Utility 2.0 Long Range Plan
2019 Annual Update

Prepared for Long Island Power Authority

June 28, 2019

Table of Contents

Executive Summary ..... **vi**

1. PSEG Long Island's Vision and Roadmap **1**

1.1 NY State Policy and REV on Long Island 2
1.2 Utility 2.0 Vision and Strategy 3
1.2.1 Empowering Customers through AMI and Data Analytics 5
1.2.2 Exploring New Innovative Offerings 6
1.2.3 Evolving to a Customer-Centric DSP 7
1.3 Utility 2.0 Roadmap 9

2. Empowering Customers through AMI and Data Analytics **12**

2.1 Progress to Date 12
2.1.1 AMI Technology and Systems – Smart Meter Deployment 12
2.1.2 Program Implementation Support: Business Process Design, Change Management 14
2.1.3 Customer Engagement 14
2.1.4 AMI-Enabled Capabilities 15
2.1.5 Data Analytics 16
2.1.6 Data Privacy 17
2.1.7 Related Initiatives Outside Utility 2.0 17
2.2 No Funding Request for AMI and Data Analytics in 2019 17

3. Exploring New Innovative Offerings **18**

3.1 Progress to Date 18
3.1.1 Super Savers: NWS with Targeted Energy Efficiency 18
3.1.2 Behind-the-Meter Storage with Solar 19
3.1.3 EV Program 19
3.1.4 Related Initiatives Outside of Utility 2.0 20
3.2 Funding Request for Customer Experience Pilots 20
3.2.1 Next Generation Insights Pilot 22
3.2.2 Energy Concierge Pilot 31
3.2.3 FlexPay Implementation Plan – An Enhanced Prepay Program Concept 39
3.2.4 On-Bill Financing Implementation Plan 44
3.3 Funding Request for Grid-Interactive Pilots 50
3.3.1 Electric School Bus Vehicle-to-Grid Pilot 51
3.3.2 Heat Pump Controls Pilot 63

4. Evolving to a Customer-Centric DSP **70**

4.1 Progress to Date 71
4.1.1 Utility of the Future 71
4.1.2 Locational Value Study and Non-Wires Solution Planning Tools 73
4.1.3 Utility-Scale Storage Program – Miller Place 74
4.1.4 Interconnection Online Application Portal 74
4.1.5 Related Initiatives Outside of Utility 2.0 74
4.2 Funding Request for DSP-Enabling Capabilities 74
4.2.1 Utility-Scale Storage Program – Brightwaters 75
4.2.2 Hosting Capacity Maps 81

5. Budget and Funding Objectives **87**

5.1 Budget Request Summaries 87

5.2 Rate Impact Analysis 88

APPENDIX A. LIPA and PSEG Long Island Structure A-1

APPENDIX B. Utility 2.0 Governance B-1

APPENDIX C. 2018 Utility 2.0 Q1 Outcomes Dashboard C-1

APPENDIX D. Related Initiatives Outside of Utility 2.0 ..... D-1

APPENDIX E. Business Case Methodology E-1

APPENDIX F. Acronyms and Abbreviations F-1

List of Tables

Table 1. Utility 2.0 Areas of Investment xi
Table 2. Utility 2.0 Funding Requests xii
Table 3. Justification by Investment Area xiii

Table 3-1. Strategic Fit – Customer-interactive Projects 21
Table 3-2. Value Proposition – Next Generation Insights 23
Table 3-3. Proposed Improved Alerts and Notifications 26
Table 3-4. Enhanced Portal Solution for Next Generation Insights 26
Table 3-5. Hypotheses – Next Generation Insights 28
Table 3-6. Principles of REV Demos – Next Generation Insights 30
Table 3-7. Budget Request Summary for Next Generation Insights 30
Table 3-8. Energy Concierge vs. Home Energy Audits 31
Table 3-9. Value Proposition – Energy Concierge 32
Table 3-10. Hypotheses – Energy Concierge 35
Table 3-11. Project Schedule – Energy Concierge 36
Table 3-12. Principles of REV Demos – Energy Concierge 38
Table 3-13. Budget Request Summary for Energy Concierge 38
Table 3-14. Value Proposition – FlexPay Pilot 40
Table 3-15. Prepay Industry Case Studies and Lessons Learned 42
Table 3-16. Principles of REV Demos – FlexPay Pilot 43
Table 3-17. Budget Request Summary for FlexPay Pilot 43
Table 3-18. Value Proposition – On-Bill Financing 44
Table 3-19. Potential Target Deployments 46
Table 3-20. Principles REV Demos – On-Bill Financing 49
Table 3-21. Budget Request Summary for On-bill Financing 49
Table 3-22. Strategic Fit – Grid-interactive Projects 51
Table 3-23. Value Proposition – Electric Bus V2G Pilot 53
Table 3-24. Hypotheses – E-Bus V2G Pilot 56
Table 3-25. Project Schedule – E-Bus V2G Pilot 57
Table 3-26. Principles of REV Demos – E-Bus V2G Pilot 59
Table 3-27. Budget Request Summary for E-Bus V2G Pilot 60
Table 3-28. Benefits and Cost Details – E-Bus V2G Pilot 62
Table 3-29. Value Proposition – Heat Pump Controls Pilot 65
Table 3-30. Hypotheses - Heat Pump Controls Pilot 66
Table 3-31. Project Schedule – Heat Pump Controls Pilot 67
Table 3-32. Principles of REV Demos – Heat Pump Controls Pilot 68
Table 3-33. Budget Request Summary for Heat Pump Controls Pilot 69
Table 4-1. North Bellmore Study Initiatives, 2019 72
Table 4-2. Value Propositions – Utility-Scale Storage 75
Table 4-3. Project Description – Utility-Scale Storage 76
Table 4-4. Project Schedule – Utility-Scale Storage (Brightwaters) 77
Table 4-5. Budget Request Summary for Utility-Scale Storage 78
Table 4-6. Benefits and Cost Details – Utility-Scale Storage Program 79
Table 4-7. Value Proposition – Hosting Capacity Maps 81
Table 4-8. Project Schedule – Hosting Capacity Maps 85
Table 4-9. Budget Request Summary for Hosting Capacity Maps 86
Table 5-1. Budget Request Summary for All Initiatives 87
Table 5-2. Residential Rate Impacts 88
Table 5-3. Commercial Rate Impacts 88

Table E-1. Funding Request Cost Category Definitions E-1
Table E-2. Cost Test Definitions E-2
Table E-3. Benefit Stream Definitions E-3
Table E-4. Cost Stream Definitions E-4

List of Figures

Figure 1. REV on Long Island vi
Figure 2. PSEG Long Island's Customer and Grid of the Future viii
Figure 3. 2018 U2.0 Approved Programs ix
Figure 4. Utility 2.0 Learning and Informing Cycle xi
Figure 5. Reporting Approach for Future U2.0 Filings by Filing Year xiii
Figure 6. Residential Customer Bill Impacts due to Utility 2.0 Investments xiv

Figure 1-1. PSEG Long Island's Customer-Centric DSP 1
Figure 1-2. NY State Policy Goals 2
Figure 1-3. PSEG Long Island's Guiding Principles 3
Figure 1-4. PSEG Long Island's Utility 2.0 Vision and Strategy 4
Figure 1-5. PSEG Long Island's Strategic Path 4
Figure 1-6. Evolution of Customer Engagement Capabilities 5
Figure 1-7. Next Generation Customer Experience 6
Figure 1-8. Maturation of New Innovative Offerings 6
Figure 1-9. DSP Data Ecosystem 8
Figure 1-10. PSEG Long Island's Roadmap 11
Figure 2-1. Smart Meter Deployment Progress 13
Figure 2-2. Annual and Cumulative Smart Meter Deployment 13
Figure 2-3. Q1 2019 Residential & Commercial Meter Deployment 13
Figure 2-4. Success Snapshot – Customer Engagement 14
Figure 2-5. My Energy Smart Lab 15
Figure 2-6. Success Snapshot – Analytics 16
Figure 3-1. North Bellmore Super Saver Program Area 19
Figure 3-2. Illustrative Insight Communication to Customer 24
Figure 3-3. Energy Insights via Device Detection and Analytics 25
Figure 3-4. Energy Disaggregation 25
Figure 3-5. Illustrative Energy Concierge Consultation Tool 34
Figure 3-6. Loan Program Application Process 47
Figure 3-7. Business Model Diagram – On-Bill Financing 48
Figure 3-8. V2G Pilot Project Concept and Benefits 52
Figure 3-9. Business Model Diagram – E-Bus V2G Pilot 55
Figure 3-10. Present Value Benefits and Costs of SCT – E-Bus V2G Pilot 61
Figure 3-11. Present Value Benefits and Costs of SCT – E-Bus V2G Pilot at Scale 63
Figure 3-12. Heat Pumps Controls Pilot Concept 64
Figure 4-1. Present Value Benefits and Costs of SCT – Utility-Scale Storage Program 79

Figure A-1. PSEG Long Island addressing New York State Policy A-1
Figure A-2. LIPA's Public-Private Partnership Structure A-3
Figure B-1. Utility 2.0 Governance B-1

Figure B-2. Utility 2.0 Steering Committee Charter B-1
Figure D-1. J.D. Power Customer Satisfaction, Q12019 ..... D-1
Figure D-2. Comprehensive Marketplace Solution D-4
Figure D-3. ADMS Architecture D-6
Figure D-4. PSEG Long Island’s Vision of the Energy Cloud D-9

Executive Summary

PSEG Long Island is submitting this Utility 2.0 Long Range Plan (Plan) for review by the Long Island Power Authority (LIPA) and the New York State Department of Public Service (DPS). This submittal is in accordance with Public Authorities Law Section 1020-f(ee) and the Amended and Restated Operations Services Agreement (OSA) dated December 31, 2013. PSEG Long Island seeks a positive recommendation on the Plan from DPS and incremental funding approval from LIPA.

The first Utility 2.0 Plan was from July 2014, this Plan is an update to that and prior iterations. This Plan reflects PSEG Long Island adapting to changing needs of customers, advancing technology, and the policy direction and goals developed within the Reforming the Energy Vision (REV) process in New York and consistent with New York State Public Service Commission (PSC) proceedings. The initiatives detailed in this filing encompass innovative offerings and foundational capabilities that will empower customers, improve system efficiency, and reduce carbon emissions.

Long Island Is a Leader in New York's Energy Future

To date, LIPA and PSEG Long Island have managed numerous efforts to secure a cleaner and more affordable energy future for Long Island. LIPA leads New York in energy efficiency and clean energy technology program deployments. Long Island is home to the state's most aggressive energy efficiency programs, its three largest utility-scale solar projects, most vibrant rooftop solar market, the state's first utility-scale battery project, and now New York's first offshore wind farm—the 130 MW South Fork Wind Farm, which is expected to be in service by the end of 2022. These initiatives are consistent with REV and state policies, are cost-effective, and help to reduce demand for electricity throughout Long Island by 1%-2% per year.

Figure 1. REV on Long Island

Source: Long Island Power Authority

PSEG Long Island has successfully completed several activities to lay the foundation for the programs and projects laid out in this Plan, including:

- **First-of-its-kind energy storage tariff**

  The behind-the-meter (BTM) battery program makes use of LIPA's existing Commercial System Relief Program (CSRP) and Dynamic Load Relief Program (DLRP) tariffs to offer incentives for qualifying battery storage equipment (whether paired with DER or standalone) in exchange for enrolling and participating in the programs. The BTM battery program has a lock-in period of 10 years to match the warranty length of most battery storage systems. The program's goal is to catalyze the local availability of energy storage for the commercial and residential market while providing load relief, especially in those defined areas of the grid where peak demand needs are most critical. The modifications that allow for energy storage also make it possible for net energy metering and Value of Distributed Energy Resources (VDER) customers to participate in the CSRP and DLRP programs for the first time, expanding the capabilities of residential and commercial customers with dispatchable DER technologies to participate in demand response (DR) events.

- **Leader in state for energy efficiency**

  PSEG Long Island has continued to build upon the historic energy efficiency (EE) initiatives undertaken by LIPA. In 2018, savings from PSEG Long Island EE initiatives represented approximately 1.4% of overall utility sales. The efficiency programs continue to support all aspects of the customer base and encompass everything from residential home energy reports (HERs) informing customers with their consumption details and insights on managing their energy use to large-scale combined heat and power (CHP) projects enabling municipal waste water districts to more efficiently provide services for their customers. PSEG long Island continues to improve its offerings, and recently launched all electric heat pump replacement and new construction programs.

  The programs enable Long Island to lead by example in fostering a cleaner and more efficient environment for the next generation to inherit.

- **Leader in state for rooftop solar PV**

  There are now over 47,000 solar PV systems on Long Island, representing about 35% of the systems in the entire state. The residential and commercial solar markets on Long Island were the first to be fully subscribed under the megawatt-block program, meaning that rebates for such systems have been phased out. Even without rebates, PSEG Long Island continues to approve about 500 applications per month for electric interconnection and the market for residential solar PV remains strong.

- **Feed-in tariffs for solar**

  LIPA is the only utility in New York State that has offered feed-in tariffs (FITs) for renewable generation. Thus far, such FITs have led to 108 power purchase agreements (PPAs) totaling

90 MW of solar PV About 58 MW of this capacity is now in operation, with the remainder in various stages of permitting and construction.

- **Largest utility-scale solar projects**

  In addition to the FITs, LIPA has executed PPAs with developers of large utility-scale solar projects located at Brookhaven National Labs (31 MW), and Suffolk County to install carports (12 MW).

- **South Fork portfolio for non-wires solution (NWS)**

  LIPA has three significant contracts for NWSs in the South Fork: 130 MW of offshore wind, 10 MW of battery storage at two locations (80 MWh each), and 8.2 MW of DR and EE.

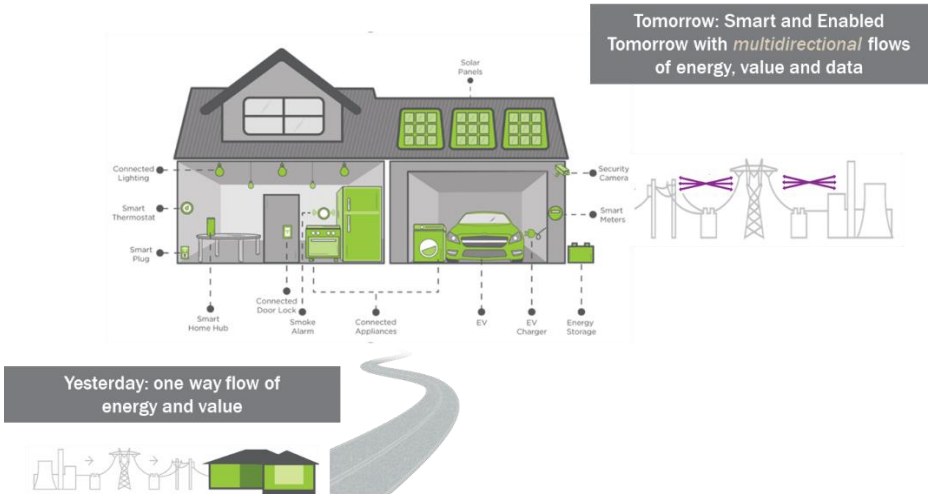
- **Town of Huntington microgrid**

  PSEG Long Island is working with developers for a potential microgrid in Huntington, which has received an award under the State's New York Prize initiative.

Utility 2.0 Vision and Pathway

The global energy industry is undergoing a transformation. Customer preferences and rapidly improving technologies are driving decarbonization and increasing the numbers of distributed solutions and tools. Ever-accelerating technology improvements have translated to a lower price of distributed energy resources (DER) to customers and grid automation capabilities that enhance visibility and allow grid operators to optimize the benefits of interconnected DER. These factors converge to drive a much greater emphasis on customer options and a more agile distribution grid (Figure 2).

