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NJ TRANSIT

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## **Executive Summary**

NJ TRANSITGRID is a first-of-its-kind microgrid system that is a component of the NJ TRANSIT Resilience Program, a capital improvements program aimed at strengthening New Jersey's transportation system to make it both more durable and reliable. The Resilience Program was formed in response to Superstorm Sandy, which caused significant damage to New Jersey in October 2012, revealing certain weaknesses and the importance of prioritizing transportation system resiliency.

With more frequent and severe weather events projected in the future, NJ TRANSIT, in partnership with several state and national organizations, created the plan for NJ TRANSITGRID, which will modernize the electric grid and provide the power to enable safe, reliable, and resilient public transportation in the event that the commercial grid is compromised or other emergencies occur; minimize disruptions to the regional workforce and economy during such times; and provide a cleaner, more efficient source of power with which to operate New Jersey's public transit system.

The NJ TRANSITGRID microgrid project will have significant impacts on the New Jersey economy due to upfront investments made in the construction of the project and the ongoing operations of NJ TRANSITGRID upon completion.<sup>1</sup>

Economic impact estimates are generated by utilizing input-output models to translate an initial amount of direct investment and expenditure into the total amount of activity that it supports, which includes multiple waves of spillover impacts generated by NJ TRANSIT's spending on goods and services (known as the indirect effect) as well as spending of labor income by employees (referred to as the induced effect). The economic impacts from these investments and operating expenditures are modeled using IMPLAN, an industry standard input-output model software program. **Ultimately, the total economic impact of NJ TRANSITGRID is the sum of its own direct footprint from project construction and ongoing operations upon completion, plus the indirect and induced effects generated by that footprint. The fiscal impact is estimated by using an industry-standard proprietary fiscal model for New Jersey, which has been used for multiple projects with scales comparable to NJ TRANSITGRID in New Jersey. This report estimates the economic and fiscal impacts from these economic activities of NJ TRANSITGRID on the State of New Jersey.** 

To complete this analysis, information about the NJ TRANSITGRID microgrid project, the project's environmental impact statement, and its federal grant application were used in combination with research on the utilities and mass transit sectors to gain further insight into industry standards and associated costs of projects similar in size and scope to NJ TRANSITGRID.

<sup>&</sup>lt;sup>1</sup> The overall NJ TRANSITGRID microgrid project is made up by two projects: NJ TRANSITGRID TRACTION POWER SYSTEM, an innovative microgrid for mass transit; and DISTRIBUTED GENERATION SOLUTIONS, which will provide resilient power to NJ TRANSIT facilities in northeastern New Jersey. This study focused on the first project NJ TRANSITGRID TRACTION POWER SYSTEM.

#### **One-Time Impact from Initial Investment in NJ TRANSITGRID**

Construction of the TRANSITGRID will have a one-time economic impact within the state. Over the five year construction period of the project, the total investment in the project will be approximately \$512 million. Of that budget, \$393 million will have a direct impact on the New Jersey economy through the purchase of goods and services related to the project and wages and salaries associated with its development. The one-time economic impact of the project on the New Jersey economy will be \$749 million, supporting 4,290 jobs and \$291 million in earnings (Figure I).

Impact Type	New Jersey
Direct Output (\$M)	\$393.4
Indirect & Induced Output (\$M)	\$355.4
Total Impact (\$M)	\$748.8
Direct Employment (Full Time Equivalent, FTE)	2,370
Indirect & Induced Employment (FTE)	1,920
Total Employment (FTE)	4,290
Earnings Supported (\$M)	\$291.4

Figure I: Estimated One-Time Impact of NJ TRANSITGRID Construction Investment

Source: IMPLAN (2015), Econsult Solutions, Inc. (2019).

#### Annual Impact from Ongoing Operations of NJ TRANSITGRID

Upon completion, ongoing operations of NJ TRANSITGRID will include the direct expenditures of the facility and associated employee salaries and benefits. These expenditures will generate indirect and induced impacts. Each year, the annual estimated operating expenditures of the NJ TRANSITGRID will be between \$17 and \$20 million<sup>2</sup>. Those expenditures will generate an estimated \$22 to \$25 million economic impact within New Jersey, supporting 56 to 59 FTE employees and between \$4 and \$5 million in earnings annually (Figure II).

Figure II: Estimated Annual Economic Impacts of NJ TRANSITGRID Operations upon Completion

Impact Type	Low End	High End	Mid-Point
Direct Output (\$M)	\$16.6	\$19.5	\$18.1
Indirect & Induced Output (\$M)	\$5.3	\$5.9	\$5.6
Total Impact (\$M)	\$21.9	\$25.4	\$23.7
Direct Employment (FTE)	30	30	30
Indirect & Induced Employment (FTE)	26	29	28
Total Employment (FTE)	56	59	58
Earnings Supported (\$M)	\$4.3	\$4.5	\$4.4

Source: IMPLAN (2015), Econsult Solutions, Inc. (2019)

<sup>&</sup>lt;sup>2</sup> Operating costs will vary with fuel/commodity (natural gas) prices, labor costs pertaining to operations and maintenance and inflationary pressures upon equipment replacement through the life cycle of the microgrid according to the Draft Environmental Impact Statement in 2019.

