FALSE DEMAND:

THE CASE AGAINST THE WILLIAMS FRACKED GAS PIPELINE

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EXECUTIVE SUMMARY

Williams, an energy industry corporation, seeks to build a costly pipeline in New York as part of its "Northeast Supply Enhancement Project" ("NESE") to enlarge its market for shale gas extracted by hydrofracking in Pennsylvania. Utility company National Grid is the project's sole named customer. It would use this pipeline to increase the burning of natural gas in New York.

The purported justification for this massive 1 billion-dollar project is based on fundamentally flawed, unsupported arguments about increasing demand for pipeline gas in National Grid's service area. These arguments have never undergone, and would not withstand, public review.

The first argument – that the pipeline is needed to carry out the locally mandated elimination of heavy No. 6 and No. 4 fuel oil from use in residential boilers – is specious. And converting 8,000 customers per year from oil to gas certainly is not necessary.

- **All of the No. 6 boilers in New York City's residential buildings converted to another fuel long ago.** Those conversions were completed three years ago in private housing, and nearly half of multi-family buildings chose not to convert to natural gas.
- **NYCHA housing stopped using both No. 6 and No. 4 oil at least a decade ago and already relies on gas for 98 percent of its heating.** The serious heating and cooking outages that many residents have been facing are due to NYCHA's persistent failure to replace or repair faulty equipment for both oil and gas, not gas supply constraints.
- **Few No. 4 boilers (which must convert to another energy source by 2030) exist in National Grid's service area** – likely fewer than 446. Even if 100% of these converted to gas, these would not require nearly the capacity of gas that the Williams pipeline would deliver. Also, converting to shale gas is neither their only choice nor their best option.
- **The remaining oil boilers, which burn ultra-low sulfur No. 2 oil, can achieve greenhouse gas emissions comparable to natural gas when biodiesel fuel is blended with oil.** They can also be replaced with clean renewable energy.
- **In the past three years, Williams has already added 210,000 dekatherms per day of capacity to National Grid's supply** – over half the capacity of the proposed Williams NESE pipeline and twice the 2012-projected capacity estimated to be needed if all No. 6 and No. 4 boilers converted to pipeline gas, and that estimate did not consider other fuel choices or improved efficiencies. Williams declared that the capacity it added in 2017 was "enough gas to meet the needs of 500,000 homes and . . . supply National Grid's immediate and growing needs for the 2017/2018 winter."

The second argument – that the pipeline is needed to address future growth – flies in the face of current conditions and trends in energy demand.

- **The national forecast for residential and commercial natural gas use is "flat" because while growth has gone up, demand has gone down.** In New York, both the New York Independent System Operator ("ISO") and Long Island Power Administration ("LIPA") predict electricity use decreases, not increases. Williams's touting of a 10% increase in need over the next decade is outdated.
- **Williams itself acknowledges that "Gas share into power generation continues to grow but renewables capture load growth" and that** "several states in New England . . . with high penetration of renewable generation could experience flat to negative gas demand growth in the long term."
- **National Grid's current peak demand program addresses the sporadic spikes in need that occur for a few hours on a few days of the year.** Based on the success of a demand pilot program, National Grid reported to the State Public Service Commission ("PSC") that it can achieve more peak demand reduction, which:

> **...may provide a cost-effective Non-Pipe Alternative solution, deferring traditional more expensive gas system upgrades while promoting a more dynamic gas system.**

Neither National Grid nor Williams has justified locking 8,000 new customers each year into burning gas. Better strategies can be deployed to forego a costly pipeline. For example:

- **Installing modern air or geothermal heat pumps in small residential buildings and homes in the City can cut average daily load by at least 33 percent of the proposed pipeline's capacity.** A State report finds it can cut energy demand citywide by roughly 158,300 dekatherms. National Grid's market share is at least 130,900 dekatherms – and likely more.
- **New boilers can be over 25 percent more efficient than old boilers.**
- **Separating water heating systems from space heating systems, even with no change in fuel, can cut demand as much as 16 percent in multi-family housing** by avoiding unnecessary space heating.
- **New York's increasingly renewable electric grid is on track to become stronger because wind and solar plus on-site storage are now competitive with natural gas combined cycle plants.** Also, use of solar power directly for water heating and peak demand relief can help cut fossil fuel consumption.
- **A proposed New York City local law would require buildings 25,000 square feet or larger to cut greenhouse gas emissions (which spur climate change) 40% by 2030 and 80% by 2050.** – which would require major reductions in fossil fuel use. Also, the 2016 State building code is likely to achieve 30% energy savings in new residential construction.

These and other measures should be ramped up before considering construction of costly and potentially risky infrastructure like a massive pipeline in the New York harbor.

BY THE NUMBERS

BOILER CONVERSION IN NYC – LITTLE DEMAND FOR NEW GAS

Buildings with No. 6 boilers in NYC that switched to another energy source at least 3 years ago	**5,300**
No. 6 boilers in NYC that still need to switch to another energy source:	**0**
NYCHA buildings burning No. 6 or No. 4 oil	**0**
No. 4 boilers in National Grid territory that must convert by 2030:	**under 446**
Portion of those No. 4 boilers too small to require certificate to operate and convert	**well over one-third**
Old prediction of National Grid gas market increase if all No. 6 and No. 4 boilers converted to natural gas with no energy efficiency	**23,200 Dth/day (avg.) 81,600 Dth/peak day**
No. 6 boilers (multi-family buildings) that did not convert to natural gas	**49%**
Likely No. 4 boilers that will not convert to natural gas	**higher than 49%**
Capacity of proposed pipeline	**400,000 Dth/day**

READILY AVAILABLE ALTERNATIVES TO ACCOMMODATE FUTURE GROWTH

Heat pumps in houses & small apt building

Total energy savings capacity of modern heat pumps in NYC and Long Island:	**158,300 Dth/day**
National Grid's share – all Long Island and at least 53% NYC (but likely more):	**130,000 Dth/day+**
Potential savings in National Grid area as percent of proposed pipeline capacity:	**33%+**

Energy efficiency

Replacing old boilers with modern boilers	**25%**
Weatherization of homes	**14%-18%**
Separating water heating from space heating (multi-family housing)	**16%**

NEW STANDARDS DRIVING NEW ENERGY SAVINGS

Governor's Policy	**70% of electricity generated by renewable sources by 2030** **100% reduction in energy sources' GHG emissions by 2040**
City of New York, 2014 One City target	**80% reduction in GHG emissions (from 2005) by 2050**
Proposed local law, 25,000+ ft^2 buildings	**40% by 2030** **over 80% by 2050**
Savings from 2016 NYS building code (for Long Island)	**30% residential** **7% commercial**

EXAMPLES OF OTHER UTILITIES TAKING THE LEAD

Portion of coal plant shut-downs in northern Indiana (NIPSCO) to be replaced by efficiency/renewables	**100%**
Portion of new electricity demand on Long Island (LIPA) to be met by efficiency/renewables	**100%**

NATURAL GAS CONSUMPTION FORECAST FOR NEXT 10 YEARS

Williams business prediction	**10% increase**
U.S. Energy Information Administration forecast for residential & commercial sector gas consumption	**flat**
NY ISO objective prediction of total electrical energy use	**Declining at average annual rate of -0.16%**

BACKGROUND

The Williams corporation (with subsidiary Transcontinental Gas Pipeline Company, LLC, or "Transco")[1] proposes to build a pipeline as part of a "Northeast Supply Enhancement Project" ("NESE") to transport up to 400,000 dekatherms[2] per day of fracked shale natural gas from a Pennsylvania compressor station to the Rockaway Transfer Point, located roughly three miles south of and seaward from the Rockaway Peninsula. The sole customer for this fossil fuel is National Grid, a utility and international corporation.[3] National Grid states that the pipeline project would increase its capacity by 14 percent for the service area.[4]

ROUGHLY ONE-THIRD OF NEW YORK'S GHGS COMES FROM FUEL-BURNING TO HEAT OR COOL BUILDING SPACES AND WATER.

New York Governor Andrew Cuomo's Executive Order No. 166 of 2017 and 2015 *State Energy Plan* declared the objective to fight climate change by reducing economy-wide greenhouse gas emissions ("GHGs") 40 percent by 2030 and 80 percent by 2050 relative to 1990 emissions levels, including a building use reduction of 23 percent from 2012 levels. The Governor also called for renewable energy resources to account for 50 percent of the electricity consumed in the state by 2030.[5] Roughly one-third of New York's GHGs comes from fuel-burning to heat or cool building spaces and water.[6] The 2017 update to the *State Energy Plan* emphasizes that to accomplish the State's goals, "New York will need to transition its energy systems away from fossil fuels."[7] Moreover, the Governor's proposed executive budget for the upcoming fiscal year raises the bar by including a commitment to source 70 percent of the state's electricity from renewable energy by 2030 and to achieve a 100 percent reduction in GHGs from 1990 levels by 2040.[8]

The project would require a Certificate of Public Convenience and Necessity from the Federal Energy Regulatory Commission ("FERC"), pursuant to the Natural Gas Act.[9] Because FERC determined that the Williams NESE pipeline project would have a significant environmental impact, it was obligated under the National Environmental Policy Act ("NEPA") to prepare an Environmental Impact Statement ("EIS").[10] The project requires construction of 23.3 miles of underwater pipeline crossing the Lower New York Bay from Middlesex County, New Jersey to the Rockaway Transfer Point. This would entail dredging and thereby disturbing over a million cubic yards of harbor material – much of it containing heavy metals and industrial toxic substances.[11] FERC issued the *Final EIS* ("*FEIS*") on January 25, 2019.

NEPA requires the EIS to evaluate reasonable alternatives to the project, including a "No Build" alternative analysis that assesses the need for the project.[12] NEPA also requires an analysis of the project's consistency with state policies.[13]

The New York State Department of Environmental Conservation ("NYSDEC") notified FERC that the draft EIS "inappropriately excludes…a meaningful consideration of the No Action Alternative or using renewable energy and conservation measures to reduce natural gas demand" and failed to address the project's alignment with State energy goals.[14] FERC argued that because Williams had a customer (National Grid) for the gas, that was enough evidence that it was necessary, and because the purpose of the project was to transport gas, renewable energy and energy efficiency were not relevant. It stated:

> **We recognize that energy conservation and efficiency programs help to reduce energy demand and that renewable energy is playing an increasing role in meeting the region's energy needs. However, because the purpose of the Project is to transport natural gas to meet National Grid's needs, and renewable energy sources or reductions in demand are not transportation alternatives, they are not considered further in this analysis.[15]**

Consequently, among many other important questions, the *FEIS* failed to analyze:

1. Whether the pipeline project is necessary;
2. What alternatives exist instead of importing more natural gas into the area; and
3. Whether the project is consistent with New York State energy policy.[16]

FERC's final decision on the application for a Certificate of Public Convenience and Necessity is pending. The project also would require permits from the U.S. Army Corps of Engineers related to dredging and other in-water activity, and a federal Clean Water Act § 401 Water Quality Certification from the NYSDEC. Regardless of FERC's dismissive approach to the FEIS, these decisions require a meaningful assessment of the need for the project, which is the matter that this report examines.

National Grid recently argued that if the Williams NESE Pipeline Project is not built, the utility may not be able to provide natural gas for the planned Belmont arena (future home for the New York Islanders hockey team) in Elmont (Nassau County), but both the Empire State Development Authority and the Public Service Commission have responded that the Belmont project can go forward without this pipeline.[17] National Grid's assertion, moreover, has not been subject to public review or analysis of alternatives in FERC's *FEIS* or elsewhere. Yet National Grid's own letter to the developer about gas services, although arguing that the pipeline would be needed for 365-day service, actually included an offer of "interruptible" service, stating:

> **NationalGrid will also assist the Customer in identifying potential alternative energy solutions, including options to completely curtail the Project's use of natural gas delivered via NationalGrid's system during certain peak winter days while being able to use natural gas on all other days.[18]**

A full investigation of potential alternatives and particularly including combinations of alternatives is certainly warranted. For example, this report describes a sizeable geothermal project in Riverhead, established by National Grid itself, that serves 10 houses.