Figure 2. PSEG Long Island's Customer and Grid of the Future



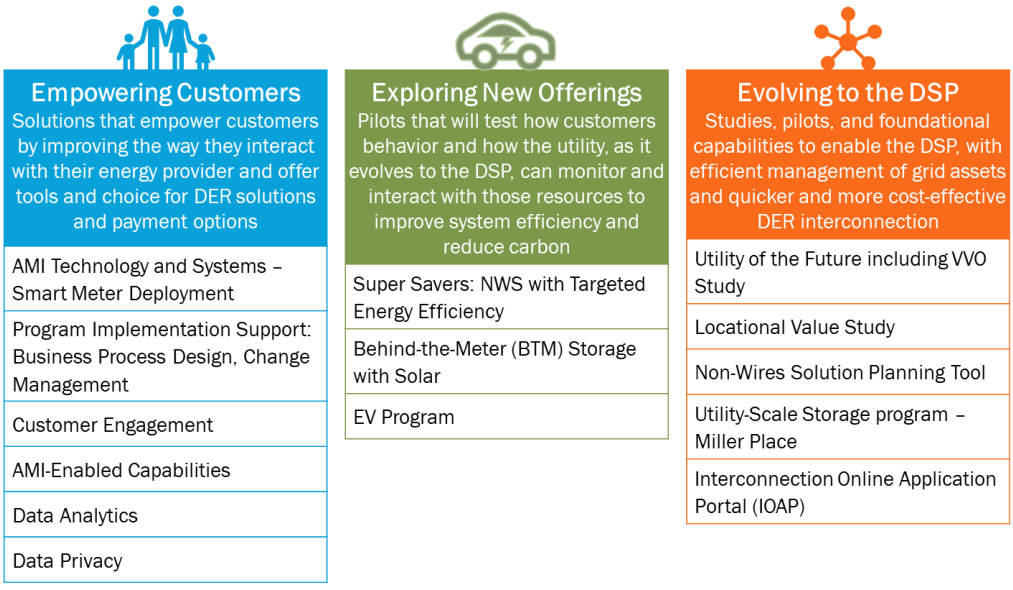
PSEG Long Island's Utility 2.0 vision is to continue to be a customer-centric, innovative, and forward-looking utility to address industry change, New York's energy policy objectives, and the needs and interests of its customers. Through the proposed programs, initiatives, and projects of its Utility 2.0 Roadmap, PSEG Long Island will act on this vision and continue to transform to a clean and distributed electrical system consistent with REV and other New York State clean energy policies. PSEG Long Island will do this in a three-part progression to:

- **Empower Customers through AMI and Data Analytics:** This Utility 2.0 pathway will use advanced metering infrastructure (AMI) and its related capabilities as a foundational enabler of greater digital insight for customers. This pathway will drive PSEG Long Island customer behavior and advance grid operations for their betterment. PSEG Long Island intends to continuously monitor the success of these initiatives, evolving or adding to them based on direct customer feedback through its customer engagement plans and successful pilots.
- **Explore New Innovative Offerings:** This Utility 2.0 pathway is where new ideas, offerings, and technologies are tested through set-duration programs or pilot projects that will provide PSEG Long Island with more experience with new energy technologies or customer strategies to support customer solutions to intelligent grid operations. These offerings are worth exploring because they can:
    - Represent potential long-term value to both the customers and the utility
    - Inform future rate design and business models
    - Support customer adoption of advanced technologies in support of its mission and state policies
- **Evolve to a Customer-Centric Distributed System Platform (DSP):** Invest in customer engagement and grid planning and utility operations functions and enable foundational capabilities and technology platforms. PSEG Long Island will leverage its AMI data and capabilities, as well as its lessons learned from new offerings, to enhance its evolution to a customer-centric DSP.

Progress of Approved Initiatives

The LIPA Board of Trustees approved the following programs proposed in the 2018 U2.0 filing on December 19, 2018.[1]

Figure 3. 2018 U2.0 Approved Programs[2]



[1] In this 2019 filing, utility-scale storage is included in the Evolving to the DSP section.

[2] This figure has been updated to reflect how these initiatives are currently being implemented.

PSEG Long Island began implementation of these programs in 2019 with a major focus on AMI deployment, scaling up to a planned 20,000 meters installed per month and 250,000 meters installed per year. In dollar and operational terms, from full-scale deployment of smart meters to new BTM energy storage and EV programs, PSEG Long Island's focus in 2019 is on implementation of these programs:

- Finalize vendor requirements
- Review and amend business processes
- Scale and amend work teams
- Develop progress metrics to track both operational and financial impacts

PSEG Long Island provides quarterly updates to LIPA and DPS detailing the progress of approved Utility 2.0 projects and annual reporting of realized benefits from the overall program.[3] The recommended quarterly updates included information on:

- Upcoming smart meter planned start and end of deployment by township
- Smart meter deployment progress by township and residential/commercial customer delineation
- Number of customers contacted by method and segment for customer engagement
- Meetings with stakeholders and elected officials
- Customer questions or complaints
- Success of contacting customers
- Current and planned alignment with National Institute of Standards and Technology (NIST) and Fair Information Practice Principles (FIPP) data security standards
- Super Saver program status updates, including projected and actual kilowatt and kilowatt-hour savings
- Phase I status and Phase II and III planning and costs for the Interconnection Online Application Portal (IOAP)[4]

PSEG Long Island has developed a *Utility 2.0 Outcomes Dashboard* designed to provide the recommended updates as part of a full report across all active Utility 2.0 programs. The dashboard includes goals and achievements as well as challenges and lessons learned. The detailed dashboard is attached in Appendix C. A summary of the dashboard and first quarter 2019 implementation of programs related to empowering customers, exploring new offerings, and evolving to the DSP are provided below and in Sections 2.1, 3.1, and 4.1, respectively.

[3] See "Recommendations Regarding PSEG Long Island Annual 2018 Update" Matter Number 14-01299 http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=1401299&submit=Search+by+Case+Number

[4] In LIPA's final determination, the implementation of the IOAP was deferred until 2020.

2019 Proposed Initiatives

As PSEG Long Island progresses through its evolution, it will continuously improve and refine its strategy and tactics to realize its vision. In each annual Utility 2.0 filing, PSEG Long Island will use past learnings to inform the projects that are pursued going forward (Figure 4). With this approach, PSEG Long Island can be flexible and responsive to the needs of its customers.

Figure 4. Utility 2.0 Learning and Informing Cycle

PSEG Long Island is continuing its programmatic structure established in the 2018 Utility 2.0 Update to *empower customers*, *explore new innovative offerings*, and *evolve to a DSP*. Projects proposed along these pathways align to central objectives of REV, to *enhance customer satisfaction*, *increase system efficiency,* and *reduce greenhouse gases* (GHGs). PSEG Long Island has adopted these core objectives as a set of overarching guiding principles (see Section 1.1 and Figure 1-3). Alignment to these objectives is illustrated in Table 1.

Table 1. Utility 2.0 Areas of Investment

Pathway	Investment Area	Customer Satisfaction	System Efficiency	Reduced GHG
Exploring New Innovative Offerings	Next Generation Insights Pilot	✓		✓
	Energy Concierge Pilot	✓		✓
	FlexPay Implementation Plan	✓		✓
	On-Bill Financing Implementation Plan	✓	✓	✓
	Electric School Bus V2G Pilot	✓	✓	✓
	Heat Pump Controls Pilot	✓	✓	✓
Evolving to a Customer-Centric DSP	Utility Scale Storage - Brightwaters		✓	
	Hosting Capacity Maps	✓	✓	✓

Table 2 summarizes the funding requests for these initiatives.

Table 2. Utility 2.0 Funding Requests

	CAPEX Request (Added) $M				OPEX Request (Added) $M			
Initiative	***3-Year Total***	**2020**	**2021**	**2022**	***3-Year Total***	**2020**	**2021**	**2022**
Next Gen Insights Pilot	0.71	0.71	-	-	2.56	0.69	0.93	0.93
Energy Concierge Pilot	1.59	1.56	0.03	-	2.49	0.96	1.03	0.50
FlexPay Plan	-	-	-	-	0.25	0.25	-	-
On-Bill Financing Plan	-	-	-	-	0.25	0.25	-	-
Electric School Bus V2G Pilot	0.08	0.08	-	-	0.64	0.50	0.07	0.07
Heat Pump Pilot	-	-	-	-	0.30	0.20	0.10	-
Storage - Brightwaters[5]	12.32	2.93	8.18	1.21	0.61	-	-	0.61
Hosting Capacity Maps	1.59	1.59	-	-	0.23	0.08	0.08	0.08
Total ($ Million)	**16.29**	**6.87**	**8.21**	**1.21**	**7.33**	**2.92**	**2.21**	**2.19**

Business Case Analysis Approach

PSEG Long Island uses three distinct ways to justify proposed U2.0 investments:

1. **Benefit-cost analyses** (BCA) calculate the societal cost test (SCT) ratio of the present value benefits to present value costs as forecasted over the lifetime of an initiative, per DPS's BCA Framework.[6] This type of justification is performed on full-scale or mature initiatives.
2. **Hypothesis testing** is conducted for pilot projects that may or may not produce a positive net value but are anticipated to be cost-effective once fully deployed. In some cases, a BCA may be performed as part of concept development, but they are not intended to be the basis for justification.
3. **Enabling initiatives** are tools, studies, or systems that enable capabilities that align with the REV Guiding Principles but do not have specific monetized benefits directly as a result of the individual initiative.

For the investments proposed in this filing, PSEG Long Island applied the following justifications, as shown in Table 3. The justifications presented in this document are specific to 2019's proposed investments only.

[5] PSEG Long Island intends to request $11.7M from NYSERDA to support the Brightwaters utility-scale storage project and yield an effective benefit-cost ratio of 1.0.

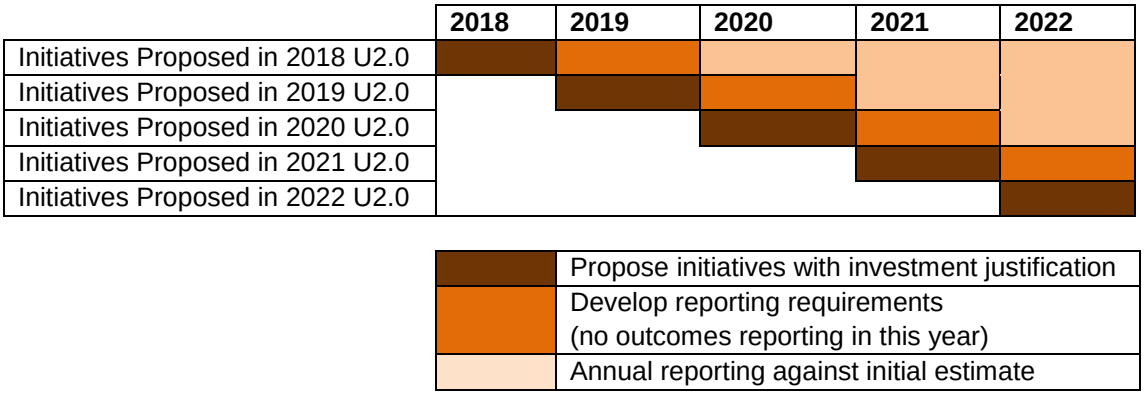
[6] See "Order Establishing the Benefit Cost Analysis Framework" Case 14-M-0101

Table 3. Justification by Investment Area

Investment Area	Benefit Cost Analysis	Hypothesis Development	Enabling Initiative
Next Generation Insights Pilot		✓	
Energy Concierge Pilot		✓	
FlexPay Implementation Plan[7]		TBD	
On-Bill Financing Implementation Plan[8]		TBD	
Electric School Bus V2G Pilot[9]	✓	✓	
Heat Pump Controls Pilot		✓	
Utility Scale Storage - Brightwaters	✓		
Hosting Capacity Maps			✓

As each year progresses, PSEG Long Island plans to use the first year following approval to develop reporting requirements, then track against the original estimate for future years to assess the progress and success of the original proposal. This also considers the time that is needed for operational change to commence, which will leverage new technologies to produce measurable benefits. For example, the 2022 U2.0 Filing would consist of the realized achievements of each initiative approved in the 2018-2020 U2.0 Filings and investment justifications for new 2022 initiatives. The reporting requirements for the initiatives approved in the 2021 U2.0 Filing would still be under development at that time. This concept is illustrated in Figure 5.

Figure 5. Reporting Approach for Future U2.0 Filings by Filing Year



Based on the framework outlined above and because reporting requirements are still in development, this filing contains investment justifications for new initiatives and limited reporting of the initiatives approved in the 2018 U2.0 Filing. PSEG Long Island recognizes the DPS requirement to reconcile costs and benefits relative to the forecasts made in 2018 and has summarized key outcomes to-date within this

[7] PSEG Long Island is seeking regulatory guidance with this filing and is requesting funding to advance the program implementation plan, and determine final business requirements accordingly, for an initial test pilot of FlexPay and On-Bill Financing.

[8] See footnote 7.

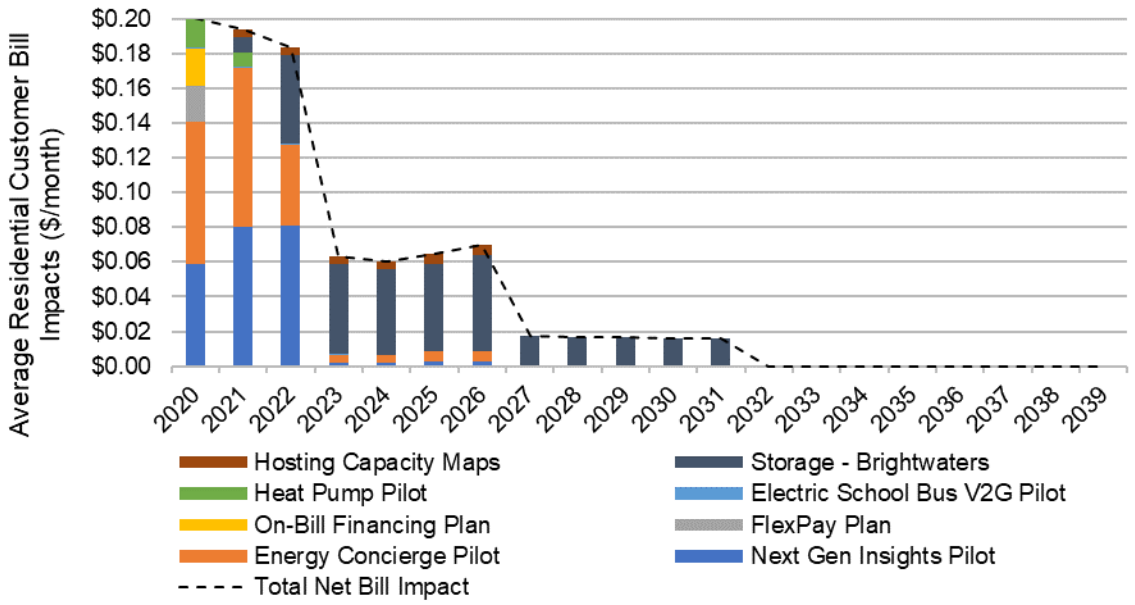
[9] For Electric School Bus V2G, a pre- versus post-pilot BCA comparison was done as a tool to show that while there may not be a viable case for investment under current market conditions, there may be a viable business model in the future. The Electric School Bus V2G pilot also includes hypotheses to be tested.

document. The 2020 U2.0 Filing will contain a more detailed update regarding the realized monetization of the BCA produced in the 2018 U2.0 Filing.

Rate Impact Analysis

The customer bill impacts for this year's filing are small due to the modest amount of incremental funding requested. As seen in Figure 6, the increase in average residential customer bill rates is primarily due to the Next Generation Insights and Energy Concierge Pilots from 2020 through 2022 as well as the Brightwaters utility scale storage project from 2022 through 2031.[10]

Figure 6. Residential Customer Bill Impacts due to Utility 2.0 Investments



Structure of the Filing

Acting on behalf of and in consultation with LIPA, PSEG Long Island has developed a detailed plan of initiatives to support REV adaptation on Long Island, including:

- **Section 1** provides the drivers that influenced the shape of PSEG Long Island's programs and PSEG Long Island's vision, strategy, and roadmap to address those drivers. The changing nature of the electric industry, the larger goals of New York through REV and other New York State clean energy policies, and the utility's informed view of the needs of its customers are the basis for the program design detailed in this Plan.
- **Section 2** describes progress to date on initiatives approved in 2018 empowered by the full deployment of AMI across Long Island and all the related capabilities that are planned to leverage this foundational infrastructure. PSEG Long Island is currently developing AMI-enabled capabilities to improve outage restoration and remote connect. Additionally, data analytics has begun to leverage the enhanced data insight from AMI to build the customer and system knowledge that will be integral to becoming a DSP.