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# 1. Introduction

## 1.1. Purpose of Report

The New Jersey Transit Corporation (NJ TRANSIT) is a significant economic engine for the state of New Jersey, producing direct and spillover effects on the regional economic activity. As the largest statewide public transit system in the United States, NJ TRANSIT is a major employer, a large-scale purchaser of goods and services, and an investor in the development and maintenance of its facilities and infrastructure. NJ TRANSIT investments and operating expenditures catalyze economic activity throughout the state.

Beyond the regular capital investments and routine operating and maintenance expenditures, NJ TRANSIT will soon construct and operate NJ TRANSITGRID, a first-of-its-kind microgrid system to improve resiliency when the commercial electric grid is compromised. This report provides estimates of the direct economic impact of the NJ TRANSITGRID and the spillover effects throughout the New Jersey economy for the following:

- First, investments in NJ TRANSITGRID will produce substantial upfront direct impacts in the project area, which will generate spillover throughout the regional and state economy.
- Upon completion, the operations of the newly constructed TRANSITGRID facilities will directly employ New Jersey workers and result in the purchases of goods and services from New Jersey businesses, stimulating ongoing economic activity throughout the economy.

## 1.2. About NJ TRANSITGRID

The NJ TRANSITGRID microgrid project is a part of the NJ TRANSIT Resilience Program, a capital improvements program aimed at strengthening New Jersey's transportation system and making it both more durable and reliable. There are five main projects in the Resilience Program, each independent but interconnected in their shared contributions to the goal of system-wide, integrated resiliency. The Resilience Program was formed in response to Superstorm Sandy, which caused significant damage to New Jersey in October 2012. Sandy revealed certain areas of weakness in the existing transit system, and with severe weather events predicted to become more frequent and potentially more damaging in the future, the state recognized the importance of prioritizing transportation system resiliency. Several years past Superstorm Sandy, NJ TRANSIT has shifted focus of the Resilience Program from repairing damage to planning for a more robust and sustainable program in the future that will better withstand emergency circumstances and serve the needs of customers.

Superstorm Sandy caused wide-spread, prolonged power outages in New Jersey and New York that affected residents and workers in New Jersey and New York for weeks. The storm caused approximately 2.6 million utility customers to experience outages, with some lasting more than two weeks. In total, it is

estimated that the storm caused \$50 billion in damages and had an even greater impact on the economy.<sup>3</sup>

NJ TRANSIT, Amtrak, and the Port Authority of New York and New Jersey (PANY&NJ) operations also suffered greatly for weeks after Superstorm Sandy. Service recovery times for rail services in the area varied from a matter of days to over a month, depending on the line. For example, Hudson-Bergen Light Rail service was restored three days after the storm, while full service of the Morris & Essex line was not restored until 34 days following the storm. Such outages and interruptions of service can have significant implications for residents and workers. Electric rail service is a critical component of the region's transportation network, with 36 percent of the 400,000 daily commuters who travel from New Jersey into New York each day relying upon rail service to get to and from work.<sup>4</sup> Other means of transportation, such as buses and ferries, regularly operate at capacity and were not able to absorb the rail service commuters that were in need of replacement transportation means to commute to and from work.

Nationally, power outages caused by storms cost the economy between \$18 and \$33 billion per year due to lost output and wages, spoiled inventory, delayed production, and damage to grid infrastructure.<sup>5</sup> Worse, it is projected that such severe weather events will become both more frequent and damaging in the near future.<sup>6</sup> Therefore, following the aftermath of Superstorm Sandy, which was the third severe weather event to cause widespread service interruptions and utility outages across the region in just two years, a partnership between NJ TRANSIT, the U.S. Department of Energy (DOE), the New Jersey Board of Public Utilities, and the Federal Transit Administration (FTA) was formed to examine the use of microgrids to help supply electricity during extreme weather and other emergency events. NJ TRANSITGRID was identified as a way to address this issue.

NJ TRANSITGRID aligns with national and statewide priorities to modernize the electric grid in order to provide the power to enable safe, reliable, and resilient public transportation in the event that the commercial grid is compromised or other emergencies occur; minimize disruptions to the regional workforce and economy during such times; and provide a cleaner, more efficient source of power with which to operate New Jersey's public transit system. To achieve these outcomes, there are two projects that make up the overall NJ TRANSITGRID microgrid project:

- NJ TRANSITGRID TRACTION POWER SYSTEM, a first-of-its-kind microgrid for mass transit; and
- DISTRIBUTED GENERATION SOLUTIONS, which will provide resilient power to NJ TRANSIT facilities in northeastern New Jersey.