The PSC opened a proceeding early this year to investigate the circumstances leading to the Consolidated Edison Company of New York ("Con Edison") declaration that it plans to impose a moratorium on connecting new natural gas customers to much of its Westchester County network. It held public hearings in February 2019, and plans to issue a PSC staff report by July 1, 2019.[19] A similar investigation may become necessary here.

FUEL OIL BOILER CONVERSION IS NO JUSTIFICATION FOR THIS PIPELINE PROJECT: THE MATH DOESN'T ADD UP

National Grid argues that the Williams NESE pipeline is necessary to accomplish the legally required conversion of No. 6 and No. 4 fuel oil boilers in New York City, and to accommodate its plan to add 8,000 new customers per year in the New York City area. Details on that plan do not appear in the *FEIS*, but a paraphrased statement by National Grid's New York President John Bruckner in *Newsday* appears to indicate that the targeted 8,000 new customers per year is not referring to new development, but rather consists of "8,000 downstate customers a year it now converts from oil to natural gas."[20]

MORE GAS PIPELINE CAPACITY, HOWEVER, IS NOT NEEDED TO ACCOMPLISH THE TRANSITION OF NO. 6 AND NO. 4 BOILERS TO CLEANER ENERGY SYSTEMS.

The City of New York has banned the use of No. 6 fuel oil since 2015, and has set a deadline of January 1, 2030 for boilers burning No. 4 fuel oil[21] to convert to a cleaner fuel or other energy system.[22] Starting in 2030, no fuel oil other than No. 2 (a lower sulfur, distillate fuel) will be allowed for power generation, heating, or other uses in the City.[23] The Williams NESE Pipeline Project proponents are trying to use this beneficial program to justify importing more gas into the State.

More gas pipeline capacity, however, is not needed to accomplish the transition of No. 6 and No. 4 boilers to cleaner energy systems. Furthermore, the remaining No. 2 boilers are already slated to reduce their emissions through use of biodiesel, and if they are replaced, they should be targeted for clean renewable energy rather than prolonged fossil fuel use.

A. Incorrect assumptions in boiler conversion need estimate

First, while a City consultant calculated in 2012 that total conversion of No. 6 and No. 4 oil to pipeline gas would create an incremental average daily demand of roughly 213,000 dekatherms of gas load and peak day demand of 746,000 dekatherms,[24] the real "need" from National Grid's service area would be only a fraction – 11 percent – of this amount. National Grid's share of the market – not accounting for non-gas conversions or boiler or building efficiencies – would be no more than an additional 23,200 dekatherms of average daily demand and 81,600 dekatherms of peak day demand.[25] Con Edison covers the market area for most (89 percent) of the City's heavy oil demand, in Manhattan and the Bronx.[26]

Second, even this maximum estimate did not account for the improved performance of new boilers or existing and upcoming improvements in home and building energy efficiency.[27]

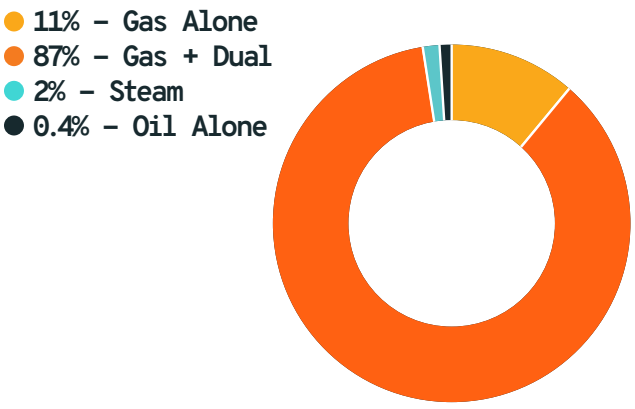
Third and most important, the calculation assumed 100 percent boiler conversion to natural gas in New York City, which has not been occurring.[28]

B. National Grid Has Already Met the Need from No. 6 Oil Conversion:

NYCHA Boilers Converted Over a Decade Ago, and Private No. 6 Boilers Converted Three Years Ago

The New York City Housing Authority (NYCHA) stopped burning not only No. 6 oil but also No. 4 oil more than a decade ago. Its early initiative to do so began in the 1970s as a reaction to the Oil Crisis.[29] Today, roughly 98 percent of NYCHA buildings rely on natural gas for heating (most with the capacity to use oil as a back-up); only 0.4 percent rely solely on No. 2 oil.[30]

Energy Sources for Heat + Hot Water in NYCHA Residential Buildings



Regarding private housing, in New York City, nearly all multifamily building fuel oil boilers using No. 6 oil had already transitioned to another fuel or energy source by late 2015. The City's database as of November 12, 2015 had found only one boiler serviced by National Grid, in a seven-floor apartment building in Woodside, Queens, that was still using No. 6 fuel oil.[31] By February 2016, the conversion (involving 5,300 buildings) was declared complete.[32]

On Long Island, the housing sector is dominated by individual homes and small apartment buildings, so very little No. 6 or No. 4 oil is used in home heating. Local home energy businesses and the Oil Heat Institute of Long Island observe that nearly all remaining fuel oil boilers on Long Island use No. 2 oil.[33]

The Heating Problem at NYCHA

The serious heating problems that NYCHA housing residents face are due to NYCHA's persistent failure to replace or repair old equipment, not gas supplies. NYCHA's poor maintenance affects not only oil heat but also natural gas heat. New York City data indicate that only three of the 14 NYCHA buildings within National Grid's territory that the Pratt Center for Community Development identified as having lost heat during the cold weather "bomb cyclone" of January 2018 rely primarily on oil for heating. The incidents of prolonged natural gas outages in NYCHA housing are disturbing.[34] Both Red Hook and Breukelen housing residents, for examples, endured cooking gas outages lasting longer than a month in 2018. In January 2018, a preliminary review by the Office of the City Comptroller Scott Stringer revealed that NYCHA's reported rate of defective boilers was five times the citywide average – 39.5 percent compared to 7.9 percent citywide.[35] Clearly, switching from oil to gas at NYCHA facilities is not a panacea to remedy energy outages. The issue is maintenance.

While NYCHA must upgrade its heating equipment in many buildings, the buildings that could become *new* gas customers for National Grid are limited in number. Only about a dozen NYCHA buildings in National Grid's service area relied completely or substantially on No. 2 oil in 2016, and roughly 18 others used No. 2 oil only sporadically while mostly using natural gas.[36]

C. Only Half of New York City's No. 6 Boilers Changed to Natural Gas.

Based on benchmark data,[37] only about half of the No. 6 boilers in benchmarked multi-family buildings (having roughly 50 units or more)[38] in New York City converted to pipeline gas. Of the remaining boilers, about 27 percent converted to No. 2 oil and 22 percent switched to No. 4 oil. While the benchmark data addresses energy use for the entire building, including electrical, the changes from 2010 to 2015 are almost entirely driven by the required fuel oil conversion that occurred for space and water heating.

Choices Made for No.6 Fuel Boiler Conversions

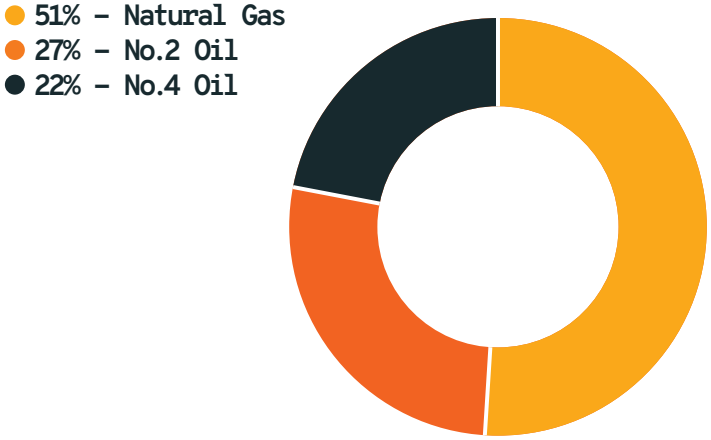


TABLE 1:
Energy Source, Multi-Family Buildings – Percentage Point Change from 2010–2015[39]

Multi-Family Buildings – Energy Source for Heat, Electricity, and Other Uses	2010	2015	Percentage Point Change
No. 6 fuel oil	63.80%	6.77%	(57.03)
No. 4 fuel oil	0.07%	12.54%	12.47
No. 2 fuel oil	0.04%	15.22%	15.18
Total fuel oil	**63.91%**	**34.53%**	**(29.38%)**
Natural Gas	10.30%	38.86%	28.58
Electrical	25.80%	26.07%	0.27
Steam	0.00%	0.55%	0.55

These statistics are highly relevant, given that the benchmarked multifamily buildings comprise roughly 48 percent of all New York City housing using fuel oil boilers.[40]

D. Few No. 4 Boilers Remain in National Grid's Service Area – and They Will Not All Convert to Natural Gas

Fewer than 446 boilers in National Grid's service area still use No. 4 fuel oil as their primary fuel,[41] and well over a third of them fall below the capacity threshold to require a certificate to operate.[42]

The percentage of No. 4 boilers that will convert to a system other than natural gas is likely to be higher than occurred for No. 6 boiler conversions given recent technological advances in alternative energy and efficiency measures. The NYC Retrofit Accelerator Program, which provides free advice to building owners about No. 4 fuel oil conversions, includes non-gas options,[43] and incentive programs are in place to encourage diverse alternatives. Indeed, the fundamental flaw in Williams's cursory and outdated discussion of alternatives in its application to FERC – which FERC neither presented nor analyzed in the *FEIS* – is that it examines each renewable energy source in isolation.[44] In contrast, the *State Energy Plan* considers each alternative energy source and energy efficiency method as part of an integrated strategy.

1. Conversion to Ultra Low Sulfur No. 2 oil boilers is an available option – and No. 2 boilers are mandated to blend more biodiesel into the fuel, which will make them environmentally competitive with natural gas.

Most burners that burn No. 4 oil can also burn ultra-low sulfur No. 2 oil – which is a distillate rather than a heavy residual fuel oil – if tanks are cleaned (and possibly retrofitted). The NYC Retrofit Accelerator program states that switching to No. 2 oil "typically involves less upfront investment than converting to natural gas."[45] In New York City, under Local Law 119 of 2016, all public and private buildings burning oil were required to use a blend of 5 percent biodiesel by October 1, 2017, and they must achieve a 10 percent blend by 2025 and a 20 percent blend ("B20") by 2034.[46]

Because use of No. 2 oil reduces particulate emissions by more than 95% when it replaces heavier oils, it "improves boiler efficiency while reducing maintenance costs."[47] If one only considers direct emissions from combustion of No. 2 oil alone, natural gas combustion is cleaner – but this is an unrealistic comparison for two reasons. First, consideration of fugitive emissions of methane (a far more powerful

GHG than carbon dioxide) from natural gas extraction and pipeline system leaks have altered that analysis, causing some to conclude that switching to pipeline gas is not necessarily better for the environment.[48] Second – and more importantly – the blending of No. 2 oil with biodiesel substantially improves emissions.

