ESTIMATED SAVINGS FOR NEW YORK CONSUMERS FROM THE MILLENNIUM PIPELINE EASTERN SYSTEM UPGRADE PROJECT

PREPARED FOR:

MILLENNIUM PIPELINE COMPANY, LLC

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PREPARED BY:

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DISCLAIMER

Concentric Energy Advisors, Inc. provides information and projections consistent with standard practices. The analyses contained herein require certain simplifying assumptions; however, it is the opinion of Concentric that these assumptions and the corresponding results are reasonable. All analyses are based on the best information available at the time they were conducted. Concentric makes no warrantee or guarantee regarding the accuracy of any forecasts, estimates, or analyses, or that such work products will be accepted by any legal or regulatory body.

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SECTION 1:
INTRODUCTION

A. OVERVIEW

Concentric Energy Advisors, Inc. ("Concentric") has been retained by Millennium Pipeline Company, LLC ("Millennium") to independently evaluate and estimate the potential savings benefits to energy market participants as well as greater economic benefits in New York associated with Millennium's Eastern System Upgrade project (the "ESU project"). As proposed, the ESU project would increase natural gas deliverability on the existing Millennium Pipeline (located in the Southern Tier and Hudson Valley areas of New York) by approximately 200,000 Dth/day from Corning, NY to its interconnect with Algonquin Gas Transmission ("Algonquin") in Ramapo, NY. The ESU project is expected to come online in September 2018. The report herein provides an overview of Concentric's analysis and an estimate of the energy market savings benefits for consumers in New York plus associated economic benefits due to the addition of the ESU project's incremental pipeline capacity.

B. EXECUTIVE SUMMARY

The primary conclusions from Concentric's analysis are as follows:

- Over the last ten years, natural gas consumption in New York has generally been comprised of one-third electric generation, one-third residential, and one-third commercial/industrial.
- Dual-fueled and gas-fired generation, together comprise more than half of the generation capacity and produce over 40% of the electricity in New York. The reliance on natural gas for generation in New York is expected to grow due to the environmental and price benefits of natural gas over other fuels used for generation.
- The price of natural gas significantly affects the price of electricity in New York as a result of the significant role of natural gas-fired generation in producing electricity in New York, and due to the nature of the competitive wholesale electric markets wherein generators' bids are significantly affected by their fuel cost. Therefore, changes in natural gas prices will result in changes in wholesale electric prices.
- The natural gas pipeline network was not originally designed to transport the significant quantities of gas now being produced in the Mid-Atlantic region, creating a need for pipeline reversals, pipeline expansions, and additional pipelines. A number of new natural gas pipeline projects, including the ESU project, have been proposed to transport the prolific Mid-Atlantic natural gas production to markets to serve demand.
- It is expected that the addition of the pipeline capacity associated with the ESU project will result in lower natural gas market prices than otherwise would be experienced in the Hudson Valley and New York City/Long Island areas absent the ESU project.
- To estimate the benefit of the ESU project, Concentric simulated the natural gas market and resulting prices under two scenarios: (i) without the ESU project; and (ii) with the ESU project. In

both scenarios, but for the exclusion or inclusion of the ESU project, all other model assumptions and inputs were held constant to isolate the impact of the ESU project on natural gas prices.

- Concentric's analysis demonstrates that the ESU project is expected to reduce natural gas prices in the Hudson Valley and New York City/Long Island areas by an average of approximately $0.07/MMBtu (approximately 2.5%), during the first 10 years of operation.
- Because natural gas-fired generators often set the price of electricity in New York, lower natural gas prices are expected to result in lower electric energy prices. Accordingly, Concentric utilized its estimate of lower natural gas prices to estimate the savings that would be achieved in the electric market if the ESU project is built.
- It is estimated that electric consumers in New York will save $495 million over the first 10 years, or an average of approximately $49.5 million per year if the ESU project is constructed
- In addition, the ESU project is expected to provide broader economic benefits to New York. These broader economic benefits are the result of three major components: construction of the ESU project, ongoing operation of the ESU project, and the re-spending of energy market savings dollars associated with the ESU project within the local economy.
- The four-year Construction Phase of the ESU project is expected to result in $314 million in total economic output, supporting an average of 440 jobs during that period.
- The Operational Phase of the ESU project is expected to generate a total of $703 million in incremental economic output within the New York economy during its first 10 years of operation, supporting an average of 357 jobs during that period.
- While the analysis captures economic benefits for New York State, the economic benefits generated from the construction and operation of the ESU project are largely expected to be realized in the areas where the infrastructure upgrades are being undertaken (*i.e.*, Delaware, Sullivan, Orange, and Rockland Counties).
- Concentric estimates that the ESU project will provide significant benefits to New York consumers. Together, the energy savings and associated economic benefits to consumers in New York are estimated to be $1.20 billion over the first 10 years of operation, or an average of $120 million per year.
- Since the capital and operating costs of the ESU project will be borne by the shippers that have subscribed for the capacity on the project, and these shippers are located outside of New York, the benefits calculated represent both the gross and net benefits to New York of the ESU project.
- The potential benefits estimated herein are based on monthly average price impacts assuming normal average weather. In periods of elevated demand when market area natural gas prices increase significantly, the opportunity for achieving benefits from lowering natural gas prices (and associated electric prices) through additional pipeline capacity could be substantially higher.

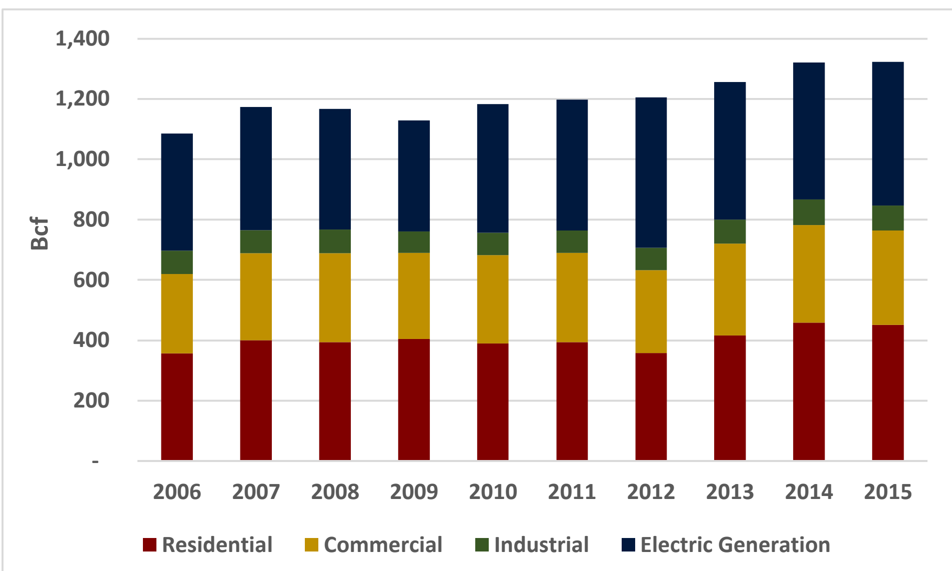
SECTION 2:
NEW YORK NATURAL GAS MARKET OVERVIEW

This section summarizes the New York natural gas market, providing context for the savings analysis discussed in the following sections. First, a discussion of the natural gas demand by both LDCs and electric generators in New York is provided, followed by a discussion of natural gas supply and infrastructure in the region.

A. NATURAL GAS DEMAND

As illustrated in Figure 1, over the last ten years, the demand for natural gas in New York has increased from approximately 1,085 Bcf/year to 1,323 Bcf/year, which translates in an increase in average daily demand from 2.97 Bcf/d to 3.62 Bcf/d, or approximately 2.2% per year over the period. Over the last ten years, natural gas consumption in New York has generally been comprised of one-third electric generation, one-third residential, and one-third commercial/industrial, and the growth has been driven by increases in residential and electric generation consumption.