The NJ TRANSITGRID TRACTION POWER SYSTEM is a planned microgrid that will provide reliable electrical power to support limited rail service in a core segment of NJ TRANSIT's critical service territory during storms or other times when the commercial grid becomes compromised. According to DOE, a

<sup>&</sup>lt;sup>3</sup> Federal Transit Administration and New Jersey Transit Corporation, *NJ TRANSITGRID TRACTION POWER SYSTEM Draft Environmental Impact Statement (DEIS)*, May 2019

<sup>&</sup>lt;sup>4</sup> Ibid.

<sup>&</sup>lt;sup>5</sup> Ibid.

<sup>&</sup>lt;sup>6</sup> Ibid.

microgrid is a "local energy grid with control capability, meaning it can disconnect from the traditional grid and operate autonomously" if need be, as in times of severe weather that compromise commercial grid functionality. This economic study focused only on the first project NJ TRANSITGRID TRACTION POWER SYSTEM given the currently available data.

Ultimately, the TRACTION POWER SYSTEM will produce and distribute electricity to provide limited traction (train locomotive) power to the following core service areas during necessary times:

- Northeast Corridor from Penn Station, New York to New Brunswick, New Jersey (approximately 33 rail miles)
- Morris & Essex Line from Hoboken Terminal to Maplewood (approximately 16 rail miles)
- Hudson-Bergen Light Rail from North Bergen to Bayonne (approximately 17 rail miles)

In addition, the TRANSITGRID TRACTION POWER SYSTEM will support non-traction functions to the already-mentioned rail segments as well as the signal system on the Main Line from its intersection with the Morris & Essex Line to the Upper Hack Lift Bridge, a segment of approximately 3 rail miles, allowing for diesel trains to operate on this non-electric segment during outages. The full project area is displayed in Figure 1.1.



Figure 1.1: NJ TRANSITGRID Project Area

Source: NJ TRANSIT (2019)

In addition to bolstering the resiliency of the public transportation infrastructure in the area, NJ TRANSITGRID will deliver many long-term benefits to the environment, which are documented in the Draft Environmental Impact Statement drafted in 2019 by NJ TRANSIT and FTA. Finally, the investment in completing and operating the NJ TRANSITGRID microgrid project will result in significant impacts on the regional economy, which are described in detail throughout the remainder of this report.

## 1.3. Report Methodology

Economic impact estimates are generated by utilizing input-output models to translate an initial amount of direct economic activity into the total amount of activity that it supports, which includes multiple waves of spillover impacts generated by NJ TRANSIT's spending on goods and services as well as spending of labor income by employees. The economic impacts from these expenditures are modeled using IMPLAN, an industry standard input-output model software program. Such models are designed to estimate two sets of spillover impacts from organizational expenditures:

- The **indirect effect**, which measures the multiplier effect from the purchase of goods and services from regional vendors (i.e. supply chain impacts); and
- The **induced effect**, which measures the multiplier effect from the spending of labor income by employees within a particular geography (i.e. labor income impacts).

The total economic impact of NJ TRANSITGRID is the sum of its own direct footprint (in terms of project construction and operations upon completion), plus the indirect and induced effects generated by that direct footprint (see Figure 1.2). This report estimates the economic and fiscal impacts from construction and operations of NJ TRANSITGRID on the State of New Jersey. The fiscal impact is estimated by using an industry-standard proprietary fiscal model for New Jersey, which has been used for multiple projects with scales comparable to NJ TRANSITGRID in New Jersey.

Figure 1.2: Economic Impact Methodology



Source: IMPLAN (2015), Econsult Solutions, Inc. (2019), Piktochart (2019)

#### 1.4. Report Outline

The remainder of the report is organized as follows:

- Section 2. Economic and Fiscal Impacts of Construction reviews the direct footprint of NJ TRANSIT's construction of NJ TRANSITGRID, as well as the spillover effects associated with construction, including indirect and induced effects. Construction of the TRANSITGRID will generate significant employment opportunities and tax revenue for New Jersey, both of which are also described in this section.
- Section 3. Economic and Fiscal Impacts of Operations reviews the direct operational footprint of NJ TRANSIT upon completion of the NJ TRANSITGRID microgrid project. As with construction, operational investments and expenditures will produce spillover direct and indirect impacts within the regional economy, as well as generate employment opportunities and significant tax revenue for New Jersey. Each of these factors is described in this section.
- Appendix A Economic Modeling Assumptions outlines the assumptions used to calculate the upfront impact from capital investment and the annual impact from operations.
- Appendix B Economic and Fiscal Impact Modeling explains the detailed approach and methodology utilized to quantify the economic and fiscal impacts described throughout the report.