Biodiesel (a distillate fuel which, in the northeast, is derived mostly from soybean oil or recycled restaurant grease) can be blended with No. 2 oil at varying percentages and burned in most No. 4 oil boilers. (It can be used alone but the system must be specially designed for it.)[49] While estimates vary, some industry research indicates that the GHG emissions of a B20 blend of No. 2 oil are roughly equal to those of natural gas on a lifecycle basis, whether considered over 20 years or 100 years.[50] With regard to the more immediate short-term greenhouse gas impacts -- over 20 years – the evidence appears strong that a B20 blend produces lower GHG emissions than natural gas, and that even a seven percent blend can produce GHG results comparable to the shale gas typically delivered to New York.[51]

Williams asserts that National Grid spends over $200 million per year to convert boilers from oil to gas.[52] While the applicant claims that natural gas should be seen as "source of energy that will bridge the gap as the renewables component of power generation is developed,"[53] a fuel that requires construction of a massive pipeline with an initial 15-year contracting period[54] and likely useful life of at least 40 years[55] is not a practicable "bridge fuel" for indoor space or water heating. Given the environmental competitiveness of a 20 percent biodiesel blend in comparison with natural gas, an urgency to convert No. 2 boilers to natural gas is not justifiable. Moreover, investing this money in natural gas conversions – instead of energy efficiency and renewable energy – works against the agenda of the New York State energy policy and New York City's energy goals.

2. A State study finds heat pumps (air or geothermal) could cut pipeline gas needs for NYC and Long Island by over 158,300 dekatherms – of which National Grid's share is at least 130,900 dekatherms, or 33 percent of the proposed Williams NESE pipeline capacity.

A new report by the New York State Energy Research and Development Authority ("NYSERDA") concludes that "heat pumps present the most attractive proposition in heating oil and electric resistance heating replacement situations." Heat pumps basically are air conditioners that can run in reverse in the winter to provide heating. Because heat pumps move heat as opposed to creating it, they are tremendously efficient energy-savers even though they use some electricity.[56] National Grid states, "Compared to traditional 'baseboard' technologies, heat pumps achieve a 50-80% reduction in electricity use."[57]

NYSERDA determined that installing heat pumps in houses and small residential buildings that can accommodate the technology could address 43 percent of the thermal heat load on Long Island and 38 percent of the thermal heat load from small residential housing in New York City. (NYSERDA is still evaluating the extent to which heat pumps can serve large buildings.)

NYSERDA calculated that such installations could reduce demand for oil or pipeline gas in both existing and new housing by roughly 35.6 trillion Btus on Long Island and 22.2 trillion Btus in New York City, for a total of 57.8 trillion Btus annually by 2025 . This would cut average daily load for all of New York City and Long Island by over 158,300 dekatherms.[58]

TABLE 2:

Potential Annual Thermal Load Served by Small-Scale Residential Heat Pumps in TBtus

Fossil Fuel Replaced or Avoided	Location	Existing Residences	New Residences to 2025	Total potential thermal load
Fuel Oil	New York City	3.1	N/A	3.1
Natural Gas	New York City	18.0	1.1	19.1
Fuel Oil	Long Island	18.3	0.5	18.8
Natural Gas	Long Island	15.5	1.3	16.8
Total		**54.6**	**1.9**	**57.8**

National Grid's market share of this includes all the small-scale residential customers in Long Island and at least 55 percent of those in New York City,[59] for a total savings of at least 47.8 trillion Btus – roughly 130,900 dekatherms/day – but likely more given that the most suitable installation sites are more dominant in its service area. National Grid's market share of the potential thermal load that can be served by small-scale residential heat pumps is therefore at least 33 percent of the capacity of the proposed Williams NESE pipeline.

Both air-source and ground-source ("geothermal") heat pump systems are available.

Air source heat pumps

Air source heat pumps use outdoor air as a thermal reservoir. The American Council for an Energy-Efficient Economy ("ACEEE") determined that, even without any incentive program, the market-based payback period in the Northeast to replace an oil-based furnace is 1.9 years, and a fuel-oil boiler is 6.2 years.[60] A NYSERDA analysis found that air-source heat pump systems were more cost-effective compared with ground source heating pumps.[61] While earlier versions had problems with performance at lower temperatures, newer air source heat pump models are very effective at 5 degrees Fahrenheit, with lower limit temperatures as low as -13 degrees Fahrenheit.[62]

Ductless mini-split heat pumps

This improved performance for air pumps in cold weather is now true of another option, the ductless mini-split air-source heat pump, which has an outdoor compressor and an indoor air handler/evaporator connected by refrigerant lines.[63] Ductless air pump heaters can be installed on a room-by-room, as-needed basis, making them both flexible and cost-effective. This may in part account for the report from *Long Island Pulse* that it "has recently begun trending on Long Island."[64]

Ground source heating pumps (geothermal energy)

Geothermal energy systems transfer thermal energy between the ground and a building for heating and cooling. Zachary Fink, owner of ZBF Geothermal, LLC, and geologist John Rhyner, Sustainable Energy Director at P.W. Grosser Consulting in Bohemia, note that local ground temperatures are only affected by atmospheric temperatures to a depth of about 30 feet. Beyond that, the ground stays a relatively consistent 50-55 degrees,[65] although it can on occasion dip down into the low 40s. Tapping into this steady temperature, geothermal systems use very little electricity (usually less than an air source pump).[66] They have no need of back-up fuel even for peak cold episodes.[67] They have gained a foothold in Long Island, where the saturated sandy soil, with its elevated water table, is a good conductor of heat. Although a geothermal system costs more to install than a natural gas

boiler, its operating costs can be 25 percent to 60 percent lower.[68] Return on investment reportedly may take four to seven years, depending on the system and rebates.[69]

National Grid itself installed a sizeable central geothermal energy system in the Glenwood Houses development of Riverhead (Suffolk County) in 2017 that serves 10 homes, posting a video about the project on its website in January 2018.[70] National Grid implemented this project as an alternative to extending natural gas pipes to the location. In a report to the PSC, National Grid stated that in the fourth quarter of 2018, while outdoor air temperature ranged as low as 6 degrees Fahrenheit, the lowest temperature of water supplied by the heat pump was 43 degrees Fahrenheit and the average was 52 degrees Fahrenheit (thus minimizing the amount of electricity required for heating), and the system worked without any interruption of service.[71]

Progress on Heat Pump Installations and Incentives

NYSERDA launched an incentive program for installation of air source heat pumps in 2017, with a $500 incentive for each system, up to a cap of $500,000 total.[72] NYSERDA's goal is to achieve installation of air source heat pumps for 15 percent of all installed HVAC systems in residential structures statewide, with 53,000 sales per year of air source heat pumps by 2020.[73] It has also undertaken a two-year, $15 million rebate program for geothermal heat pumps. A single-family home can receive up to $15,000 and a building up to $500,000.[74] The Bipartisan Budget Act of 2018, moreover, reinstated the tax credit for geothermal installations – 30 percent of expenditures in 2019 for a system serving a dwelling in which the taxpayer, as owner, resided.[75]

The Public Service Enterprise Group of Long Island ("PSEG Long Island"), which provides electricity in Suffolk and Nassau Counties, strongly promotes incentives for heat pumps.

TABLE 3:

Heat Pump Installations in Nassau and Suffolk Counties 2017–2018[76]

Type of Heat Pump	2017 Installations	2018 Installations	Total
Air Source Heat Pump (ducted)	180	340	520
Ductless Mini-Split	1,200	1,880	3,080
Geothermal	181	151	332
Totals	**1,461**	**2,371**	**3,832**

Actual installations on Long Island likely exceed the amounts recorded by PSEG, since some people do small-scale installations that may not qualify for an incentive. Kerry O'Brien of T.F. O'Brian Cooling & Heating in New Hyde stated in 2016 that he was installing roughly 400 ductless systems per year.[77] ZBF Geothermal reported that its number of new customers for geothermal heat pumps on Long Island has doubled each year in recent years.[78]

3. Solar energy has growing uses for heating of water and individual home spaces, while both wind and solar are gaining strength in the electrical grid.

Solar domestic water heating

Solar thermal power (as differentiated from photovoltaic systems that produce electricity) is well-suited for use as a hot water heating source to offset domestic hot water systems. It works

whenever the sun is out, even on cloudy days, and can save 20 percent of a typical residence's water bill.[79] A taxpayer may claim a federal tax credit of 30 percent of expenditures in 2019 for a solar water heating system if the taxpayer owned and resided in the dwelling unit. Expenditures include labor costs for on-site preparation, assembly or original system installation, and for piping or wiring to connect a system to the home.[80]

Solar and wind as contributors to electrified heating

Electrification of heating systems can allow buildings to access the solar and wind energy that is increasingly available through the electrical grid. Con Edison, for example, acquired 980 megawatts of solar and wind projects in September 2018, making it the second largest solar power provider in North America.[81] Electrification can fully replace a building's use of fossil fuel, or it can be deployed as part of a dual-fuel gas/electric space or water heating system that switches a customer from natural gas to electricity during peak demand hours as a demand management strategy.[82] An analysis by the Institute for Energy Economics and Financial Analysis ("IEEFA") of data from Bloomberg New Energy Finance, an industry research firm, concluded that "wind and solar are the cheapest form of bulk generation and can already compete with CCGT [natural gas combined cycle generation] for dispatchable generation when combined with onsite storage" and that over the next 10 years, batteries are projected to achieve substantial cost declines similar to that which wind and solar have achieved.[83] The Northern Indiana Public Service Company's preferred resource plan released in October 2018 calls for adding 1,145 megawatts of solar and solar-plus-storage capacity by 2023, raising its renewable generation above 50 percent and allowing it to shut down old coal plants.[84]

The Governor's proposed budget for 2020 incorporates steps toward the following targets:

- Quadruple New York's offshore wind target to 9,000 megawatts by 2035, up from 2400 megawatts by 2030;
- Double distributed solar deployment to 6,000 megawatts by 2025, up from 3,000 megawatts by 2023;
- More than double new large-scale land-based wind and solar resources; and
- Deploy 3,000 megawatts of energy storage by 2030, up from 1,500 megawatts by 2025.[85]

Solar Power for direct space heating.

Solar power as a direct option for home heating is a very small – yet growing – part of the home heating sector. While it comprises only .06 percent of home heating in New York City, solar power has more than doubled, from 882 units in 2010 to 1,934 in 2017, a 119 percent increase. Suffolk County has made significant strides, with solar-powered homes comprising 0.2 percent of households, and the year 2017 saw 15 times more solar energy homes, rising from 52 in 2010 to 796 in 2017.[86]

E. New Natural Gas Space Heating Boilers Can Be Over 25 Percent More Efficient Than Old Fuel Oil Boilers, Thus Reducing Demand

The City consultant that produced the 2012 estimate on boiler conversion demand disclosed at the time that its estimate was "based on a strict conversion with no allowance for increased efficiency due to boiler replacement that may result from shifting from oil to gas."[87] While an older boiler typically may have an annual fuel utilization efficiency ("AFUE") rating of 65 percent (*i.e.*, 35 percent of fuel energy is lost),[88] new gas-fired steam boilers must have an AFUE rating of at least 80 percent and high-efficiency

models are 90 to 98.5 percent efficient. A switch from an older boiler with a 65-percent AFUE rating to a 90-percent AFUE boiler increases fuel efficiency by 25 percent.[89] A private energy company states, "Compared to even 10 years ago, new boilers are substantially more efficient, often by as much as 20-30%."[90] National Grid states that a high-efficiency natural gas boiler or furnace can cut an energy bill by 30 percent.[91]

F. Separating Water Heating in Multi-Family Buildings Can Cut Fuel Demand by 16 Percent, and Further Savings Can Be Achieved by Using Renewable Energy for Water Heating

Remarkable efficiency improvements can be achieved simply by separating space heating and water heating functions during boiler conversion. A City report explains:

> **Among audited multifamily buildings, almost 90 percent of the floor area is heated by a boiler that works double duty as a domestic hot water heater. If not controlled properly during the summer months, these boilers can waste significant amounts of fuel by running at full capacity.[92]**

In other words, separating a domestic hot water system from a space heating system can allow a building to shut down its space-heating boiler in the summer and possibly downsize it as well.