Figure 1:
Annual Natural Gas Consumption in New York[1]



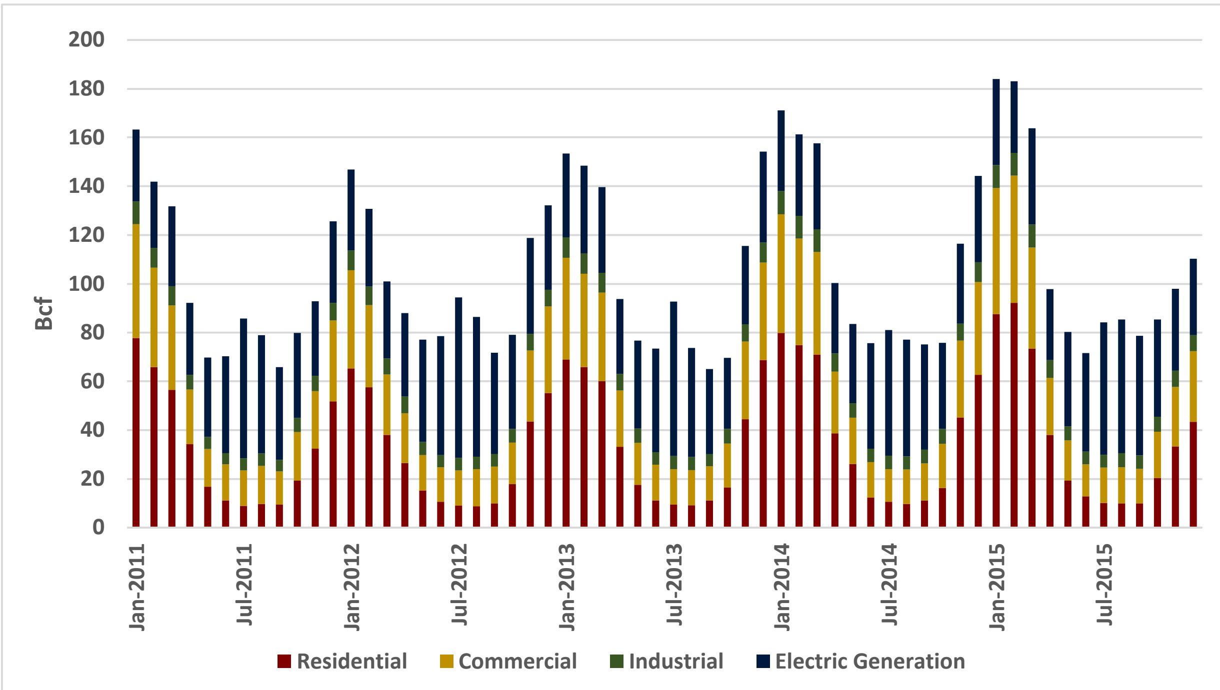
Local natural gas distribution companies ("LDCs") deliver the majority of the natural gas consumed in New York, serving residential and commercial customers as well as a significant portion of the industrial and power generation load. Certain industrial customers and electric generators have direct connections to interstate pipelines, and thus are not served by the LDCs.

The demand for natural gas in New York rises significantly during winter months as residential and commercial customers use natural gas to heat their homes and businesses. In addition, air

1 Annual Natural Gas Consumption by End Use for New York. U.S. Energy Information Administration. Release date February 29, 2016.

conditioning load in the hot summer months increases demand for natural gas by electric generators, meaning the lowest natural gas use usually occurs in the shoulder months. Figure 2 illustrates the seasonality of the natural gas demand in New York, whereby the average day consumption during January 2015 was approximately two and a half times greater than the average day consumption during June 2015.

Figure 2:
Monthly Natural Gas Consumption in New York[2]



LDCs in New York

New York is served by eleven major LDCs (*i.e.*, those that serve at least 10,000 customers); although some of these LDCs are owned by the same parent company. In addition, New York has a number of smaller LDCs that serve only a few communities, and there are many areas of New York where there is no natural gas distribution service. Figure 3 shows the service territory for each of the major LDCs.

[2] Monthly Natural Gas Consumption by End Use for New York. U.S. Energy Information Administration. Release date February 29, 2016.

Figure 3:
Service Territories of Major LDCs in New York[3]

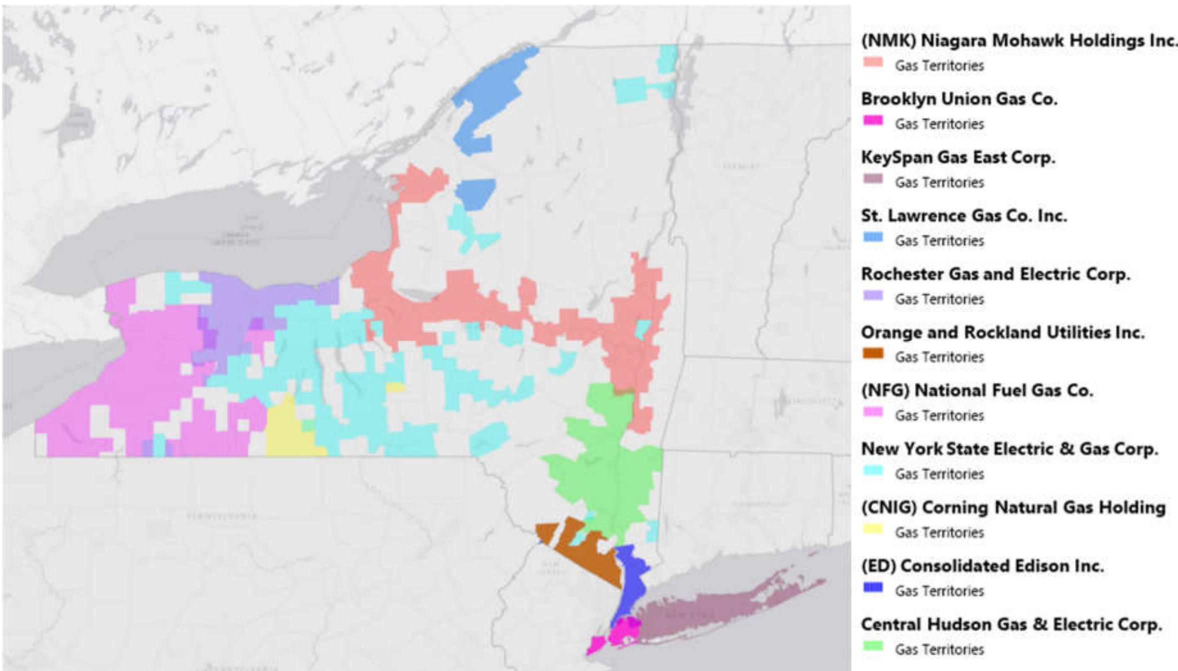


Figure 4 presents summary operating statistics for each major LDC in New York. As shown in Figure 4, the LDCs serving New York City (*i.e.*, Brooklyn Union and Consolidated Edison) serve the largest number of customers and have the largest annual natural gas consumption. Together these two utilities comprise nearly half of the total customer count and natural gas consumption of the major LDCs in New York.

