NY GEOTHERMAL ENERGY ORGANIZATION

VIA E-MAIL

Climate Action Council Co-Chairs:
Doreen Harris, President and CEO, New York State Energy Research and Development Authority
Basil Seggos, Commissioner, New York State Department of Environmental Conservation; and
Sarah Osgood, Climate Action Council Executive Director

2022 07 01

Re: NY-GEO Comments on the Climate Action Council Draft Scoping Plan

Dear President Harris, Commissioner Seggos and Executive Director Osgood

Please accept the attached comments from NY-GEO on the Climate Action Council's Draft Scoping Plan

Sincerely,

Bill Nowak

Bill Nowak
Executive Director, NY-GEO
716-316-7674
nygeoinfo@gmail.com

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

Introduction

The New York Geothermal Energy Organization (NY-GEO) commends the Climate Action Council for its open process that has led to an extensive Draft Scoping Plan aimed at reducing New York's greenhouse gases 40% by 2030 and 85% by 2050.

New York is an important actor in the world's efforts to avoid runaway climate instability. Our ability to produce a comprehensive, robust and well-designed plan – one that is effectively carried out - can be an important turning point in what has rapidly become an uncertain struggle for human survival in the face of a collapsing climate.

We are in general agreement with the thrust of the Draft Scoping Plan recommendations. A good deal of research, debate and thought has gone into the integration analysis that shows the plan is capable of guiding New York to meet its greenhouse gas reduction goals. However, there is very little room for error in getting to 85%. This plan needs to be fully, consistently and enthusiastically enacted by successive State governors, legislatures, and agencies, along with an informed, willing and energized citizenry, bolstered by effective laws, funding, incentives and education. There is no guarantee all those elements will come together. In fact, it is likely that more than a few of them will falter between now and 2050. For that reason, we urge the Council not to take steps that will weaken the recommendations in the Draft Plan and to look for ways to strengthen the recommendations and move timelines forward wherever possible.

Our comments will focus on the Scoping Plan's Buildings recommendations where NY-GEO believes the expertise of our members will provide an important perspective. Our members are largely stakeholders supporting the Ground Source Heat Pump (GSHP) industry.

In particular we'll focus on the following areas:

- The Importance of a Timeline for Electrification
- Is Hydrogen an Alternative to Electrification for the Building Sector?
- GSHPs Role in Mitigating the Impact of Electrification on Peak Demand
- Electric Rates and Heating
- Review & Revise Ground Source Heat Pump Drilling Regulations
- Economy Wide Strategies

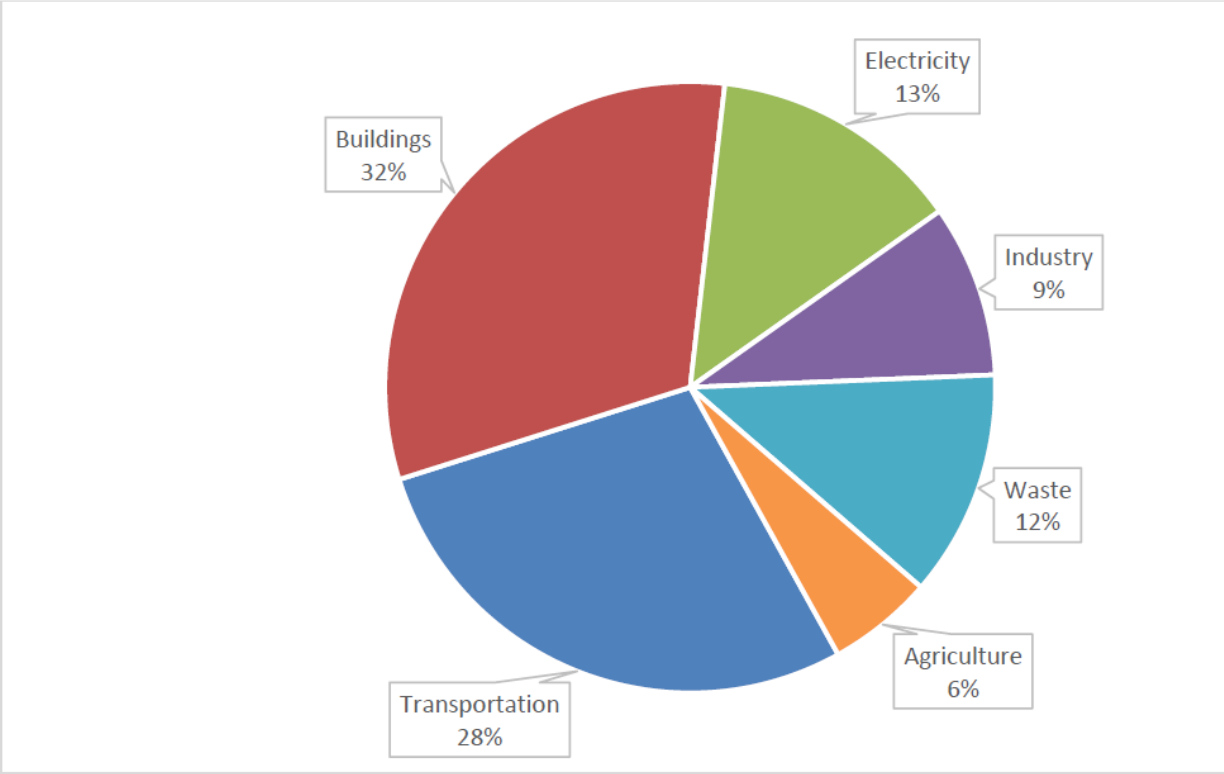
The Importance of a Timeline for Electrification:

New York's housing market needs clear signals on how and when it will be required to reduce GHG emissions. There is currently very little awareness, as new buildings are going up and old buildings rehabbed, that fossil fuel heating is approaching obsolescence and may need to be replaced at significant costs sooner, rather than later. The clearest way to send this message would be for New York State to post a timetable for the transition to highly efficient electric heating and cooling.

NY's transition to building electrification will include several elements, including giving and taking away "carrots" and employing "sticks". The time for signaling the use of sticks is upon us.

As shown in the figure below from the Scoping Plan, the building sector is the largest source of GHG emissions in the NYS economy. The Plan notes in Section 4.1 – Summary of Sectoral Emissions, that the vast majority of the building emissions are from importing and burning fuels, with the remaining 14% coming from HFC's released from building equipment and foam insulation.

Figure 2. 2019 New York State GHG Emissions by Scoping Plan Sector



Recent announcements in several jurisdictions and even by several auto manufacturers of the end of gas-powered car sales provide a significant market signal that the end is within sight for climate polluting vehicles. Because of the relative importance of the heating sector in New York's cold climate, the Climate Action Council, as well as Governor Hochul and State Legislators, have a golden opportunity to make an internationally significant parallel announcement in the heating sector.

Without distinct "writing on the wall", it is not clear that any amount of cost cutting or education efforts will jar the market out of doing things the way they've always been done. NY-GEO is aware of GSHP system proposals, even for tall downstate buildings, that were cost competitive but rejected, seemingly on the basis of familiarity with conventional heating systems more than anything else. The market is currently comfortable with fossil fuel heating and needs a strong signal to move in another direction.

We also face an enormous challenge transforming the HVAC industry itself to one that is working to meet our climate challenges. A clear set of end dates would be very helpful in turning the attention of HVAC design and installation stakeholders to the transition to fossil-fuel free heating. New Y ork State has a more than adequate supply of HVAC contractors capable of installing heat pumps with a small amount of additional training for in-building systems. What is needed is a market signal that their skills will be needed installing a slightly different set of equipment with far higher environmental benefits – heat pumps.

The skillsets and capitalized companies that are more difficult to develop and create for the transition to building electrification include GSHP drilling and system design professionals. Without a strong market commitment, it is very difficult for existing drill contractors to make the substantial capital investment needed for expensive new equipment to expand their operations. Dates requiring no fossil fuels in buildings are also required to draw design professionals with engineering and architecture practices into specifying heat pump systems consistent with CLCPA goals.
This same signal is required to draw those with engineering, architecture and other important skills into the system design end of heating electrification.

The Climate Action Council's initial draft proposal called for an all-electric code for low rise new construction starting in 2025. After the CAC's integration analysis showed that the 2025 date did not bring the building sector to an acceptable level of greenhouse gas reductions, the Council moved its timetable for a new construction prohibition of fossil fuels up to 2024.

We urge the Council to maintain the 2024 date in its recommendations. All electric technology for heating, hot water, cooking and clothes drying is mature and ready for use. New York needs to take on the challenges involved with

making all-electric the standard for new construction. Anything less renders the Scoping Plan “too little too late”.

It is completely unacceptable for new construction to continue including fossil fuel appliances that will be discharging substantial greenhouse gases emissions for decades, especially during the crucial few years where we need to start substantially reducing GHG emissions to avoid a climate catastrophe.

Is Hydrogen an Alternative to Electrification for the Building Sector?

While electrification of heating was well studied and well vetted in the Climate Action Council process, some commenters, particularly gas utilities, are now focusing on hydrogen and renewable natural gas (RNG) as alternatives to electrification. These fuels may well have their place in particularly hard to electrify niches – perhaps high-temperature intensive industries and certain transportation sectors. However, green hydrogen will be a very inefficient and expensive way to heat buildings.

If a wind turbine or a solar farm produces 100 kWh of electricity for the purpose of producing and delivering hydrogen for heating a building, a good deal of that energy would be lost before it reaches the building's heating and hot water systems.