# 2. Economic and Fiscal Impacts of Construction

#### 2.1. Overview

This section details the one-time economic and tax revenue impacts from the construction of NJ TRANSITGRID. The design and construction for the project is projected to cost a total of \$512 million over a five-year period.<sup>7</sup> **During that period, the direct investments made in construction will generate an estimated \$749 million in economic impact in New Jersey. Further, this activity will support the creation of 4,290 direct, indirect, and induced job-years over the construction period in a variety of sectors.**<sup>8</sup>

#### 2.2. Direct Footprint

The NJ TRANSITGRID microgrid system has seven components and will include the construction of a natural gas-fired electric power generating plant (referred to as the Main Facility), a four-acre solar power facility, new electrical lines providing power to the railroad substations in Kearny and Jersey City, New Jersey, and electrical substations and other infrastructure to support the new facility.

In a competitive selection process for Public Transportation Resilience Projects in Response to Hurricane Sandy, the FTA selected NJ TRANSITGRID for \$410 million (75 percent federal match) under the Disaster Relief Appropriations Act of 2013. NJ TRANSIT committed the remaining 25 percent of funding, in the amount of \$137 million, from the New Jersey State Transportation Trust Fund (TTF), making the total commitment of funds for construction of NJ TRANSITGRID \$546 million (see Figure 2.1).<sup>9</sup>

<sup>&</sup>lt;sup>7</sup> The total \$512 million design and construction cost is calculated by summing up the estimated design and administration cost and the construction cost for the NJ TRANSITGRID TRANCTION POWER SYSTEM according to the Draft Environmental Impact Statement in 2019. <sup>8</sup> When aggregated over time, employment impacts are expressed in job-years, which reflect the number of individual years of full-time equivalent (FTE) employment, rather than a distinct number of individual employees (since two job years over a two-year period could be fulfilled by the same employee, or alternatively by multiple employees.)

<sup>&</sup>lt;sup>9</sup> According to the Draft Environmental Impact Statement in 2019, the total commitment of funds required for construction of the overall resiliency project is approximately \$546,353,085, which includes the DISTRIBUTED GENERATIONS SOLUTIONS project.



#### Figure 2.1: NJ TRANSITGRID Funding Sources and Amounts

Source: NJ TRANSITGRID (2019)

The total design and construction cost of the NJ TRANSITGRID is approximately \$512 million over the course of 5 years, according to the Draft Environmental Impact Statement in 2019. This one-time investment will include expenditures for design, material procurement, and construction. Of the total estimated construction cost, \$84 million is for design and project administration costs and \$428 million is associated with construction costs.<sup>10</sup>

For analysis purposes, not all costs are included in the input-output model. Because input-output models use the direct purchase of goods and services within the geographies of interest to estimate the ripple effect of spending throughout the economy, costs such as permits and fees are not considered direct purchases of goods and services and are therefore excluded from the model. Additionally, costs associated with purchasing specialized equipment from beyond the geography of interest, such as the combined cycle gas turbine for the Main Facility, will have little to no effect on the local and regional economies and are therefore excluded from the model as well. Based on the Grant Application in 2014, the following items are not modelable expenditures:

• The estimated permitting fee during Design & Administration is around \$1.8 million, which is excluded from modeling the impact for these activities.<sup>11</sup>

<sup>&</sup>lt;sup>10</sup> The construction cost of the project in this study is represented in current US dollars (year 2019) and does not include future inflation.
<sup>11</sup> The Grant Application in 2014 indicated that around 0.36 percent of the total construction cost is permitting cost. Applying 0.36 percent to the total construction cost of \$428.3 million leads to the permitting cost of around \$1.8 million.

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• The estimated purchase cost for generation equipment of a combined-cycle plant with 140MW is around \$117 million.<sup>12</sup> All of the generation equipment of NJ TRANSITGRID will be purchased outside of state, thus will be excluded from modeling the impact for the construction activities.

In total, the modeled amount from construction investment for NJ TRANSITGRID is \$393 million (see Figure 2.2). This represents a one-time direct impact to the local economy.

	Estimated	Excluded	Modeled
Activity	Cost	Cost	Costs
Design & Administration (\$M)	\$83.6	\$1.8	\$81.8
Construction Costs (\$M)	\$428.3	\$116.7	\$311.6
Total Estimated Cost (\$M)	\$511.9	\$118.8	\$393.4

Figure 2.2: Estimated Construction Cost Breakdown for NJ TRANSITGRID

Source: NJ TRANSIT (2019), Energy Sector Management Assistance Program (2009)

Based on PJM's 2018 study, an older version of which was used to estimate various pieces of the project budget in prior documents related to the project, the cost of labor will make up roughly 32 percent of the total construction cost of this type of project. Therefore, we estimate that the total cost of labor during the construction period is 32 percent of \$393 million, or \$137 million.<sup>13</sup> We compared this proportion to other construction projects of this scale to verify the assumption. This estimate of direct labor cost together with the total modelable construction budget is used for calculating the spillover indirect and induced economic impact, jobs, and earnings.

## 2.3. Estimated Economic Impact from Construction

In an interconnected economy, direct expenditures give rise to "spillover" impacts throughout the supply chain (in the form of indirect effects) and through the recirculation of labor income (in the form of induced effects). Beyond its direct footprint of \$393 million, the construction of NJ TRANSITGRID will produce significant indirect and induced effects throughout the regional economy. The total economic impact of NJ TRANSITGRID construction within New Jersey is the sum of the direct footprint from construction and the indirect and induced effects that result from those direct expenditures.

