175 a month, which covers the costs of the geothermal infrastructure equipment, a solar PV system, LED-lighting package, appliances, and other technologies, and includes maintenance service. The savings in utility electricity costs can be equal to or greater than the monthly energy fee.” Other emerging models include Enbridge Energy utility ownership model in Ontario ⁵⁴, the Serenbe Community outside Atlanta Georgia, ⁵⁵ PanTerra Energy ⁵⁶, and partnerships that have been developed by Orca ⁵⁷. National Grid has put together a demonstration project to test utility ownership of a common loop under New York’s Renewing the Energy Vision (REV) program ⁵⁸ See also Bosch’s paper on 3rd party ownership. ⁵⁹

⁵³ *Developers and Builders Going All In on Geothermal Heating and Cooling*, 2017 11 06 PROUDGREENBUILDING website <https://www.proudgreenbuilding.com/articles/developers-and-builders-going-all-in-on-geothermal-heating-and-cooling/>

⁵⁴ *Canadian-Based Enbridge Embarks on Geothermal Plan*, Jennifer Runyon, Renewable Energy World 2017 04 17, <https://www.renewableenergyworld.com/articles/2017/04/canadian-based-enbridge-embarks-on-geothermal-plan.html> accessed 2018 07 15

⁵⁵ *Geothermal Part 2: Major Benefits to Community-Scale Solutions*, Mike Black, TechHomeBuilder website, 2016 09 22 <http://techhomebuilder.com/emagazine-articles-1/geothermal-part-2-3-major-benefits-to-community-scale-solutions> accessed 2018 07 15 and <http://www.contractormag.com/geothermal/atlanta-area-planned-community-progressive-contractors-dream> accessed 2018 07 15

⁵⁶ <http://panterra-energy.com/> accessed 2018 07 15

⁵⁷ *Carrier, Orca Energy Team to Provide Financing Option for Energy Efficient Geothermal Systems*, 2015 10 15 https://www.carrier.com/carrier/en/bs/news/news-article/carrier_orca_energy_team_to_provide_financing_option_for_energy_efficient_geothermal_systems.aspx accessed 2018 07 15

⁵⁸ *National Grid launches geothermal demonstration project in Glenwood Village*, Denise Civiletti-Riverhead Local News Oct 21, 2017 <https://riverheadlocal.com/2017/10/21/national-grid-launches-geothermal-demonstration-project-glenwood-village/> Accessed 2018 07 15

⁵⁹ *Overcoming the First Cost Barrier to Ground Source Heat Pump Technology: The Utility Ground Loop Service Provider*, Bosch Thermotechnology

- NY-GEO has previously forwarded the concept of thermal renewable energy credits (T-RECs) ⁶⁰ in the context of the State’s Clean Energy Standard (CES) ⁶¹, which requires 50% of New York’s electricity to be generated from renewable sources by 2030. Just as this energy efficiency initiative does, that effort requires a “hold harmless” mechanism, without which beneficial electrification would count against the ultimate program goal. To explain, the smaller the amount of electricity a utility sells, the easier it is for the utility to achieve 50% renewables. Electrifying the heating or transportation sectors means selling more electricity and requires the utility to secure more renewables. This creates more demand for renewables, which tends to drive up the price and require more effort and expense for the utility meet the 50% goal. T-RECs allow the utility to include the renewable energy harvested by heat pumps to count toward the clean energy goal in a positive way. In Massachusetts, T-RECs are currently offered through the Department of Energy Resources under their alternative energy portfolio standard, which was implemented in 2008 ⁶². It requires meeting 5% of the state's electric load with "alternative energy" by 2020 and “renewable technologies that generate useful thermal energy” are included as alternative energy. The DOER applies maximum multipliers for GSHP systems. The T-RECs can be pre-minted through this program, potentially providing several thousand dollars toward the system’s upfront costs. This same mechanism, which credits heat pumps for the renewable energy they provide, could be instituted in New York State
- An equitable rate structure as outlined in our recommendation 4 above, while lowering operating expenses to reflect true delivery costs, would not directly lower upfront costs. However, in a strong market it could possibly be “pre-minted” to do so. In that case, an entity could provide capital to building and home owners to be paid back through the savings afforded over time by lower delivery costs. In any case, it would definitely even the “value proposition” a building owner can consider when weighing HVAC options. NY-GEO emphasizes that equitable rates are not an incentive or subsidy, but are an accurate reflection of costs.

http://www.greenbuildermedia.com/hubfs/Energy_Solutions_Art/Utility_Ground_Loop_Service_Provider_White_Paper.pdf accessed 2018 07 15