- Power is lost as the electricity runs on the grid from the renewable source to the electrolysis facility.
- In electrolysis 25% of the electrical energy is wasted as it is used to split water into hydrogen and oxygen. (See Amory Lovins, CEO Rocky Mountain Institute – 20 Hydrogen Myths (which is a pro hydrogen article): https://rmi.org/wp-content/uploads/2017/05/RMI_Document_Repository_Public-Reprts_E03-05_20HydrogenMyths.pdf)
- The hydrogen supply would then face further losses as it is stored and transported. Hydrogen (H_2) has an atomic mass of 2, as opposed to natural gas or methane (CH_4) which has a mass of 16, making hydrogen far more likely to leak in storage or while being transported through pipes.

If we generously estimate the three areas of losses above at a total of only 25%, the hydrogen would reach the home with 75% of the original renewably generated energy intact, so would contain 75 kWh of energy. (For those used to calculations using BTUs, 1 kWh equals 3,412.14 BTU's.) If the furnace or boiler in the home is in good condition and operates at 90% efficiency, another 7.5 kWh of energy would be lost at the furnace or boiler. Using these generous assumptions, the hydrogen would heat the home with 67.5 kWh of the original 100 kWh of energy. Another way of stating this is the electricity has been used at a rate of 67.5% efficiency.

In contrast, with a heat pump operating at 300% efficiency (a high level of efficiency for an air source heat pump and a low one for a geothermal heat pump) with a 10% line loss transporting the electricity from the turbine or solar panel to the home, the heat pump will deliver 270 kWh of heat to the home and the electricity has been used at a rate of 270% efficiency.

This means it will take a minimum of 4+time the amount of electricity generation to heat a building with hydrogen compared to heating it with a heat

pump. While the hydrogen industry may be able to improve on the numbers presented above, there will always be an energy loss as electricity is used to electrolyze the water into hydrogen and oxygen, the process of burning will always be less than 100% efficient and the net amount of energy available for heating will always be a multiple less than the electricity generated. In contrast, properly installed heat pumps will always produce far more heat energy than the original renewable electricity generated.

As valuable as green hydrogen might be in some niche areas of the economy, using hydrogen for heating and hot water in buildings is an expensive and wasteful non-starter when highly efficient electric heat pumps are available.

In addition to the analysis above, which focuses on the most efficient use of electricity in transitioning the heating sector, members from NY-GEO's Policy Advisory Board have developed a broader analysis of hydrogen that is being submitted under Thomas Geothermal Energy (TGE). We urge this analysis also be given serious consideration as the Scoping Plan is finalized.

GSHP's Role in Mitigating the Impact of Electrification on Peak Demand

New York has been making substantial efforts to move to carbon free electricity sources in order for the electric generation sector to contribute to a 40% GHG reduction by 2030 and an 85% reduction by 2050. Achieving these reductions is a tremendous challenge. And adding to the challenge will be demand from electrifying the transportation and heating sectors. According to the New York System Operator's (NYISO's) *2022 Draft Load & Capacity Data Report* (aka the Gold Book) "The Total Resource Capability in the NYCA (New York Control Area) for the summer of 2022 is projected to be 41,060 MW". 37,431 MW of that capacity is from within the NYCA with rest imported and from "Special Case Resources". According to the Gold Book, Summer peaks over the past decade have ranged from slightly less than 30 GW to 34 GW. Winter peaks over the same period have ranged from 23+ to less than 26 GW.

Meeting all, or even a substantial portion of the heating and hot water peak demand load in our state with electric heat pumps, has the potential to create a large winter peak that would force a potentially expensive build out of current generating and delivery infrastructure. The build out can be made manageable through insulating and air sealing (i.e. weatherizing) our buildings, and more significantly by maximizing the degree to which we use peak-efficient heat pumps to mitigate the growth of peak winter electric demand.

Ground source heat pumps (GSHP) are far and away the most peak-efficient way to electrify the heating load because the heat source and sink maintain a relatively constant temperature throughout the seasons. In contrast, the heat source for air source heat pumps (ASHP) is the outside air, and it varies widely in temperature through the seasons, and even day to day within seasons.

The efficiency of heat pumps, when heating, is generally expressed as "co-efficient of performance" (COP) – the ratio between the input electricity used to power the heat pump and the total heat output that is provided. The heating performance of GSHPs has been measured in New York State and has been found to average ~3.6. Field data for air source heat pumps is much harder to come by. Using the field experience of NY-GEO contractors, who install both ASHP and GSHP systems, we estimate that the difference in peak-demand efficiency could result in a significant difference in peak demand for every percentage point difference in the ratio of GSHP to ASHP that New York winds up with in 2050.