Over the five-year design and construction period, it is estimated that the construction of NJ TRANSITGRID will generate a total economic impact of \$749 million in New Jersey, supporting 4,290 Full Time Equivalent (FTE) job-years and \$291 million in earnings (see Figure 2.3).<sup>14</sup>

<sup>&</sup>lt;sup>12</sup> Study of Equipment Prices in the Power Sector, Energy Sector Management Assistance Program, 2009. Inflated to 2019 US Dollars.

<sup>&</sup>lt;sup>13</sup> PJM Cost of New Entry Estimates for Combustion Turbine and Combined Cycle Plants, PJM Interconnection, L.L.C, 2018.

<sup>&</sup>lt;sup>14</sup> All job estimates throughout the analysis are full-time equivalent (FTE) to the overall total number of jobs supported. When aggregated over time, employment impacts are expressed in "job-years," which reflect the number of individual years of FTE employment, rather than a distinct number of individual employees (since two job years over a two-year period could be fulfilled by the same employee, or alternatively by multiple employees).

Figure 2.3: Estimated One-Time Impact of NJ TRANSITGRID Construction Investment in New Jersey

Impact Type	Impact Amount
Direct Output (\$M)	\$393.4
Indirect & Induced Output (\$M)	\$355.4
Total Impact (\$M)	\$748.8
Direct Employment (FTE)	2,370
Indirect & Induced Employment (FTE)	1,920
Total Employment (FTE)	4,290
Earnings Supported (\$M)	\$291.4

Source: IMPLAN (2015), Econsult Solutions, Inc. (2019)

#### 2.4. Estimated Tax Revenue Impact from Construction

In addition to the total economic impact from construction, the direct and indirect economic activity associated with constructing NJ TRANSITGRID will also grow the state's tax base. While NJ TRANSIT is a tax-exempt entity, and thus its contractors will not incur sales tax on materials for the construction of the project, other activity associated with NJ TRANSITGRID construction will be taxable, including wages associated with the project. Further, much of the spillover activity (the indirect and induced impacts) will occur in the private economy, and therefore will generate tax revenue.

The fiscal impact is estimated by using an industry-standard proprietary fiscal model for New Jersey, which has been used for multiple projects with scales comparable to NJ TRANSITGRID in New Jersey. These estimates are derived using an effective tax rate for each tax category to account for the progressive tax rate in the State and tax deductions that tax payers take.<sup>15</sup> Income tax revenues are calculated by applying the effective rate to labor income, a component of the *earnings supported* number reported above (that number includes benefits).<sup>16</sup> Sales and business tax revenues are calculated by the *value add* generated by the economic activity, which is a component of the total impact described in Figure 2.3.<sup>17</sup>

Over the five year design and construction period, it is estimated that the investment in construction for NJ TRANSITGRID will generate \$11 million in income, sales, and business tax revenue to the State of New Jersey (see Figure 2.4). Besides tax revenue, the design and construction period will also generate around \$2 million in permitting revenue to the government.

<sup>&</sup>lt;sup>15</sup> The income/business/sales effective tax rates are determined by calculating New Jersey's annual income/business/sales tax revenues' proportion of the annual gross state product. This is based on our proprietary fiscal model that is updated annually.

<sup>&</sup>lt;sup>16</sup> The investment in construction will support an estimated \$291.4 million in earnings, which translates to \$244.8 million in wages. The model then applies a 2.4% effective income tax rate to account for New Jersey's progressive income tax structure as well as deductions and nontaxable income.

<sup>&</sup>lt;sup>17</sup> Value added is a component of the total economic impact of construction investment and totaled \$516.3 million. Similar to the income tax calculation, effective tax rates were applied based on New Jersey's gross state product.

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Figure 2.4: Estimated One-Time Tax Revenue Generated from NJ TRANSITGRID Construction Investment

Тах Туре	Revenue Amount
Income Tax (\$M)	\$5.9
Sales Tax (\$M)	\$4.0
Business Tax (\$M)	\$1.0
Total (\$M)	\$10.9

Source: NJ CAFR (2017), Econsult Solutions, Inc. (2019)

### 2.5. Estimated Job Impact by Industry from Construction

The economic impacts associated with NJTRANSITGRID's design and construction affect a wide range of industries, far beyond the design sector and construction sector. While the construction industry and architecture, engineering and related services are the largest individual beneficiaries from these investments, other industries including health care and social assistance; retail; professional, scientific, and technical services; administrative and support and waste management and remediation services; other services (except public administration); and accommodation and food services also see significant benefits from the indirect (supply chain) and induced (labor income) impacts of the capital activity.