A City report found that separating heating systems for space and water was, by far, the most productive tactic for energy efficiency in multifamily buildings. Combined with installing low-flow fixtures to reduce hot water use, it is five times more effective than lighting changes in saving energy.[93] A multifamily building with a linked hot water system uses 10,000 Btus more fuel per square foot than a similar building with a separate water heating system – "an amount equal to 16 percent of a typical multifamily building's fuel use." This 16 percent savings is a substantial opportunity for energy conservation, given that in New York City, 80 percent of multifamily properties used their space-heating steam boilers to heat their hot water as well.[94]

The impact of separation can also be enhanced by modernization. National Grid asserts that a high-efficiency natural gas water heater can save 50 percent more energy than older, non-efficient water-heating models.[95]

Further savings can be achieved by use of renewable energy for water heating. The ACEEE found that separating – and electrifying – water heating functions using an air-source heat pump system is particularly cost-effective, stating that "Heat pump water heaters often have a lower initial cost than oil water heaters, in addition to their lower operating costs."[96]

G. House and Building Heat Energy Needs Are Trending Downward; New Efficiency Standards Will Greatly Increase This Trend

The New York State Fire Prevention and Building Code Council's 2016 updated New York building codes will achieve 30 percent energy savings for new residential construction and seven percent for new commercial construction over the prior building code.[97] In addition, NYSERDA is developing a more aggressive voluntary "NYStretch Energy Code.[98]

Pending legislation in New York City would have substantial impacts as well. In December 2018, Councilmember Costa Constantinides introduced legislation that would cap GHG emissions for large buildings. It would require buildings 25,000 square feet or larger to cut GHG emissions 40 percent by 2030 and 80 percent by 2050 from 2005 levels – which would entail substantial reductions in fossil fuel use. Given that two thirds of GHG emissions from multifamily buildings are generated by on-site space and hot water heating, it is likely that a great many buildings will need to change their

heating systems to come into compliance.[99] The legislation would be accompanied by Property Assessed Clean Energy ("PACE") legislation (a loan program).[100] These initiatives are buttressed by the City's existing energy benchmarking and data auditing programs, which keep the pressure on buildings to improve their performance.[101]

In 2014, the six-story Knickerbocker building in the Bushwick neighborhood of Brooklyn became the nation's first 100-percent affordable mid-size apartment building designed in compliance with "Passive House" standards (which rely on architectural technology to reduce energy needs). The building is designed to use 85 percent less energy for heating than typical buildings. It has, for example, a sculpted façade that shades windows in the summer yet maximizes sun exposure in the winter.[102] Future growth need not be as wasteful as in the past.

The existing housing stock in New York City (and likely in Nassau and Suffolk counties) offers plenty of opportunity for energy savings through weatherization. The 2017 NYC Housing and Vacancy survey tracked maintenance deficiencies such as water leaks and cracks or holes in walls, ceilings or floors. Such defects often go hand-in-hand with poor weatherization. Over 67,000 renter-occupied units (3.6 percent of units) had five or more deficiencies. Even 2,708 owner-occupied dwellings showed critical defects, multiple intermediate defects or inadequate construction (0.2 percent of units).[103] Correcting such defects can achieve substantial energy savings. The ACEEE evaluated and selected the Northwest Bronx Community and Clergy Coalition's Bronx Healthy Buildings Program for an award in 2018 for, among other achievements, reducing participating Bronx residents' gas bills by up to 18 percent.[104] The Department of Energy confirms that weatherization of homes results in a savings in heating energy consumption, on average, of 18 percent.[105]

National Grid provides rebates to customers for installing already available energy efficiency measures and makes specific statements on their effectiveness. These include:

Thermostatic radiator valves, which regulate the radiator's flow of water and adjust it based on room temperature – National Grid states that turning the valve down can cut heating costs by up to 20% yet improve comfort.

Weather-sensitive reset controls, which adjust boiler temperature up or down based on the weather – National Grid states that installing this on an older boiler can reduce heating costs by 10 percent.

Insulating hot water pipes reduces heat loss and saves energy by raising water temperature by as much as 2°F to 4°F, allowing the consumer to lower the water temperature setting. National Grid does not quantify the savings.

Wi-Fi enabled thermostats, which allow consumers to pre-set higher temperatures in the summer and lower temperatures in the winter when away from home or asleep – National Grid asserts this can cut a consumer's energy bill by up to $180 a year.[106]

For example, the "Seasonal Savings" program of the Southern California Gas Company ("SoCalGas") for residences cut gas heat consumption by 8 percent in the 2016-2017 winter through remote adjustment of over 50,000 "smart thermostats" for furnaces. Furnaces were adjusted less than one-degree Fahrenheit, on average.[107]

Hot water conservation also can reduce water heating costs. New York City's Local Law 84 of 2009 mandated annual water use benchmarking for buildings over 50,000 square feet in gross floor area. In 2016, the City expanded this requirement to mid-size buildings between 25,000 to 50,000 square feet (Local Law 133 of 2016).[108]

H. In the Past Three Years, Williams Has Already Added More than Twice the 2012 Projected Capacity Estimated for Total Boiler Conversion to Pipeline Gas

Williams' Transco recently added substantial new pipeline capacity to National Grid's service area, including the Rockaway Delivery Lateral/Northeast Connector and the New York Bay Expansion project:

- The Rockaway Delivery Lateral/Northeast Connector Project, launched in 2015, added 100,000 dekatherms per day of new capacity as part of the 647,000 dekatherms per day of firm service it directed to a new delivery point on the Rockaway Peninsula for National Grid. The project achieved the new capacity by generating greater compression at three existing facilities in New Jersey and Pennsylvania.[109]
- Williams declared that its New York Bay Expansion project, launched in 2017, would "increase natural gas delivery capacity to New York City by 115,000 dekatherms per day in time for the 2017/2018 heating season."[110] Williams asserted, "That's enough gas to meet the needs of 500,000 homes and will supply National Grid's immediate and growing needs for the 2017/2018 winter."[111]

The total capacity of these two projects is more than twice the amount of additional peak capacity and nearly four times the amount of average daily capacity predicted to be needed even if all New York City No. 6 and No. 4 boilers switched to pipeline gas – which half of the No. 6 boilers did not do, and which many of the No. 4 boilers will not do. It is far more reasonable to strengthen renewable energy capacity than to add – and burn – well over three times as much gas as Williams added to National Grid's system in 2017.

UNREASONABLE FEAR-MONGERING:
EFFECTIVE STRATEGIES TO MANAGE SPORADIC PEAK DEMAND ARE ALREADY IN PLACE AND CAN BE STRENGTHENED

No one denies that on extremely cold winter days when natural gas demand peaks, it can exceed the capacity of Williams's existing Lower New York Bay Lateral pipeline that serves National Grid, even though the pipeline has significant unused capacity during most of the year.[112] But the proposed Williams NESE pipeline is not needed to guarantee that customers will be able to "heat their homes and run their businesses during the cold winter days, where there is usually a disruption on the delivery system which leads to service interruptions."[113] Statements like those are misleading: People in New York City and Long Island do not go without heat on peak demand days.

As National Grid acknowledges, a peak demand "only lasts for a few hours." If a gas system is built to serve the peak level, then "there is a great deal of excess capacity during the non-peak hours."[114] Moreover, National Grid already has a system in place of supplemental gas sources and demand reduction strategies to address peak demand.[115]

Many larger customers – such as institutions, industrial and electric generation facilities – have dual-fuel capabilities. These customers can choose a less expensive 'interruptible" gas delivery service, under which they voluntarily switch to other fuel or reduce nonessential uses during peak demand hours.[116] Such uses may include laundering, allowing minimally trafficked areas to go a few hours without heat, or other activities.[117] National Grid recently reported that through improved annual communications with interruptible customers, phase-in of alternate fuel affidavits, and equipment testing, it has experienced roughly 95 percent compliance with requests to switch to alternate fuels.[118]

National Grid does *not* claim that its existing peak demand management systems have failed or that heating crises have occurred. Rather, it asserts that higher amounts of natural gas burning should occur in the future. It argues that the "need" that it claims would be generated from new customer growth, extreme weather, increased power plant use of gas, and the price advantage of natural gas over fuel oil "stretches the benefits offered by interruptible and TC [temperature-controlled] customers."[119]

Yet National Grid itself says that more can be done to manage peak demand by adopting strategies similar to effective programs in the electric industry like pre-cooling (a program under which an area is cooled to a temperature below its set point to reduce cooling load during peak demand periods yet maintain occupant comfort). National Grid states, "Theoretically, the same approach could be used for the gas system via pre-heating."[120]

National Grid is also testing a voluntary gas demand response program targeting large commercial firm gas customers in areas prioritized by gas distribution constraints. The demand reduction activations are "predictable in terms of length and time," lasting from 6:00 a.m. to 9:00 a.m., and occurring "no more than six (6) times per winter."[121] It states:

> **This predictability should allow participating customers to shift their demand without the need for backup fuels. By simply shifting customer usage, the Project aims to demonstrate that the need for dual-fuel systems, where customers rely on less-clean fossil fuels, may be eliminated.[122]**

During peak demand periods, a cloud-based application sends automated signals to direct load-control devices to turn off and on the furnaces, boilers and other equipment enrolled in the program. The participants are already familiar

with this technology through electricity demand response programs, and they receive an annual incentive. [123] National Grid notes that this program could "help to lay the foundation for future time-of-use rates for gas customers."[124]

In the first test of this program, 100 percent of the 16 customers participated by responding to the demand reduction instructions and "Initial results indicate the customers were able to curtail the loads as planned."[125] While the number of participants was fewer than the Project goal, the average commitment per customer – 63 percent – was higher than the 25 percent expected, so "the amount of demand reduction potential that was signed up exceeded the overall Project goal by 39% (190.7 MMBtu/hr compared with a goal of 140 MMBtu/hr)."[126] While the pilot included just 16 customers, National Grid had identified 500 customers that would have qualified to participate.[127] National Grid is also undertaking a demand pilot in Rhode Island.[128]