Another way of expressing the difference in peak demand efficiency between ground source and air source heat pumps is that GSHPs provide thermal storage. The ground itself is a thermal storage medium consistently replenished year after year by absorbed solar energy. In addition, geothermal systems remove much of the solar energy absorbed by buildings and store that thermal energy underground when GSHP systems are used to cool

buildings. GSHP systems deposit, or sink, the heat from the building in the ground around the ground heat exchange (GHX) loop during the cooling process. Once the thermal storage value of a geothermal installation is understood, a GHX loop can be categorized and recognized as a form of thermal storage infrastructure.

GSHPs have a demonstrated lower peak demand relative to other electrification technologies. This lower kW is directly attributable to the GHX's storing thermal energy that in turn allows more efficient operation during the coldest and hottest days of the year. It has the impact of more well recognized Distributed Energy Resources (DER) like an electric battery storage device – they both can be utilized to lower kW of a building during peak events.

NY-GEO recommends several measures to support GSHP installations as a way to reduce peak demand and thereby reduce the pressure on electricity costs as we electrify the transportation and buildings sectors of our economy. We'll start with eliminating current subsidies that create an unlevel playing field in favor of gas heating relative to heat pumps.

At one point the Legislature, Governor and Public Service Commission made the decision that it was in the public interest for New Yorkers to have natural gas service. Policies were put in place to encourage consumers to use gas for their fuel needs. These policies included rate basing the expense of gas infrastructure, granting long depreciation terms reflecting the long life of gas infrastructure, and offering line extensions for free – paid for by all gas customers – to new customers. The latter is commonly known as the 100-foot rule. The Legislature also created an 'obligation to serve" gas customers within a given distance of existing gas mains.

There needs to be clear recommendations in the Scoping Plan to phase out the policies that encourage gas expansion and gas use. The subsidy of the 100-foot rule needs to be eliminated. Depreciation terms need to reflect the fact that most gas infrastructure will no longer be in use after 2050, concurrent with NY eliminating 85% of its GHG emissions by that date.

At the same time, the Governor, Legislature and PSC need to decide that it is in the public interest to protect electric rate payers from increased costs due winter electric peak demand by setting policies and incentives that encourage thermal storage.

The Scoping Plan could encourage thermal storage by the including the following recommendations:

- More fully and directly recommend the repeal of the 100-foot rule, and depreciation that takes fossil fuel infrastructure past the 2050 CLCPA deadline, as these policies create an unlevel playing field by subsidizing gas relative to decarbonized alternatives like heat pumps.

In concert with removing gas reinforcing policies, the Scoping Plan should recommend policies that reinforce thermal storage, including:

- Provide a thermal storage incentive for the installation of GHX loops. NY-GEO requests the establishment of a thermal storage incentive based on the value of the peak demand reduction the GHX loop provides. Currently incentive programs, by not valuing peak demand reduction, tend to reinforce the lower first cost of ASHPs, which are not peak-demand efficient. Coupled with the thermal storage incentive, GSHPs should continue to be provided with the current rebates under the PSC ordered utility NYS Clean Heat program. These are based on the energy savings generated by the heat pump and are applicable to both ASHPs and GSHPs
- Re-examine the effective useful life (EUL) of the ground heat exchange (GHX) loop in the State's Technical Resource Manual (TRM). The TRM currently includes the GHX loop as part of a GSHP system installation, which is credited with a 25-year EUL. The 25-year EUL accurately applies to the indoor equipment of a GSHP system, primarily made up of the geothermal heat pump, a piece of equipment with an average life of about 25 years until needing replacement. The outdoor equipment is the GHX loop, which is buried underground and protected from weather and wear and tear. GHX loops are generally warranted by pipe manufacturers for 55 years. They are made of the same type of plastic pipe used widely for gas and water utility lines, which, as we noted, are depreciated by utilities far beyond 50 years in most instances. We recommend the GHX loop should have an 85-year EUL under the TRM, and should be depreciated under the same terms currently extended to gas or water utility infrastructure.

In addition, the Scoping Plan should include recommendations in relation to legislation that was considered in the legislative session that ended June 2nd.

- Make the Geothermal Heat Pump tax credit refundable. The draft Scoping Plan notes on page 133: "And to further encourage homeowners to install GSHPs, New York could provide a geothermal tax credit to offset GSHP system expenditures that is comparable to the State's Solar Energy System Equipment Credit." This recommendation was helpful when, as part of this year's budget agreement, the Governor and Legislature adopted a residential geothermal tax credit set at the same level as the solar tax credit, being 25% of installation cost up to $5,000 (Part FF of S82009C). This tax credit is already stimulating interest and activity in the residential GSHP market. We request that the final scoping plan build on this step by recommending that the credit be amended to be refundable. For many low and moderate-income New Yorkers, their state tax liability is too small for the tax credit to have an appreciable impact on the upfront cost of the

system, which is the primary market barrier to consumers choosing geothermal.