[10] The rate impact analysis shown here does not include any proposed NYSERDA funding for the Brightwaters storage.

- **Section 3** details the portfolio of innovative projects that test emerging solutions for the PSEG Long Island customers and system that align to larger policy goals of REV. This area is the laboratory within PSEG Long Island's Utility 2.0 program that focuses on pilot projects to test new technologies and solutions that empower customers and evolve to a DSP Projects that prove to be successful at the pilot stage can be moved to scale within the customer and DSP pathways. This section also provides an update on 2018 initiatives, including the Super Savers Program, which is a NWS effort to attract load response through a multi-solution portfolio of targeted efficiency, DR, and customer-sited distributed energy resources (DER), as well as PSEG Long Islands EV and BTM storage programs.
- **Section 4** outlines a series of initiatives to begin to transform the Long Island grid toward DSP functionality as defined by REV, evolving the distribution grid into a multifaceted platform that can functionally integrate DER and foster innovative new business models. Funding is sought to continue deployment of utility-scale storage and develop hosting capacity maps. Additionally, a progress update is provided on 2018 DSP-enabling initiatives, which includes the Utility of the Future team and the activities it has underway. PSEG Long Island also has many DSP-enabling initiatives underway which are funded outside of Utility 2.0, as described in the appendices.
- **Section 5** provides an overview of the overall Utility 2.0 program budgets and correlating rate impacts. While a positive net benefit is central goal of the proposed initiatives, other important aspects such as testing and learning new approaches, such as through hypotheses testing, as well as the advancement of policy goals focused on lowering carbon and resource diversity were considered.

1. PSEG Long Island's Vision and Roadmap

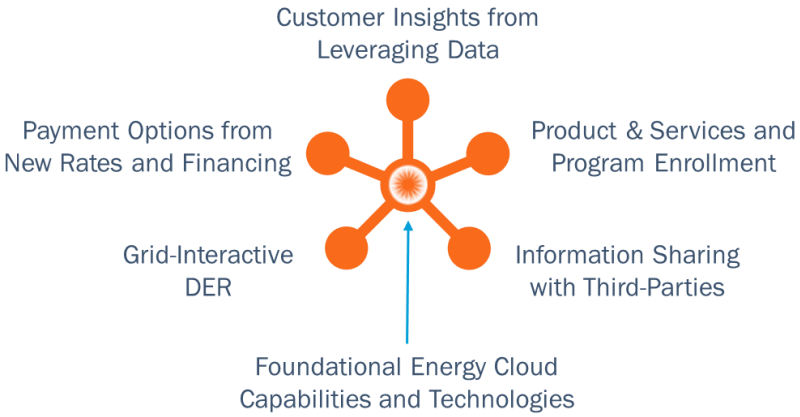
The development of new initiatives and the overall direction of Utility 2.0 is informed by the continued transformation of the modern energy system. PSEG Long Island is committed to providing excellent service and valuable information to all its customers in ways that educate them on energy-related decisions. Tomorrow's customers will expect a service experience on par with other industry leaders who, in many cases, are not utilities at all, but customer-centric businesses like Airbnb, Netflix, and Amazon. Driven by these experiences, Long Island's residents, businesses, and communities will expect personalized and frictionless services that fit their lifestyles and aspirations, while maintaining value for the cost of services.

Meanwhile, the industry is seeing a significant transformation in how customers are powering their homes and businesses (Figure 2). Increasingly, customers are reducing their energy consumption, generating and storing their own electricity, and electrifying previously fossil fuel-powered building systems and vehicles. Growing up with the tools to manage engagement with their physical and digital worlds at their fingertips, first-time customers will expect greater lifestyle integration from their energy providers. Similarly, commercial customers are facing pressure to keep pace with sustainable, innovative, and customer-centric business models while managing their energy costs.

To handle the operational variability introduced by energy efficient technologies, electrification, and other distributed energy resources (DER), operators will rely on pervasive, intelligent digital networks that support complex operations. This will be achieved through the deployment of new technologies like advanced sensors, two-way communication networks, Internet of Things platforms, and customer engagement solutions deployed as a foundational Distributed System Platform (DSP) in alignment with the definition of a DSP by the NY Joint Utilities.

As the utility evolves, PSEG Long Island, working with LIPA, will continue to evolve its solutions, initiatives, and projects to support its customers, vision, and mission in accordance with New York State's goals, as it has done since initiating its Utility 2.0 Plan in 2014. PSEG Long Island aspires to lead the industry by becoming a best-in-class customer-centric DSP across its customer offerings and grid operations while supporting New York's vision of sustainable, open, and customer-centric energy services.

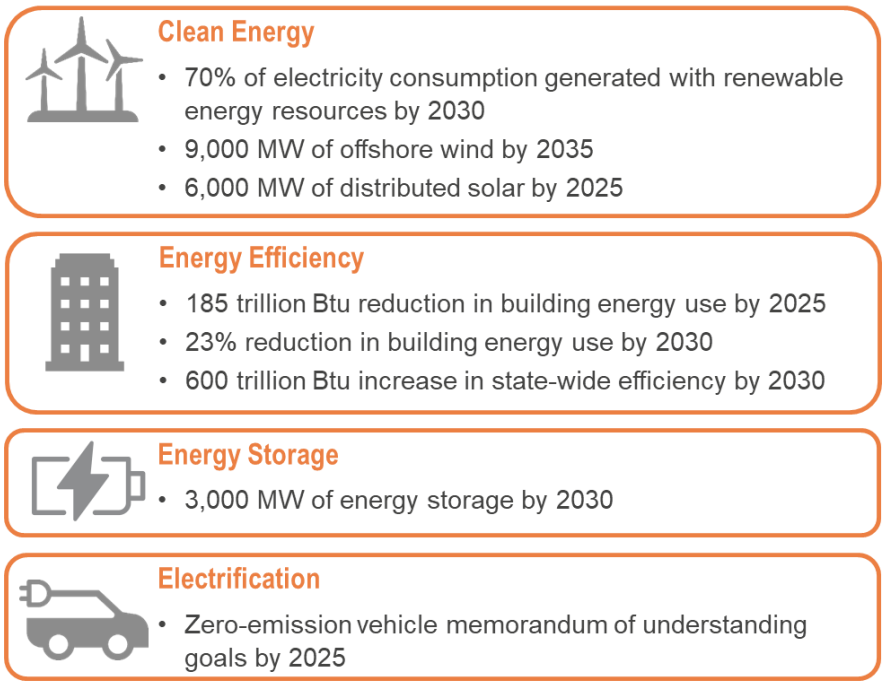
Figure 1-1. PSEG Long Island's Customer-Centric DSP



1.1 NY State Policy and REV on Long Island

Since 2014, New York State has adopted nation-leading policy goals which it has advanced through the Public Service Commission's Reforming the Energy Vision, or REV, orders to "reorient both the electric industry and the ratemaking paradigm toward a consumer-centered approach that harnesses technology and markets."[11] Over the next decade, New York State's focus on sustainability, the electrification of transportation, the introduction of distributed resources, and the increase in customer expectations will require New York utilities, including PSEG Long Island to reinvent how they engage with customers and third-parties. Figure 1-2 represents a summary of the State's policy goals, as articulated in its recent climate bill[12], focused on achieving 100% reduction of the electricity sector's greenhouse gas emission by 2040.

Figure 1-2. NY State Policy Goals



Source: NY State

PSEG Long Island, under its structure with LIPA, is uniquely positioned to respond to NY Climate Bill and REV. The structure on Long Island is unique in the US electric industry in that the utility that manages and operates the system, PSEG Long Island, does not own the assets or raise the capital that funds long-term investment – that role is served by LIPA. PSEG Long Island acts as the service provider, essentially an independent contractor, that operates the system on behalf of LIPA. Rather than earn its financial return through recovering costs plus a return on rate base, as an investor-owned utility would, PSEG Long Island is paid a management fee for prescribed services with an incentive for added compensation based on performance against established operating targets. Arguably, this is the purest form of performance-based ratemaking in the industry today. See additional details on this structure and how PSEG Long

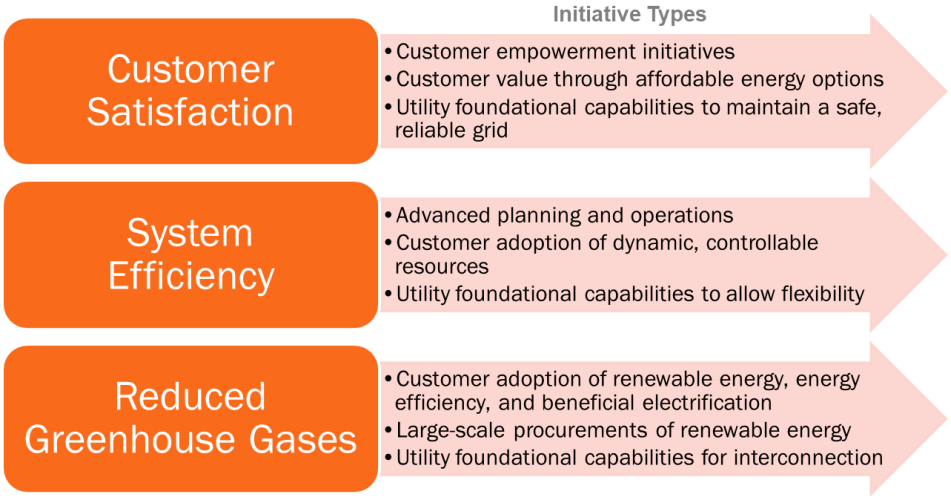
[11] "Proceeding on a Motion of the Commission in Regard to Reforming the Energy Vision," Case 14-M-0101 and *Order Adopting Regulatory Policy Framework and Implementation Plan*, February 26, 2015.

[12] This statement and graphic reflect the goals of NY Senate Bill S6599 at the time of publication of this filing. For the latest, see https://www.nysenate.gov/legislation/bills/2019/s6599

Island addresses REV through its activities and filings including, but not limited to Utility 2.0, in Section 1.3 and in Appendix A.

PSEG Long Island believes advancing NY Climate Bill and REV objectives are core to Long Island's energy future. For its initiatives, PSEG Long Island drivers can best be summarized in three guiding principles that mirror REV objectives in Figure 1-3. These guiding principles can be seen in Utility 2.0 and related initiatives.

Figure 1-3. PSEG Long Island's Guiding Principles



1.2 Utility 2.0 Vision and Strategy

PSEG Long Island's mission is to build an industry leading electric service company that places safety first, in all it does, providing its customers across Long Island and the Rockaways with:

- Excellent customer service.
- Best-in-class electric reliability and storm response.
- Opportunities for energy efficiency and renewable energy.
- Local, caring, and committed employees, dedicated to giving back to their communities.

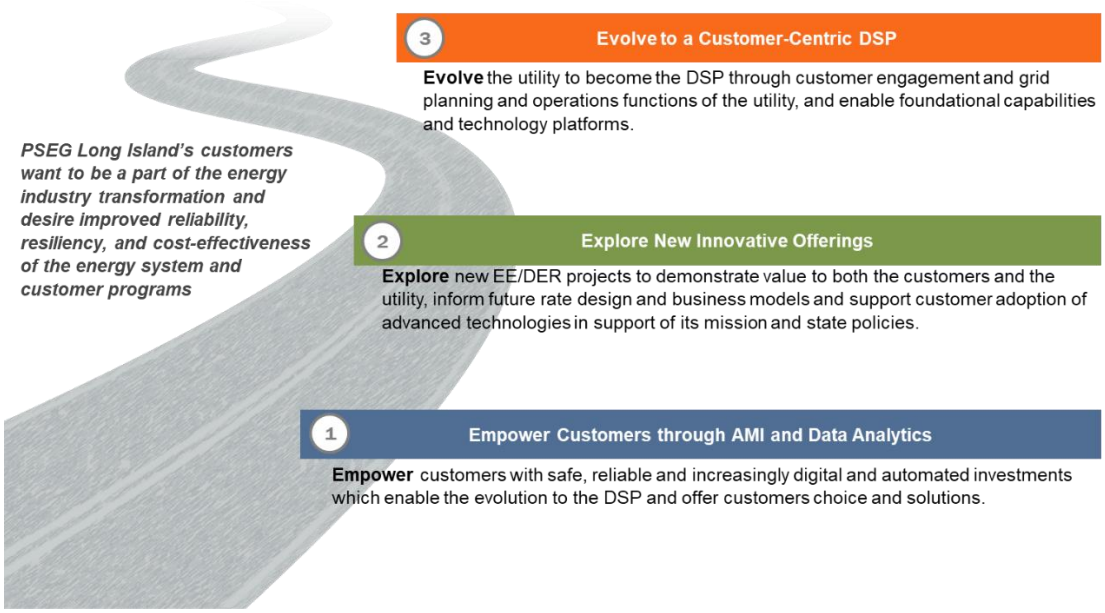
Building on its ongoing efforts, mission, and the state of the market, PSEG Long Island's Utility 2.0 vision is to be a customer-centric, innovative, and forward-looking utility that provides clean and reliable energy, develops options for new energy products and services, and enables customers to make informed energy decisions.

Figure 1-4. PSEG Long Island's Utility 2.0 Vision and Strategy

PSEG Long Island's Utility 2.0 vision is to be a customer-centric, innovative, and forward-looking utility that is dedicated to a clean, reliable and resilient energy system. PSEG Long Island will achieve this vision by empowering its customers through AMI, exploring new offerings, and evolving to become the utility of the future, including performing functions of the DSP, for Long Island and the Rockaways.

As described in its 2018 Utility 2.0 filing (Figure 1-5), PSEG Long Island has employed a three-pronged strategy to execute on its Utility 2.0 vision and drive down the road from today to tomorrow.

Figure 1-5. PSEG Long Island's Strategic Path

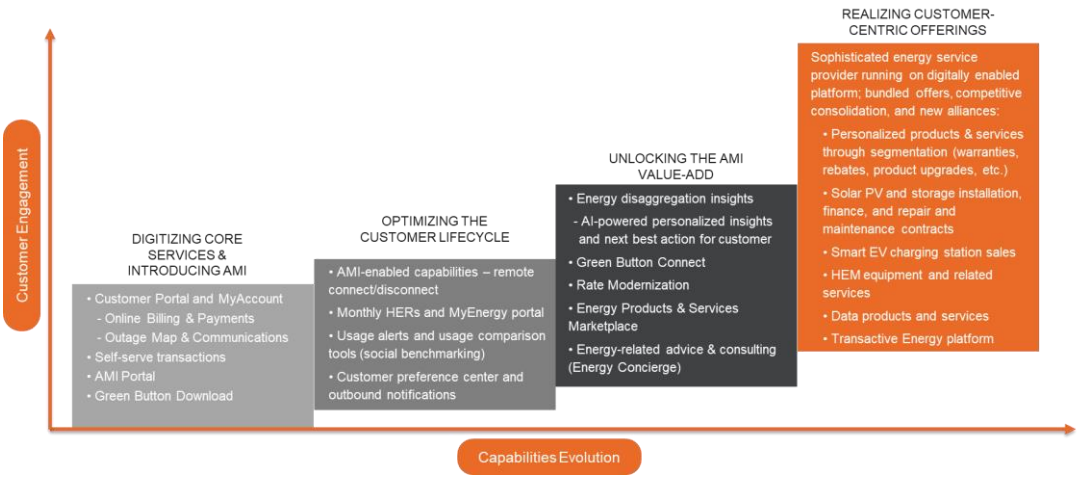


As PSEG Long Island progresses down this road it will continuously improve and refine its strategy and tactics to realize its vision. In each annual Utility 2.0 filing, PSEG Long Island will use past learnings to inform the projects that are pursued going forward. With this approach, PSEG Long Island can be flexible and responsive to the needs of its customers.