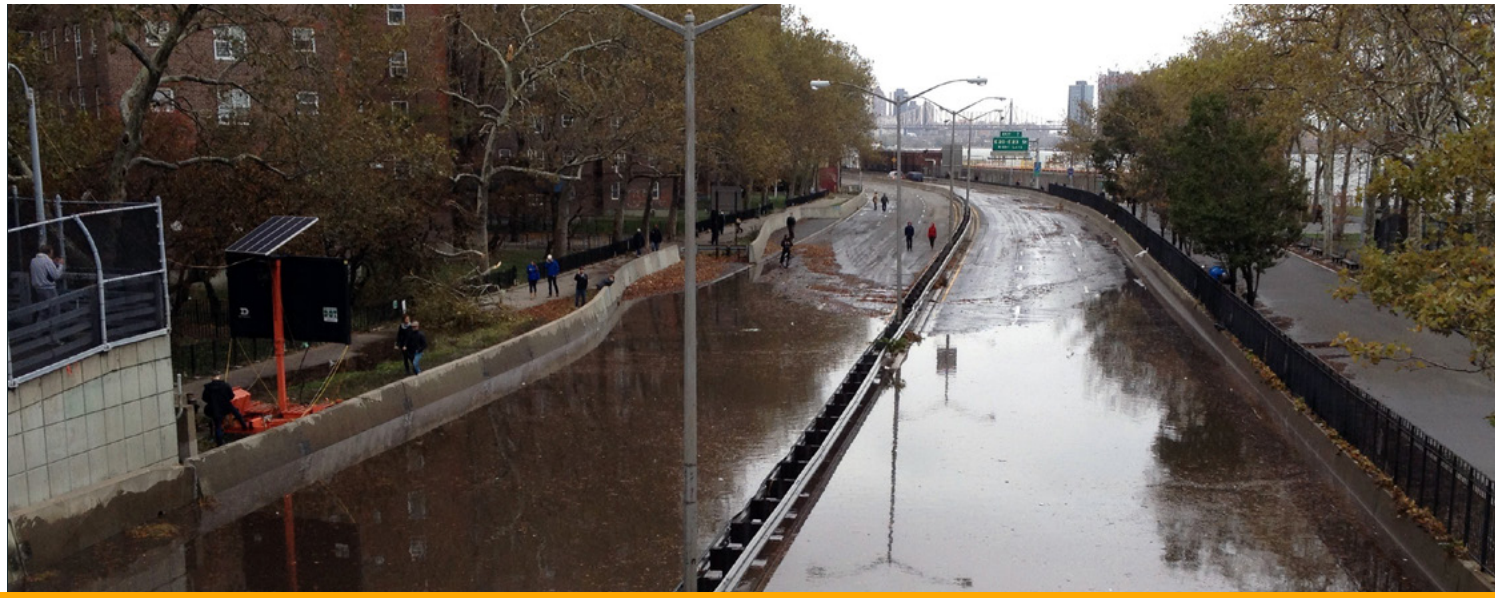
National Grid explicitly acknowledges the potential for further Demand Response to avoid pipeline construction. It declares that a successful program:

> **...would create more responsive relationships with participating customers and may provide a cost-effective Non-Pipe Alternative solution, deferring traditional more expensive gas system upgrades while promoting a more dynamic gas system. [129]**

Given that National Grid's own Demand Response pilot project is underway in New York and another is being launched in Rhode Island, seeking a permit to build costly infrastructure to increase gas imports in New York now is premature at best.

IF A GAS SYSTEM IS BUILT TO SERVE THE PEAK LEVEL, THEN "THERE IS A GREAT DEAL OF EXCESS CAPACITY DURING THE NON-PEAK HOURS." – NATIONAL GRID

National Grid could further reduce demand by engaging its residential customers in the program. In California, residential customers were willing to participate in demand reduction incentives. SoCalGas instituted a successful demand response program that tapped a broad base of 9,000 customers who had installed smart thermostat, offering incentives for participation for a few hours on days of peak demand (5 a.m. to 9 a.m. and 5 p.m. to 9 p.m.). Customers saved 0.03 to 0.05 therms during morning events, representing load impacts between 16-25% per customer. For evening events, participating customers saved 0.012 to 0.019 therms, representing load impacts between 10.7%-15.6% per customer.[130]



MORE GAS PIPELINE CAPACITY IS NOT NEEDED TO ACCOMMODATE GROWTH:

EVEN PEAK ENERGY DEMAND IS SHIFTING VERY SLOWLY AND MANAGEABLY

Williams's prediction of increased demand is not justified in light of existing trends. Project proponents predict that "demand will continue to grow by more than 10% in the next 10 years," blaming not only fuel oil boiler conversions but also "rising demand from new construction."[131] Yet Williams itself acknowledges in its *2018 Fall Update: Customer Service*, which discusses U.S. power generation by fuel and demand growth between 2017 and 2040, that:

> **Gas share into power generation continues to grow but renewables capture load growth…. Several states in New England or the west with high penetration of renewable generation could experience flat to negative gas demand growth in the long term.[132]**

In fact, this trend is clearly emerging in New York State as well. Even as early as 2009, the *State Energy Plan* observed that:

> **Although the total number of residential and commercial natural gas customers has increased, particularly in the downstate market area, overall statewide gas consumption has remained relatively flat for these sectors. This can be attributed to decreased customer usage due to conservation measures and increased efficiency for new natural gas appliances.[133]**

And the national forecast for natural gas by the U.S. Energy information Administration states that from the years 2000 through 2050, "Natural gas consumption in the residential and commercial sectors remains largely flat because of efficiency gains and population shifts that counterbalance demand growth."[134]

The trend of manageable energy demand in New York is well-documented for electricity. The New York Independent System Operator (NYISO), operator of the State's bulk electric grid, reports that energy use in New York is expected to *decrease*, not increase, for the next decade, stating:

> **As recently as 2014, long-term forecasts of energy usage projected 10-year average growth at 0.16%. The 2015 forecast projected no (0.00%) energy growth and the 2016 forecast projected a moderate decline (-0.16%) in energy use.[135]**

Its 2017 *Power Trends* report declared: "The NYISO forecasts energy usage . . . in New York to decrease at an annual average rate of -0.23% from 2017 through 2027."[136] Forecasts of uncontrollable energy demands, although typical years ago, do not apply in New York today and pursuant to State energy policies should not be applicable in the coming years. Thus, while Williams relies on a 2014 NYSERDA study on the capacity of energy efficiency to claim that natural gas demand must increase,[137] this is clearly out-of-date.

The Long Island Power Authority ("LIPA"), which serves 1.1 million customers on Long Island and the Rockaways in Queens,[138] recognized this trend when it released its 2017 draft *Integrated Resource Plan* ("IRP"), a 20-year roadmap for electrical power production and demand management. LIPA revised its long-term load forecasts downward, predicting virtually no growth in energy needs through 2035. It predicted a 1,700 MW decline – roughly equal to the energy generated by three to five power plants – by 2030 compared to the 2013 forecast. It plans to meet the State's 50% by 2030 renewables target by solar or wind powering

350,000 homes and cutting grid demand by 950 MW through energy efficiency, rooftop solar and other "behind the meter" initiatives.[139] Explaining its change in direction, LIPA reported that:

- Local power plant production has dropped dramatically and will continue to decline, "driven by increases in energy efficiency, net-metering, feed-in-tariffs, the decoupling of economic growth and energy use, and lower econometric growth projections." [140]
- LIPA reports that it expects a net decline in peak demand despite growth. It states that the impact on peak demand of the otherwise-expected load growth of 1.1 percent, "after adjustment for various demand side programs such as energy efficiency and renewables...is expected to decline over the 2018 to 2022 period[141].

LIPA predicts that it will have surplus generating capacity through 2035 and thus has no need to build the power plants contemplated in its 2010 management plan. Instead of new fossil fuel infrastructure, LIPA plans to invest in energy demand management and in local renewable energy sources, flexible systems of battery storage, flexible peaking generators "to balance intermittent renewable resources."[142]

This reduction in electricity demand translates into reduced need for natural gas to fuel power plants. Some proportion of the existing natural gas pipeline capacity that has been used for electric generation may become available for direct fuel uses such as heating.

LIPA is not alone. The Northern Indiana Public Service Company ("NIPSCO") announced in November 2018 not only that it plans to phase out all coal-fired electrical generation for its 457,000 customers over the next 10 years, but also that it will "replace" this energy generation (comprising 65 percent of its portfolio) entirely with energy efficiency and renewable energy. In other words, it has no intention of relying on natural gas for either permanent or temporary replacement of any of that energy capacity. NIPSCO plans to retire its four-unit, 1,600-megawatt R.M. Schahfer plant by 2023 and its 540-megawatt Michigan city plant by 2028, relying instead on energy efficiency, wind, solar and battery-storage strategies.[143]

Finally, while Williams has argued that deactivation of the Indian Point nuclear reactors, planned for 2021, is a justification for the pipeline, this is not correct. The New York ISO states that it has not identified a "generator deactivation reliability need." It found that the shutdown could be addressed using natural gas, but at locations north of the City not served by the proposed pipeline.[144] Moreover, a study by a consultant for the New York Battery and Energy Storage Technology Consortium illustrated how the need could be met instead through 450 megawatts of energy storage combined with wind and solar power as well as energy efficiency.[145]

THE OVERBUILD TREND IN THE PIPELINE INDUSTRY:

A BAD SYSTEM FOR MANAGING PEAK DEMAND FUELED BY A DE FACTO MARKET INCENTIVE THAT NEW YORK'S PUBLIC SERVICE COMMISSION OPPOSES

Building to peak demand is a bad system that is not in the public's best interest. The *State Energy Plan* explains that building to peak need is why energy is more expensive in New York than it needs to be:

> **In order to maintain reliability, we have been making expensive energy infrastructure improvements to satisfy peak demand, but we are using the whole system less over the remaining course of the year. As a result, the overall system is both energy and capital inefficient.[146]**

National Grid has also argued that redundancy is needed in the event that the existing Lower New York Bay Lateral pipeline's service is disrupted,"[147] but it is not reasonable policy to double all the gas pipelines in the country purely for redundancy's sake. The adverse impacts of pipeline construction should not be doubled, nor is duplication a guarantee of stability when the fuel itself entails leak and explosion risks to be managed and its price can be volatile.

Unfortunately, a problematic national trend to overbuild pipeline capacity is being fueled by a FERC mechanism that was initially intended to protect consumers – but currently is operating to do the opposite. This mismanaged mechanism has become an incentive to overbuild pipeline capacity. Williams, through its subsidiary Transco, supplies more than half the natural gas used in New York City, and the New York City metropolitan area's consumer prices for gas are higher than the national average,[148] so New York is already a lucrative market for the company. But this *de facto* incentive, which can increase costs for consumers, currently is built into the Williams application to FERC.

Normally, a company does not invest its capital in overbuilding infrastructure, but gas pipelines companies have an incentive to do so because of the potential to reap high returns. FERC sets the "cost-of-service fallback rate," also known the "recourse rate" for the purpose of negotiations between a monopoly pipeline and a shipping customer. This recourse rate is a traditional cost-of-service rate tariff that shipping customers have the option to choose if they are unsatisfied with the monopoly pipeline company's proposed negotiated rates. If FERC sets this rate properly, reflecting current market conditions, it can protect pipeline customers by limiting the monopoly pipeline company's negotiation power. As the PSC has explained, "an appropriate recourse rate equalizes an otherwise imbalanced negotiation."[149] Unfortunately, for well over a decade, this has not occurred – and Williams is seeking in this FERC proceeding a recourse rate that puts New York consumers at risk.

In its application, Williams is calling for a high pre-tax return on equity of 15.34 percent of the rate base embedded in its proposed recourse rate.[150] This 15.34 percent rate of return, which FERC has granted to Transco in previous proceedings, has not been updated for 15 years. Failure to update that rate has created a problem so serious that the New York State PSC joined the State of North Carolina in a District of Columbia Court of Appeals challenge to FERC approval of the 15.34 percent pre-tax rate in other Williams pipeline projects. The PSC cautions that:

> **[T]he prices FERC permits Transco to charge (whether directly or indirectly) will affect the prices paid for gas by retail gas customers in the New York City metropolitan area and Long Island.[151]**

The PSC informed the Court that it had prepared a Discounted Cash Flow analysis indicating that the rate of return for setting recourse rates should be 10.95 percent, which it stated is "more than 400 basis points lower than the outdated rate of return uncritically adopted by FERC." It urged that economic conditions had changed "so drastically since 2002 that importation of the rate of return from Transco's 2002 general rate case resulted in an unjustly and unreasonably high recourse rate."[152] The Court held oral argument on November 13, 2018, and its decision is pending.

Building for production market desires rather than real consumer need is also a bad system that is not in the public's best interest. The Congressional Research Service, in a 2018 report, stated:

> **The growth in U.S. shale gas production is driving the expansion of natural gas pipeline infrastructure at the local level (to gather and process the gas) and at the national level to transport natural gas from producing regions to consuming markets, typically in other states.[153]**

This observation leads to the important question of whether the real driver for this pipeline may be the Pennsylvania shale gas producers' desire to build a larger market outlet. It would certainly be a "tail wagging the dog" rationale for construction.