Figure 2.5 shows the proportion of the total employment impact associated with NJTRANSITGRID's design and construction that accrue in and beyond the design and construction industries within the state. In New Jersey, approximately 45 percent of the employment supported by NJTRANSITGRID's design and construction is in sectors outside of design and construction.

Figure 2.5: Estimated Job Industry Breakdown by 2-Digit NAICS Code from Construction Investment  $^{\rm 18}$ 



Source: IMPLAN (2015), Econsult Solutions, Inc. (2019), Piktochart (2019)

<sup>&</sup>lt;sup>18</sup> The "All Other Sectors" includes Finance and Insurance (7.1%), Real Estate and Rental and Leasing (5.4%), Retail Trade (5.1%), Wholesale Trade (4.6%), Transportation and Warehousing (4.4%), Educational Services (2.6%), Arts, Entertainment, and Recreation (2.4%), Information (1.6%), Manufacturing (1.8%), Construction (1.0%), Management of Companies and Enterprises (0.9%), Public Administration (0.4%), Utilities (0.3%), Mining, Quarrying, and Oil and Gas Extraction (0.2%), Agriculture, Forestry, Fishing and Hunting (0.2%).

## 3. Economic and Fiscal Impacts of Operations

#### 3.1. Overview

This section details the economic impact from annual operations associated with NJ TRANSITGRID. Future annual spending at the Main Facility is estimated to range from \$16.6 million to \$19.5 million. Each year, the direct operating expenditures at the Main Facility will generate an estimated \$22 million to \$25 million in economic impact in New Jersey, supporting approximately 56 to 59 direct, indirect, and induced FTE jobs.

#### 3.2. Direct Footprint

Once completed, the proposed Project will include a natural gas-fired generation plant, referred to as the Main Facility (Preferred Alternative Project Component A), with a net generation of 104MW to 140MW, which would include using steam power generation from waste heat. The total annual operating budget is estimated to range from \$16.6 million to \$19.5 million according to the Draft Environmental Impact Statement in 2019<sup>19</sup>.

For modeling purpose, low end and high end of the budget estimates are shown, as well as the midpoint of \$18.1 million (see Figure 3.1).

Figure 3.1: Estimated Annual Operation Cost for NJ TRANSITGRID

Range	Annual Operations
Low End (104MW) (\$M)	\$16.6
High End(140MW) (\$M)	\$19.5
Mid-Point (\$M)	\$18.1

Source: NJ TRANSIT (2019)

Based on data provided by NJ TRANSIT (the findings in the Draft Environmental Impact Statement in 2019) and industry research, the estimated number of employees for on-going operations is 30 FTEs. The average annual salary per New Jersey employees in the Electric Power Generation, Transmission, and Distribution sector is around \$91,000 based on the New Jersey data of the Bureau of Labor Statistics' Occupational Employment Dataset.<sup>20</sup> Based on that industry average, the total labor cost of NJ TRANSITGRID's annual operations will be approximately \$3 million (assuming average annual salary per employee and 30 estimated jobs).

<sup>&</sup>lt;sup>19</sup> Operating costs will vary with fuel/commodity (natural gas) prices, labor costs pertaining to operations and maintenance and inflationary pressures upon capital equipment replacement through the life cycle of the microgrid according to the Draft Environmental Impact Statement in 2019.

<sup>&</sup>lt;sup>20</sup> The dataset estimates the share and salaries of different occupations in the industry of interest, using the share as the weight and the salary as the value, the weighted average salary for the industry is calculated.

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### 3.3. Estimated Economic Impact from Operations

Once completed, the annual operations of the NJ TRANSITGRID will generate "spillover" effects in the state. These spillover effects are the indirect effect, the multiplier effect from the purchase of goods and services from local vendors, and the induced effect which measures the multiplier effect from the spending of labor income by employees. The total economic impact of NJ TRANSITGRID's operations is the sum of its direct footprint and the indirect and induced effects that occur as a result of this direct spending.

Each year, it is estimated that the operations of NJ TRANSITGRID will generate a total economic impact ranging from \$22 million to \$25 million in New Jersey, supporting around 56 to 59 FTE jobs and around \$4.3 million to \$4.5 million in earnings (see Figure 3.2).

	Low End	High End	Mid-Point
Impact Type	Impact	Impact	Impact
Direct Output (\$M)	\$16.6	\$19.5	\$18.1
Indirect & Induced Output (\$M)	\$5.3	\$5.9	\$5.6
Total Impact (\$M)	\$21.9	\$25.4	\$23.7
Direct Employment (FTE)	30	30	30
Indirect & Induced Employment (FTE)	26	29	28
Total Employment (FTE)	56	59	58
Earnings Supported (\$M)	\$4.3	\$4.5	\$4.4

Figure 3.2: Estimated Annual Economic Impacts of NJ TRANSITGRID Operations upon Completion

Source: IMPLAN (2015), Econsult Solutions, Inc. (2019)

### 3.4. Estimated Tax Revenue Impact from Operations

Although NJ TRANSIT is a tax-exempt nonprofit organization, the fiscal impacts generated by NJ TRANSITGRID's activities are substantial. NJ TRANSITGRID's operations increase New Jersey tax bases directly by employing staff which generates taxable income, and indirectly via spending by vendors and employees on taxable goods and services.