- Pass the geothermal sales tax exemption bill S642a/A8147. A sales tax exemption, when applied at the wholesale level, would make geothermal installations more affordable. It would be particularly helpful in larger projects, such as multifamily building projects involving multiple heat pumps, where equipment is a greater percentage of project costs.

In addition to these recommendations, we urge a closer look at a suggestion from page 133 of the Draft Scoping Plan: “Specific to the buildings sector, levying a “feebate” on fossil fuel equipment and allocating the revenues to support building decarbonization is another possible policy option to provide a market signal that encourages purchase of heat pumps while also providing a new source of funding.”

Electric Rates and Heating

In New York, current residential electric utility rates charge customers for both delivery and supply in direct proportion to the number of kWhs of electricity they use. This is commonly referred to as a volumetric rate. Volumetric rates, especially when combined with time of use provisions, usually are accurate in reflecting a utility's cost of securing the **supply** of electricity in the market, as utilities pay generators on a per kWh basis. However, the same does not apply to the utility's costs for **delivery** of the electricity, especially for heat pump customers. In both NYSERDA reports and utility rate cases, it has been recognized that volumetric delivery rates frequently result in overcharges for customers who switch to heat pumps.

NYSERDA released Report Number 18-44 in January 2019, titled *New Efficiency: New York Analysis of Residential Heat Pump Potential and Economics*. Starting on page 58 of the report they addressed this overcharge, calling it an inverse cost shift.

> The "inverse cost shift" refers to the following effect. Customers who install heat pump technology to replace conventional oil or gas combustion heating and air conditioning increase electricity usage during the winter and decrease electricity usage during the summer. For many customers, the result is a net increase in annual electricity usage that results in a net annual bill increase and increased revenues for the utility. Because the system is generally less constrained in the winter heating season, the increase in cost for the utility to provide the additional electricity in the winter is often less than the increase in revenue for the utility. This phenomenon most typically occurs for installations in the residential sector and is largely due to the structure of volumetrically based retail rates in the residential sector, which are designed to recover both variable costs as well as a portion of fixed-system infrastructure costs through a variable rate.
>
> For regulated utilities that earn a specified return on invested capital, an increase in utility revenues that exceeds the cost to serve additional load cannot be retained as profit but must be returned to utility ratepayers. As a result of these dynamics, the installation of a heat pump may lead the customer to start paying for a relatively larger fraction of the total systemwide grid infrastructure costs, which in turn, translates to a rate decrease for ratepayers as a whole; an "inverse cost shift" from non-heat pump ratepayers to the heat pump customer occurs. Rectifying this cost shift could improve the payback for customers.

> To quantify the inverse cost shift, this analysis compares the change in customer electricity bills between the heat pump and counterfactual case to the change in utility costs of providing the additional electricity; to the extent, upon installation of the heat pump, the customer's electricity bill is calculated to increase by more than the underpinning utility cost of procuring the bulk electricity, this is counted as the inverse cost shift.

Below is an excerpt from the table on page 60 of the report showing the impact of the cost shift on GSHP system customers who switch from oil heating in various utility territories across the state:

Table 9-1. Inverse Cost Shift per Installation per Year, Single-Family, Fuel Oil Replacement Retrofit (2019)

	2019 Annual	Bill Change	Utility Cost Change	Inverse Cost Shift
GSHP	PSEG LI	$843	$206	$637
	ConEdison	$1,030	$203	$827
	Central Hudson	$574	$199	$375
	Nat Grid	$596	$200	$396
	RG&E	$616	$173	$443
	NYSEG	$888	$190	$698
	ORU	$740	$195	$545

This overcharge has been the subject of discussion in numerous recent utility rate cases and has been addressed in various Public Service Commission orders issued in settling cases. The Geothermal Rate Impact Credit adopted on June 14, 2018 by the Public Service Commission (PSC) in the Central Hudson Rate Case [1] recognizes this phenomenon. The most robust and direct solution to this overcharge that has been activated in the New York market to date was instituted in the last Con Edison case and resulted in the establishment of a voluntary demand-based delivery rate. Here is the text from page 60 of the Joint Proposal in case 19-E-0065:

> "6. Optional Demand-Based Rate
> The Company will establish an optional demand-based rate, which will be available with no cap to (a) existing residential geothermal customers and (b) new residential geothermal customers that meet the Company's requirements for its

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

heat pump program to be launched during 2020. This rate will also be available to up to 5,000 other residential customers, including residential geothermal customers that do not meet the requirements. This rate will be based on the rate structure of Rider Z, Rate IV, and include a $27.00 customer charge, which reflects the full customer cost set forth in the 2017 ECOS study. The supply component of this rate will assess time-of-use supply for full-service customers. In addition, this Optional Demand-Based Rate will be subject to review in the Company's next electric base rate case. The Company agrees to track the accounts that sign on to this Optional Demand-Based Rate by adding a billing indicator in its existing Customer Service System. The Company will provide the following data points in an annual report filed with the Commission on March 1 of each Rate Year: (1) the number of customers participating in the rate, (2) the location of participating customers by county, (3) monthly on and off-peak kW and kWh, and (4) monthly bill impacts. Reporting of the items specified above shall be provided separately for participants using geothermal technologies and participants without such technologies.