1.2.1 Empowering Customers through AMI and Data Analytics

PSEG Long Island's objective is to continue to improve customer engagement by leveraging AMI capabilities currently being deployed and by gradually adding new capabilities that leverage data-driven insights (customer-facing and utility-facing). These capabilities build and improve over time to continuously extract value from AMI-enabled technology and data for the benefit of PSEG Long Island's customers, thereby helping drive the overall customer engagement and improve customer experience (Figure 1-6).

Figure 1-6. Evolution of Customer Engagement Capabilities



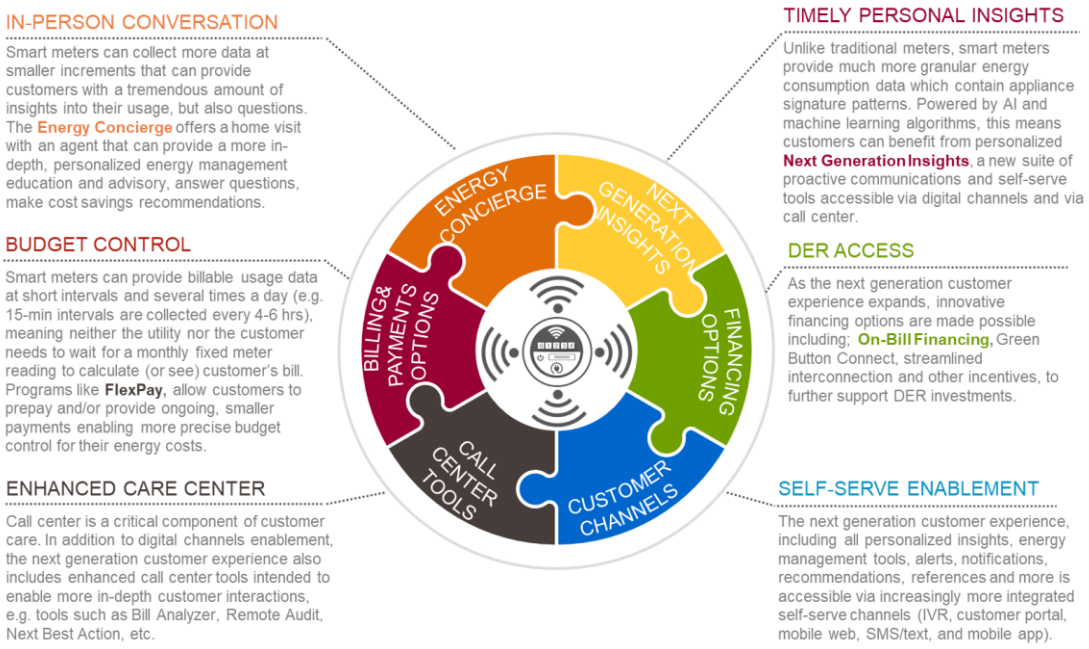
Source: Adapted from "The Changing Value of Customer Experience in the Energy Cloud," Navigant

PSEG Long Island has an opportunity to leverage AMI meters interval data and provide customers with personalized energy usage and actionable energy cost insights, enabling greater engagement than what would otherwise be achievable. With each successive addition of AMI functionality for customers, additional grid operations and financial integrity value is realized from AMI that benefits all stakeholders. By providing customers with support throughout their journey to efficient and renewable adoption, PSEG Long Island hopes to empower customers not only with information, but also with the tools to see these changes through.

PSEG Long Island's 2018 Utility 2.0 filing set the foundation for this customer platform by providing AMI access to all customers, establishing foundations of data analytics capabilities and improving the tools that customers have at their disposal through My Account. With 2018's approval of foundational technology and capabilities - e.g. deployment of customer portal for commercial and industrial customers, implementation of an advanced billing engine to support rate modernization - this filing is focused on an update on the implementation of those initiatives. In parallel, customer experience pilot projects, as described below, are proposed to test personalized energy insights and encourage customers to act on those insights and make informed, affordable, and environmentally-friendly decisions.

Collectively, PSEG Long Island's 2018 and 2019 Utility 2.0 initiatives for customers comprise a suite of informational and advisory tools containing the building blocks of PSEG Long Island's next generation customer experience (Figure 1-7). Over time, PSEG Long Island intends to continuously monitor the success of these building blocks and initiatives, evolving or adding to them based on direct customer feedback through its customer engagement plans and successful pilots (reference Section 1.2.2).

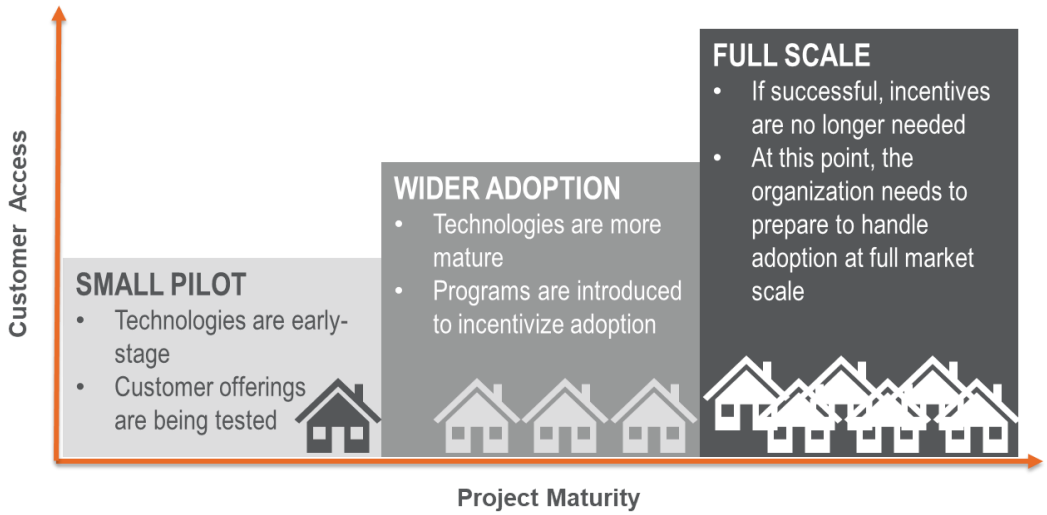
Figure 1-7. Next Generation Customer Experience



1.2.2 Exploring New Innovative Offerings

PSEG Long Island strives to be at the forefront of innovation by exploring new customer offerings that expand its utility services or by identifying new ways in which third-party assets could be used to provide grid benefits. Initially, these offerings would be tested through set-duration programs or pilot projects that will provide more experience with new energy technologies or customer strategies. If successful, these initial experiments could be scaled across Long Island for the benefit of all customers (Figure 1-8).

Figure 1-8. Maturation of New Innovative Offerings



Consistent with Utility 2.0 Roadmap (U2.0 Roadmap) (Section 1.3), PSEG Long Island will pursue:

- **Customer Experience Pilots:** Test capabilities that provide customers with personalized insights, enhanced agent tools, and billing options, and if successful, would be added to PSEG Long Island's Next Generation Customer Experience at scale.
- **Grid-Interactive Pilots:** Test new customer- or grid-sited technologies that could provide shared benefit to customers and the grid and, if successful, would be scaled to Long Island-wide programs or adopted by PSEG Long Island's transmission and distribution (T&D) teams.
- **Energy Efficiency (EE) Programs:** Incentive programs for energy efficient technology adoption in accordance with New Efficiency: New York. These programs are proposed in PSEG Long Island's 2020 Energy Efficiency and Renewable Plan to be filed shortly after this Utility 2.0 plan.
- **DER Programs:** Incentive programs for DER technology adoption, such as EVs, battery storage, non-wires solutions (NWS), or other initiatives that are not addressed in PSEG Long Island's Energy Efficiency and Renewable Plan.

In 2018, PSEG Long Island's offerings focused on programs to increase adoption of DER technology through its Super Savers NWS program, EV charger incentives, and behind-the-meter (BTM) storage incentives. Utility-scale storage was also included as an innovative offering; however, as T&D pursues additional storage applications as foundational DSP-enabling technology, future updates and projects will be included in that section.

In 2019, PSEG Long Island's proposed offerings explore a suite of in-person, Customer Service Representative (CSR) and self-serve customer interactive tools that provide insights and guidance on energy management, new customer payment options, including both bill payment and DER financing, and technology tests that will transform DER on the grid-to-grid assets that promote system efficiency, such as with vehicle-to-grid technology and heat pump controls.

Working with third parties is yet another way PSEG Long Island can reach its customers. Third-party engagement can potentially generate more innovative solutions to improve the environment, increase the efficiency of the grid, and reduce the customer's costs. PSEG Long Island will continue to build upon these programs and explore partnerships with third-party market participants to deliver value through business model innovation, such as through its continued work with REV Connect.[13] PSEG Long Island will execute its strategy to develop its innovative products, solutions, and platforms by:

- Building upon its organizational experience
- Institutionalizing learning
- Informing the opportunity to scale innovation
- Engaging customers in new ways
- Partnering with third-party energy service providers

1.2.3 Evolving to a Customer-Centric DSP

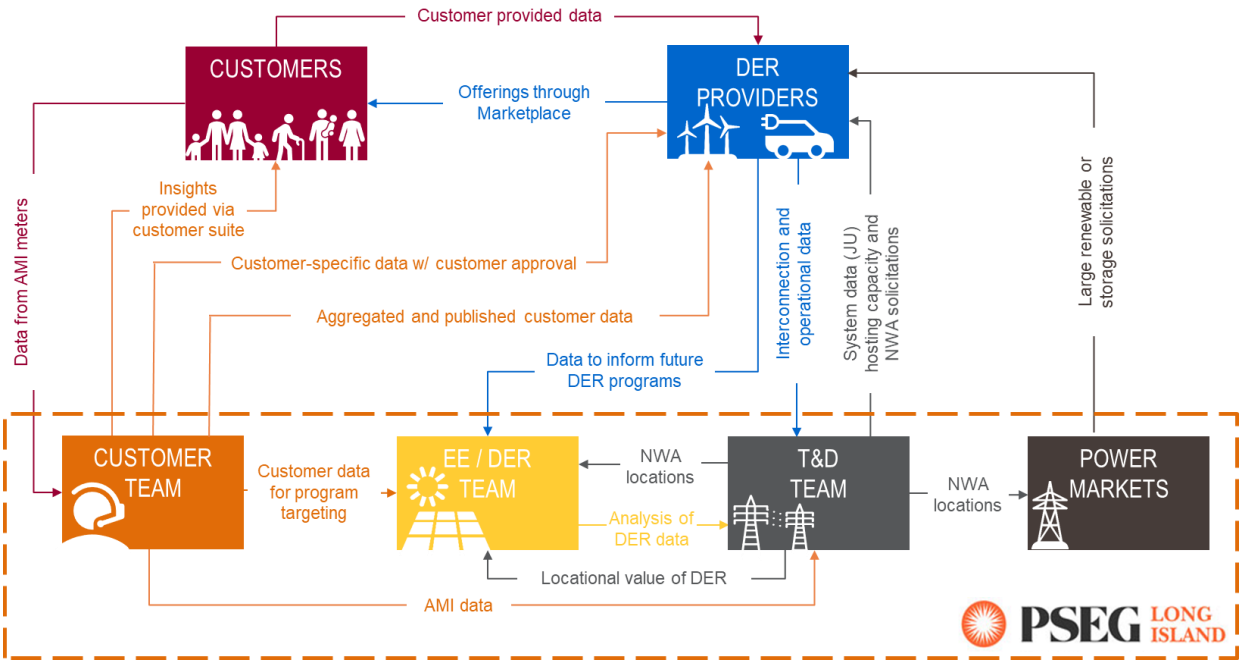
PSEG Long Island, alongside the New York Joint Utilities, expect that DER (end-use EE, demand response [DR], distributed storage, and distributed generation [DG]) will be key to achieving its vision to serve its customers of the future. To facilitate adoption and grid integration of these resources, PSEG Long Island shares in the Joint Utilities' vision of transforming themselves into a utility that performs the

[13] REV Connect: nyrevconnect.com

functions of the DSP and that will offer DER products and services, creating new sources of value for customers and market participants. The DSP enables PSEG Long Island to use its grid infrastructure, systems and programs to integrate DER and animate a robust marketplace of options for customers. Under the policy of the State of New York's Reforming the Energy Vision or REV, the DSP is a central vehicle to facilitate state energy and environmental goals.[14]

Through its Utility 2.0 and parallel efforts, PSEG Long Island will evolve to the DSP and transition away from the historic model of a unidirectional electric system serving inelastic demand. PSEG Long Island's continuing efforts to modernize and strengthen its electrical distribution system while creating opportunities for customers to take control of their energy use and bill are aligned with New York's REV initiative. This transformation will touch all aspects of PSEG Long Island's organization and enable efficient and effective access to data across departments and externally with customers and DER providers (Figure 1-9). PSEG Long Island has already begun developing its Utility 2.0 governance structure (5.2Appendix B) to support an internally coordinated effort.

Figure 1-9. DSP Data Ecosystem



As a future DSP, PSEG Long Island will plan for and operate a dynamic grid that encompasses both sides of the utility meter and relies increasingly on distributed resources and dynamic load management. To enable this evolution, PSEG Long Island will pursue DSP-enabling initiatives that will ensure its electrical distribution system can serve as the foundation of the DSP. Leveraging the existing T&D infrastructure is critical to efficiently integrating intermittent and nascent technologies into the electric grid to reduce greenhouse gas (GHG) emissions, lower customer costs, and increase reliability and resilience.

[14] According to the New York Department of Public Service the DSP is "an intelligent network platform that will provide safe, reliable and efficient electric services by integrating diverse resources to meet customers' and society's evolving needs. The DSP fosters broad market activity that monetizes system and social values, by enabling active customer and third-party engagement that is aligned with the wholesale market and bulk power system."

PSEG Long Island is optimizing system investments to coincide with the penetration of customer-centric technology and developing an integrated set of actions to be implemented programmatically. PSEG Long Island's goal of the DSP is to enable balanced, long-term outcomes for customers, to maximize the value of customer DER, and to position PSEG Long Island's networks for resilience.

Enabling the DSP requires enhancing existing T&D platforms, tools, and information available to T&D organizations. To support these efforts, the Utility of the Future group will explore and utilize advanced technologies to evolve the PSEG Long Island DSP vision. PSEG Long Island is exploring technologies like power flow models, DER management systems (DERMS), advanced distribution management systems (ADMS) and outage management systems (OMS) to provide a platform for the DSP vision and to further align with New York REV objectives. The Utility of the Future (UoF) (Section 4.1.1) organization will leverage best practices from the industry to collaboratively define the technology needed to integrate renewables, reduce carbon, reduce energy consumption, improve system resiliency and pave the way for a customer-centric DSP platform. The UoF organization will also work with the statewide DSP Market Design and Integration Working Group to develop market structures for DER and renewables.

PSEG Long Island has made substantial progress in developing the systems, processes, and capabilities that enable DSP 1.0. Investments will facilitate continued progress in DSP 1.0 by focusing on:

- **DER integration capabilities:** Integrated planning; operational communications; granular load forecast and customer consumption behaviors; measurement, monitoring, and control capabilities; distribution automation; IOAP Portal and distribution management systems.
- **Information sharing capabilities:** Data management and analysis software; customer and aggregators interfaces.
- **Market services capabilities:** Non-wires solutions (NWS) planning and procurement; New York Independent System Operator (NYISO) coordination.