Figure 4:
Major New York LDC Summary Operating Statistics - 2014[4]

	Customer Count	Consumption (Mcf)
National Grid - Brooklyn Union	1,218,939	200,231,304
ConEd - Consolidated Edison of New York	1,074,594	343,932,686
National Grid - Niagara Mohawk	597,733	178,855,684
National Grid - KeySpan Gas East	570,436	189,773,917
National Fuel Gas Distribution	524,548	100,058,917
AvanGrid - Rochester Gas & Electric	307,216	52,124,524
AvanGrid - New York State Electric & Gas	262,661	58,445,294
ConEd - Orange & Rockland	131,493	33,292,660
Fortis - Central Hudson Gas & Electric	77,031	18,176,958
Enbridge - St. Lawrence Gas	15,797	7,318,969
Corning Natural Gas	14,850	6,183,753

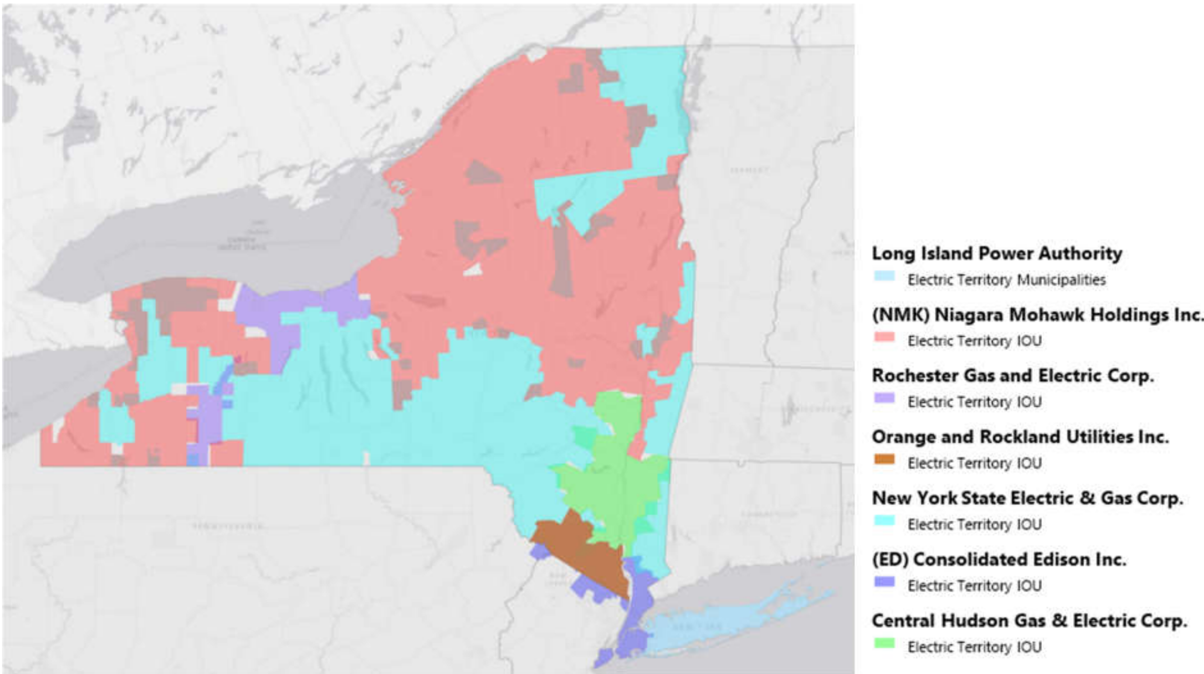
3 SNL Financial

4 U.S. Energy Information Administration, Form 176

Electric Utilities in New York

As shown illustrated in Figure 5, there are seven major electric utilities serving customers in New York.

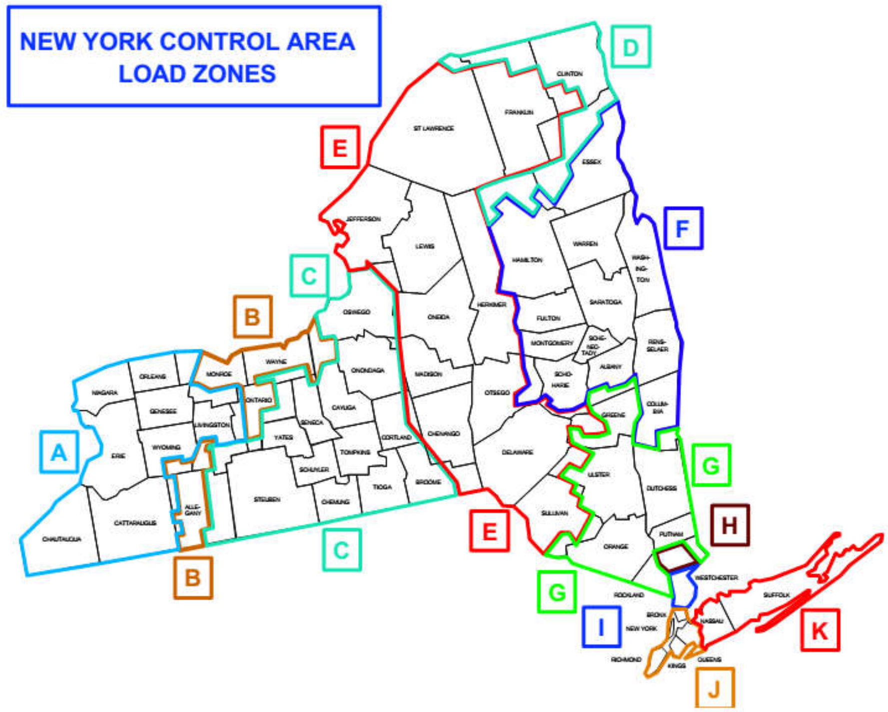
Figure 5:
Service Territories of Major Electric Utilities in New York[5]



The New York wholesale electricity market is operated by the New York Independent System Operator, Inc. ("NYISO"), a regional transmission organization that coordinates the movement of wholesale electricity in New York and manages the competitive electric market. The power generators located in New York are dispatched by the NYISO in a least-cost manner, subject to certain market conditions and operational constraints. The last generating unit dispatched to serve demand within a particular area is known as the "marginal unit," which sets the electric price paid by all customers in that area. New York is divided into eleven electric zones, as illustrated in Figure 6. In 2014, New York consumed approximately 160 TWh of electricity. Zone J (New York City) has the largest electric consumption (53 TWh in 2014), followed by Zone K (Long Island; 22 TWh in 2014).

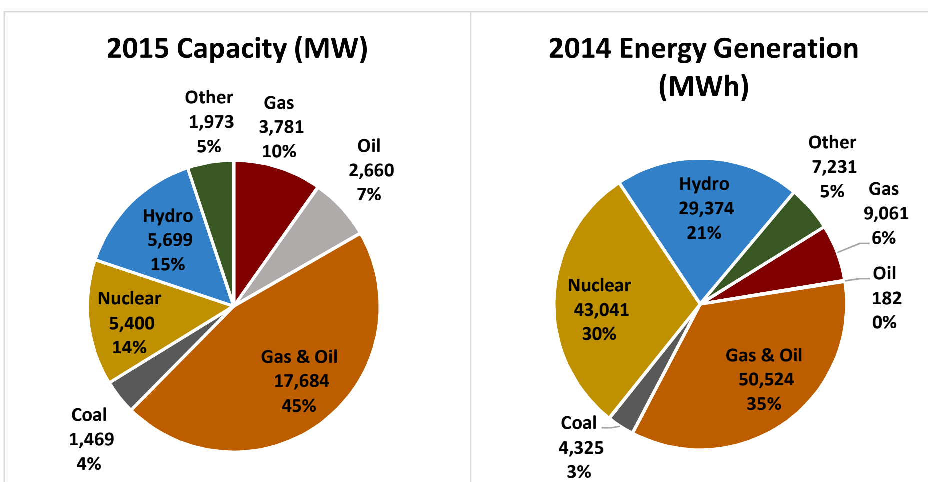
5 SNL Financial

Figure 6:
NYISO Electric Load Zones[6]



As shown in Figure 7, dual-fueled and gas-fired generation, together comprise more than half of the generation capacity and produce over 40% of the electricity in New York.