⁶⁰ Comments of NY-GEO, the New York Geothermal Energy Organization in Case 15-E-0302, In the Matter of the Implementation of a Large Scale Renewable Program, Order Expanding Scope of Proceeding and Seeking Comments, issued January 21, 2016, and Staff White Paper on Clean Energy Standard, issued January 25, 2016, April 14, 2016 <http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={FCD0B215-13DE-4840-B7BD-B4465A40BA20}> accessed 2018 07 16

⁶¹ <https://www.nyserda.ny.gov/All-Programs/Programs/Clean-Energy-Standard> accessed 2018 07 16

⁶² Database of State Incentives for Renewables& Efficiency (DSIRE) website <http://programs.dsireusa.org/system/program/detail/4624> accessed 2018 07 16

- The “high upfront cost” of GSHP systems may in some ways be reflective of the true cost of HVAC installations. NY-GEO is not aware of a detailed, comprehensive inventory and accounting of the socialized costs of fossil fuel heating. In our publicly filed testimony in the current Orange and Rockland rate case,⁶³ we estimate the total cost of bringing natural gas to new customers in the proposed Tuxedo Farms housing development at more than \$47,000, most of which would be socialized costs absorbed by all O&R ratepayers. This cost of course doesn’t include the hefty tax breaks that help pay for gas exploration, drilling and transmission to New York. Nor does it include the socialized impacts of the health problems caused by burning fossil fuels. And, until a realistic carbon price is attached to natural gas, the probably catastrophic cost impacts of climate change won’t be part of the comparison either. It would quite an eye opener if economy wide removals of fossil fuel “training wheels” could be put in place before considering how to support the development of the heat pump market.

The Renewable Heating and Cooling Policy Framework⁶⁴, released by NYSERDA in February of 2017, showed early on that NYSERDA would be looking closely at the upfront cost gap barrier that exists for heat pumps. When the Governor’s current GSHP rebate program sunsets within the coming year, NYSERDA will have had 2 years experience with New York’s market conditions, including time with and without the federal 30% tax credit in place. We understand NYSERDA to be close to an accurate understanding of the market price gap that currently exists for GSHP installations as well as the grid value those installations bring to all rate payers. We look forward to providing NYSERDA and the DPS with any information they require to develop an effective successor to the current rebate program. We have strong hopes that NYSERDA will come up with an effective package of incentives, financing options and ownership options that will allow the market to thrive

As with most renewables there is a dilemma in that low-income citizens, who can benefit most from the economic and environmental benefits of the renewables are least able to afford the upfront costs. NYERDA has developed a residential financing option for geothermal installations for low income New

⁶³ *Testimony of the New York Geothermal Energy Organization in case 18-0067*, 2018 05 25 <http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={9B53E7B7-B5A6-458D-8029-06F27FC27288}> accessed 2018 07 15

⁶⁴ *Renewable Heating and Cooling Policy Framework: Options to Advance Industry Growth and Markets in New York* February 7, 2017, NYSERDA, <http://www.mc-group.com/renewable-heating-and-cooling-policy-framework-options-to-advance-industry-growth-and-markets-in-new-york/> Accessed 7/15

Yorkers⁶⁵. Earlier this year, geothermal installations were integrated in the Green Jobs/Green New York program. The availability of long term, low cost financing with the option of repaying the loan on utility bills can go a long way toward making renewable heating affordable for LMI customers. NY-GEO looks forward to continuing to work with NYSERDA and the DPS on ways to bring the benefits of GSHP technology to all New Yorkers, including targeted rebates.

⁶⁵ <https://www.nyserda.ny.gov/All-Programs/Programs/Residential-Financing-Options> accessed 2018 07 16

Net Zero Carbon Code

RECOMMENDATION 10: The development of a detailed glide path to a net zero carbon emission building code for New York State

As the NENY White Paper points out: ⁶⁶

“Building energy codes in new construction can lock in energy performance as well as the carbon footprint of the building for the subsequent 50 years through the energy performance of the building shell and the selection of an HVAC system. Building energy codes in renovation typically apply to lighting, windows and roofing, and HVAC and hot water system components, which are routinely upgraded during a building’s life. Driving energy efficiency and carbon reduction through energy code allows New York to leverage existing market activity and the natural cycle of building upgrades into long term benefits. More aggressive building codes based on energy and carbons savings needs to be built into New York’s long-term transition to a low-carbon economy and accelerated action needs to start now.”

This statement was reinforced in the technical webinars NYSERDA and DPS presented in June ⁶⁷ and was built upon with the slide below that outlines specific net-zero targets and timelines projects on state owned buildings and campuses:

Leading by example

Accelerating energy efficiency in State facilities and construction will save energy, prove value, and catalyze market adoption of the best solutions.

