BEFORE THE NEW JERSEY BOARD OF PUBLIC UTILITIES

IN THE MATTER OF NATURAL GAS COMMODITY AND DELIVERY CAPACITIES IN THE STATE OF NEW JERSEY – INVESTIGATION OF THE CURRENT AND MID-TERM FUTURE SUPPLY AND DEMAND, DOCKET NO. GO20010033.

Comments of Affordable Energy for New Jersey

on the

London Economics International report:

"Analysis of Natural Gas Capacity to Service New Jersey Firm Customers."

February 8, 2022

I. INTRODUCTION AND SUMMARY

Affordable Energy for New Jersey (AENJ) appreciates this opportunity to provide comments on the report prepared for the New Jersey Board of Public Utilities (BPU) by London Economics International (LEI): "Analysis of Natural Gas Capacity to Service New Jersey Firm Customers" (LEI Report).

AENJ finds numerous faults with the LEI Report, which appears to have been prepared with a goal of confirming the Energy Master Plan's (EMP) stated conclusion that no new gas pipeline capacity will ever be needed in the state, or should be allowed to be constructed, if energy

efficiency and electrification policies designed to reduce the state's carbon emissions are put into place. AENJ disagrees with the conclusions of the EMP and with the LEI Report's findings.

As AENJ discusses below, the LEI report suffers from the following flaws:

1. The LEI Report fails to provide any reasoned basis for its rejection of the econometric forecasts prepared by the New Jersey gas distribution companies (GDCs) – forecasts which are also reviewed and approved by the BPU – and instead adopts a "naïve" forecast of growth in design day firm demand based solely on historical trends for the previous five years. The LEI forecast assumption is not consistent with standard forecasting practice of extreme values and its assumptions regarding future energy efficiency savings are unsupported.

2. The LEI Report assumes unrealistic costs to electrify existing residential natural gas consumption for space and water heating. Based on actual experience, these costs are far greater than those assumed by the EMP and, as such, the electrification goals set forth in the EMP will not be met. The report also fails to recognize that the increased demand for electricity brought about by electrification of end-use natural gas consumption will most likely be met with new natural gas-fired generation. This will increase the overall demand for natural gas and increase costs to end-use consumers who use electricity. Moreover, with increased electrification, curtailing generating plants using natural gas when natural gas pipeline capacity is constrained will become increasingly problematic and disruptive to consumers.

3. The LEI Report's consideration of energy efficiency measures is simplistic, assumes modeled energy efficiency reductions will be realized without accounting for real world impacts, and fails to consider the customer costs associated with installing smart meters needed for TOU pricing for natural gas.

4. The LEI Report fails to consider costs to consumers from non-pipeline alternatives (NPAs), such as smart thermostats for direct load control (DLC. Nowhere does the LEI Report actually evaluate costs and benefits of these alternatives.

5. The LEI Report's "best practices" and "Playbook" is geared towards central control of natural gas consumption by the BPU. AENJ strongly believes consumers are in the best position to determine for themselves the comfort levels for their homes and businesses.

II. THE LEI REPORT WRONGLY RELIES ON A "NAÏVE" FORECAST OF NATURAL GAS DEMAND AND AN ARBITRARY ASSUMPTION ABOUT ENERGY EFFICIENCY IMPACTS

The basis for the LEI Report's findings that no new pipeline capacity will be needed is a simple assumption that design day firm demand will increase at an average rate of only 0.80% per year. LEI's assumption is based on its simplistic linear average of annual historical growth of 0.95% between 2016 and 2020, and an assumption the energy efficiency programs will reduce that growth to 0.80% (page 23).

The LEI Report's forecast growth is what is known as a "naïve" forecast, that is, one based solely on previous observations of the variable to be estimated – in this case, peak natural gas demand. LEI ignores all of the underlying economic factors that affect natural gas demand. Instead, LEI assumes that the future will be exactly the same as the past. Hence, the term "naïve" forecast.

While adopting its naïve forecast, LEI rejects the more detailed econometric forecasts prepared by the gas LDCs (see. pp. 43-48), even though these forecasts were submitted to the BPU and, presumably, approved by the BPU. The reasons given by LEI for rejecting the GDC forecasts reveal profound ignorance over the nature of econometric modeling.

First, LEI criticizes the GDC forecasts because "it is not based on the historical trend in demand per HDD of 0.95%" (p. 47). In other words, LEI claims that, because the GDC forecasts are not naïve, they are somehow deficient. This turns accepted econometric modeling to forecast natural gas demand on its head. Naïve forecasts are inherently deficient.

LEI's naïve growth assumption is based on only 13 days between 2016 and 2020, and assumes without any empirical basis that design day peak demand is determined solely by heating degree days. In other words, LEI assumes there are no other factors that can affect natural gas demand over time. Instead, as shown on page 40 (Figure 20), LEI assumes, with no verification, that the relationship between natural gas peak demand and HDDs is linear.