Figure 7:
New York Generation Capacity and Energy Generation by Fuel[7]

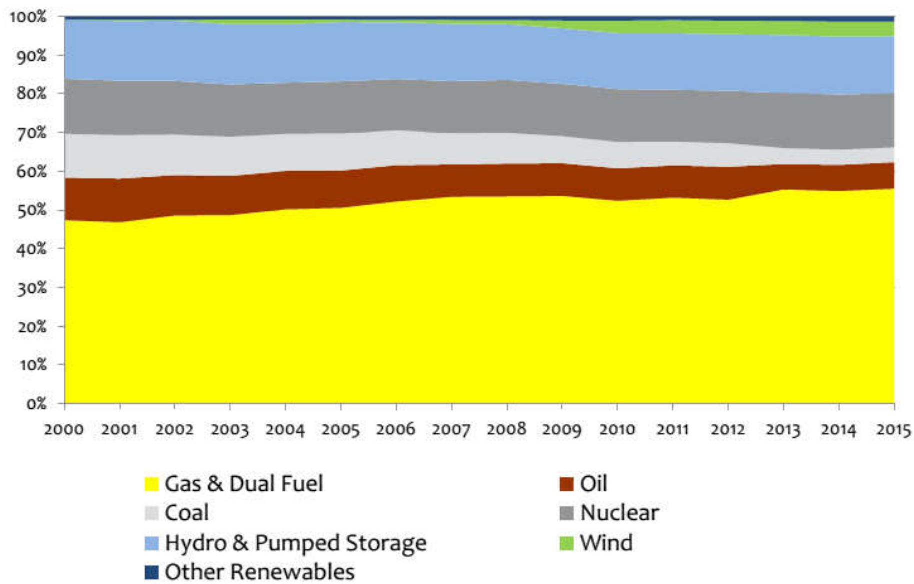


6 NYISO

7 2015 Load & Capacity Data: A Report by the New York Independent System Operator, Inc. Released April 2015.

As shown in Figure 8, the fuel mix for generation capacity in New York has changed over the last 15 years, with increasing reliance on natural gas and renewable generation and decreasing reliance on coal-fired and oil-fired generation. Specifically, the proportion of generation capacity fueled by natural gas/dual fuel (where natural gas is one of the fuels) has grown from 47% in 2000 to 56% in 2015. In addition, wind power capacity has grown from 0% in 2000 to 4% of New York's total generation capacity in 2015. In contrast, the share of generating capacity from coal and oil have declined during the same period, and the share of generating capacity from hydro and nuclear facilities have remained constant.

Figure 8:
New York Fuel Mix - Generation Capacity by Fuel[8]



The reliance on natural gas for generation in New York is expected to grow due to the environmental and price benefits of natural gas over other fuels used for generation. In addition, due to challenging economic conditions, the future of New York's nuclear power plants (*e.g.,* Ginna and Indian Point) is uncertain. It is likely that natural gas-fired generation will replace some of the lost capacity if/when nuclear and other plants retire in the future, as more than half of the generation in the NYISO generation queue is either natural gas fired or dual fueled.[9]

As a result of the significant role of natural gas-fired generation in producing electricity in New York, and due to the nature of the competitive wholesale electric markets wherein generators' bids are significantly affected by their fuel cost, the price of natural gas significantly affects the price of electricity. The price of electricity paid by consumers in New York, as well as in many parts of the U.S., is often set by natural gas-fired electric generating facilities. This means that natural gas-fired generation represents the "marginal unit" in the majority of the hours of the year. As a result, since

8 Power Trends 2015: Rightsizing the Grid. New York Independent System Operator. p. 27.

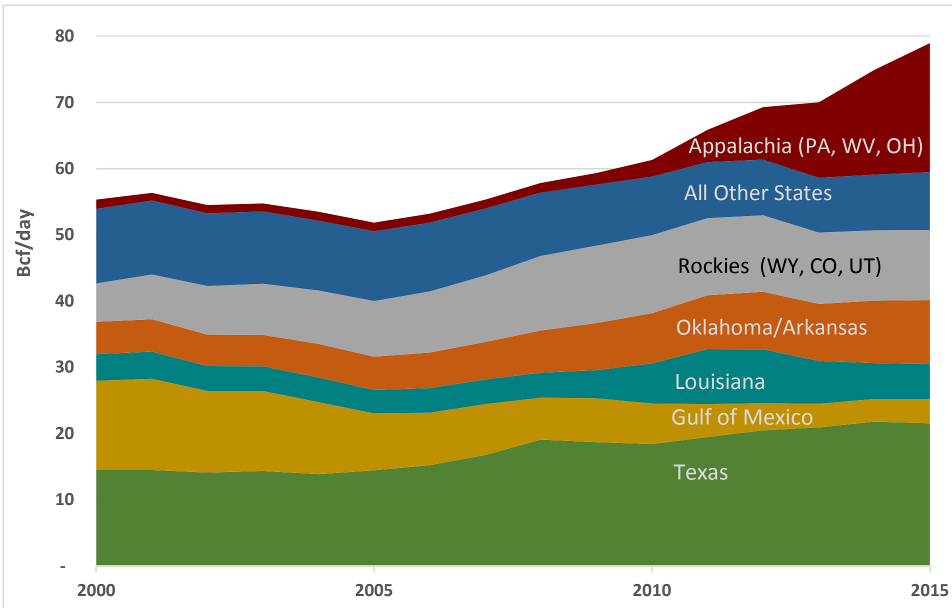
9 NYISO Interconnection Queue. Accessed March 10, 2016.

the cost of fuel for a natural gas-fired generating facility represents the majority of the overall electric production cost, lower natural gas prices will reduce wholesale electric prices.

B. NATURAL GAS SUPPLY

Historically, the majority of U.S. natural gas production occurred in the Gulf Coast area, including Gulf of Mexico offshore, Texas, and Louisiana, as shown in Figure 9. Because natural gas markets in the northeastern U.S., including New York, had demand that far exceeded any indigenous natural gas production capability, natural gas was delivered to these markets via large, long-haul pipelines from distant supply basins.

Figure 9:
U.S. Marketed Natural Gas Production[10]



In the past decade, advances in drilling technologies have made the extraction of natural gas more economic, adding substantial natural gas production from new locations and drastically changing the pattern of natural gas flows across the continent. As shown in Figure 10, the Marcellus Basin, located in Pennsylvania, West Virginia, Ohio, and New York now produces the largest amount of shale natural gas in North America. Production in the Marcellus Basin increased from effectively zero in 2008, to 2 Bcf/d by the end of 2010, to over 17.4 Bcf/d by early 2016.[11] As of 2013, natural gas production in Pennsylvania alone ranked second in the nation to only Texas, and as of 2014, surpassed offshore Gulf of Mexico production combined with Louisiana production.[12] While a less mature gas play, the

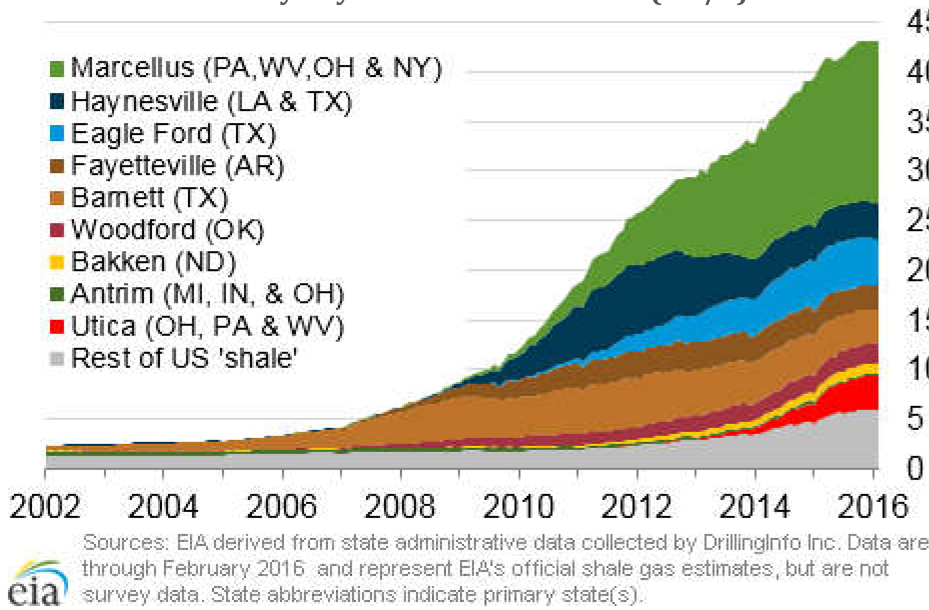
10 Natural Gas Marketed Production by State. U.S. Energy Information Administration. Released February 29, 2016.