The IEEFA explains that FERC's weak regulatory process has failed to reign in a pipeline construction race:

> **[C]urrent low natural gas prices in the Marcellus and Utica region are driving a race among natural gas pipeline companies that want to capitalize on low prices by building new pipeline capacity to higher-priced markets. An individual pipeline company acquires a competitive advantage if it can build a well-connected pipeline network that offers more flexibility and storage to customers; thus, pipeline companies are competing to see who can build out the best networks the quickest. This is likely to result in more pipelines being proposed than are actually needed to meet demand in those higher-priced markets.[154]**

Notably, Williams declares Transco "the fastest growing interstate national pipeline system."[155] Participants in the FERC proceeding have raised concerns about overbuilding.[156]

FERC's own policy statement on approval of pipelines cautions that sending the wrong price signals to the market can "exacerbate adverse environmental impacts, distort competition between pipelines for new customers, and financially penalize existing customers of expanding pipelines and of pipelines affected by the expansion."[157] It warns that doing so can lead to "inefficient investment and contracting decisions."[158] **The bottom line is, when a fossil fuel pipeline is not necessary, it should not be built.**

CONCLUSION

The Williams NESE Pipeline Project is completely unnecessary and would unwisely lock the State of New York into a pipeline gas market expansion plan that is not in the State's best interest. The Williams NESE Pipeline Project would move the State of New York, the counties of Long Island and the City of New York in a direction that subverts the State energy policies established by the Governor as well as New York City initiatives. This non-essential yet costly pipeline construction proposal should be rejected in favor of the diverse energy efficiency and renewable energy alternatives that are available.

ENDNOTES

1 Transco is a wholly owned subsidiary of the Williams corporation – a Fortune 500 Delaware corporation headquartered in Tulsa, Oklahoma, and primarily involved in energy infrastructure. Williams, 2018 Fall Update: Customer Service (2018) (http://www.1line.williams.com/Transco/files/presentations/2018FallUpdateCustSvcs.pdf), slides 4 and 5. For clarity, this report will refer to it as Williams/Transco.

2 Williams/Transco, Application for Certificate of Public Convenience and Necessity (Northeast Supply Enhancement Project) Docket No. CP17-101 (March 27, 2017) (hereafter, Williams/Transco Application to FERC), p. 1. Natural gas is most meaningfully measured by its heating or energy capacity rather than volume. A standard measure is one British thermal unit ("Btu") – which is the amount of natural gas needed to raise the temperature of one pound of water by one-degree Fahrenheit. One dekatherm of natural gas equals 1 million Btu (1MMBtu).

3 FERC, Northeast Supply Enhancement Project – Final Environmental Impact Statement (Transcontinental Gas Pipeline Company, LLC), Docket No. CP17-101-000, FERC/EIS-0280 (Jan. 25, 2019) (hereafter, FEIS) (available at https://www.ferc.gov/industries/gas/enviro/eis/2019/01-25-19-FEIS.asp), p. ES-1. The Rockaway Transfer Point is an existing interconnection between the Lower New York Bay Lateral and Rockaway Delivery Lateral pipelines in offshore New York.

4 Matthew Flamm, "Business Groups Say Natural-Gas Delivery Has Reached a Crisis Point. Environmentalists Agree," Crain's New York Business (March 4, 2019) (available at https://www.crainsnewyork.com/node/683816/printable/print).

5 Governor Cuomo, Executive Order 166, "Redoubling New York's Fight Against the Economic and Environmental Threats Posed by Climate Change and Affirming the goals of the Paris Climate Agreement" (June 2, 2017) (available at https://www.governor.ny.gov/news/no-166-redoubling-new-yorks-fight-against-economic-and-environmental-threats-posed-climate); State of New York, 2015 New York State Energy Plan, Vol. 1: The Energy to Lead (June 25, 2015) (available at https://energyplan.ny.gov/Plans/2015.aspx) (hereafter, 2015 State Energy Plan), p. 45. See PSC. "Order Adopting Clean Energy Standard," p. 1 (August 1, 2016) (available at http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7B44C5D5B8-14C3-4F32-8399-F5487D6D8FE8%7D).

6 NYS Energy Research and Development Authority ("NYSERDA"), New Efficiency: New York Analysis of Residential Heat Pump Potential and Economics, Report No. 18-44 (Jan. 2019) (available at https://www.nyserda.ny.gov/-/media/Files/Publications/PPSER/NYSERDA/18-44-HeatPump.pdf) (hereafter NYSERDA 2019 Analysis of Heat Pumps), p. 1.

7 NYSERDA, The Energy to Lead: Biennial Report to the 2015 State Energy Plan (2017) (available at https://energyplan.ny.gov/Plans/2015-Update) (hereafter, NYSERDA 2017 Update to State Energy Plan), p. 104. It is also needed to achieve New York City's goal to cut GHGs 80% below 2005 levels by 2050, under Local Law 66 of 2014. City of New York, One City: Built to Last (available at https://www1.nyc.gov/site/builttolast/index.page) (hereafter, One City: Built to Last).

8 Office of the Governor, New York State, Executive Budget, FY 2020, Executive Budget Briefing Book: Environment, Energy and Agriculture (available at https://www.budget.ny.gov/pubs/archive/fy20/exec/book/environment.pdf), p. 73; and Office of the Governor, Press Release, "Governor Cuomo Announces Green New Deal Included in 2019 Executive Budget" (Jan. 17, 2019) (https://www.governor.ny.gov/news/governor-cuomo-announces-green-new-deal-included-2019-executive-budget) (hereafter, Governor Cuomo News Release on Energy).

9 Natural Gas Act of 1938, 15 USC § 717(h).

10 FERC acted as lead agency to prepare the FEIS.

11 Roughly 822,000 cubic yards of this material would have to be dumped. Williams/Transco, Northeast Supply Enhancement Project Responses to Environmental Information Requests dated Oct. 23, 2018, FERC Docket No. CP17-101-000 (submitted Nov. 2018), Table 1, p. 6.

12 40 C.F.R. §§ 1502.13 and 1502.14(d).

13 40 C.F.R. § 1502.16(c). (e) and (f).

14 NYSDEC stated, "Both alignment with NYS GHG reduction policy and the significance of the projected GHG emissions from the NESE Project should be discussed in the FEIS." Letter From K. Gaidasz, Project Manager, NYSDEC to Secretary K. Bose, FERC (May 14, 2018) (available at (https://elibrary.ferc.gov/IDMWS/common/opennat.asp?fileID=14917953), pp. 4 and 9.

15 FEIS, p 3-1.

16 A discussion of energy alternatives in an appendix to the Williams/Transco application – which was not presented in the FEIS – was not based on current need projections, failed to consider increased energy efficiency in buildings and boilers, and failed to evaluate combinations of alternative energy sources and efficiency measures. See Williams/Transco Application to FERC, Resource Report 10: Alternatives (Mar. 2017).

17 See Marie J. French, "Utility Argues New Jersey-New York Pipeline Needed for Belmont Arena," Politico (Jan. 10, 2019) (available at https://www.politico.com/states/new-york/city-hall/story/2019/01/09/utility-argues-new-jersey-new-york-pipeline-needed-for-belmont-arena-780780); and Mark Harrington, "National Grid Presses State for New Gas Pipeline," Newsday (Feb. 1, 2019) (available at https://www.newsday.com/long-island/national-grid-pipeline-1.26686092).

18 Letter from Joseph V. Scibelli, Complex Non-Standard Gas Connections Representative, National Grid, to Adam Bickoff, Director, Sterling Project Development (Nov. 9, 2018), in Belmont Arena DEIS, Appendix A (available at https://esd.ny.gov/belmont-park-redevelopment-project-deis), pp. 45-46.

19 PSC, Hearing Notice: Public Statements Hearings Scheduled for Con Edison Temporary Gas Moratorium – DPS Staff Will Analyze, Review Changing Market Conditions Behind Company's Decision (Feb. 7, 2019) (available at http://www3.dps.ny.gov/pscweb/WebFileRoom.nsf/ArticlesByCategory/5F2F0B9F675A3E308525839A004CD2BA/$File/pr19010.pdf?OpenElement).

20 See, Mark Harrington, supra. National Grid's own proffered energy plan for 80% GHG reductions by 2050 calls for increased burning of natural gas for heating from 55% to 60% of heating sources. For natural gas GHG reductions it primarily recommends converting half of all vehicles to electric by 2030. National Grid, Northeast 80x50 Pathway (June 15, 2018) (available at http://news.nationalgridus.com/wp-content/uploads/2018/06/80x50-White-Paper-FINAL.pdf).

21 No. 4 oil is a blend of No. 6 and No. 2 oil.

22 City of New York, Local Law 43 of 2010 and Rules of the City of New York, Title 15, §§ 2-15(b)(2), (c)(1) and (d) (available at http://www.nyc.gov/html/dep/pdf/air/heating_oil_rule.pdf). The Rules were promulgated by the New York City Department of Environmental Protection ("NYCDEP"). In 2010, only one percent of buildings were using No. 4 and No. 6 heating oil – but those boilers' emissions were causing 86 percent of soot pollution in the City. D. Seamonds, D. Lowell, T. Balon, The Bottom of the Barrel: How the Dirtiest Heating Oil Pollutes Our Air and Harms Our Health (Environmental Defense Fund, 2016) (available at https://www.edf.org/sites/default/files/10085_EDF_Heating_Oil_Report.pdf).

23 New York City adopted more comprehensive legislation in 2015, Local Law 38, that effectively bans the burning of No. 6 fuel oil for any purpose by January 1, 2020, and the burning of No. 4 fuel oil by January 1, 2030 (except that any boiler replaced before the deadline must use a cleaner fuel). City of New York. "Local Laws of The City of New York For the Year 2015, No. 38" (Apr. 16, 2015 (available at https://www1.nyc.gov/assets/buildings/local_laws/ll38of2015.pdf).

24 ICF International, Assessment of NYC Natural Gas Market Fundamentals and Life Cycle Fuel Emissions (report to New York City Mayor's Office of Long-Term Planning and Sustainability) (Aug 28, 2012) (available at http://www.nyc.gov/html/om/pdf/2012/icf_natural_gas_study.pdf) (hereafter, ICF 2012 Assessment of NYC Natural Gas Market and Emissions), pp. 33-34. The calculation is based on estimated consumption by No. 6 and No. 4 fuel oil boilers subject to the City's phase-out mandate. Peak demand – i.e., the amount necessary to meet demand at its highest points during the year, which for heating fuel would be the coldest hours of the coldest days -- generally is about 3.5 times average daily demand but usually only lasts for a couple hours.

25 *Id.,* For a similar estimate, see Michael Aucott, Ph.D., Report, Exhibit B, Intervenors' Additional Comments on FERC's March 2018 DEIS, FERC Docket CP17-101-000, submitted by Eastern Environmental Law Center on behalf of NY/NJ Baykeeper, Food & Water Watch, Central Jersey Safe Energy Coalition, and Princeton Manor Homeowners Association, May 10, 2018. ICF stated that even a complete conversion of No. 6 and No. 4 boilers to natural gas would cause no more than a 6% increase in National Grid's peak day demand. ICF 2012 Assessment of NYC Natural Gas Market and Emissions, pp. 33-34.