Forecasting peak demand presents empirical challenges because one is forecasting extreme values, rather than average ones. Typically, an extreme value forecast will not be linear. For example, below a certain temperature, furnaces will run continuously. Hence, additional temperature decreases will have little impact on peak demand. Similarly, peak demand over time will be affected by changes in natural gas appliance saturation, appliance efficiency, changes to the housing mix (e.g., the percentage of single-family vs. multi-family structures, average home size), and so forth. To account for these factors, forecasters will typically test various non-linear specifications. LEI appears to not have performed any empirical analysis beyond its simplistic trend line analysis.

Second, the LEI Report claims that several of the GDCs do not account for future energy efficiency gains adequately (p. 46). Yet, even for those GDCs whose treatment of future efficient LEI does not criticize, LEI nevertheless criticizes those GDCs peak demand forecasts.

Third, the LEI Report states that "two GDCs rely on customers switching from oil to natural gas for a portion of demand growth, even though this practice is likely to slow given public policies which encourage electrification …" (p. 48). However, the policies that encourage electrification, such as those presented in the EMP, grossly underestimate the costs of electrification. Because of electrification's much higher than projected costs, it is doubtful consumers and businesses will embrace it. Indeed, curiously absent from the LEI Report is any discussion of actual electrification by New Jersey consumers. Rather than rely on assumptions, it would be far more useful to examine the actual numbers of residential and business customers who have switched from natural gas to electricity by installing heat pumps. AENJ suspects that number is quite small.

Fourth, the LEI Report discusses growth in natural gas demand being driven by the electric power sector. This is true and, should electrification accelerate, the resulting increase in electricity peak demand is likely to be met primarily with natural gas generation. The LEI Report then states that, "To the extent the power sector is not contracting for FT on interstate pipelines or on laterals belonging to GDCs, nor contracting for substantial amounts of gas in storage, the power sector is last in line for gas delivery with other interruptible customers."

What the LEI Report appears to have ignored is changes in PJM's capacity market rules, specifically penalties for generator non-availability when PJM requires a generator to operate. These changes increase the incentive for generators to contract for firm transportation: generators have a greater incentive to enter into firm transportation contracts with pipelines. (Moreover, as discussed below, increased peak demand for electricity caused by electrification of end-use natural gas will be met primarily with additional natural gas generation, causing demand to increase further owing to the inherent loss of efficiency between burning gas at the end use (e.g., a furnace or water heater) and burning gas to generate electricity.) As more generators contract for firm capacity, then by definition they cannot be interrupted. As such, growth in electric sector use of natural gas will increase the need for firm pipeline capacity.

III. THE LEI REPORT ASSUMES ELECTRIFICATION OF EXISTING RESIDENTIAL NATURAL GAS CONSUMPTION FOR SPACE AND WATER HEATING WILL TAKE PLACE IN ACCORDANCE WITH THE EMP

LEI assumes the state's misguided electrification proposals set forth in the EMP will take hold. However, as an AENJ report discussed, the costs of residential electrification assumed in the

EMP are grossly underestimated.[1] Consequently, LEI's assumption about increasing electrification reducing either the rate of growth of natural gas demand or even reducing natural gas demand, are unlikely to be realized. A study prepared by Diversified Energy Specialists examined actual heat pump conversion costs for over 600 homes in Massachusetts over the five-year period 2014-2019.[2] That study found the average cost to convert a home was almost $23,000 for an average size home of 1,500 square feet, triple the assumed cost of installing a heat pump that is assumed in the EMP. Moreover, over 90% of the homes evaluated retained a supplementary heat source, including wood stoves, electric resistance heaters and, importantly, natural gas furnaces.

In addition to adopting the rosy heat pump retrofit costs contained in the EMP, the LEI report claims that electrification via heat pumps replacing natural gas furnaces and water heaters will increase because of cost declines from (i) increased competition among manufacturers; (ii) advanced R&D efforts to improve heat pump performance in cold climates; and (iii) reduced installation costs through lower labor costs (p. 64). None of these claims has any empirical basis.

LEI cites no evidence of increased competition among heat pump manufacturers, nor of new manufacturers who have entered or plan to enter the market for heat pumps. And, although R&D efforts may be able to improve heat pump efficiency in cold weather, those efforts do not yield results in any continuous fashion. And, no amount of R&D for air source heat pumps will be able to overcome the basic laws of thermodynamics and heat transfer: when outside temperatures are extremely cold, there is little heat that can be extracted.