11 Drilling Productivity Report. U.S. Energy Information Administration. Released March 7, 2016.

12 Natural Gas Marketed Production by State. U.S. Energy Information Administration. Released February 29, 2016.

Utica Basin, located in Ohio, Pennsylvania, and West Virginia, is also expected to produce substantial natural gas supplies going forward. Production in the Utica Basin recently exceeded 3.6 Bcf/d.[13]

Figure 10:
Monthly Dry Shale Gas Production (Bcf/d)[14]



Previously, New York, and the northeastern region of the U.S. in which the Marcellus and Utica reside, was nearly completely dependent upon long-haul pipelines to deliver natural gas to serve their markets, but the now the prolific Mid-Atlantic region has completely changed the market dynamics – major producing areas of the past are being replaced with new producing areas, and major market areas that were thousands of miles away from production now have access to production in very close proximity.

C. NATURAL GAS INFRASTRUCTURE

LDCs typically purchase natural gas to serve their customers directly in production area supply basins (*e.g.*, Gulf Coast) or other liquid trading points, transport it over natural gas pipelines, and then deliver it to end-use customers over the local distribution system. Accordingly, LDCs typically have a number of natural gas supply contracts as well as various firm transportation contracts on pipelines, and they pass on the costs of these contracts to the customers for which they purchase natural gas supplies. Certain customers (typically very large customers, *e.g.*, industrials and electric generators) do not purchase their natural gas from the LDC; instead, they buy their natural gas from a third-party marketer at a mutually agreeable price, usually tied to local market area natural gas prices. Regardless of the price paid, natural gas generally must travel from production area supply basins to the market area through the interstate pipeline system.

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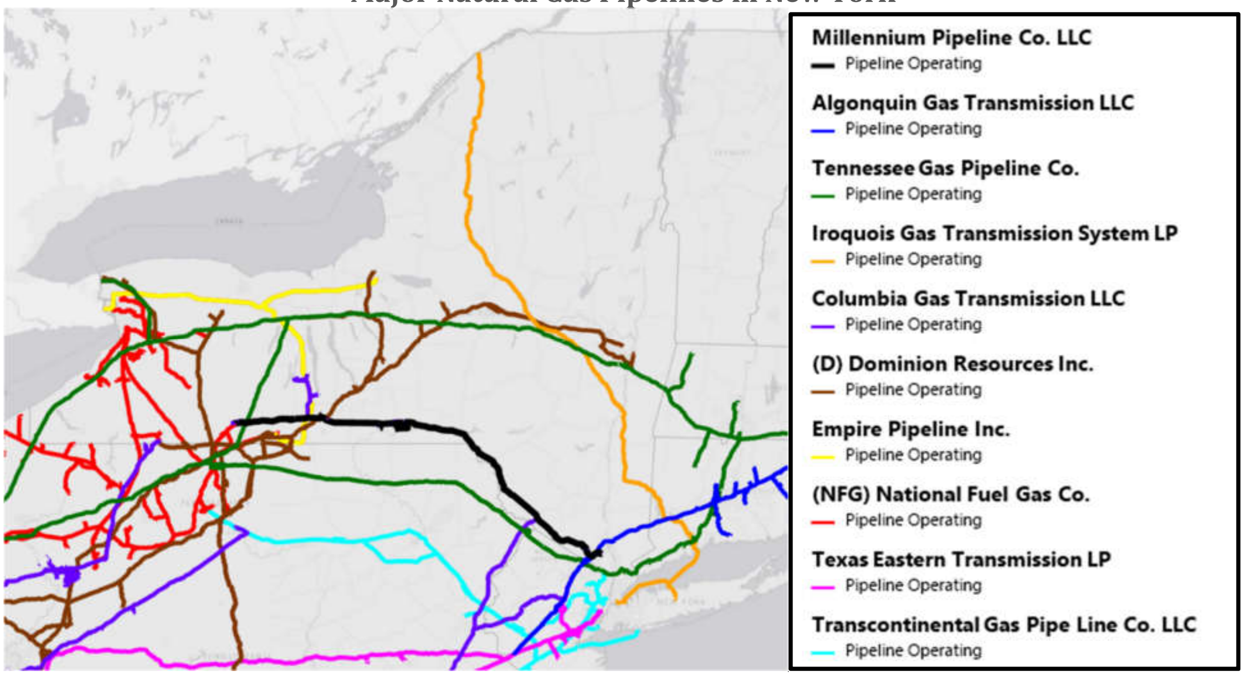
13 Drilling Productivity Report. U.S. Energy Information Administration. Released March 7, 2016.

14 Natural Gas Weekly Update. U.S. Energy Information Administration. March 17, 2016.

As illustrated in Figure 11, New York natural gas markets are served by several major long-haul pipelines, including Millennium Pipeline.[15]

Figure 11:
Major Natural Gas Pipelines in New York



Transcontinental Gas Pipeline, Texas Eastern Transmission, and Tennessee Gas Pipeline ("Tennessee") all originate in the Gulf of Mexico, and were originally built to transport Gulf of Mexico gas supplies thousands of miles to consuming markets in the Northeast, including New York, that did not have sufficient natural gas production to meet demand. Iroquois Gas Transmission and Millennium are relatively newer pipelines, built to increase gas supply deliverability into the Hudson Valley and New York City/Long Island areas, as well as to interconnect with pipelines that deliver natural gas supplies into New England (*i.e.*, Algonquin and Tennessee). All of these pipelines were built prior to the significant increase in natural gas production in the northeast.

However, as discussed, in the past decade, advances in drilling technologies have made the extraction of natural gas across North America more economic, adding substantial new natural gas production in places that did not previously have significant natural gas production, including in the northeast. The pipeline network was not originally designed to transport the significant quantities of gas now being produced in the Mid-Atlantic region, creating a need for pipeline reversals, pipeline expansions, and additional pipelines. A number of new natural gas pipeline projects, including the ESU project, have been proposed to transport the prolific Mid-Atlantic natural gas production to markets to serve demand. As noted, the ESU project is designed to increase natural gas deliverability on the existing Millennium Pipeline by approximately 200,000 Dth/day from Corning, NY to its interconnect with Algonquin in Ramapo, NY. It is expected that the majority of the gas to be delivered across Millennium associated with the ESU project will be sourced from the Mid-Atlantic region.

15 Pipeline locations are approximate for illustrative purposes.

SECTION 3:
ENERGY MARKET BENEFITS

A. INTRODUCTION

Additional natural gas pipeline infrastructure that increases the delivery of supplies can influence wholesale natural gas prices. It is expected that the addition of the capacity associated with the ESU project will result in lower natural gas market prices than otherwise would be experienced in the Hudson Valley and New York City/Long Island areas absent the ESU project. As noted, because natural gas-fired generators often set the price of electricity in New York, lower natural gas prices are expected to result in lower wholesale electric prices. Accordingly, Concentric estimated the natural gas and electric market price benefits for New York consumers due to the incremental pipeline capacity to be provided by the ESU project during its first 10 years of operation (*i.e.*, 2019-2028). The approach utilized by Concentric to estimate savings and the associated results are described in more detail below.

B. NATURAL GAS PRICE BENEFITS

ANALYSIS FRAMEWORK

It is generally accepted that natural gas markets that are constrained during some or all of the year, and thus reflect higher and more volatile natural gas pricing during such periods, can benefit from additional pipeline capacity to mitigate the higher and more volatile pricing. Given this, the objective of Concentric's analysis was to estimate the ability of the ESU project to reduce the price of gas delivered to consumers in the Hudson Valley and New York City/Long Island areas.