26 *Id.,* p. 34. An analysis by researchers at Columbia University found that 53% of the No. 4 and No.6 unconverted boilers left in November 2015 were located above 110th Street in Manhattan and the Bronx (which is Con Edison service territory). D. Carrion, W. V. Lee and D. Hernandez, "Residual Inequity: Assessing the Unintended Consequences of New York City's Clean Heat Transition," Internat'l J of Envtl Res & Pub Health 15(1):117, 123 (Jan. 11, 2018) (available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5800216/).

27 ICF 2012 Assessment of NYC Natural Gas Market and Emissions, p. 34.

28 ICF International predicted that total conversion to natural gas was "unlikely" but its calculation did not consider it. Id., p. 34.

29 See, The Bottom of the Barrel, p. 9; NYC Cleanheat, "Case Studies and Testimonials" (available at https://www.nyccleanheat.org/content/case-studies-and-testimonials). See also statement of NYCHA spokesperson Zodet Negron in J. Callahan, "A New Year Means Cleaner Air for New Yorkers (Jan. 15, 2015) (https://nextcity.org/daily/entry/air-clean-new-yorker-heat-conversion-oil-natural-gas).

30 NYCHA, Next Generation NYCHA Sustainability Agenda (April 22, 2016) (available at https://www1.nyc.gov/assets/nycha/downloads/pdf/NGN-Sustainability.pdf); See also New York City Open Data, NYCHA Buildings – Heating Oil Consumption and Costs 2010-2016 (available at https://data.cityofnewyork.us/Housing-Development/Heating-Oil-Consumption-And-Cost-2010-2016-/bhwu-wuzu) and NYCHA Buildings – Heating Gas Consumption and Costs 2010-2018 (available at https://data.cityofnewyork.us/Housing-Development/Heating-Gas-Consumption-And-Cost-2010-June-2018-/it56-eyq4) (hereafter, NYC Open Data re NYCHA buildings).

31 See, City of New York, "Clean Heat Data: Remaining No. 6 Buildings, last updated Nov. 12, 2015" (available at https://www.nyccleanheat.org/content/press-and-downloads). Among Con Edison customers, 27 boilers (21 buildings) had not yet converted by Nov. 12, 2015. Id.

32 Office of the Mayor, Press Release, Mayor de Blasio and DEP Announce That All 5,300 Buildings Have Discontinued Use of Most Polluting Heating Oil, Leading to Significantly Cleaner Air " (Feb. 9, 2016) (available at https://www1.nyc.gov/office-of-the-mayor/news/152-16/mayor-de-blasio-dep-that-all-5-300-buildings-have-discontinued-use-most-polluting).

33 While the FEIS states that the pipeline's purpose is to supply natural gas to New York City, public statements by Williams describe a broader reach, including Long Island. Williams, Press Release, "NESE Project receives Final Environmental Impact Statement from FERC" (Jan. 25, 2019) (available at http://northeastsupplyenhancement.com/press/nese-project-receives-final-environmental-

impact-statement-from-ferc/). Williams's Application materials state that the capacity is fully subscribed by both Brooklyn Union Gas Company (National Grid's "KEDNY") and KeySpan Gas East Corporation (National Grid's "KEDLI"). Williams/Transco Application to FERC, Resource Report 10: Alternatives, p. 10-1 (Mar. 2017). The company has stated that 188,700 dekatherms per day is contracted to KEDNY and 211,200 dekatherms/day to KEDLI. Williams/Transco, Request for Pre-Filing Review (May 9, 2016), p. 1. Consequently, this report includes Long Island in its discussion.

34 A review of NYCHA's "Service Interruptions Overview" webpage on March 6, 2019, e.g., found 36 natural gas outages in NYCHA housing in the Bronx, Brooklyn, Queens and Manhattan. NYCHA, "Service Interruptions Overview" as of Mar. 6, 2019 (current status available at https://my.nycha.info/Outages/Outages.aspx).

35 Office of NYC Comptroller Scott Stringer, News Release, "As New Yorkers Face Sub-Zero Conditions, Comptroller Stringer Announces New Audit of NYCHA Heating Systems" (Jan. 6, 2018) (available at: https://comptroller.nyc.gov/newsroom/press-releases/as-new-yorkers-face-sub-zero-conditions-comptroller-stringer-announces-new-audit-of-nycha-heating-systems/). See also Office of NYC Comptroller Scott Stringer, Audit Report on the New York City Housing Authority's Maintenance and Repair Practices, FK14-102A (July 13, 2015) (available at https://comptroller.nyc.gov/wp-content/uploads/documents/FK14_102A.pdf).

36 See New York City Open Data, NYCHA Buildings – Heating Oil Consumption and Costs 2010-2016 (available at https://data.cityofnewyork.us/Housing-Development/Heating-Oil-Consumption-And-Cost-2010-2016-/bhwu-wuzu) and NYCHA Buildings – Heating Gas Consumption and Costs 2010-2018 (available at https://data.cityofnewyork.us/Housing-Development/Heating-Gas-Consumption-And-Cost-2010-June-2018-/it56-eyq4).

37 Buildings over 50,000 sq. ft. must participate in the benchmarking program under Local Law 84 of 2009 (available at https://www1.nyc.gov/assets/buildings/local_laws/ll84of2009.pdf), and that threshold has been lowered to 25,000 sq. ft. by Local Law 113 of 2016 (available at https://www1.nyc.gov/assets/buildings/local_laws/ll133of2016.pdf).

38 See Urban Green Council, "About benchmarking in New York City" (https://metered.urbangreencouncil.org/site/about).

39 City of New York, Urban Green Council, New York City's Energy and Water Use 2014 and 2015 Report (Oct. 2017) (available at https://www.urbangreencouncil.org/content/projects/new-york-city-energy-and-water-use-2017-report) (hereafter, NYC Energy and Water Use 2014 & 2015 Report), p. 30. Some buildings may have converted to electricity or steam. Roughly 55% of building emissions are from on-site heat, hot water, and cooking. City of New York, PlaNYC, NYC's Pathways to Deep Carbon Reductions (Dec. 2013) (available at https://s-media.nyc.gov/agencies/planyc2030/pdf/nyc_pathways.pdf) (hereafter, PlaNYC Pathways to Deep Carbon Reductions), p. 19.

40 NYC 2017 Housing & Vacancy Survey, Series 1B, Table 42 (available at https://www.census.gov/data/tables/time-series/demo/nychvs/series-1b.html).

41 Williams/Transco Application to FERC, Vol. 1, "Environmental Reports: Resource Reports 1" (Nov. 2016), p. 1-6 reports that 446 buildings used No. 4 fuel oil in November 2015. The City's database of boiler permits and registrations indicates that the 2019 number may be under 400. NYC Open Data, CATS Database of Boiler Permits [and Registrations] Issued Feb. 22, 2019 (available at https://data.cityofnewyork.us/Environment/CATS-Permits/f4rp-2kvy) (hereafter, NYC Current Boiler Database).

42 NNYC Current Boiler Database. A review of current No. 4 boiler permits and registrations in Brooklyn, Queens and Staten Island indicates that roughly 38% do not require a certificate to operate, which is required for boilers with a capacity of 4.2MMBtu/hr and above. See http://www.nyc.gov/html/dep/pdf/air/boiler-filing-applicability.pdf.

43 See https://retrofitaccelerator.cityofnewyork.us/resources/heating.

44 See, e.g., Williams's discussion of solar energy, which states that 'solar energy cannot offset the need for fuel in natural gas heating systems, nor will it enhance the reliability of the natural gas delivery system for the service territory." Williams/Transco Application to FERC, Resource Report 10: Alternatives (Mar. 2017), p. 10-10.

45 NYC Retrofit Accelerator webpage, "Heating Oil Conversions" (available at https://retrofitaccelerator.cityofnewyork.us/resources/heating-oil-conversions). Although most NYCHA buildings are heated by natural gas, roughly a dozen buildings in National Grid's service area rely completely or substantially on No. 2 oil, and roughly 18 others use No. 2 oil sporadically. See New York City Open Data, NYCHA Buildings – Heating Oil Consumption and Costs 2010-2016 (available at https://data.cityofnewyork.us/Housing-Development/Heating-Oil-Consumption-And-Cost-2010-2016-/bhwu-wuzu) and NYCHA Buildings – Heating Gas Consumption and Costs 2010-2018 (available at https://data.cityofnewyork.us/Housing-Development/Heating-Gas-Consumption-And-Cost-2010-June-2018-/it56-eyq4).

46 See Local Law 119 of 2016 (available at https://www1.nyc.gov/assets/buildings/local_laws/ll119of2016.pdf); and NYC Department of Citywide Administrative Services, "New York City Submits Strong Comments to EPA Supporting Biodiesel ," Biodiesel Magazine (Oct. 2017) (available at http://www.biodieselmagazine.com/articles/2516181/new-york-city-submits-strong-comments-to-epa-supporting-biodiesel).

47 Michael Tobias, New York Engineers webpage blog, "How NYC Is Phasing Out Heavy Heating Oils" (available at https://www.ny-engineers.com/blog/how-nyc-is-phasing-out-heavy-heating-oils).

48 See, e.g., PSE Healthy Energy, The Greenhouse Gas Impacts of Proposed Natural Gas Pipeline Buildout in New York (Feb. 2018) (available at https://www.psehealthyenergy.org/wp-content/uploads/2018/02/NY.Pipelines-1.pdf).

49 Michael Tobias, New York Engineers, supra.

50 Entropy Research, LLC, Analysis of Fuel Cycle Energy Use and Greenhouse Gas Emissions from Residential Heating Boilers (submitted to National Oilheat Research Alliance) (June 2018) (available at https://noraweb.org/wp-content/uploads/2019/02/GHG-Resource-Analysis-for-Residential-Boilers-June-2018.pdf), pp. 85-86.

51 Id., pp. 88-89. See also Exergy Organization, Assessment of Liquid Fuel Emissions (submitted to the PSC in case 12-G-0297, "Proceeding on Motion of the Commission To Examine Policies Regarding the Expansion of Natural Gas Service") (Feb. 15, 2013) (available at http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7B97BEFC67-437C-46DE-801B-D23FD3E18D6E%7D), p. 10 (stating that a 5%t biodiesel blend with No. 2 oil can achieve levels comparable to natural gas).

52 See, Williams, press statement, "NESE Resubmits Clean Water Permit Application to NYSDEC" (May 16, 2018) (available at https://northeastsupplyenhancement.com/press/nese-re-submits-clean-water-permit-application-to-nydec/).

53 Williams/Transco Application to FERC, Resource Report 1: General Project Description, p. 1-8.

54 Williams/Transco Application to FERC, p. 3.

55 See Oil Change International, Burning the Gas "Bridge Fuel" Myth (Nov. 2017) (available at http://priceofoil.org/content/uploads/2017/11/gas-briefing-nov-2017-v5.pdf).

56 They can achieve a coefficient of performance many times higher than 1.0, the theoretical maximum efficiency for typical combustion heat sources and traditional electric resistance heat. NYSERDA 2019 Analysis of Heat Pumps, pp. S-2 and 1.

57 National Grid, Northeast 80x50 Pathway, supra, p. 7.

58 NYSERDA 2019 Analysis of Heat Pumps, Table 4.9, pp. 17-18. If heat pumps were only used to replace fuel oil boilers it still would have the potential to reduce future gas demand by 18.8 TBtu on Long Island and 3.1 TBtu in New York City, for a total of 21.9 TBtu, reducing average daily load by roughly 60,000 dekatherms. Id. NYSERDA estimates that heat pumps at small residential sites could serve almost a quarter of all statewide space heating and cooling load. Id., p. S-2. (While heat pumps in small buildings would only address 7% of the total City load, smaller buildings are much more prevalent in National Grid's service area than the rest of the City, so the percentage for its service area would be significantly higher.)