1.3 Utility 2.0 Roadmap

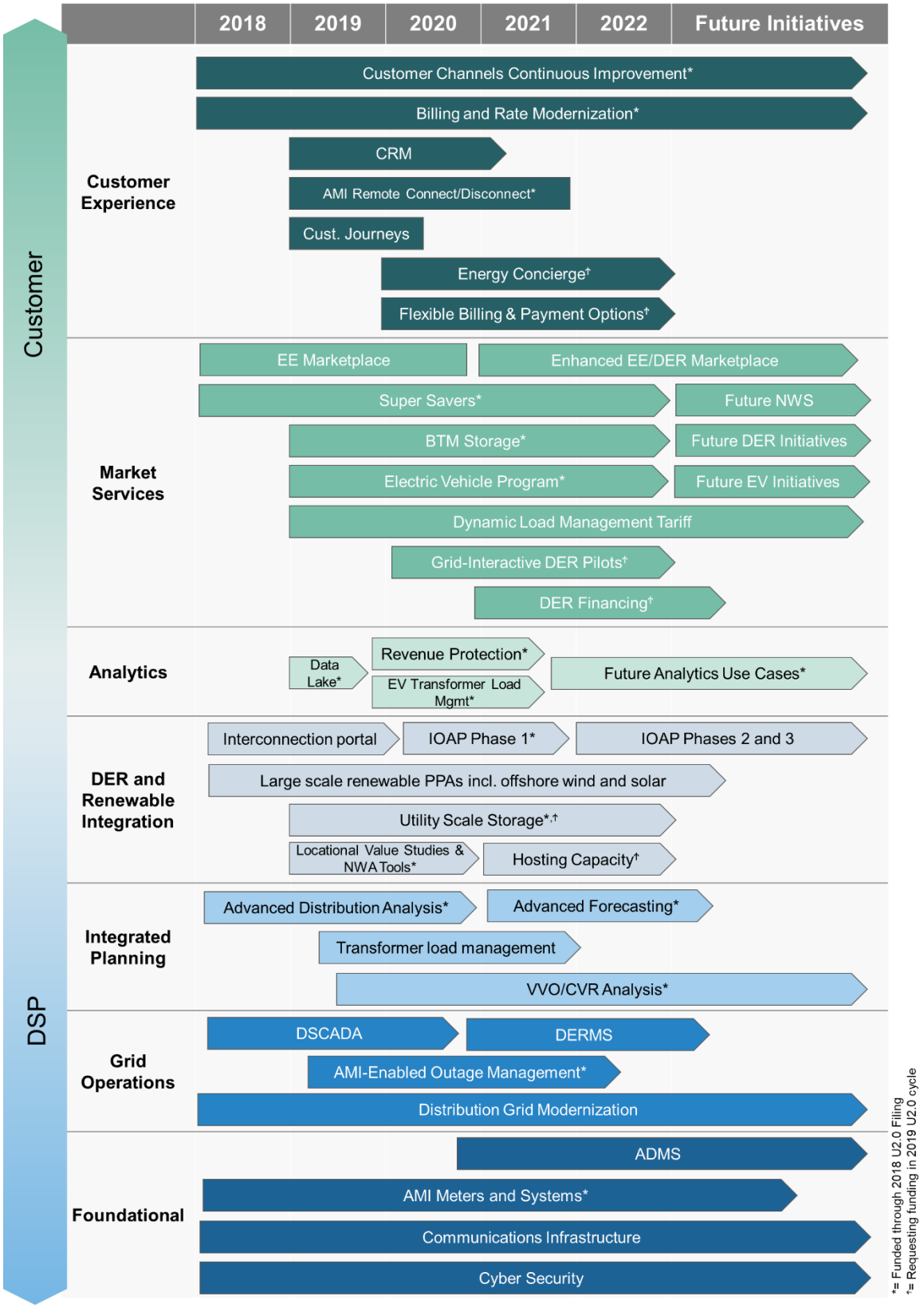
PSEG Long Island's efforts to modernize and strengthen its electrical distribution system while creating opportunities for customers to take control of their energy use and bill are summarized in the U2.0 Roadmap (Figure 1-10). Many, but not all, of these initiatives are funded through Utility 2.0. Over time, PSEG Long Island will update this roadmap to reflect the latest thinking on strategic pursuits on the horizon, including alignment with LIPA's strategic planning.

As this roadmap shows, PSEG Long Island is pursuing its vision through parallel efforts to improve its customer offerings and build DSP-enabling capabilities. Chevrons related to the 2018 and this year's 2019 Utility 2.0 filing are identified accordingly and described in the main body of this filing while some represent related initiatives are also included in this roadmap and described in Appendix D. These efforts are categorized into seven initiatives:

- **Customer Experience:** These are customer-interactive capabilities that empower customers through data-powered insights, connect customers seamlessly to energy products and services, expand billing and payment options, and add more financing options.
- **Market Services:** These services connect customers to PSEG Long Island's pricing options and programs as well as to products and services offered by third parties.
- **Energy Cloud Analytics:** This category encompasses use cases that harness enterprise data to provide nuanced insights that improve customer experience and operations across PSEG Long Island's functions.

- **DER and Renewables Integration:** These projects meet PSEG Long Island's goals for renewable generation and safely and expediently connecting those renewables to the grid. This category includes both front-of-the-meter and BTM renewables.
- **Integrated Planning:** Evolve the T&D planning process to facilitate DER integration and to enable key DSP capabilities. This suite of capabilities ensures the reliable, safe, and efficient planning and design of the electric T&D network.
- **Grid Operations:** These investments are needed to manage, maintain, and operate the electric power system to achieve system stability, power quality, and reliability.
- **Foundational Technologies:** Communications and operations infrastructure needed to enable both DSP and customer objectives, including DER integration and market participation.

Figure 1-10. PSEG Long Island's Roadmap



2. Empowering Customers through AMI and Data Analytics

PSEG Long Island is committed to engaging customers and providing them with more information and opportunities to control their energy usage. Through foundational investments like AMI, the company will provide customers more granular and timely usage data viewable through a streamlined platform and easily transferred to authorized third parties. PSEG Long Island's next generation customer experience (Figure 1-7) provides a lasting platform from which new capabilities can be added, successful pilots can be scaled, and under-utilized tools can be improved or removed—all driven by what has proven to satisfy customers through a robust Voice of the Customer research program.

Over time, initiatives to empower customers will evolve and improve, increasingly using the data made available through PSEG Long Island's analytics initiatives and putting the power of those analytics in the hands of customers through self-serve channels and via agent-assisted channels. PSEG Long Island will ensure that all capabilities and programs make the most of these insights available through internal governance and change management.

2.1 Progress to Date

An update on the programs approved in 2018 focused on empowering customers is provided in the following sections and in greater detail in the Utility 2.0 Outcomes Dashboard (See Appendix C) as well as other initiatives outside of Utility 2.0 (see Appendix D.1).

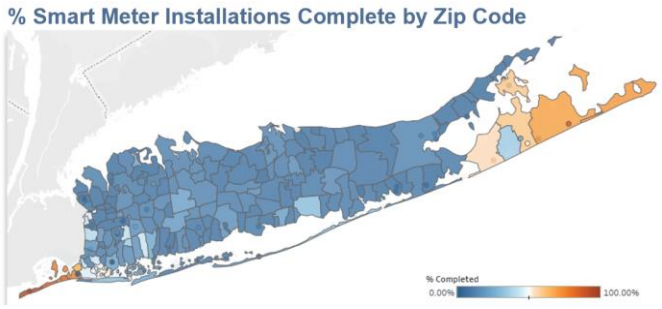
2.1.1 AMI Technology and Systems – Smart Meter Deployment

PSEG Long Island successfully installed more than 77,000 smart meters in the first quarter, positioning themselves to meet the 2019 goal of 250,000 meters.[15] When full-scale deployment launched in January 2019, the deployment team learned that the existing work management system and work flow processes were not structured to properly handle the increase in deployment volume; the IT team addressed outages that kept meter technicians from installing meters for several days in January and February. However, through a positive partnership with International Brotherhood of Electrical Workers Local 1049, coordination efforts amid the increase in installation field crews, seasoned teams, and hands-on leadership, PSEG Long Island ultimately exceeded its planned installation target. Deployment will continue until complete in 2022.

[15] PSEG Long Island has a yearly goal of deploying 230,000 smart meters through the Utility 2.0 program. This is supported by additional smart meter deployment occurring as part of the utility's core operations, summing to a goal of 250,000 smart meters per year from 2019 to 2022.

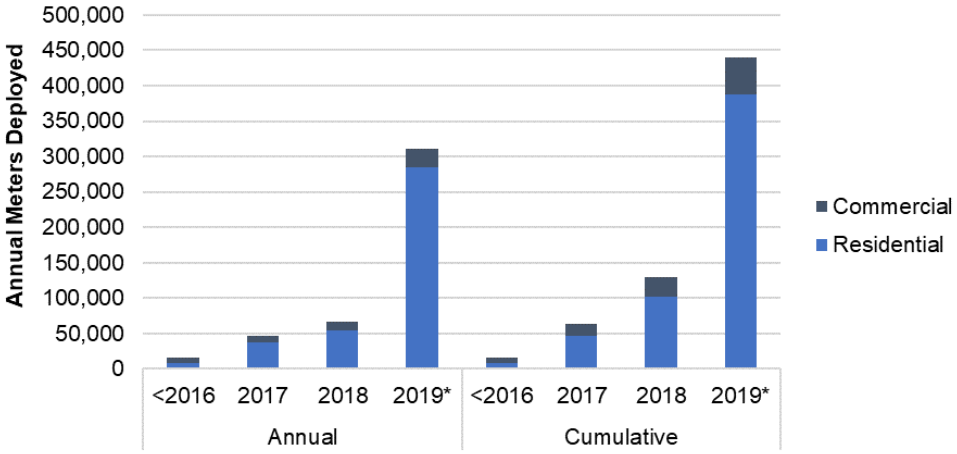
Figure 2-1. Smart Meter Deployment Progress

Deployment is currently focused in the Rockaways and South Fork and will move into North Fork, East End, Northwest Nassau County and Central Suffolk during 2019.



A graphical presentation of annual and cumulative commercial and residential smart meter deployment is presented in Figure 2-2.

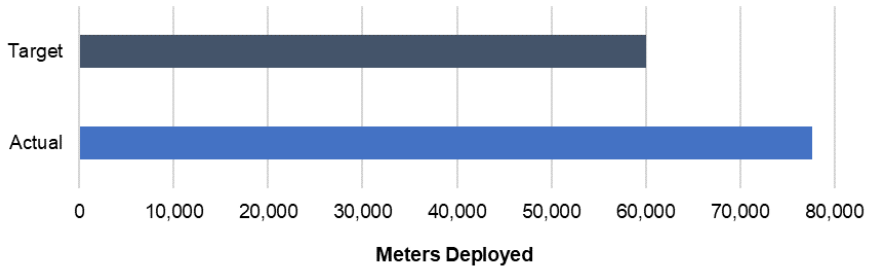
Figure 2-2. Annual and Cumulative Smart Meter Deployment[16]



**2019 is a year-end projected value*

The bar chart highlighting Q1 2019 in Figure 2-3 shows that PSEG Long Island surpassed the cumulative (residential and commercial) quarterly AMI deployment target of 60,000 meters.

Figure 2-3. Q1 2019 Residential & Commercial Meter Deployment



[16] Cumulative meter installation counts may differ from the cumulative count of individual per year installations as numbers are reflective of the time at which communication with the meter is established, which may be captured in subsequent years' data. Additional changes are attributed to meters that are requested to be removed at a later time.

2.1.2 Program Implementation Support: Business Process Design, Change Management

In conjunction with deploying smart meters, PSEG Long Island is beginning the design and implementation of business processes. Business process design is the means to change operational approach, so the value of new technologies and systems can be realized. These processes use AMI to improve operations, especially with regard to minimizing the impact of outages, and to gain valuable insight into system conditions and customer needs.

Initial implementation support focused on Remote Connect Switch (RCS) capability and OMS integration to AMI. Teams of business, functional, IT, and change management experts defined business and IT requirements and developed to-be business process flows to automate RCS and OMS processes. The change management team completed stakeholder and change need assessments for RCS and OMS, developed a communications plan, and launched a change agent network across impacted teams. Implementation support will continue for further AMI-enabled capabilities to include the advanced billing engine (time-of-use [TOU]) rates for customers and advanced analytics to analyze system conditions.

2.1.3 Customer Engagement

At this stage in meter deployment, the customer engagement focus includes the communication campaign, which supports meter installation to educate and avoid pre- or post-installation opt-outs. The communication campaign also includes reaching out to customers after installation to check on the experience and reinforce the new capabilities at their disposal. This communication includes letters, emails, and calls prior to meter installation, and emails, postcards and informational newsletter after installation. As more customers have smart meters installed, focus will increasingly shift toward post-installation engagement around benefits and offerings due to AMI.

Figure 2-4. Success Snapshot – Customer Engagement

After initially refusing installation of nearly 300 smart meters, the Shinnecock leadership met with PSEG Long Island and was provided information on smart meter installation and benefits. Shinnecock leadership now welcomes AMI and has requested a visit from the My Smart Energy Lab to further inform the community.

Since launch of full-scale smart meter deployment, PSEG Long Island has seen low levels of negative media coverage and no substantial increase in customer calls. The customer engagement team continues community engagement through meetings with elected officials and stakeholders, development of the mobile My Smart Energy Lab (formerly the Smart Technologies Mobile Education Center), and planned customer focus groups for later in 2019.

Figure 2-5. My Energy Smart Lab

2.1.4 AMI-Enabled Capabilities

PSEG Long Island's roadmap calls for a phasing in of AMI-enabled capabilities. The focus for 2019 has included rate modernization, outage management, and revenue protection.

Rate Modernization

To provide new rates to customers, PSEG Long Island is building an Advanced Billing Engine that will allow the utility to adapt internal systems to provide simple, easy to understand, customer-centric rate options. It has been a challenge for the utility to align vendor solutions with planned capabilities and the integration requirements of current IT systems. To address this, technical meetings with vendors have helped to define the project scope and integration requirements for the Advanced Billing Engine solution. PSEG Long Island plans to model pilot customer rates and test billing operations for the Advanced Billing Engine in early 2020, and is currently developing rate pilots for TOU and EV rates

Customer research conducted in the second half of 2018 and in the first half of 2019 has enabled PSEG Long Island to confirm key aspects of initial rate designs, associated bill designs, identify more likely to adopt customer segments and clarify key message framing for introducing customers to these new choices. Research has identified important personalized information that is required by customers to make confident informed decisions when considering switching rate plans. This research as well continuing research in 2019 will inform system design and associated customer engagement solutions.

Outage Management

Following successful business process design in the first quarter, OMS integration to AMI will begin in the second half of 2019.

Revenue Protection

PSEG Long Island has conducted several best practice interviews to learn how best to implement revenue protection. The utility is developing analytics capabilities that will use AMI data to identify various energy theft and meter tampering scenarios. Remote connect switch integration, which has completed business process design and proceeded to technical design, will also support revenue protection with immediate, remote disconnect on closed accounts.

Commercial and Industrial (C&I) Portal

PSEG Long Island has awarded a contract for the development of a new C&I Portal to First Fuel. This new software will offer exciting insights to commercial customers including multiple account energy aggregation, energy saving tips, energy use benchmarking, etc. The portal is expected to go live in 4Q 2019.

2.1.5 Data Analytics

As described in the 2018 Annual Utility 2.0 Filing, applied analytics are essential to PSEG Long Island's U2.0 vision and to achieving the full value of the AMI-enabled, digital grid. PSEG Long Island is receiving troves of real-time, granular AMI data every day, along with grid and customer data from various sources. Mining this data can provide insights that fundamentally change how PSEG Long Island serves its customers and how it manages the overall business. This will lead to a more reliable grid for its customers while improving overall customer satisfaction.

The base foundational structure has been established through an iterative process utilizing two use cases - Electric Vehicle (EV) and Revenue Protection analytics. Business analysts and domain experts have begun to unlock the benefits of big data for the organization through insights into customer EV charging behavior and potential revenue leakage scenarios.

Figure 2-6. Success Snapshot – Analytics

Using AMI data, customers can easily view energy use at 15-minute intervals, track usage, and spot trends. Customers can also receive MyAlerts texts or emails to alert them of a nearing usage threshold or weekly usage summary.

In parallel to the Analytics team, a Utility of the Future team has been established, as described in Section 4.1.1.

Technical Architecture

PSEG Long Island has delivered a core big data cloud platform in May 2019, with platform security and cloud infrastructure components. Today, the big data cloud platform is collecting 63 million meter reads daily from the meter data management system along with other key customer and T&D datasets.