Finally, as more states implement electrification mandates and offer subsidies for converting from natural gas to electricity, the demand for heat pumps will increase. As introductory economics students know, when demand increases, market prices increase. And, given the specialized labor requirements for installing heat pumps, increased electrification will likely lead to labor shortages and/or higher labor costs, much as the current "supply chain" issues are affecting most manufacturers today.

A. Electrification and the Demand for Natural Gas

The LEI Report appears not to realize that electrification is almost certain to increase the demand for natural gas, especially during peak hours, because that increased demand for electricity will most likely to be met with natural gas-fired generation. For example, the U.S. Energy Information

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1 AENJ, "Natural Gas: Crucial for New Jersey's Energy and Economic Future," October 2020.

2 Diversified Energy Specialists, "Case Study: Massachusetts Air-Source Heat Pump Installations, 2014-2019," Report prepared for National Oil Heat Institute, November 19, 2019.

Administration predicts that total natural gas-fired generation in the U.S. will increase significantly between now and 2050.[3]

Under an electrification scenario, New Jersey will not be able to meet the increased demand for electricity with renewable technologies, such as offshore wind facilities. The realities of the time requirements for design, permitting, and construction are such that the Biden Administration's goal of 30,000 MW of offshore wind by 2030 and the New Jersey goal of 3,500 MW of offshore wind by 2030 and 7,500 MW by 2035 are unrealistic.[4] Similarly, siting utility-scale solar photovoltaic facilities on scarce land in the state is likely to become more difficult, given growing opposition to such facilities. New Jersey's high population density means that land for solar PV will be increasingly scarce.

Furthermore, wind and solar generation all require back-up generation to deal with their inherent intermittency. Because the costs of battery storage are prohibitive, increasing wind and solar capacity in the state means greater need for gas-fired generation back-up. Such generation is especially likely to be needed during peak demand hours, such as early morning and evenings when solar energy is not available, and on windless days when winter temperatures are typically their coldest.

Even the most efficient natural gas-fired generator is less efficient than direct consumption of natural gas at the end-use. The most efficient natural gas generators have heat rates of around 6,000 Btus per kilowatt-hour, which implies about 57% efficiency. Coupled with transmission and distribution losses totaling around 7% (5% for transmission and 2% for distribution), only about half of natural gas energy will be converted to useful end-use electricity consumption. In contrast, natural gas furnaces and water heaters have efficiencies of 90% - 95%. Moreover, heat pump efficiency is at a minimum when temperatures are coldest and natural gas demand is highest. Again, therefore, electrification is unlikely to reduce natural gas demand and far more likely to increase it during peak demand hours. In other words, electrification will not reduce peak natural gas demand; it will increase peak natural gas demand.

The LEI Report assumption that electric generating plants will be interrupted in cases where natural gas demand exceeds pipeline capacity also is inconsistent with its assumption of increased electrification. As more consumers and businesses electrify end-use energy, including furnaces, water heaters, and vehicles, interrupting natural gas supplies to the generating plants that provide electricity for those end-uses will become more problematic. In other words, the

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3 US EIA, Annual Energy Outlook 2021, Table 9.

4 For a discussion, see Jonathan Lesser, "The Biden Administration's Offshore Wind Fantasy," Manhattan Institute, February 2022. [**Mike – Report to be released Feb 1, will have link then]**

costs of interrupting electricity consumption increase as the proportion of total end-use energy electricity provides increases.

IV. THE LEI REPORT'S CONSIDERATION OF ENERGY EFFICIENCY ALTERNATIVES IS SIMPLISTIC AND IGNORES SIGNIFICANT COSTS

The LEI Report discusses a number of energy efficiency measures that it believes will eliminate the need for new pipeline capacity. These include various rebate programs for higher efficiency appliances, weatherization programs, consumer education, and so forth. The LEI report fails to discuss the costs of such programs, how those costs would be paid and by whom, and how cost-effective they are. This is especially important in a state like New Jersey with a comparatively older housing stock, for which weatherization costs are likely to be higher than newer housing.

For example, the LEI report references a US Dept. of Energy report claiming that average weatherization cost for a single-family home is $4,695 and average savings are $283 per year. That translates into a simple payback period of almost 17 years, before accounting for the time value of money. If one uses a discount rate of 7.0%, which approximates the weighted average cost of capital for New Jersey GDCs, then the payback period is infinite. In other words, the homeowner never fully recovers the initial weatherization costs. At a 4.0% consumer discount rate, the payback period is almost 28 years. (Although societal discount rates may be different, it is the discount rates used by consumers that are most relevant for the simple reason that it is the consumer's money.)

The LEI Report also emphasizes demand response programs, including time-of-use (TOU) tariffs and DLC. TOU pricing requires specialized gas smart meters that track natural gas consumption by time of day. Such meters are costly. There is no evidence that the additional cost of installing meters and adopting TOU pricing, which many consumers would likely object to if it meant they were forced to reduce thermostat settings in peak hours in order to reduce expenditures. The LEI report presents no evidence that such programs would be cost-effective.