- Undertake and act upon energy master planning for new construction and retrofits
- Path to net-zero energy (NZE) new construction for State buildings: SUNY’s leadership commitment (2020) and a viable schedule across State entities for low-rise office (2020), housing (2025), and other (2030) building typologies
- Intelligent building solutions
- Expand State options to use performance contracting and design/build models
- Annual benchmarking and disclosure for State buildings > 25,000 square feet

 Get signatures from others and tra

⁶⁶ New Efficiency, New York, April 2018, NYS Department of Public Service and NYS Energy Research and Development Agency, page 61 <https://www.nyserdera.ny.gov/About/Publications/New-Efficiency>

⁶⁷ June 2018 Technical Conference Presentation pdf, NYS Department of Public Service <http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={97ADEBA6-57C4-42C5-BD26-98535FF32C10}> accessed 2018 07 16

The slides also pledged to “develop carbon-focused metrics” and “advance mandatory stretch codes to deliver increased energy savings in the 2020 stretch code”.

These pledges are crucial. NY-GEO urges that they be augmented by a pledge to attain a net zero carbon-based code by a specific date with a glide path defined to reach that goal that is tied in to the 40% by 2030 and 80% by 2050 goals.

Allowing the development community to plan for a well-defined future gives them the certainty they need to make productive investments. The urgency of meeting New York’s climate goals can best be reflected in a code plan that is tied to those goals

Statewide Online Pre-Screening Tool

RECOMMENDATION 11: The development of a statewide online pre-screening tool so building owners can easily access data on the geothermal potential of their properties, building on models developed for New York City's Local Law 6 and the NYPA/NYSERDA Geothermal Clean Energy Challenge

In 2016 New York City passed Local Law 6 of 2016, which requires municipal HVAC projects to consider geothermal as a first option and to be used if it is found to be economical.⁶⁸ Of particular note is cost of carbon used in calculating the economics of a project.

2. If the geothermal system has the lowest net present value of all alternatives considered it shall be selected for implementation.

3. The social cost of carbon value shall be as follows:

<i>Year</i>	<i>Dollar value per metric ton of carbon dioxide equivalent</i>
<i>2017</i>	<i>128</i>
<i>2018</i>	<i>132</i>
<i>2019</i>	<i>136</i>
<i>2020</i>	<i>140</i>
<i>2021</i>	<i>142</i>

Pursuant to Local Law 6, the City has produced a fantastic web resource that provides property specific pre-screening information on the geothermal suitability of each property – private as well as public - in the City.⁶⁹

⁶⁸ A LOCAL LAW To amend the administrative code of the city of New York, in relation to geothermal systems 2016 https://www1.nyc.gov/assets/buildings/local_laws/ll6of2016.pdf accessed 2018 07 16

⁶⁹ <https://www1.nyc.gov/assets/ddc/geothermal/index.html> accessed 2018 07 16

On a State-wide level, the NYSERDA/NYPA Geothermal Clean Energy Challenge program provides: ⁷⁰

“The owners of the first 75 eligible sites to participate in the Geothermal Clean Energy Challenge will be able to take the first step by using a free summary report provided by NYSERDA and NYPA. The free report will include a quantitative analysis of the technical and economic viability of their potential GSHP systems and a review of important qualitative factors specific to implementing their potential systems.

Eligible applicants determined to have the best sites for GSHP systems will be offered the opportunity to receive financial assistance for detailed energy audits and schematic designs for a GSHP system.”

NY-GEO recommends that plans be developed for the best aspects of the NY City pre-screening tool and the Geothermal Challenge summary report to be combined in a statewide, property specific database to provide building owners with the best available pre-screening data to inform their decisions to investigate moving forward on the transition to efficiently heat and cool their building through GSHP.

⁷⁰ <https://www.nyserda.ny.gov/All-Programs/Programs/Geothermal-Challenge> accessed 2018 07 16

kWh vs. Btus

RECOMMENDATION 12: The adoption of kWh as opposed to Btus as the unified Energy Efficiency unit of measurement to bring NYS in line with the rest of the world as well as with a post-electrification future dominated by electrical energy use as opposed to fossil fuel burning

As an all fuels approach is embraced, it will be important for all the participants active in developing energy policy in New York State to get comfortable and familiar with a single unit of measurement. By definition, 3.412 British thermal units (Btu) are the equivalent of 1 Watt hour (Wh).