Data Governance

In the first quarter of 2019, PSEG Long Island established the overarching Energy Cloud Data Governance Model, identifying business data owners, data stewards and data custodians. The next step is to formalize the Cloud Data Governance Organization and operating model to support ongoing analytics use cases.

Use Case Implementation

PSEG Long Island identified two use cases as high priority for 2019 implementation: Theft Analytics and EV Analytics.

- **Theft Analytics:** PSEG Long Island is identifying potential energy theft scenarios based on AMI interval data, providing revenue protection personnel with an objective basis for investigating accounts, rather than relying on field inspections. In future releases, machine learning algorithms will be used for consumption anomaly detection and predictive modelling of theft scenarios.
- **EV Analytics**: The AMI-based analytics solution provides insights on EV customer behavior, their charging patterns as well as the potential impact of these EVs on the grid. PSEG Long Island will be able to better serve its customers by designing new rates options for them along with EV programs tailored to meet their needs. EV Analytics will also mitigate any potential transformer overload conditions associated with projected EV growth and adoption on Long Island. PSEG Long Island can proactively repair or replace transformers susceptible to overloads due to multiple EV customers, resulting in a more reliable network for PSEG Long Islands customers.

Customer EV charging patterns can also be used to identify suitable locations for charging stations to promote EV adoption on Long Island.

In the future, both the Revenue Assurance and EV analytics will continue to grow and evolve using more advanced modelling methodologies. Application of Artificial Intelligence solution such as machine learning will continue to provide the depth of knowledge to support ongoing decision making. Finally, the availability of AMI data and its incorporation with other data sources will provide additional benefits through new and innovative use cases. Some use cases being considered are:

- ETR accuracy
- transformer load analysis
- asset management
- customer usage patterns
- rate design
- customer segmentation
- performance of energy efficiency programs

2.1.6 Data Privacy

With the increase in digital information transfer, data privacy is an increasingly integral part of utility operations. PSEG Long Island assesses its data privacy framework, practices, and procedures as recommended by the National Institute of Standards and Technology (NIST) and the Fair Information Practice Principles (FIPP). As of the first quarter of 2019, PSEG Long Island is in complete alignment with 12 out of 18 NIST and FIPP recommendations, partially aligned with five recommendations, and not aligned with one recommendation. Since July 2018, PSEG Long Island data privacy practices around management and accountability and openness, monitoring, and challenging compliance have been addressed to align with recommendations, and plug-in EV privacy concerns have been improved from non- to partial alignment. Details on partial and non-alignment are available in the Utility 2.0 Outcomes Dashboard (See Appendix C).

2.1.7 Related Initiatives Outside Utility 2.0

PSEG Long Island is implementing several enhanced capabilities to improve the overall customer relationship management and expand communication options with its customers. The initiatives work in concert with Utility 2.0, leverage the foundational AMI investment, and are intended to continue to support PSEG Long Island's vision of Utility 2.0 in the long-term. PSEG Long Island is currently one of the leading utilities in terms of digital intelligence, according to the J.D. Power Digital Intelligence Benchmark, and has continued to implement an array of tools to modernize the customer experience. PSEG Long Island is expanding its suite of digital tools to include a mobile application and Salesforce web chat option in addition to its existing digital tools for customer engagement such as the Alexa Skill and AMI data driven energy usage notifications and alerts.

2.2 No Funding Request for AMI and Data Analytics in 2019

With its focus on implementation of AMI and related initiatives funded in 2018, PSEG Long Island is not requesting funding for any new full-scale initiatives for empowering customers through AMI and data analytics in this year's filing. See Section 3.2 for information on customer experience pilots which PSEG Long Island is proposing this year.

3. Exploring New Innovative Offerings

PSEG Long Island has adopted a culture of exploration and innovation by continuously testing new customer offerings and grid-interactive technologies and encouraging adoption of technologies that have been proven valuable and in alignment with New York State policy goals and LIPA initiatives.

With the 2018 Utility 2.0 filing and ongoing Energy Efficiency and Renewable Plan efforts, PSEG Long Island has laid the groundwork for increased adoption of beneficial DER. With that in place, PSEG Long Island has shifted its focus to a test, learn, and scale approach to future program development. Included in this year's filing is a set of four pilot projects that will collectively change the way customers pay for their utility services and transform customer devices into controllable tools that provide both customer comfort and grid benefit.

With this increased focus on innovation and learning, PSEG Long Island has developed a testing methodology for justifying proposed pilot projects. Most of the pilot concepts and third-party partners originated through REV Connect (see Appendix D.2.2). For each of the pilot projects, a test case will be defined, including a set of test hypotheses and target metrics these pilots are aiming to achieve. While projects are not REV demonstration projects, each pilot has been aligned with the principles used by the IOUs in New York.[17]

At the end of the pilot, a post-project BCA will be conducted to test the performance of the pilot against targets. Through this process, PSEG Long Island will identify learnings and determine if the offering should be developed into a full-scale program that would provide a forward-looking beneficial BCA. In one case, vehicle-to-grid (V2G), a pre- versus post-pilot BCA comparison was done as a tool to show that while there may not be a viable case for investment under current market conditions, there may be a viable business model in the future.

PSEG Long Island will continue to solicit future ideas for scalable, market-based solutions from customer through feedback, from the market through REV Connect, and from internal ideation and innovation channels. Additionally, PSEG Long Island will also focus on learning from its existing pilots and programs to identify opportunities to scale them up. For example, PSEG Long Island may seek to expand its Super Saver program or use information from its e-bus and heat pump pilots to identify scalable models that limit the need for utility incentives yet remain attractive to customers.

3.1 Progress to Date

The programs approved in 2018 that focused on exploring new offerings include Super Savers, Utility-Scale Storage, BTM Storage with Solar, and the EV Program. Details can be found in the Utility 2.0 Outcomes Dashboard in Appendix C.

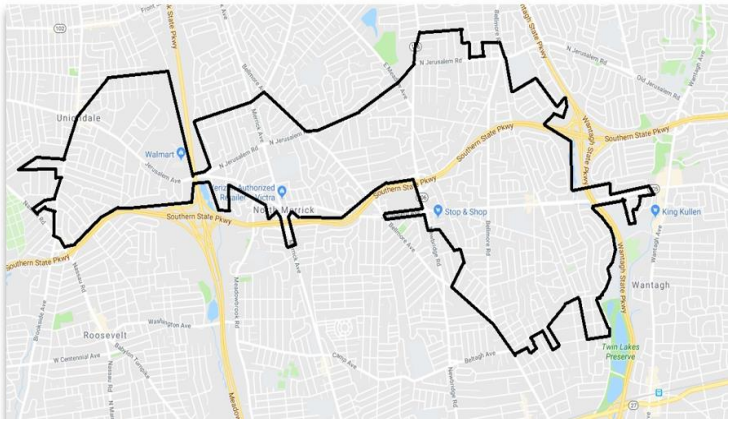
3.1.1 Super Savers: NWS with Targeted Energy Efficiency

Through the North Bellmore Super Savers pilot, PSEG Long Island is learning how to best encourage customer participation in a community program to adopt EE and DER measures and evaluate whether these efforts can avoid sufficient load to defer infrastructure upgrades. The Super Savers team responded to low program participation in the smart thermostats rebate, direct load control (DLC)

[17] Memorandum and Resolution on REV Demonstration Projects, December 12, 2014. Summarized here: https://nyrevconnect.com/rev-briefings/principles-rev-demonstrations/

program, and Power to Save rate option with further customer outreach and more rebate offers. The team is pursuing a cost-effective solution for low-cost to no-cost products such as smart thermostats and LED lighting.

Figure 3-1. North Bellmore Super Saver Program Area



In the first quarter of 2019, the team launched a ThinkEco Smart AC kit initiative, the Commercial Free Lighting initiative, and a TOU rate segmentation analysis to identify customers to target for the Power to Save rate. A major challenge is that the participant area is based on circuit boundaries and does not align with community boundaries, limiting the ability for community-centered outreach. The Patchogue Super Savers pilot program was deferred for 2020 implementation.

3.1.2 Behind-the-Meter Storage with Solar

The program focused on incorporating New York DPS recommendations into the program design and expanding to include standalone and solar-paired storage for all customers classes throughout PSEG Long Island's service territory. The program team created a modified dynamic load management (DLM) tariff that was approved by the LIPA Board of Trustees in May 2019. The team also collaborated on a New York State Energy Research and Development Authority (NYSERDA) storage rebate program to be implemented by PSEG Long Island that will allow residential customer participation by also requiring participation in PSEG Long Island's dynamic load management program.

3.1.3 EV Program

The current EV program consists of outreach and marketing, residential and commercial workplace charging programs, and a direct current fast charging (DCFC) program aligned with the Joint Utilities DCFC program. PSEG Long Island prepared the Residential Smart Charging program for an early second quarter 2019 launch and developed multiple customer marketing and outreach channels for the residential and commercial programs, including website updates, social media, partnerships with EV dealerships and car websites, and live events. DCFC website content and marketing materials are expected be available in early Q3.

The ongoing Commercial Workplace Charging program has provided rebates for 40 ports. The goal is to install 100 by the program's conclusion at the end of 2019. At that time, customers will be directed to participate in the NYSERDA commercial charging program.

Through the commercial workplace charging program, PSEG Long Island is learning how to effectively and securely collect EV charging equipment and network data shared by various third-party providers.

This is the first step in using charging data to understand the impact of EVs on load and provide EV customer rates.

In addition, responses to the PSEG Long Island Off Peak Incentive Program RFP are due in July 2019 and implementation is expected in Q4 2019. There are currently four bidders being considered.

Other initiatives considered in 2019 include the deployment of a tool to support acquisition and analysis of EV data. Data from EVs may come from various sources (e.g., chargers, vehicles, AMI) and in different formats. This tool would help to ensure that all data is consistently structured and can be automatically analyzed in aggregate, rather than required manual intervention across multiple datasets. The scope and requirements for this tool are under further consideration. The ultimate objectives are to enable PSEG Long Island to have a scalable, cost-effective framework for analyzing EV data, as well as to enable analysis that informs better planning for PSEG Long Island and better programs for its customers to support EV adoption and promote beneficial electrification.

3.1.4 Related Initiatives Outside of Utility 2.0

The projects proposed in this filing are related to a broader set of activities underway by PSEG Long Island to support grid modernization and improved customer offerings. There are various other customer offerings and PSEG Long Island initiatives related to the projects proposed in this filing; however, they are outside the scope of Utility 2.0. For example, each of the four Customer Experience Pilots (Section 3.2) will share insights with and direct customers to the features of the enhanced marketplace (Appendix 5.2D.2.3). Additionally, the heat pump controls pilot (Section 3.3.2) builds upon incentives from the EE and Renewable Plan (Appendix 5.2D.2.1) to support controls that better use ductless mini-split heat pumps. Lastly, many of the pilot ideas proposed here (Section 3.3.1) built upon ideas submitted from market partners through REV Connect, in particular the V2G and heat pump pilots that were direct responses to REV Connect's 2019 Connected Communities Innovation Sprint (Appendix D.2.2).

3.2 Funding Request for Customer Experience Pilots

Taking the next step in the evolution of its customer options, PSEG Long Island is proposing the following pilot initiatives to help customers understand insights coming from their smart meter and help them unlock the capabilities and benefits these insights can deliver. Several of the features included in these pilots will be augmented by artificial intelligence (AI) and customer segmentation, including identification of the next best EE/DER actions for customers, high bill analysis and rate advisory, and then measuring the energy and monetary savings for both the customer and PSEG Long Island resulting from these solutions.

- The first is the **Next Generation Insights**, a suite of proactive communications as well as self-serve and CSR-enabled energy insights and bill analysis tools that will enable customer engagement.
- The second is the **Energy Concierge**, a residential advisory service to increase customer satisfaction through in-home visits and human interaction.

PSEG Long Island customer research conducted in 2018 indicated customers' desire for increased optionality and flexibility related to billing and payment options. This sentiment is shared by PSEG Long Island employees and other stakeholders. Based on the stakeholder inputs and industry research, PSEG Long Island is proposing to further develop implementation plans for two initiatives. If planning efforts are able to meet customer and regulatory requirements, implementation proposals will be provided in a future filing.

- **FlexPay Pilot:** Offer customers the option for pre-payment of energy to help provide optionality for certain segments of customers.
- **On-Bill Financing:** To offer low-cost financing, using LIPA capital, to reduce the upfront cost of DER adoption and reduce the need for incentives – a key tenant of New Efficiency: New York.

PSEG Long Island's objective to create a holistic customer experience reflects the overall strategy for this Utility 2.0 filing, as presented in Table 3-1.

Table 3-1. Strategic Fit – Customer-interactive Projects

Project	Customer Satisfaction	System Efficiency	Reduced GHG
Next Generation Insights	Provides personalized insights into changes in electric bills, including energy usage, associated costs of appliances and suggests optimal products or programs via self-serve and CSR-assisted channels	Increased customer education and awareness can drive more efficient customer behavior	Guides customers to adopt energy efficient practices, programs and devices
Energy Concierge	Uses experiential education to teach customers about energy usage in their homes, online tools to support monitoring of usage and changes as well as suggests optimal products or programs to adopt for savings via in-person visits		
FlexPay	Customers will have more options for paying their electric bill according to their financial schedule		Customer optionality to pay for their electricity usage prior to consumption and via more payment outlets can lead to adoption of DER and EE which will help reduce carbon emissions.
On-bill Financing	Customers will have the option to invest in desired DER and EE products and services with financial assistance from PSEG Long Island		Customer optionality to pay for costly DER and EE investments though their electricity bill with lower interest rates can lead to adoption of DER and EE which will help reduce carbon emissions.

3.2.1 Next Generation Insights Pilot

Research conducted by Illume Advising, LLC with PSEG Long Island customers in 2018, revealed that customers are often not clear on specifically why their bills are so high or how much energy their specific household appliances use. Even when customers conceptually understand that some equipment uses more energy than others, such as a pool pump or air conditioner, they do not have a clear understanding of the actual day-to-day electricity costs of those appliances.

Additionally, customer focus groups revealed customers seek better understanding of how their equipment and lifestyle decisions impact their bill. Smart meters show customers more granular data, such as spikes in usage measured in kilowatt-hours; however, customers still find it difficult to understand what that means and what actions they could take to lower their costs. This information is not translated into information a customer can relate to, such as dollars owed for usage, until a month or more later when the bill arrives. End of the month surprises often catch customers off guard, contributing to the negative perception of having no choice and no control over their bill.

PSEG Long Island has a strong foundational suite of energy efficiency, billing and payment, and home energy management education and awareness programs. With this foundation, customers have started to better understand opportunities to save energy and money; however, the information delivered can be challenging for customers to understand and relate to (i.e., kWh-based breakdowns and alerts vs. $-based breakdowns and alerts). PSEG Long Island is proposing to demonstrate how AMI interval data and machine learning can be used to gain deeper energy insights, delivering personalized cost breakdown by appliance with specific tips and next best action recommendations, thereby increasing opportunities for sustained behavior changes.

Customers Quotes

"I don't know how much the dishwater or the heat costs. If I get any information on the electricity use, it's about the electricity over the month or over the day, it's not broken down…"

"Kilowatt hours are hard to figure out."

Next Generation Insights Pilot will test a number of customer engagement hypotheses via a suite of proactive communications as well as self-serve and CSR-enabled energy management tools. PSEG Long Island believes that the energy disaggregation approach will be the key component to unlocking personalized customer insights based on actual usage of major appliances in the home. Appliances leave fingerprints or signatures on the whole home energy waveform. This Next Generation Insights service will use market-available pattern recognition and machine learning to extract and classify these appliance fingerprints. This foundational disaggregation will then associate the cost of usage throughout the month and associate costs to appliances to provide customers with meaningful relatable insights.

Customers Quotes

"I think it would be a good idea to send an alert that somebody is using a major appliance during peak hours. Here's an alert. If I'm told, I have an opportunity to stop it… I want to see it as an APP notification or text alert."

"Definitely a breakdown in dollars, as personalized as possible."

"I would like to see the breakdown of making adjustments what I could save."