The analysis of smart thermostat costs for DLC (p. 110) in the LEI Report also is misleading. The report examines costs to consumers assuming GDCs offer a $100 rebate to customers. But the report simply ignores the additional $156 million costs that consumers would pay (based on an assumed $150 cost per thermostat.) LEI then wrongly compares the utility cost with the cost GDCs would pay for capacity on the PennEast pipeline. This comparison is non-sensical because LEI ignores the costs of thermostats paid by consumers. Hence, the true comparison would be $469 million for thermostats versus $366 million - $603 million for the pipeline. It also ignores the non-monetary cost to consumers of having the GDC lower temperatures below what consumers would otherwise prefer. It also ignores the fact that reservation rates for pipelines are often negotiated below the full cost-of-service rates.

Although DLC obviously can reduce peak demand, once again, the LEI Report does not include any cost-effectiveness analysis of the incentives that would be needed to encourage consumers to sign on to such programs versus the savings. The case study of the Southern California Edison program (p. 60) reveals that DLC savings were miniscule: in aggregate, the average savings in "evening events" was 0.031 MMcf for 9,208 customers, which translates into savings of 3.4 cubic feet of natural gas per customer. Based on these values, even if NJ GDCs signed on 1 million customers, the savings would be only 3.4 MMcf, or 34 Dth. By contrast, as shown in Figure 19 of the LEI Report, peak day demand was around 4 million Dth over the 2016 – 2020 peak days reported. Thus, the likely peak demand savings would be miniscule.

As for targeted electrification, the LEI Report relies on rosy forecasts, such as the citation to a National Grid report claiming that heat pumps could reach cost parity with natural gas systems in the early 2030s (p. 64). Such predictions of ever-decreasing costs rarely come to fruition. One reason for this is that, as the demand for heat pumps increases relative to natural gas furnaces, the former will tend to increase in price and the latter will decrease in price. Moreover, the National Grid study cited references a 2018 McKinsey study assumes decreasing electricity costs over time thanks to "low-cost" renewables.[5] This is demonstrably false. (Even the EMP assumes electricity costs will increase over time in New Jersey.

The LEI Report fails to provide any analysis of the relative costs and benefits between energy efficiency measures and DLCs, versus adding new pipeline capacity. Nor does the report consider the impacts of a scenario in which the BPU prohibits new pipeline capacity, but demand is not reduced sufficiently to avoid shortages. Furthermore, the "premiums" advocated by the MEI Report for increased resiliency would also be paid for by consumers. And again, nowhere does the LEI Report provide any type of cost-benefit comparison of increased resiliency that ignores new pipeline capacity versus adding capacity. In effect, LEI defines "resiliency" as restricting consumers' access to natural gas.

V. THE LEI REPORT'S "BEST PRACTICES" AND "PLAYBOOK" RECOMMENDS "ALERTS" THAT ARE SIMPLISTIC AND GEARED TOWARDS CENTRAL CONTROL OF NATURAL GAS CONSUMPTION BY THE BPU

The LEO Report's "best practices" for supply shortfalls all emphasize direct control by the BPU. All of the "best practices" recommended by LEI completely ignore the costs to end-use consumers arising from supply shortfalls caused by insufficient pipeline capacity. The LEI Report also ignores the costs arising from improved resiliency and infrastructure improvements in lieu of additional pipeline capacity. The report also recommends increasing penalties – presumably to be paid by

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[5] See p. 19 of the McKinsey Report cited in the National Grid Report at p. 33, fn. 9.

LDCs – to ensure greater resiliency investments. Of course, those investments will be paid by GDC customers. Furthermore, the "premiums" advocated by the MEI Report for increased resiliency would also be paid for by consumers. And again, nowhere does the LEI Report provide any type of cost-benefit comparison of increased resiliency that ignores new pipeline capacity versus adding capacity. In effect, LEI defines "resiliency" as restricting consumers' access to natural gas.

It is also ironic that, while the EMP emphasizes reduced emissions, the LEI Report recommends ending the WARMAdvantage program to encourage consumers to switch from oil to natural gas heat.

Overall, the LEI Report's recommendations emphasize governmental control of limited natural gas supplies by reducing consumption through direct load controls. Although the LEI Report does not recommend mandatory electrification, such mandates are already in place in numerous jurisdictions, such as New York City. Moreover, the EMP also emphasizes mandatory electrification.

Governmental control of natural gas consumption because of insufficient gas pipeline capacity should be a last resort, not the preferred choice of New Jersey regulators. Yet, that is precisely what reliance on the LEI Report's biased and unsupported findings will lead to.