Similar to the fiscal impact estimates for NJ TRANSITGRID's construction, we calculated the tax revenues using the effective tax rates based on the industry-standard proprietary model for New Jersey. These estimates are derived using an effective tax rate for each tax category to account for the progressive tax rate in the State and tax deductions that tax payers take. Income tax revenues are calculated by applying the effective rate to labor income, a component of the *earnings supported* number reported above (that number includes benefits).<sup>21</sup> Sales and business tax revenues are calculated by the *value add* generated

<sup>&</sup>lt;sup>21</sup> The investment in construction will support an estimated \$291.4 million in earnings, which translates to \$244.8 million in wages. The model then applies a 2.4% effective income tax rate to account for New Jersey's progressive income tax structure as well as deductions and nontaxable income.

by the economic activity, which is a component of the total impact described in Figure 3.2.<sup>22</sup> In other words, the income tax revenue is collected from the direct, indirect and induced activities, while the sales tax and business tax only come from the indirect and inducted activities, as these taxes for the direct activities are zeroed out because NJ Transit is a tax-exempt organization.

Each year, it is estimated that the direct operations of NJ TRANSITGRID will generate between \$148,000 and \$158,000 in income, sales, and business tax revenue to the State of New Jersey (see Figure 3.3).

Figure 3.3: Estimated Annual Tax Revenue Generated by NJ TRANSITGRID Operations upon Completion

	Low End	High End	Mid-Point
Тах Туре	Revenue	Revenue	Revenue
Income Tax	\$81,000	\$84,000	\$82,000
Sales Tax	\$54,000	\$59 <i>,</i> 000	\$56 <i>,</i> 000
Business Tax	\$13,000	\$15,000	\$14,000
Total	\$148,000	\$158,000	\$152,000

Source: NJ CAFR (2017), Econsult Solutions, Inc. (2019)

## 3.5. Estimated Job Impact by Industry from Operations

Upon completion, NJ TRANSITGRID's day-to-day operations, including the purchase of goods and services and the spending of labor income it generates, impact a variety of sectors throughout the local and state economy. In addition to the utilities sector, in which the direct employment will be created, the sectors most impacted by NJ TRANSITGRID's operations will likely be health care and social assistance; professional, scientific, and technical services; administrative and support and waste management and remediation services; finance and insurance; and accommodation and food services based on the IMPLAN estimates (see Figure 3.4). Overall, industries besides utilities receive 48 percent of total employment impact in New Jersey.

<sup>&</sup>lt;sup>22</sup> Value added is a component of the total economic impact of operations and totaled between \$13.4 million and \$15.0 million. Similar to the income tax calculation, effective tax rates were applied based on New Jersey's gross state product.

Figure 3.4: Estimated Job Industry Breakdown by 2-Digit NAICS Code from Operations of NJ TRANSITGRID  $^{\rm 23}$ 



Source: IMPLAN (2015), Econsult Solutions, Inc. (2019), Piktochart (2019)

<sup>&</sup>lt;sup>23</sup> The "All Other Sectors" include Retail Trade (5.9%), Other Services (except Public Administration) (3.7%), Transportation and Warehousing (3.5%), Real Estate and Rental and Leasing (2.3%), Construction (1.9%), Mining, Quarrying, and Oil and Gas Extraction (1.7%), Wholesale Trade (1.5%), Arts, Entertainment, and Recreation (1.3%), Educational Services (1.3%), Transportation and Warehousing (1.0%), Management of Companies and Enterprises (0.5%), Information (0.3%), Public Administration (0.2%), Agriculture, Forestry, Fishing and Hunting (0%) and Manufacturing (0%).

## Appendix A – Economic Modeling Assumptions

CONSTRUCTION BUDGET ASSUMPTIONS			
Pre-Construction Design & Administration			
Cost Type	Amount	Source	Note
Design & Administration	\$83,586,747	Draft Environment Impact Statement 2019	
Permitting	\$1,828,554	Grant Application, 2014	Permitting cost are excluded from the modeling because this is considered as a fiscal impact, and not as cycled in the local economy and generating economic impact
Design & Administration Excluding Permitting	\$81,758,193	Calculation	IMPLAN Input
Construction			
Cost Type	Amount	Source	Note
Total Construction Cost	\$428,327,406	Draft Environment Impact Statement 2019	
Generation Equipment Purchase	\$116,695,800	Study of Equipment Prices in the Power Sector, 2009	All of the generation equipment purchase will be outside of state, so it is excluded from the modeling.
Total Construction Cost Excluding Equipment Purchase	\$311,631,606	Calculation	IMPLAN Input
% Labor Cost of Total Construction Cost	32%	Cost of New Entry Estimates for Combustion Turbine and Combined Cycle Plants in PJM, 2018	
Estimated Labor Cost	\$137,245,007	Calculation	IMPLAN Input
OPERATION BUDGET ASSUMPTIONS			
Scenario	Annual Operations	Source	Note
Low End (104MW)	\$16,600,000.00	Draft Environment Impact Statement 2019	IMPLAN Input
High End(140MW)	\$19,500,000.00	Draft Environment Impact Statement 2019	IMPLAN Input
Mid-Point	\$18,050,000.00	Calculation	IMPLAN Input
Estimated Number of Jobs for Operation	30	Draft Environment Impact Statement 2019	IMPLAN Input
Average Annual Salary per Employee	\$91,121	Bureau of Labor Statistics, Occupational Employment Statistics, 2018	Occupations in NAICS 221100 - Electric Power Generation, Transmission, and Distribution
Estimated Total Labor Cost	\$2,733,633	Calculation	IMPLAN Input