3.2.1.1 *Goals and Objectives*

The goal of this pilot is to test Next Generation Insights capabilities designed to engage customers via user-friendly communications while providing home-specific energy cost insights and bill analysis. Ultimately, the capabilities will be tested by measuring the resulting customer satisfaction, energy efficiency uplift, and reduced high-bill calls per hypotheses proposed below.

3.2.1.2 *Value Proposition*

PSEG Long Island believes that the Next Generation Insights will provide value to them by increasing customer satisfaction through a suite of self-serve and CSR-assisted tools that allows customers to monitor and inform their energy usage. It will also enable customers to understand how energy efficient products or specific rates could be used as tools to lower their energy costs.

Table 3-2. Value Proposition – Next Generation Insights

Stakeholder	Value Proposition
Participating Customers	• Improves customer awareness of energy usage and associated cost by major household appliance and equipment • Provides customers with personalized and specific energy usage and actionable insights • Enables informed decision making and sustainable behavior change • Helps better manage energy-related costs
Non-Participating Customers	• Societal benefit from the resulting energy conservation realized by the participating customers
PSEG Long Island	• Empower customers with tools leveraging data and AI powered insights • Facilitates improved customer satisfaction through educating and interaction
LIPA	• Supports LIPA's goals for increased customer satisfaction and decarbonization by enabling customers with better tools and information
NY State	• Addresses the REV objectives to enhance customer knowledge and capabilities through self-serve and CSR-assisted access to energy management tools and information • Reduces carbon emissions through the increased adoption of EE measures and/or behavioral changes
Third-Party Partners	• Offers opportunities for data analytics vendors to demonstrate operational capabilities.

3.2.1.3 *Initial Proof of Concept*

PSEG Long Island is currently partnering with a third-party software as a service (SaaS) provider to conduct energy insights proof of concept in its territory using AMI data from approximately 30,000 PSEG Long Island homes. The goal was to analyze and share the kinds of insights that are possible using

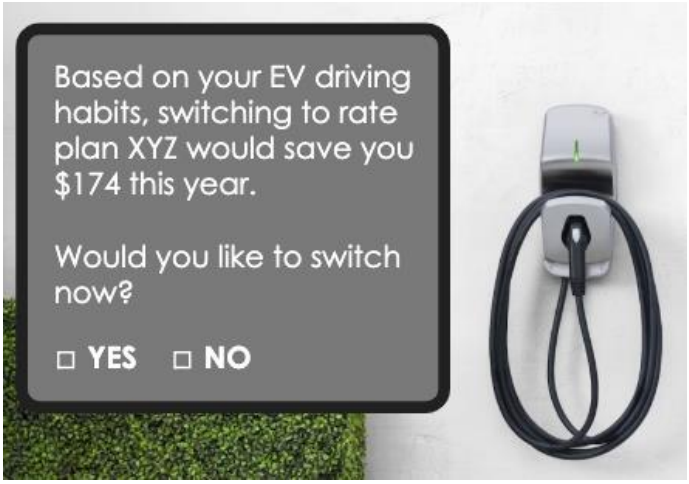
disaggregation to improve service to PSEG Long Island customers and improve utility decision making before investing in a larger scale energy insights pilot.

The initial report received from its energy insights partner showed examples of how AMI can support the following use cases:

- **Customer Engagement:** Examples of the kinds of communications that are enabled by disaggregation of AMI data
- **Innovative Electric Rate Pricing:** Support PSEG Long Island's rate cases, marketing and analysis of already implemented rate plans such as TOU rate and EV rates
- **EV Adoption:** Determining who has EVs to target EV-specific load shifting solutions, and system-wide analysis of charging behaviors
- **Demand-side management:** Targeting demand-side management programs such as smart thermostat, and
- **Non-Wires Solutions:** Support both the planning and implementation of Non-wires-solutions

Figure 3-2 portrays an example of the insights a customer who is charging during peak times may receive, to be encouraged to sign up for an EV rate to save money and preserve the grid.

Figure 3-2. Illustrative Insight Communication to Customer



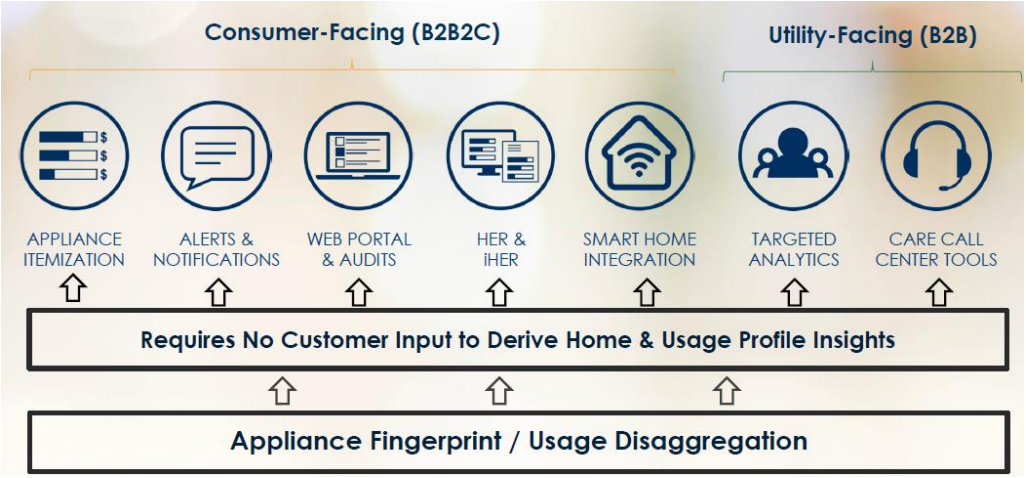
Based on this example and others provided in the proof of concept report, PSEG Long Island strongly believes that the Next Generation Insights platform that combines AI-powered disaggregation information with timely communications via preferred channels is a capability worthy of a large pilot investment.

3.2.1.4 *Scope*

The Next Generation Insights Pilot scope will include an energy insights engine with the insights' portal and digital alerts including a suite of complementary CSR tools. The pilot population will include 100,000 residential customers with AMI meters. The following are proposed capabilities to test:

1. **Energy Disaggregation Insights:** PSEG Long Island will test disaggregation AI-powered technology to itemize a customer's energy bill and provide personalized tips specific to that home. This information will enable customers to better understand their home profiles, understand the associated costs, and provide opportunities to save energy and save money.

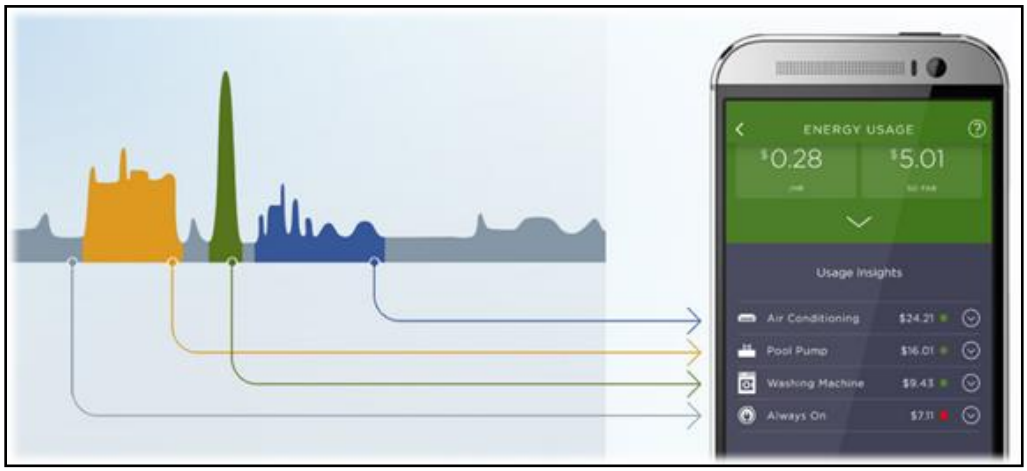
Figure 3-3. Energy Insights via Device Detection and Analytics



**Illustrative representation of how usage disaggregation can support a range of insights including complementary utility-facing tools*

Energy disaggregation is the science of breaking down appliance level energy use from whole house data using appliance fingerprints as shown in Figure 3-4. White papers on disaggregation identify it as the optimal solution for achieving energy efficiency savings.

Figure 3-4. Energy Disaggregation



**Illustrative representation of how appliance signature patterns appear in data and how the resulting disaggregation can be represented to customers*

Appliances leave fingerprints or signatures on the whole home energy waveform. PSEG Long Island intent is to leverage market-leading pattern recognition and machine learning to extract and classify these appliance fingerprints. Appliance signatures vary significantly due to size, age, model, condition, and usage behavior.

2. **Improved Insights Reporting, Alerts, and Notifications:** Today, PSEG Long Island provides basic usage (kilowatt-hour) alerts and notifications, and customers are able to set their preference (channel and frequency of communications). PSEG Long Island is looking to enhance this capability through best-in-class proven approaches for omni-channel behavioral EE designed to engage customers at key points during their billing cycle. These alerts and notifications are timed to each customer's particular billing cycle such that they will receive the alert they need right when they need it. Proposed

touch points are intended to optimize for relevancy and timing to best suit the customer by providing a next-best action for the customer, increasing the likelihood of the customer adoption of the energy-saving tip or signing up for the promoted program. This facilitates a more interactive and engaging relationship with the customer, leading to higher satisfaction and program adoption.

Table 3-3. provides additional information on proposed alerts and notifications:

Table 3-3. Proposed Improved Alerts and Notifications

Type	AMI Data	Monthly Data	Descriptions
Monthly Summary Itemization	✔	✔	Sent via direct mail, email and/or text early (e.g., Day 6) in a billing cycle, summarizing what happened in the previous billing cycle, including bill amounts, itemization (both usage and associated cost), and recommendations at whole house and appliance category level.
Budget Alerts	✔		Triggered when the customer's energy cost total exceeds a budget set by the user. By default, sent when 75% and 100% of the customer's billing cycle budget are hit.
Bill Projection/ Mid-Cycle	✔		Sent mid-cycle, informing the user of energy costs so far, and estimated electricity cost for the billing cycle.
High Usage	✔		Triggered the day after the user used significantly more energy on a single day compared to their daily average.

Customers with smart meters who receive energy insights will have access to:

- Itemized energy bill by appliance category leveraging AI analysis of AMI data
- Similar home comparison for appliances
- Appliance preferences pages to fine tune recommendations and itemization
- Customer next best actions

Table 3-4. illustrates the enhanced portal solution.

Table 3-4. Enhanced Portal Solution for Next Generation Insights

1	**Billing and Usage History:** **100% Itemization Using Disaggregation:** Breakdown of energy usage in the selected billing cycle into groups such as heating, cooling, laundry, cooking, and more dependent upon the granularity of meter data and historical data sources to be leveraged in machine learning and true disaggregation processes.
2	**Personalized Tips:** Top four tips for each appliance category based on insights developed from the disaggregation. These tips are specific to the greatest savings opportunity for each individual home. These are designed to include utility EE and DER programs as desired. **Savings potential** is provided for all major appliance categories.
3	**Similar Homes Comparison:** Allows customers to see how their usage stacks up to similar-sized homes in their area by top end use appliances

3. Next Generation Call Center Solution (CSR-assisted): In addition to the proactive communication and self-serve suite of customer facing energy management tools, PSEG Long Island would also include an AI-powered call center solution enabling CSRs to resolve high bill inquires and other critical customer issues efficiently and effectively, improving customer satisfaction with personalization, recommendations, and targeted incentives, while maximizing the customer experience by transforming into value providers.

Call center solution would include the following components:

- **Customer Bill Analyzer:** This feature would empower CSRs with detailed insights into customers' actual usage and costs at an appliance level to quickly identify reasons for high bills and reach a timely resolution. This component extends beyond the consumption of each appliance and is able to arm CSRs with comparative models and patterns of usage and consumption (month-to-month, year-over-year) to respond with more accuracy and help the customers get to a better understanding. CSRs will be able to reduce escalations and truck rolls, while driving improved engagement and customer experience with the call center.
- **Next Best Action:** PSEG Long Island CSRs would be able to go beyond resolving regular customer support calls, to provide personalized insights and recommendations. The next-best-action component would empower CSRs to create the wow factor for customers, exceed their expectations and serve value that they never anticipated, whatever may be the reason for their call. It may be a rebate that they did not know about and that is relevant for their home, a better rate plan that saves them money, a product offering that can save them hundreds of dollars on their energy bill, or a warning for an upcoming high bill. With an AI-powered recommendations engine, Action Advisor would help find the highest value offers, rebates, products, and insights, and invite CSRs to end each call on a high note and convert the customer into a big fan and an avid marketeer for the utility.
- **Remote Audit:** The Remote Audit component enables the CSRs to provide specific in-depth insights and drive data capture to assist customers in their remote energy audit via phone channel. This component can be used in conjunction with the customer bill analyzer to reduce escalations and truck rolls. With its AI-powered disaggregation insights, the Remote Audit is pre-filled with customer's usage data, captures additional data points without creating friction, and provides an energy audit with additional context and detailed insights to customers.

Ultimately, these self-serve and call center capabilities would underpin PSEG Long Island's next generation customers experience.

3.2.1.5 *Hypotheses Testing*

Through a combination of pilot survey and data analysis, PSEG Long Island believes the Next Generation Insights platform will drive customer engagement, have a positive impact on Customer Satisfaction (CSAT), and lower high bill inquires. Additional positive impacts expected include energy savings and reduced high bill call handling times.

Hypothesis

The hypotheses and targets to measure and validate this belief are summarized in Table 3-5.

Table 3-5. Hypotheses – Next Generation Insights

Hypothesis	Metric	Measure of Success
Customers will engage with the Next Generation Insights platform.	• Email engagement • Web engagement • Survey engagement	Email engagement - 30 -35% Web Engagement - 2.0 - 5.0% Survey Engagement - 5%
Customers are very satisfied with the alerts program.	• Will deploy a Customer Delight Index survey to gauge the customer sentiment for the alerts program	Perception/CSAT | Likes/Satisfied or greater - 70-80%
There will be a positive impact on high bill calls volume and high bill call handling.	• Percent reduction in high bill calls received • Percent Reduced Call Duration from Call Center Solution • Percent Reduced High Bill Field Visits	Call volume Targets: • 30% or greater reduction in high bill calls • 5% or greater reduction in high bill call duration • 20% or greater reduction in High Bill Field Visits

Measurement and Reporting

Based on the utility case studies using energy disaggregation insights and keeping in mind PSEG Long Island's objectives to test a holistic customer experience, the proposed data collection and reporting plan will include the following:

- **Customer Engagement Metrics** – monthly, standardized, point-in-time reports based on standard engagement metrics including email, web, and survey engagement metrics (includes user activity tracking)
- **Customer Satisfaction Metrics** – PSEG Long Island will deploy a survey designed to gauge the customer sentiment for the alerts program
- **Number of High Bill Calls Received** – During the pilot, PSEG Long Island will monitor the impact of the Next Generation Insights platform on the number of high bill calls received. Types of data that will be used in this process include:
  - Instances of high-bill complaints from homes that are subscribed to the solution during the measurement period, mapped at the Account ID level
  - "Baseline" data for benchmarking purposes (e.g., historical/contemporaneous trend of # of high bill calls received per customer across all PSEG Long Island customers)
- **High Bill Call Length & Outcomes** – PSEG Long Island will also monitor the impact of the Next Generation Insights complementary call center tools on the duration of high bill calls received. Types of data that will be used in this process include:
  - Duration of each customer call identified as a High Bill Call Instance
  - Outcomes of calls identified as high bill calls: resolution rate, escalation rate, etc.
  - "Baseline" data for benchmarking purposes (e.g., historical/contemporaneous trend of the length of high bill calls received across all PSEG Long Island customers)

3.2.1.6 *Implementation Plan*

The implementation plan is divided into eight main stages:

- **Stage 1: Partner** with a third-party company to provide the Energy Insights platform.
- **Stage 2: Plan** and mobilize necessary internal and third-party resources.
- **Stage 3: Define** data and integration requirements.
- **Stage 4: Design** configurable user content and specifications.
- **Stage 5: Integrate** with application and module.
- **Stage 6: Test** user acceptance and functionality.
- **Stage 7: Launch** final solution the public.
- **Stage 8: Ongoing Support** for implementation.