59 National Grid's share of all residential customers is 55%. ICF 2012 Assessment of NYC Natural Gas Market and Emissions, p. 26. Its share of smaller residential building customers, however, is likely much higher.

60 Steven Nadel, ACEEE, Energy Savings, Consumer Economics, and Greenhouse Gas Emissions Reductions from Replacing Oil and Propane Furnaces, Boilers and Water Heaters with Air-Source Heat Pumps, Report A1803 (July 2018) (available at https://aceee.org/research-report/a1803) (hereafter, ACEEE Report on Cost-Effectiveness of Air-Source Heat Pumps), Table ES1, pp. iii and iv. The estimate assumes the system is used only for heating, not adding use for air conditioning.

61 NYSERDA, Heat Pumps Potential for Energy Savings in New York State (Mar. 2015 rev) (available at https://www.nyserda.ny.gov/-/media/Files/EDPPP/Energy-Prices/Current-Outlook/Presentations/Heat-Pumps-Potential.pdf) (hereafter, NYSERDA 2015 Report on Heat Pumps Potential), p. 9.

62 NYSERDA 2015 Report on Heat Pumps Potential, pp. 25-26.

63 NYSERDA 2015 Report on Heat Pumps Potential, pp. 25-26.

64 Clark Devereaux, "New Alternative Ways to Heat Your Home," Long Island Pulse (Jan. 22, 2016) (available at http://lipulse.com/2016/01/22/new-alternative-ways-to-heat-your-home/.)

65 Clark Devereaux, supra.

66 Telephone interview of Zachary Fink, ZBF Geothermal, LLC, Jan. 24, 2019; Clark Devereaux, supra.

67 NYSERDA 2019 Analysis of Heat Pumps, p. 15.

68 PSEG Long Island, webpage, "Geothermal Energy: 7 Good Reasons to consider Geothermal" (https://www.psegliny.com/saveenergyandmoney/solarrenewableenergy/geothermal).
New York Newsday recently observed that new geothermal projects have slowed in recent years, in part because of its technical complexity. But it cites the PSEG as reporting that the energy saved by the systems has been increasing, likely because of larger systems being installed. It also observes that the Sayville Public Library has installed a successful system which, when kept on its initial settings, "just works." Mark Harrington, "New Sign-ups for Geothermal Energy Systems Decline on LI," Newsday (Mar. 2, 2019) (available at https://www.newsday.com/long-island/geothermal-rebates-signups-1.27929308).

69 Jan Tyler, "Geothermal Air Conditioning and Heating Can Cut Energy Costs," Newsday (Nov. 18, 2017) (available at https://www.newsday.com/lifestyle/home-and-garden/geothermal-air-conditioning-and-heating-can-cut-energy-costs-1.13796182).

70 See, https://us.ournationalgrid.com/news-article/bringing-greener-energy-to-glenwood-village; and Steve Wick, "Geothermal heating system installed at Glenwood Village in Riverhead," Riverhead News Review (Oct. 30, 2017) (available at https://riverheadnewsreview.timesreview.com/2017/10/83835/geothermal-heating-system-installed-at-glenwood-village-in-riverhead/).

71 National Grid, Keyspan Gas East Corporation (KEDLI), "Geothermal Gas REV Demonstration Project – Q4 2018 Report," submitted to

PSC (Jan. 31, 2019), pp. 1-2

72 NYSERDA, Air-Source Heat Pump Program Manual - Program Opportunity Notice 3653, V. 3 (April 2018) (available at https://portal.nyserda.ny.gov/servlet/servlet.FileDownload?file=00Pt0000005wvc6EAA), p. 3.

73 NYSERDA, "Clean Energy Fund Investment Plan, Products Chapter, Portfolio: Market Development," PSC Matter No. 16-00681 (Nov. 2018) (available at http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={6E4CA076-938B-42EC-95DE-B6912C476534}), p. 14.

74 NYSERDA 2017 Update to State Energy Plan, p. 21; and NYSERDA webpage, "Ground Source Heat Pump Rebate" (https://www.nyserda.ny.gov/All-Programs/Programs/Ground-Source-Heat-Pump-Rebate).

75 The credit is reduced to 26% in 2020 and 22% in 2121. Qualified expenditures include labor costs as well as piping or wiring to connect a system to the home. U.S. Department of Energy, webpage, "Residential Renewable Energy Tax Credit" (available at https://www.energy.gov/savings/residential-renewable-energy-tax-credit).

76 Source: Energy Efficiency and Demand Management Programs, PSEG Long Island (provided Feb. 6, 2019).

77 Clark Devereaux, supra.

78 Telephone interview of Zachary Fink, ZBF Geothermal, LLC, January 24, 2019.

79 NYSERDA, webpage, "Solar Thermal: Hot Water" (https://www.nyserda.ny.gov/Researchers%20and%20Policymakers/Power%20Generation/Solar%20Power/Solar%20Hot%20Water).

80 The credit is reduced to 26% in 2020 and 22% in 2121. U.S. Department of Energy, webpage, "Residential Renewable Energy Tax Credit" (available at https://www.energy.gov/savings/residential-renewable-energy-tax-credit).

81 Jason Litwak, Director of Government Relations, "Testimony of Con Edison Before the New York City Council Committee on Environmental Protection" (Dec. 4, 2018).

82 See NYSERDA 2017 Update to State Energy Plan, p. 104.

83 Cathy Kunkel, IEEFA and Lorne Stockman, Oil Change International, The Vanishing Need for the Atlantic Coast Pipeline (Jan. 2019) (available at http://ieefa.org/wp-content/uploads/2019/01/Atlantic-Coast-Pipeline_January-2019.pdf), p. 11.

84 Northern Indiana Public Service Company, LLC, Integrated Resource Plan 2018 (released Nov. 1, 2018) (available at https://www.nipsco.com/docs/default-source/default-document-library/2018-nipsco-irp.pdf). See also, Dennis Warmsted, IEEFA, blog, "Five Ways Utilities Are Driving the Rapid Expansion of Solar-Plus-Storage" Technology Gains Pose a Major Threat to Baseload Power Providers" (Feb. 14, 2019) (http://ieefa.org/ieefa-u-s-5-ways-utilities-are-driving-the-rapid-expansion-of-solar-plus-storage/).

85 Governor Cuomo News Release on Energy.

86 U.S. Census Bureau Community Survey 2010 and 2017. See also NYSERDA, Patterns & Trends: New York State Energy Profiles 2001-2015 (Oct. 2017) (https://www.nyserda.ny.gov/-/media/Files/Publications/Energy-Analysis/2001-2015-patterns-and-trends.pdf). Although solar energy in Nassau County provides heat for only 0.001 percent of households, roughly 490 new solar-fueled homes appeared between 2010 and 2017.

87 ICF 2012 Assessment of NYC Natural Gas Market and Emissions, p. 33, note 26.

88 Older fuel oil boilers had an AFUE rating ranging from 56% to 70%. U.S. Department of Energy, webpage, "Furnaces and Boilers" (https://www.energy.gov/energysaver/home-heating-systems/furnaces-and-boilers).

89 Consumer Reports, Boiler Buying Guide (available at https://www.consumerreports.org/cro/boilers/buying-guide/index.htm).

90 U.S. Boiler Company, webpage, "Oil Boiler Efficiency" (https://www.usboiler.net/oil-boiler-efficiency.html).

91 National Grid webpage, "Services and Rebates" (https://www.nationalgridus.com/Services-Rebates?filters=For%20Homeowners|New%20York%20City%20(Brooklyn,%20Queens,%20Staten%20Island)|Natural%20Gas|Heating) (hereafter, National Grid webpage re Services and Rebates).

92 NYC Energy and Water Use 2014 & 2015 Report, p. 4.

93 See NYC Energy and Water Use 2014 &2015 Report, p. 48 (Figure 28: Multifamily Energy Conservation Measure (ECM) Estimated Energy Savings) and pp. 49-50.

94 NYC Energy and Water Use 2014 & 2015 Report, p. 35 and p. 70, note 23 ["Multivariate linear regression results for multifamily buildings indicate that DHW system type has a statistically significant impact on site fuel EUI ($F(2,1069) = 16.28$, $p < .001$, $R2 = .05$, R2 adjusted = .05)"]. A separate water heater can also be equipped with technology to shift the time of water heating based on a home's hot water use patterns. See, ACEEE, Energy Impacts of Smart Home Technology (April 2018) (available at https://aceee.org/research-report/a1801), pp. 14-15.

95 National Grid webpage, "Heating Your Home: Savings You Can Warm Up To" (https://www.nationalgridus.com/NY-Home/Energy-

Saving-Programs/Heating-Your-Home?gclid=EAIaIQobChMIgcWck4_c3wIVk4-zCh1iFQeSEAAYASAAEgLKAvD_BwE).

96 ACEEE Report on Cost-Effectiveness of Air-Source Heat Pumps, pp. iii and 20.

97 The new NYS Energy Conservation Construction Code is consistent with the guidelines of the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) 90.1–2013 and the 2015 International Energy Conservation Code for commercial and residential building construction. NYSERDA 2017 Update to State Energy Plan, p. 40.

98 NYSERD's draft voluntary code is roughly 8.5% more efficient than the residential provisions of the 2018 International Energy Conservation Code and 3.5% more efficient than the commercial provisions of ASHRAE 90.1-2016. NYSERDA is reviewing public comments on it. See, NYSERDA 2017 Update to State Energy Plan, p. 40. NYSERDA webpage, "NYStretch Energy Code 2019" (https://www.nyserda.ny.gov/All-Programs/Programs/Energy-Code-Training/NYStretch-Energy-Code-2019).

99 Intro 1253-2018 (available at https://legistar.council.nyc.gov/LegislationDetail.aspx?ID=3761078&GUID=B938F26C-E9B9-4B9F-B981-1BB2BB52A486). The current version of the bill exempts buildings with rent-stabilized units. Such units comprise roughly 44% of rental housing stock.2017 Housing and Vacancy Survey Selected Findings, p. 1.

100 Intro 1252-2018 (available at https://legistar.council.nyc.gov/LegislationDetail.aspx?ID=3761079&GUID=6D07BB04-3355-4C2F-AC39-07C636842490).

101 See New York City Local Laws 84 and 87.

102 "Knickerbocker Commons Passive House Apartment Buildings" (https://architizer.com/projects/knickerbocker-commons-affordable-housing/); One City, Built to Last, p. 38.

103 2017 Housing and Vacancy Survey Selected Findings, Table 18, p. 27.

104 ACEE, The Next Nexus: Exemplary Programs that Improve Health (March 2018) (available at https://aceee.org/research-report/h1802), p. 5.

105 U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, factsheet, "Weatherization Works!" (Feb. 2018), (available at https://www.energy.gov/sites/prod/files/2018/06/f52/EERE_WAP_Fact%20Sheet-v2.pdf). See also Virginia Energy Efficiency Council webpage report of 2018 evaluation of weatherization, smart thermometers and furnace replacements in Virginia showing 18% heating savings and 14% overall gas usage savings from weatherization alone, and additional savings from use of a mart thermometer and replacement of a furnace (available at https://vaeec.org/smart-thermostat-weatherization-assistance-program-pilot/).

106 National Grid webpage re Services and Rebates.

107 SOCal Gas news release: "SoCal Joins Nest to Announce Results of Winter Seasonal Savings Energy Efficiency Program" (June 29, 2017) (available at https://sempra.mediaroom.com/index.php?s=19080&item=137305).

108 See New York City Office of Sustainability webpage, "Green Buildings and Energy Efficiency: NYC Benchmarking Law " (http://www.nyc.gov/html/gbee/html/plan/ll84.shtml). The grade will be based on the rating earned using the U.S. Environmental Protection Agency ("EPA") ENERGY STAR Portfolio Manager.

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