The Optional Demand-Based Rate (OD-BR) – officially known as Service Classification (SC) 1 Rate IV - was instituted but remains largely unknown to Con Edison customers.

Con Edison filed their Optional Demand-Based Rate Report for 2021 on March 1st 2022, and it gives data on the 5 customers who accessed the program in 2021, only 1 of whom is a geothermal customer. That customer heats and cools a VERY large house, and thus is not typical, but as shown in the table below excerpted from the Con Edison report, they saved over $3,400 in their first four months accessing the rate compared to what they would have paid using the utility's standard residential rate.

Con Edison Optional Demand-Based Rate Report - January 1, 2021 - December 31, 2021

Account	Borough	Geothermal	Month	On-Peak kW	On-Peak kWh	Off-Peak kW	Off-Peak KwH	Monthly Bill Impact (Compared to Prior Rate)
577X	WS	Yes	September	16.8	1720	20.8	4720	-433.62
			October	28.8	2320	27.2	6840	-593.14
			November	28.4	2920	28.4	10000	-1,075.28
			December	32	3480	36.4	11840	-1,325.19

Despite its limited application, the OD-BR is a logical and well-structured response to the inverse cost shift. NY-GEO requests the Climate Action Council to include among its final recommendations one that explicitly requests the Public Service Commission to make accessible, well publicized, demand-based delivery rates that address the NYSERDA identified inverse

cost shift available from utilities across New York State. The rates should be voluntary.

To ease ratepayer anxiety about trying a novel rate, for each utility it should include the provision for a potential one-time bill credit, allowing those who adopt the DB-OR to switch back to their prior rate and receive a bill credit for excess payments, if they discover, during their first 12 months on the rate, that the new rate doesn't provide them with savings.

This ability to switch back is currently provided to those who adopt Con Edison's Rider-Z electric rate and is described on Leaf 327.6 or page 432 of the current tariff. The Rider-Z "Price Guarantee" allows customers to experiment with the rate without taking on the risk of paying more. If a similar guarantee was in place for SC-1 Rate IV, and it is well publicized and accessible to Con Edison customers, we should expect a dramatic increase in its use.

The Rider-Z tariff states:

> These Customers will receive the price guarantee for the first twelve-month period of the Pilot. Under this price guarantee, the Customer will receive a credit following first twelve-month period of the Pilot for the difference, if any, between what the Customer paid in excess of what the Customer would have paid under SC 1 Rate I over such twelve-month period.

A price guarantee is also available under National Grid's Voluntary Time of Use Rate, wherein:

> Customers have the option of receiving a one-time comparison of one year of charges on the SC-1 VTOU services versus the SC-1 standard tariff. The comparison is based on the 12-month period beginning with the bill period following the Company's receipt of vehicle registration. If you would have paid less on the SC-1 standard rate, excluding the balance of ESRM charge, then the Company will provide you with a one-time bill credit for the difference.

That text is found at the bottom of this page.
https://www.nationalgridus.com/media/pdfs/resi-ways-to-save/vtou-toucomparisoncharts.pdf

It is important to note that this is a cost-based request, and is not a subsidy in any sense.

Utility bills, or the operating costs of heating and cooling solutions, will be a major factor in the success or failure of the Climate Action Council's Final Plan. Giving consumers a clear path to save on their electric bills by rectifying the inverse cost shift, while taking peak demand pressure off the grid, is a win-win recommendation.

Review & Revise Ground Source Heat Pump Drilling Regulations

NY-GEO encourages the New York State's Climate Action Council to include a strong recommendation in the Scoping Plan that NY DEC undertake an immediate review of GSHP drilling regulations, especially for closed loop systems which go beyond 500 feet in depth. We believe the New York State's Climate Action Council's Scoping Plan needs to call for a careful review of GSHP drilling regulations, especially for closed loop systems which go beyond 500 feet in depth. We feel it's important to preface our request observing the important principles of protecting our state's groundwater resources, maintaining safe practices related to methane deposits, and restricting vertical bores from passing into adjacent property boundaries.

There are two significant area where NY-GEO would like to focus the review of deeper GSHP boreholes:

1. **Dense urban environments with limited area** to install GSHP infrastructure is often a focus of this dialog. Deeper boreholes reduce the area required to serve a building but require reduced regulatory burden to make these applications more broadly adopted.
2. NY-GEO estimates **95% of single-family homes** across NYS can be served by GSHP boreholes less than 750 feed in depth. Many existing average-sized homes across NYS require more capacity than a 500-foot borehole can supply and adding a second borehole is a significant additional expense.