To conduct its analysis, Concentric used GPCM, which is the industry-standard gas market simulation software.[16] GPCM is a network optimization model that simulates flows of gas in the North American natural gas market to develop long-run price forecasts. The model provides a high degree of granularity and close approximation of the capabilities and constraints of real world operating assets, as well as the microeconomic principles that underlie competitive markets, all of which make it an ideal tool for analyzing the impact of changes to pipelines and other infrastructure assets.

The GPCM model reflects all the primary components of the North American natural gas network, including supply, pipeline transportation and storage, and demand.

First, natural gas production enters the pipeline system from suppliers based on supply curves that relate the amount of gas offered to market clearing prices; the higher the price, the more gas will be produced, subject to resource and reservoir limitations. Supply curves are differentiated by supplier type and by geographic location.

Second, gas flows from producers to consumers across a network of over 250 pipelines. Each pipeline's capability and cost to move gas are based on actual, asset-specific configurations and capabilities. Each pipeline is modeled separately within GPCM with specific configurations, delivery

[16] GPCM is a software product owned and maintained by RBAC Inc.; Concentric licenses GPCM from RBAC.

capabilities, costs, and other operational variables. Each pipeline is divided into zones that represent aggregations of meters, grouped based on delivery constraints and/or market pricing areas. Flows across each segment of pipeline are constrained by the actual ability of the pipeline to move gas in the region. Additionally, the gas can flow between pipelines through interconnections that are also configured individually and constrained based on the actual operating parameters of the interconnections. Natural gas storage is also reflected within the GPCM model, whereby gas flows into and out of storage are based on real-world configurations (*i.e.*, location, pipeline connections, size, operating capacity, and injection and withdrawal rates) and are differentiated by storage facility.

Third, natural gas demand is reflected in the model based on customers that receive gas from pipelines, including, for example, LDCs (providing gas for residential, commercial, and most industrial customers), directly-connected industrial consumers, and gas-fired power plants. Customers' demands for gas are based on long-run projections of consumption, which is differentiated by customer, as well as elasticity for that demand based upon demand curves.

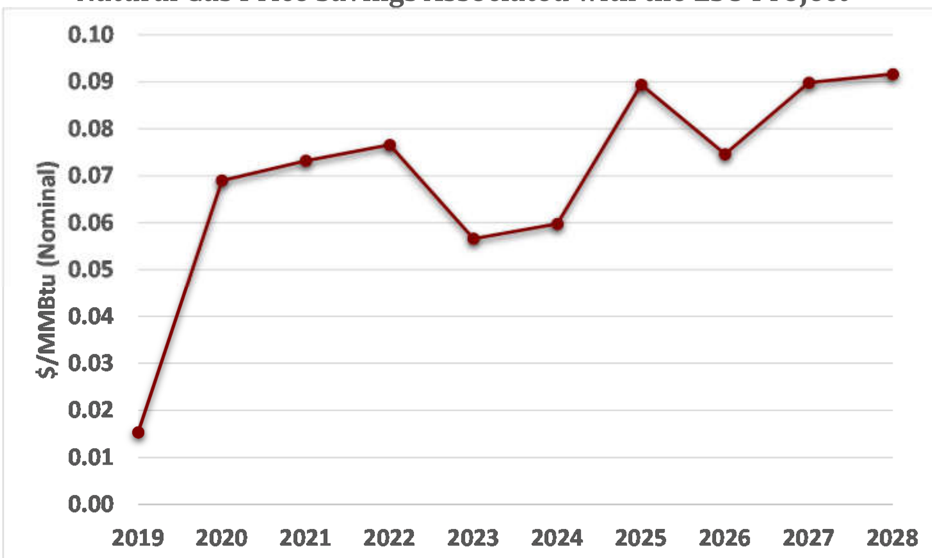
Just as in the actual natural gas market, natural gas prices are established in GPCM based on the interaction of projected supply and demand for natural gas and the infrastructure capabilities of the natural gas network. Specifically, consumer demands for gas, production levels, and the availability of pipeline and storage capacity, all contribute to the formation of natural gas prices. Prices are differentiated by location, similar to the standard indices reported in the natural gas trade press.

To estimate the benefit of the ESU project, Concentric simulated the natural gas market using GPCM under two scenarios: (i) without the ESU project; and (ii) with the ESU project. In both scenarios, but for the exclusion or inclusion of the ESU project, all other model assumptions and inputs were held constant in order to isolate the impact that the addition of the ESU project would have on wholesale natural gas prices. For example, in both scenarios, weather and other factors that influence demand were assumed to be average. In the scenario in which the ESU project is assumed to be operational, Millennium's deliverability of Mid-Atlantic gas to and across the interconnection with Algonquin at Ramapo, NY was increased by 200 MMcf/d. A comparison of the two scenarios, and the resulting suppression of market area natural gas prices associated with the ESU project, provides the basis for the benefits to New York energy consumers calculated herein.

RESULTS

Figure 12 demonstrates that the ESU project is expected to reduce natural gas prices in the Hudson Valley and New York City/Long Island areas by an average of approximately \$0.07/MMBtu (approximately 2.5%), during the first 10 years of operation.

Figure 12:
Natural Gas Price Savings Associated with the ESU Project[17]



As discussed above, natural gas is used by residential, commercial, industrial customers, as well as electric generators in New York. Typically, LDCs purchase the gas used by residential and commercial customers, and the gas used by some industrial customers. Since LDC customers tend to be insulated from local natural gas prices due to the purchasing practices of LDCs,[18] the majority of the energy market savings due to lower natural gas prices will be experienced through lower electric prices.[19]

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17 Prices reflect an assumed annual inflation rate of 2% over the forecast period.

18 To the extent that New York LDCs purchase gas at lower market area natural gas prices resulting from the ESU project, these benefits would be passed on to LDC customers. However, the quantity of natural gas that New York LDCs purchase at local market area prices varies and is confidential; therefore, any benefits of the ESU project to LDC customers in New York were excluded from the analysis.

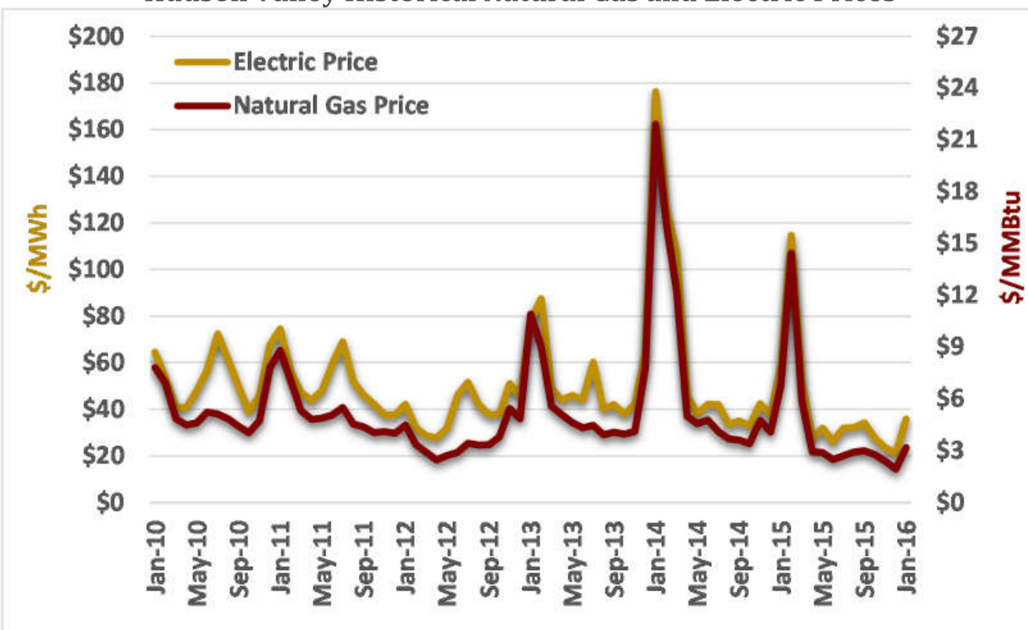
19 Some (typically larger) industrial transportation customers purchase their own natural gas from third-party marketers and these supplies can be priced based on market area prices (as opposed to production area prices reflective of Mid-Atlantic or Gulf Coast prices). Concentric estimated the savings that these industrial transportation customers may realize due to the impact of the ESU project lowering market area wholesale natural gas prices based on historical annual demand for the industrial transportation customers in the service territories of the LDCs in the Hudson Valley and New York City/Long Island areas. Based on consumption of approximately 7 Bcf per year, it is estimated that industrial transportation consumers in New York will save a total of \$3.5 million over the first 10 years that the ESU project is operational, and an average of approximately \$0.35 million per year if the ESU project is constructed and dampens market area natural gas prices.