We propose that rather than continuing to use Btus for program goals, such as the overall 185 TBtus goal, that Wh, kWh and MWh become the new currency for the all fuels approach. NY-GEO contends that Whs are a better unit of measure to adopt than Btus for the following four reasons:

- As a Wh is larger unit of energy, smaller numbers will describe the same amount of energy than if Btu's are used, resulting in more easily understood comparisons. A factor of 3.4 may not be very significant when millions and trillions of the units are being described, but every little bit helps when spreading common understanding of energy concepts.
- New York's clean energy and regulatory communities have largely focused their efforts on the electricity sector where kWh's and MWh's have become increasingly familiar and meaningful terms. This familiarity gives Wh a leg up on Btu as minds shift to think of energy efficiency across fuels.
- The future is electric. As we transition to electric vehicles and heat pumps which are fueled by kWh it will make less and less sense to think of their output in terms of Btus. It will be much easier to think of kWh inputs resulting in kWh results or outputs than having to continue switching back and forth.
- The world has largely adopted the metric system of measurement where Watts are the official unit of power and kWh are commonly used as a unit of energy. If we weren't talking about moving to an all fuels system, it might make sense to retain both Btus and kWhs, but as long as we're going to need to be using a common term, NY-GEO urges using the one New Yorkers are most familiar with, which also happens to conform to international standards.

Managed Decapitalization

RECOMMENDATION 13: The adoption of a process to prepare for decapitalization of the natural gas utility industry that minimizes the exposure of ratepayers

There can be much human pain, injustice, misery, and chaos caused as industries are crowded out in the marketplace. Buffalo, NY is an important example of a Rust Belt city whose economy was decimated by the decline of the domestic steel industry, particularly the closing of the vast majority of the Bethlehem and Republic Steel factories. Buffalo was one of the largest and wealthiest cities in America at the beginning of the 20th century. According to the US Census Bureau's 2016 American Community Survey Buffalo is now the 18th poorest of the 599 largest cities in America.⁷¹ It is currently at about half of its peak population. Rochester, NY fares even worse at number 13 on the poverty list after the decline of major employers like Kodak and Xerox. Further examples of destructive industry transitions are littered across the state.

Western New York has also had to absorb significant, albeit smaller economic shocks as coal plants have closed recently in Tonawanda and Dunkirk, decimating local tax bases and adding to unemployment.

The natural gas industry is a far smaller employer than steel and other industries, but its impact on consumers through their heating and electric bills should not be underestimated. As the necessity of responding to climate change requires the heating sector to burn less and less gas each year, it will be important to manage that decrease in a way that minimizes its impact on those who are left paying gas utility bills. Otherwise, a nightmare can be envisioned in 20 to 50 years where the unfortunate minority who are left heating with gas are left to themselves to finance an infrastructure that was built to serve more than half of New York's households.

There are few examples of managed decapitalization of industries, but it will be important for New York to thoughtfully manage the transition away from fossil fuel heating. One place to start is in readjusting depreciation so that assets are depreciated to reflect not only their expected physical life but their expected useful life in service. New York should carefully consider the status of natural gas assets being

⁷¹ See *Richest, Poorest Cities and Counties Based on New Census Data*, Michigan News, 2017 09 20 https://www.mlive.com/news/index.ssf/2017/09/see_richest_poorest_us_cities.html accessed 2018 07 16

installed today, which are being depreciated over 65 years and more. Will the presumably small customer base of 2078 be able to absorb those depreciation costs?

The status of gas utility workers needs to also be an important consideration. Their absorption into the renewable heating sector and the electric utility sector, which will grow substantially under beneficial electrification, should be well planned for and well carried out.

Germany recently established a Coal Exit Commission, formally called the *Commission on Growth, Structural Change and Employment* that could serve as a model for New York in answering some aspects of the challenge of natural gas utility decapitalization.⁷²

⁷² *Germany's Coal Exit Commission*, Benjamin Wehrmann, Clean Energy Wire, 2018 06 25
<https://www.cleanenergywire.org/factsheets/germanys-coal-exit-commission> accessed 2018 07 16

Locational Incentives and Market Development

RECOMMENDATION 14: The adoption of an incentive structure that balances the importance of locational and other granular factors with the importance of encouraging market penetration by virtue of being easy for property owners to understand

NY-GEO understands the importance of location in utility system decisions. The price increase impact of load increasing decisions are far more significant on hot days in urban areas, when many other consumers are making the same decision in an area with low marginal capacity to absorb the peak than they are in an area with opposite characteristics.

We urge the Commission to balance the importance of location and other factors that might make for a regionally variable program with the importance of providing a consistent, easily and widely understood incentive arrangement that can be easily understood and communicated on a statewide scale. In a market that is largely unaware of renewable heat options, the less complicated and confusing an incentive or financing package is, the more likely it is to be accepted. In 2018 information travels fast across New York State. The more consumers can see a consistent policy and price support signal, the sooner they will become comfortable with the technology and its advantages