Presently most of the GSHP drilling falls under guidelines from the DEC Division of Water for boreholes 500 feet deep or shallower. However, as the industry expands, we have identified as a high priority the regulatory and permitting framework for drilling GSHP boreholes beyond 500 feet. Article 23 of the Environmental Conservation Law provides the DEC authority to regulate such activities, but our interpretation of the only regulations issued pursuant to Article 23 – 6 NYCRR Parts 550-559 – is that they are directed toward "[f]ostering, encouraging and promoting the development, production and utilization of natural resources of oil and gas" while serving the overarching imperative of protecting groundwater. As such, many of the provisions of Parts 550-559 are facially inapplicable to, or ill-fitting for, GSHP industry drilling activities. This dynamic creates uncertainty, hindering an efficient scaling of GSHP measures needed to achieve the "major shift in end-use electrification" identified in the June 2020 Pathways Analysis.

More recently in the report produced in June 2021 by the Pace Energy & Climate Center, commissioned by NYSERDA, titled *Overcoming Legal and Regulatory Barriers to District Geothermal in New York State* produced Table 1. comparing the Regulatory Requirements for Closed Loop Ground Source Loops above and below 500 feet.

Table 1. Requirements for Closed Ground Source Loops

Source: Well Owner and Applicants Information Center, NYSDEC, available at https://www.dec.ny.gov/energy/1522.html (accessed March 6, 2021); Well Operator Responsibility, NYSDEC, available at https://www.dec.ny.gov/energy/1639.html (accessed March 6, 2021); Ground Source Heat Pump Drilling Regulations Discussion, Presentation by NY-GEO (Nov. 12, 2020).

Under 500 Feet	500+ Feet
Driller and pump installer certification and registration	
Municipalities may impose additional requirements	
	Organizational Report (Form 85-15-12)
	Application for permit to drill well (Form 85-12-5)
	Environmental Assessment (Form 85-16-5)
	Financial Security Worksheet (Form 85-11-2)
	Certified site plan
	Casing and cementing plan
	Drilling progress reports
	Periodic drilling drift correction
	Well drilling and completion report (Form 85-15-7)
	Annual reports of status and use of well
	Incident reports of leakage or condition posing risk to environment or the health, safety, welfare, or property of any person
	Permit to plug and abandon

Here's a synopsis of the current state of GSHP drilling in NYS:

1. New York State imposes different requirements for GSHP boreholes drilled less than 500 feet and the identical boreholes over 500 feet.
2. Permitting requirements for GSHP boreholes over 500 feet in depth are designed for oil and gas production, which are considerably more rigorous and costly.
3. The different permitting regimes effectively limit geothermal system design to shallower depths for many developers of residential and individual building systems.
4. Consequently, more boreholes must be drilled than would be required if deeper boreholes were employed to support the same system capacity.
5. The greater number of GSHP boreholes increases overall costs due to greater drilling time, materials requirements, particularly costly well casing, expanded site restoration area, and increased production of cuttings and water.

To assist in its efforts, NY-GEO has formed a committee of industry professionals, including GSHP drillers, to identify market impediments that can be addressed in parallel with the State's broader policy-making process. NY-GEO looks forward to engaging with NYS DEC more broadly to discuss ways to expand GSHP drilling with establishing the appropriate regulatory footing.