Source: NJ TRANSIT (2019), Energy Sector Management Assistance Program (2009), PJM Interconnection, L.L.C. (2018), Bureau of Labor Statistics(2018), Econsult Solutions, Inc. (2019)

# Appendix B – Economic and Fiscal Impact Modeling

Economic impact estimates are generated by utilizing input-output models to translate an initial amount of direct economic activity into the total amount of economic activity that it supports, which includes multiple waves of spillover impacts generated by spending on goods and services and by spending of labor income by employees. This section summarizes the methodologies and tools used to construct, use, and interpret the input-output models needed to estimate this project's economic impact.

### B.1. Input-Output Model Theory

In an inter-connected economy, every dollar spent generates two spillover impacts:

- First, some amount of the proportion of that expenditure that goes to the purchase of goods and services gets circulated back into an economy when those goods and services are purchased from local vendors. This represents what is called the "**indirect effect**," and reflects the fact that local purchases of goods and services support local vendors, who in turn require additional purchasing with their own set of vendors.
- Second, some amount of the proportion of that expenditure that goes to labor income gets circulated back into an economy when those employees spend some of their earnings on various goods and services. This represents what is called the "<u>induced effect</u>," and reflects the fact that some of those goods and services will be purchased from local vendors, further stimulating a local economy.

The role of input-output models is to determine the linkages across industries in order to model the magnitude and composition of spillover impact to all industries of a dollar spent in any one industry. Thus, the total economic impact is the sum of its own direct economic footprint plus the indirect and induced effects generated by that direct footprint.

## B.2. Input-Output Model Mechanics

To model the impacts resulting from the organizational expenditures, the team developed a customized economic impact model using the IMPLAN input/output modeling system. IMPLAN represents an industry standard approach to assess the economic and job creation impacts of economic development projects, the creation of new businesses, and public policy changes within its surrounding area.

IMPLAN has developed a social accounting matrix (SAM) that accounts for the flow of commodities through economics. From this matrix, IMPLAN also determines the regional purchase coefficient (RPC), the proportion of local supply that satisfies local demand. These values not only establish the types of goods and services supported by an industry or institution, but also the level in which they are acquired locally. This assessment determines the multiplier basis for the local and regional models created in the IMPLAN modeling system. IMPLAN takes the multipliers and divides them into 536 industry categories in accordance to the North American Industrial Classification System (NAICS) codes.

The IMPLAN modeling system also allows for customization of its inputs which alters multiplier outputs. Where necessary, certain institutions may have different levels of demand for commodities. When this

occurs, an "analysis-by-parts" (ABP) approach is taken. This allows the user to model the impacts of direct economic activity related to an institution or industry with greater accuracy. Where inputs are unknown, IMPLAN is able to estimate other inputs based on the level of employment, earnings, or output by an industry or institution.

## B.3. Employment and Wages Supported

IMPLAN generates job estimates based on the term "job-years", or how many jobs will be supported each year. For instance, if a construction project takes two years, and IMPLAN estimates there are 100 employees, or more correctly "job-years" supported, over two years, that represents 50 annual jobs. Additionally, these can be a mix of full and part-time employment. Consequently, job creation could feature more part-time jobs than full-time jobs. To account for this, IMPLAN has a multiplier to covert annual jobs to full-time equivalent jobs.

Income to direct, indirect, and induced jobs is calculated as employee compensation. This includes wage and salary, all benefits (e.g., health, retirement) and payroll taxes (both sides of social security, unemployment taxes, etc.). Therefore, IMPLAN's measure of income estimates gross pay opposed to just strictly wages.

### B.4. Tax Revenue Impact

The economic impacts in turn produce one-time or ongoing increases in various tax bases, which yield temporary or permanent increases in various tax revenues. To estimate these increases, the team created a tax revenue impact model to translate total economic impacts into their commensurate tax revenue gains. These tax revenue gains only account for a subset of the total tax revenue generation that an institution or industry may have on the economy. Furthermore, where institutions are tax exempt, only the tax revenue generation from supported indirect and induced industries is accounted for.