C. ELECTRIC PRICE BENEFITS

ANALYSIS FRAMEWORK

As previously noted, wholesale electric generating resources in New York are a part of the NYISO, and natural gas-fired generation plays a critical role, with the costs of such generating resources often setting the price of power that consumers pay. Natural gas-fired generators operating in the competitive wholesale electric markets typically purchase gas at local spot market prices. As a result, electric prices in New York are closely tied to natural gas prices. For example, Figure 13 illustrates the historical relationship between monthly natural gas prices and electric prices in the Hudson Valley.

Figure 13:
Hudson Valley Historical Natural Gas and Electric Prices



Therefore, if the ESU project is constructed and dampens market area natural gas prices, it is expected it will also translate into lower electric energy prices. Accordingly, Concentric utilized its estimate of lower natural gas prices to estimate the savings that would be achieved in the electric market if the ESU project is built.

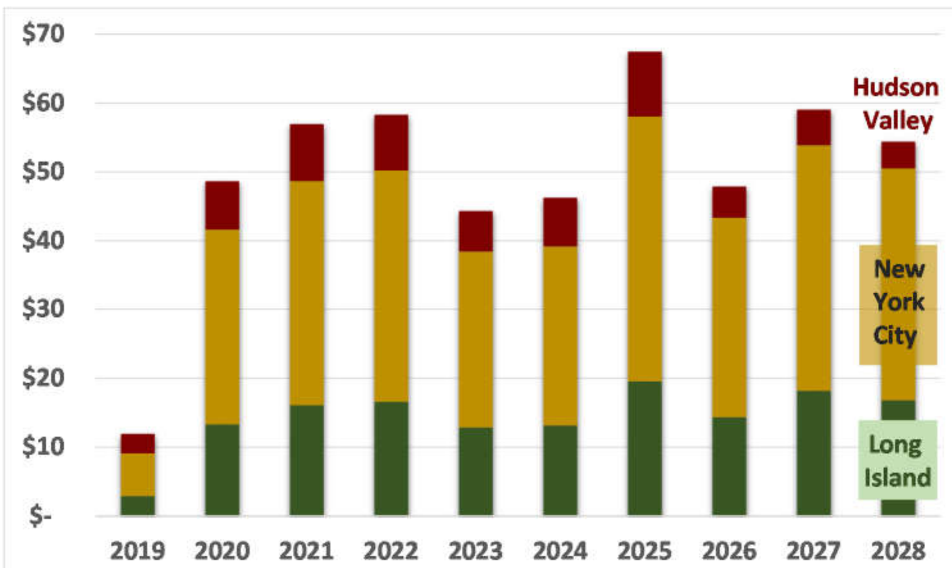
Since the natural gas price benefits are expected to be realized in the Hudson Valley and to the south, and since there are transmission constraints limiting the flow of electricity between upstate and downstate New York, Concentric focused its electric price benefit analysis on the NYISO zones located in the Hudson Valley and to the south. Specifically, Concentric estimated electric price benefits in Zones G, H, I, J, and K, which represent Hudson Valley, Millwood, Dunwoodie, New York City, and Long Island.

Concentric evaluated the historical relationship between natural gas prices and electric prices separately for each zone. Based on this analysis, Concentric developed factors that were used to estimate the reduction in electric prices resulting from the reduction in natural gas prices if the ESU project is built. These electric price reductions were multiplied by forecasted electric consumption by zone to determine the electric price benefits to New York consumers associated with the ESU project.

RESULTS

Concentric's analysis demonstrates that annual average electric prices in the Hudson Valley and New York City/Long Island areas of New York are expected to be reduced as a result of the ESU project. Specifically, Hudson Valley annual average electric prices are expected to be reduced by $0.34/MWh (approximately 1%) as a result of the natural gas price reduction associated with the ESU project over the first 10 years of operation. As shown in Figure 14, when the average electric price benefit is multiplied by the forecasted electric consumption, the annual benefit to Hudson Valley and New York City/Long Island electric consumers associated with the ESU project ranges from approximately $12 million to $67 million per year over the first 10 years of operation.

Figure 14:
Electric Market Benefit to New York Associated with the ESU Project ($ Million, Nominal)



Based on the analysis, it is estimated that electric consumers in New York will save in total $495 million over the first 10 years, or an average of approximately $49.5 million per year if the ESU project is constructed and dampens market area natural gas prices, which in turn results in lower wholesale electric prices.

SECTION 4:
ECONOMIC BENEFITS

A. INTRODUCTION

In addition to the energy market benefits described in Section 3, the ESU project is also expected to benefit the New York State economy more broadly. These broader economic impacts are derived from three categories of activity related to the ESU project: (i) the construction of the ESU project; (ii) the ongoing operation of the ESU project; and, (iii) the re-spending of energy market savings associated with the ESU project within the local economy. The assumptions, methodology and results of Concentric's economic benefits analysis are discussed below.

B. ANALYSIS FRAMEWORK

To examine the broader economic benefits resulting from the ESU project, Concentric used IMPLAN, a widely-accepted and utilized software model. IMPLAN is a production-based, input-output model that accounts for all of the dollar flows between the different sectors of the economy within a specified geographic region. Through this approach, and for a specified region, IMPLAN is able to model how dollars injected into one sector of the economy are subsequently spent and re-spent in other sectors of that region's economy, generating what is known as "economic multiplier" effects.

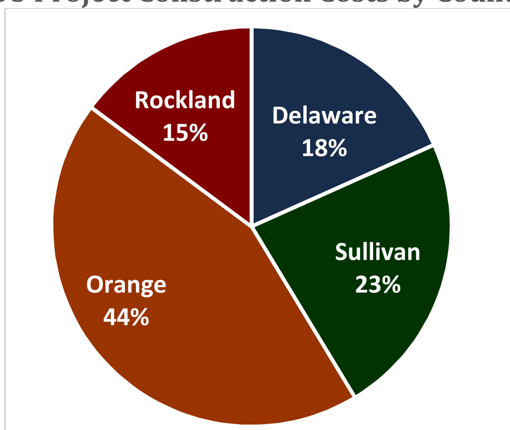
The IMPLAN model recognizes that not all of the dollars spent on the construction and operation of the ESU project, nor all of the dollars of energy market savings resulting from the development of the ESU project will be spent locally, as there will be "leakage" from the New York economy. The term leakage refers to the fact that a portion of these dollars will be either saved by households and businesses or spent on goods and services produced outside of New York State. In subsequent rounds of spending, income generated will also be taxed at the federal level, resulting in another source of leakage.

Using the actual historical spending patterns of households, businesses and government agencies, IMPLAN is able to model an economic "event" (*i.e.*, any expenditure leading to the production of goods or services) to analyze how and where the dollars associated with that event will be spent. For a particular event, the economic impacts resulting from dollars spent directly in the local economy are referred to as the "direct effects" of that event. These direct effects will then also lead to "supply chain" and "income" effects in the local economy. Supply chain effects (commonly referred to as "indirect" effects) refer to spending within the local economy by businesses in order to produce the goods and services purchased with direct effect dollars. Income effects (commonly referred to as "induced" effects) are defined as the spending of wages earned by the individuals holding jobs generated by the direct and supply chain effects.