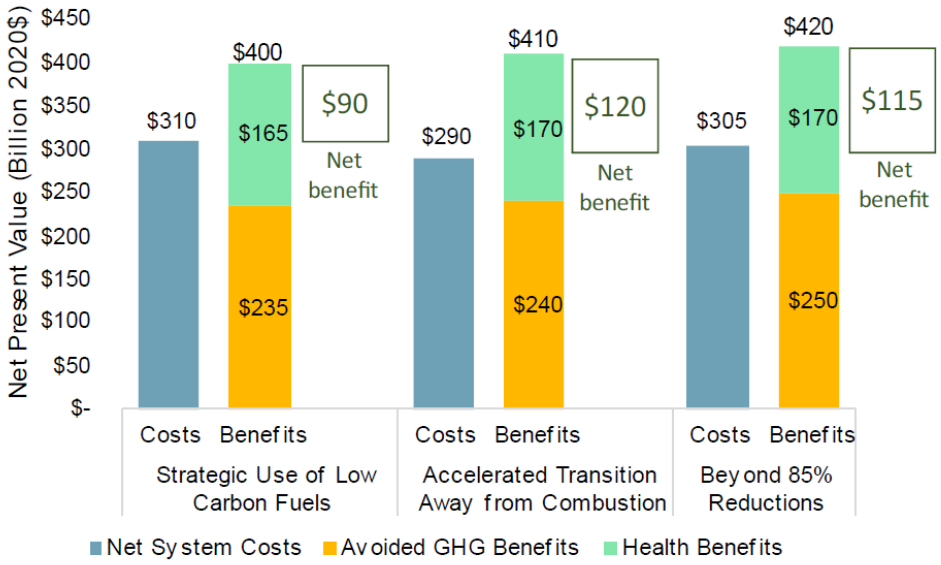
Economy Wide Strategies

We will have less to say about economy-wide strategies than other sections of the Draft Scoping Plan. However, NY-GEO does believe that it will be crucial for the Council to adopt an effective economy-wide strategy designed to withstand potential twists and turns robustly enough to generate a substantial portion of the funding needed to support New Yorkers in meeting the CLCPA's mandates without unfairly burdening New York's disadvantaged communities and low and moderate-income citizens. The strategy must also better reflect the true costs of burning fossil fuels. Three things should be clear as the Council approaches their economy-wide strategy design work:

1. Greenhouse gas emitting fossil fuels and their infrastructure have been subsidized generously throughout their long history of use:

- In New York State, among other subsidies are the 100-foot rule and long-term depreciation for gas infrastructure whose use must be phased out long before 2050 if we are to meet the CLCPA's 2050 GHG reduction mandate.
- In addition, for New York State we have documentation of the many subsidies enumerated in the legislature bill S4816/A6882, known popularly as the Fossil Fuel Subsidy Elimination bill. The lead sentence in the justification memo for this bill notes "New York State spends over $1.5 billion every year on fossil fuel related tax expenditures, distorting the market and subsidizing the use of greenhouse gas-emitting fossil fuels."
- In addition, there are huge federal and even international subsidies for fossil fuels that have been extensively documented, which contribute substantially to reducing the cost of fossil fuels to consumers.
- Finally, much of the cost of fossil fuel use is externalized – paid for by society. These are costs that exist because of fossil fuel burning, but the costs aren't reflected in the price of the fuels. As the Draft Scoping Plan notes, the net present value of the greenhouse gas emissions that will be avoided through a successfully executed Scoping Plan run from $235 to $250 Billion. The value of the avoided health care costs run from $165 to $170 Billion.

Figure 12. Summary of Benefits and Costs (Net Present Value Relative to Reference Case)



The subsidies above mean that in people's lives the true cost of burning fossil fuels is hidden from view. In the power generation sector, this has slowed down the adoption of wind and solar. In the transportation sector this has slowed down the adoption of electric vehicles – in fact, the impact of fossil fuel prices on the transportation sector is particularly evident when, as gasoline prices dip the sales of gas guzzling oversized vehicles soar – a phenomenon that has been well documented in numerous media features and print articles.

The impact of subsidized fossil fuels is particularly evident in the heating sector where utilities can typically charge 4 to 5 times less per unit of energy for gas than for electricity. This means that heat pumps need to be 4 to 5 times more efficient than furnaces and boilers to result in a good "value proposition" for utility ratepayers. While this is certainly true for most geothermal installations, the fact is that if the true cost of burning fossil fuels was reflected in their price, their standing in the marketplace would quickly fade away as ratepayers scramble to replace them with heat pumps.

2. There is an enormous need for revenue to support New York's citizens in making the transition to the carbon neutral future envisioned by the CLCPA. NY RENEWS, a well-respected force behind passage of the CLCPA, has put that figure at $15 Billion per year. At the Climate Action Council's 16th meeting on 2021 10 14, the estimate for early year net direct costs was "on the order of $10 Billion per year." Revenues generated from the Final Scoping Plan's Economy-Wide Strategy need to fund a substantial portion of the costs of the Plan that are not met through private sector investment and that are beyond the reach of New York's LMI citizens. The results of these expenditure promise to put New Yorkers on a much more solid financial footing. In that

same presentation from October of 2021, it was pointed out that of the $50 Billion New Yorkers annually spend on energy, almost $30 Billion are estimated to leave New York State. In an electricity-based energy system almost all of the dollars spent on energy would remain in-state, fortifying local economies. And historically, electricity prices are far more stable than fossil fuel prices, which vary widely, are subject to international fluctuations and can be used to the advantage of authoritarian regimes as seen in the current Russian invasion of Ukraine

3. For the building sector transition, it is crucial that the strategy be economy wide and sensitive to the relative cost between electricity and fossil fuels. NY-GEO has presented reservations on carbon proposals such as NYISO's that would focus solely on the electric generation sector. Increasing electricity prices while maintaining subsidies and current conditions for burning fossil fuels is the last thing we need as we transition to an emission-free electric-based economy.

Lastly, we support and agree with the comments on the Economy Wide Strategy being filed by Earthjustice, Environmental Advocates and others that start with a robust carbon pricing strategy with a strong emphasis on reliable, revenue, electrification as the main medium of transition, avoiding regressive impacts on LMI and Disadvantaged Communities, and the inclusion of pricing for methane and nitrous oxide while accurately including all sectors that are contributing to greenhouse gas emissions.