In this analysis, the economic benefits to New York resulting from the ESU project were analyzed at the state level. Concentric used the most recent New York-specific input-output data available from IMPLAN, which is based on 2014 economic data. The analysis modeled the economic impacts associated with three specific events associated with the ESU project: (i) the construction of the ESU project; (ii) the ongoing operation of the ESU project; and, (iii) any re-spending by households and businesses of energy market savings dollars associated with the ESU project within the local economy.

The Construction Phase of the ESU project is assumed to occur over the four-year period from 2015 through 2018. The ESU project has an estimated construction cost of approximately $275 million. Annual construction spending during each of the four years was based on detailed construction cost estimates provided by Millennium. Figure 15 provides a breakdown of the ESU project construction costs by the counties in which upgrades to the Millennium pipeline system will occur.

Figure 15:
ESU Project Construction Costs by County[20]



In modeling the economic benefits from the operation of the ESU project, the Operational Phase of the ESU project was defined as the first 10 years of the project's operating life, spanning from 2019 to 2028. For the purpose of this analysis, the Operational Phase of the ESU project was assumed to consist of both the operational expenditures by Millennium over the 10-year period, and well as re-spending of energy market savings dollars over the same period.

The operating expenditures modeled during the Operational Phase include annual operations and maintenance ("O&M") spending, property taxes, and the replacement of compressor engines every five years. The annual operating expenditures were based on cost estimates provided by Millennium.

In modeling the economic impacts associated with energy market savings during the Operational Phase, annual energy savings were allocated between households and business customers (including both commercial and industrial customers with spending patterns tracked by industry codes) based on the weighted average breakdown of electric load by customer segment for the investor-owned electric utilities located in the Hudson Valley and New York City/Long Island areas. Concentric assumed that no federal income tax leakage applied to the energy market savings. To account for leakage attributable to personal savings, the energy market savings allocated to households were further allocated to nine household income brackets based on each income bracket's *pro rata* share of total household spending on electricity in the State of New York in 2014. Custom household savings rates were then assumed for each income bracket. For the energy market savings allocated

[20] Figure 15 indicates the portion of total construction costs applicable to system upgrades that will occur in each county. These percentages are not estimates of the portion of construction dollars spent within each county.

to businesses, it was assumed that 80% of the energy market savings would be re-spent with the remaining 20% removed from the New York economy as corporate savings. Energy market savings were then assumed to be spent by New York households and businesses based on the respective 2014 historical spending patterns for these customers.

C. RESULTS

The economic impacts to the State of New York associated with the ESU project are summarized in Figure 16.

Figure 16:
Economic Impacts to New York State Associated with the ESU Project

	Employment (person-years)	Employment (average annual jobs)	Economic Output ($Million, Nominal)
Construction Phase (2015-2018)	**1,761**	**440**	**$314**
Operational Phase (2019-2028)			
Operational Expenditures	376	38	$64
Spending of Energy Market Savings	3,195	319	$639
Total Operational Phase	**3,571**	**357**	**$703**
Total Economic Impact	**5,332**	**381**	**$1,017**

The Construction Phase of the ESU project is expected to result in a total economic impact (*i.e.*, the sum of direct, supply chain, and income effects) of approximately $314 million in incremental economic output within New York over the four-year construction period, which will support an average of 440 jobs during that period. The economic output and employment opportunities resulting from the construction of the ESU project are expected to occur predominantly in construction-related sectors. While the analysis captures economic benefits for all of New York State, the economic benefits generated from the construction of the ESU project are largely expected to be realized in the areas where the infrastructure upgrades to the Millennium pipeline system are being undertaken (*i.e.*, Delaware, Sullivan, Orange, and Rockland Counties), as Millennium intends to rely on local contractors, union labor, and construction materials wherever possible.

During the Operational Phase of the ESU project, the aggregate direct, supply chain, and income effects are anticipated to generate $703 million in total economic output, which would support an average of 357 jobs over the 10-year period from 2019 through 2028.

Of the total economic impacts from the Operational Phase, the operational expenditures made by Millennium are expected to generate $64 million in incremental economic output, supporting an average of 38 jobs during the period. The economic activity generated by the operation of the ESU project would be broadly distributed among the sectors of the New York economy. Property taxes account for the majority of the operating expenditures associated with the ESU project, and these property tax dollars will be spent by local governments on a diverse range of goods and services. The economic activity and employment generated by the O&M spending and compressor engine replacement represents a relatively smaller share of the benefits from operational expenditures compared with those generated by property taxes, with most jobs created from these activities occurring in construction-related sectors.

Geographically, the economic benefits attributable to the operation of the ESU project are anticipated to be focused predominantly in Delaware, Sullivan, Orange, and Rockland Counties, where new pipeline infrastructure is to be installed. Since property tax expenditures drive the economic benefits generated from the ESU project's operational expenditures, it would follow that a substantial portion of the economic benefits arising from operational expenditures associated with the ESU project should accrue to the areas where system upgrades will occur.

The reinjection of energy market savings dollars into the local economy during the Operational Phase produces the greatest economic benefit to New York. The spending of energy benefit dollars by residential, commercial, and industrial electric customers within the local economy is expected to generate $639 million in incremental economic output in New York over the 10 year period, which will support an average of 319 jobs during the period.

In total, the Construction and Operational phases of the ESU project are expected to generate a direct effect of $588 million in economic output in the New York economy. These direct impacts are then expected to lead to supply chain and income impacts of $429 million in additional economic output within the State. The $588 million in direct impacts from the ESU project spent locally in the New York economy results in an economic multiplier effect (1.73), generating a total of $1.02 billion in local economic output. Put differently, every dollar associated with the ESU project that is spent locally will generate an additional $0.73 in supply chain and income-related economic activity in New York State.

The benefits of the ESU project to the State of New York are broad and substantial. The economic benefits to the State are driven primarily by the reinjection of energy market savings dollars into the local economy, but each component of the ESU project (*i.e.*, the construction of the ESU project, ongoing operational expenditures related to the ESU project, and the re-spending of energy market savings dollars attributable to the ESU project) delivers significant and quantifiable benefits to New York.

SECTION 5:
CONCLUSION

As discussed, Concentric estimates that the ESU project will provide significant benefits to New York consumers, both through energy savings and associated economic benefits. Figure 17 summarizes the estimated benefits during the Operational Phase of the ESU project.

Figure 17:
Estimated Benefits to New York Consumers during the Operational Phase (2019-2028)
($ Million, Nominal)

	10 Year Total	Annual Average
Energy Market Savings	**$495**	**$49.5**
Economic Impacts		
Operational Expenditures	$64	$6.4
Spending of Energy Market Savings	$639	$63.9
Economic Impacts Total	**$703**	**$70.3**
Total Operational Phase Benefits	**$1,198**	**$119.8**

As reflected in Figure 17, it is estimated that benefits to consumers in New York could reach approximately $1.2 billion over the first 10 years of the ESU project's operations or an average of $120 million per year. In addition, the construction of the ESU project itself over the four-year period from 2015 to 2018 is expected to result in an additional $314 million in economic output. It is important to note that since the capital and operating costs of the ESU project will be borne by the shippers that have subscribed for the capacity on the project, and these shippers are located outside of New York, the benefits to New York calculated above represent both the gross and net benefits to New York associated with the ESU project.

It is important for policy makers and other stakeholders to understand that the potential benefits estimated herein are based on monthly average price impacts assuming normal average weather. In periods of elevated demand when market area natural gas prices increase significantly, the opportunity for achieving benefits from lowering natural gas prices (and associated electric prices) through additional pipeline capacity can be substantial. For example, January 2014 natural gas prices in New York City were approximately $25/MMBtu on a monthly average basis; however, an individual day reached $120/MMBtu. Because the analysis herein is based on monthly average impacts, it has excluded potential extra savings on peak or design days, which are the days when natural gas demand and market area gas prices tend to be the highest. Therefore, to the extent that additional infrastructure such as the ESU project will reduce market area natural gas prices during peak days or peak events, in addition to monthly averages, there is the potential that additional benefits will be achieved.

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