Project Schedule

After the contract is awarded to a third-party vendor in Q2 2020, work can begin between PSEG Long Island and the vendor to define, design and integrate the Next Generation Insights platform. After testing is complete, a full commercial launch is planned, likely in late 2020 or early 2021.

Communications Plan

The use of AI and energy disaggregation will enable PSEG Long Island to provide customers the connection between their energy usage, their costs, their behaviors and recommendations to manage all three. More relevant information will be pushed out to customers in a timely manner allowing customers the ability to modify their behaviors during a billing cycle thereby providing them greater control over their energy and costs.

Under the Next Generation Insights Pilot, in addition to proactive pushed alerts, customers will have the ability to engage with us more deeply either through a self-service portal or with the assistance of a live CSR. Customers will have access to greater information than in the past and be presented with more options such as personalized energy recommendations, online home energy appliance usage and cost profile, pricing and service choices, bill analyzer, remote audit energy assessments and more.

For the communications approach, PSEG Long Island will partner with a 3rd party vendor on outbound communications. These communications will include program-introduction communications, monthly digital reports with major appliance disaggregation information and proactive energy alerts and recommendations.

PSEG Long Island will work with the vendor on messaging, branding, format and other content with respect to outbound customer communications. Cost of such communications will be included in the overall service contract of the third-party vendor.

3.2.1.7 *Principles of REV Demo Projects*

The proposed pilot aligns with several principles of REV demos, as described in Table 3-6.

Table 3-6. Principles of REV Demos – Next Generation Insights

Principle	Description
Includes partnership between utility and third-party service providers	PSEG Long Island will partner with a third-party SaaS provider to deploy and test the Next Generation Insights platform in Long Island.
Demonstrations should delineate how the generated economic value is divided between the customer, utility, and third-party service provider(s)	The Next Generation Insights platform provides value to all parties, with customers receiving value of additional insights and better offerings targeted based on those insights, third-party partner benefiting from improved algorithms from additional data and the utility benefiting from data that can reduce overall costs to customers through operational savings.
Offers competitive markets for grid services	The insights from energy disaggregation may inform the value of grid services from buildings-to-grid.
Informs rules that will help create competitive markets	If the pilot is successful, PSEG Long Island would have proven the value of energy disaggregation for customer engagement, thus increasing the competitive market for these services. Also, customer insights could lead customers to PSEG Long Island's energy marketplace including many vendors.
Identifies questions it hopes to answer or problems or situations on the grid and the market should respond with solutions	See 3.2.1.5 for hypotheses being tested for this pilot
Informs pricing and rate design modifications	Data compiled from the Energy Disaggregation Insights can be used to better inform rate design. For example, know when customer charge their EV could help inform EV TOU rates.
Includes various customer participants	This pilot will be made available to residential customers and the population size of this pilot will scale over time as AMI is deployed. If proven successful, this could be made available to all customers.

3.2.1.8 *Budget Request*

Table 3-7 summarizes the budget request by cost category and capital versus operations and maintenance (O&M) for the Next Generation Insights initiative, including internal IT upgrades and third-party SaaS fees.

Table 3-7. Budget Request Summary for Next Generation Insights

	Added Capital Costs ($M)				Added O&M Costs ($M)			
Cost Type	***3-Year Total***	**2020**	**2021**	**2022**	***3-Year Total***	**2020**	**2021**	**2022**
IT Upgrades	*0.25*	0.25	-	-	-	-	-	-
Third Party Support	*0.46*	0.46	-	-	*2.56*	0.69	0.93	0.93
Total	***0.71***	***0.71***	***-***	***-***	***2.56***	***0.69***	***0.93***	***0.93***

3.2.2 Energy Concierge Pilot

As evidenced by feedback from customer focus groups, some customer segments continue to be confused by industry terms that are difficult to understand and hard to relate to (e.g., “kWh”). While numerous billing, payment, informational services, as well as the comprehensive suite of energy efficiency programs currently offered, can help, a customer can be overwhelmed. There is currently a gap in serving the segment of PSEG Long Island’s customer base that is hesitant to self-explore these numerous services and solutions. These customers require experiential education to become aware of and truly understand the variety of programs and services offered. They need to be taught one-on-one how to find information and utilize the tools PSEG Long Island provides to them.

Additionally, PSEG Long Island focus groups and customer satisfaction research shows home energy audits have proven to be successful programs for educating customers, increasing participation in other EE programs, and increasing customer satisfaction. Additional feedback shows an increase in satisfaction when customers directly interact with PSEG Long Island employees in the field.

While PSEG Long Island’s current EE programs offer home energy audits focused on home energy improvements, these visits are not focused on providing customers access and information on the full breadth of PSEG Long Island programs or other EE or DER technologies. These in-home visits with customers provide a prime opportunity to introduce them to a wide variety of products and services that could be accessed through PSEG Long Islands channels, such as the energy marketplace, or through its trade allies and other third-party providers. PSEG Long Island has deployed a similar model already through its existing Business and Commercial Advisory program aimed at commercial customers’ energy assessments. The differences between the proposed Energy Concierge pilot and the Home Energy Audits is summarized in Table 3-8.

Table 3-8. Energy Concierge vs. Home Energy Audits

Stakeholder	Energy Concierge	Home Energy Audits
Administrator	PSEG Long Island	Lockheed Martin
Lead for Visit	PSEG Long Island	Trade Ally
Funding Source	Utility 2.0	EE Filing
Trains Customers on My Account	✔	
Examines Customers Usage Patterns using Next Gen. Insights	✔	
Recommends PSEG Long Island Customer Programs + Bill Options	✔	
Conducts Comprehensive Home Energy Assessments		✔
Trains Customer on Self-Serve Home Energy Assessment	✔	
Recommends PSEG Long Island EE Programs and Incentives	✔	✔
Recommends PSEG Long Island DER Programs and Incentives	✔	
Recommends EE Solutions	✔	✔
Recommends DER Solutions	✔	

In this filing, PSEG Long Island proposes an innovative approach to increase customer access to other initiatives currently being implemented or proposed such as Next Generation Insights, modernized rates, and other EE/DER programs, pilots and incentives. It can be the means to drive much greater customer utilization of DER products and services being offered by Innovative Offerings such as BTM Storage, EV Charging, and Heat Pumps, all fostering the state's goals around beneficial electrification, carbon reduction and customer options. The Energy Concierge can also be a customer outreach and education tool for AMI, including helping customers understand the benefits of AMI or high bill concerns.

3.2.2.1 *Goals and Objectives*

The goal of the Energy Concierge program is to provide in-home personalized advisory services based on the specific customer needs, provide a breakdown and interpretation of their current electric usage and bill, and give the customer recommendations on energy saving solutions. PSEG Long Island is proposing to offer a more comprehensive residential Concierge advisory service to increase customer satisfaction through in-home visits and human interaction, raise customer awareness and adoption of utility-offered rates and programs, raise customer awareness and adoption of EE and DER solutions (such as through the marketplace or other third-party channels), provide a more education-focused home energy assessment updating specific appliance information, and/or as needed conduct a full energy audit.

3.2.2.2 *Value Proposition*

Compared to traditional home energy or online audits, consultations provided through the Energy Concierge program will enable more personalized and education-focused home energy assessments with the potential for interactive results, including direct links to PSEG Long Island customer offerings. The value of this approach is summarized in Table 3-9.

Table 3-9. Value Proposition – Energy Concierge

Stakeholder	Value Proposition
Participating Customers	• Increases opportunity for customers to interact a with PSEG Long Island representative to ask questions about energy use. • Increases opportunity for customer education of available offerings and how they could potentially save money, save the planet, or save themselves from an outage, depending on their priority.
Non-Participating Customers	• Allows for potential avoidance of peak load restrictions via adoption of DER and EE measures. • Informs PSEG Long Island on how best to portray benefit of DER and EE measures which could improve how these products, services, and incentives are marketed to customers through other channels.
PSEG Long Island	• Empowers customers with education and additional products and services options. • Facilitates improved customer satisfaction through education and interaction. • Enhances individual customer profiles and personas based on data observed and recorded during the home visit.

Stakeholder	Value Proposition
LIPA	• Supports LIPA's goals for increased customer satisfaction via increased customer choice. • Enables potential energy savings and decarbonization through education and recommendation of DER and EE products and services.
New York State	• Addresses the REV objectives to enhance customer knowledge and capabilities through access to an Energy Concierge home/business visit. • Reduces carbon emissions through the increased adoption of DER and EE products and services as recommended by the Energy Concierge.

3.2.2.3 *Scope*

PSEG Long Island is proposing to form an in-home Energy Concierge team made up of six full-time personnel under an existing supervisor in the first year (2020) of the program. An in-home Energy Concierge would be another potential career path for the meter reading and meter services personnel whose roles will be impacted by AMI deployment and remote connect/disconnect automation.

PSEG Long Island proposes utilizing employees to bring a broader concierge experience directly to customers homes with the goal of helping customers:

- access PSEG Long Island's website, My Account, and other digital self-service tools, including how to view their 15-minute AMI data, personalized energy savings tips, and the online marketplace
- provide third-party access to the customers' agents through Green Button
- understand their usage and associated costs and work through high bill exploration
- optimize their communication preferences and set up digital engagement preferences, including signing up for billing and payment alerts, outage alerts, voice (Alexa), social media (Facebook, Twitter), and other self-serve engagement channels
- understand benefits of EE and DER technologies and direct customers to the Enhanced Marketplace or other channels to third-party providers
- understand the benefits of relevant available programs and rebates offered by the utility
- understand and select the best rate option

PSEG Long Island's Energy Concierge program will use a suite of customer experience tools to bring this service to participating customers.

Training

Members of the in-home concierge team would be trained on how to how to engage customers, analyze their home's performance, assess their needs, and make informed recommendations. The Energy Concierge program will be distinct from the home energy audit program, but customers could choose to have both visits completed at the same time. The Energy Concierge could be trained on how to conduct the technical energy audits themselves or could be paired with a certified auditor. Consultations will last approximately one-hour and consultations that include audits (either done by a dual-trained Energy Concierge or by an auditor who accompanies an Energy Concierge) would last approximately 2-3 hours.

Energy Concierge personnel will require up-to-date knowledge of various products and services that could be used to make personalized recommendations to the customer. This will require an

understanding of energy use and how it impacts customer bills, as well as how to evaluate the potential for energy efficiency measures, (such as smart thermostats, ENERGY STAR-rated appliances, electrification of HVAC, new windows or insulation) or distributed energy solutions (such as solar, battery storage, an EV or charger).

Tools

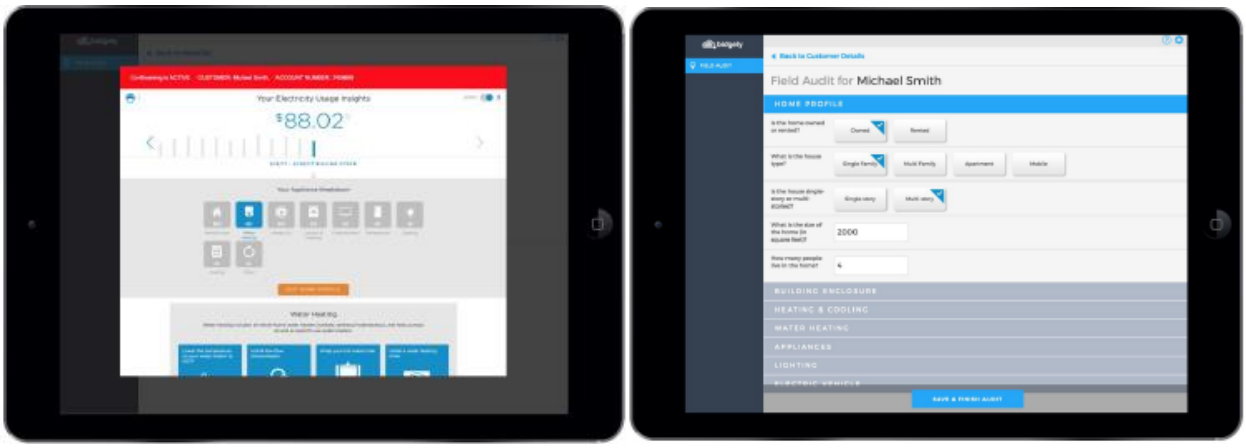
PSEG Long Island would provide its Energy Concierge with an application designed to digitize the entire home consultation process and give the Concierge an efficient tool from which they can identify valuable, personalized insights into each consumer's energy usage. This information and links to PSEG Long Island online tools would be uploaded to Energy Concierge personnel tablets.

This would allow the Energy Concierge to perform their consultation with an informed view of the customer's current energy usage behavior from sources such as: the energy disaggregation analytics, customer persona analytics, and the customer energy profile. A utility-facing Next Generation Insights tool (Section 3.2.1) will enable the Energy Concierge to perform deep analyses and segmentation using customers disaggregated end use appliances in both kilowatt-hours and associated costs, combine with other data from a customer's profile and program participation history, and enhance targeted engagement for relevant programs and services. For example, if the customer shows behavior trends that are amenable to offerings that require engagement on the customer side, the Energy Concierge would come prepared with recommendations powered by analytics insight to leverage the customer's propensities.

The Energy Concierge's consultation tool would be designed based on the three-step process below:

1. Access insights portal: Energy Concierge can check for high usage appliances and neighborhood comparison prior to visiting the home
2. Conduct in-home consultation: Energy Concierge would follow an intuitive interface to fill out the survey consisting of questions customized for PSEG Long Island
3. Review completed report with customer: Energy Concierge would obtain the customer signature and complete the consultation, with an option to share the report with the customer electronically or print out the report onsite.

Figure 3-5. Illustrative Energy Concierge Consultation Tool



** Illustrative representation of tablet-based application and screens Energy Concierge would use during in-home consultations*

Upon completion of an in-home consultation, a report will be generated on the Energy Concierge's tablet device. The Energy Concierge will be able to walk the customer through the report and interject with recommendations providing the customer with a comprehensive and personalized set of next best actions and increasing customer's awareness of all the user-friendly tools via self-serve channels.

3.2.2.4 *Hypotheses Testing*

PSEG Long Island believes that the Energy Concierge program will improve customer satisfaction by providing them with a dedicated human agent to answer their questions and to guide them on all the capabilities and offerings of the next generation customer suite. PSEG Long Island expects this will promote adoption of DER and EE products and services, as well as PSEG Long Island programs and rebates, which will be available through the next generation customer suite.

Hypothesis

The hypotheses and associated target metrics are summarized in Table 3-10.

Table 3-10. Hypotheses – Energy Concierge

Hypothesis	Metric	Measure
PSEG Long Island employees can be trained to be an Energy Concierge, to conduct home or visits and recommend product, services, and other offerings.	Number of full-time equivalents (FTEs) trained to be an Energy Concierge	Assessment of knowledge of PSEG Long Island programs and EE/DER solutions Target: 90% score on post-training assessment
Personalized customer interactions matched with data insights will increase customer satisfaction.	Feedback as collected directly from the Energy Concierge	Program surveys reveal a greater than 80% satisfaction level with Concierge
	Number of Energy Visits Conducted	2,000 of Customer interactions (Target: 2000 by July 2021)
Assessments and recommendations made by the Energy Concierge during or following visits will increase the adoption of EE and DER offerings.	Number of purchases and installations of EE and DER products	# of EE products purchased through company channels (Target: 100 by June 30, 2021)
		# of DER products purchased through the company channels (Target: 100 by June 30, 2021)
	Adoption of new PSEG Long Island payment options	Number of customers signed up for different rate

Measurement and Reporting

Customer satisfaction will be assessed through participating customers surveys.

PSEG Long Island will institute measurement capabilities via the Marketplace and internal systems to track sales of product offerings that originated from Energy Concierge. Results will be reported via the quarterly Outcomes Dashboard.

3.2.2.5 *Implementation Plan*

The implementation plan is divided into four main stages:

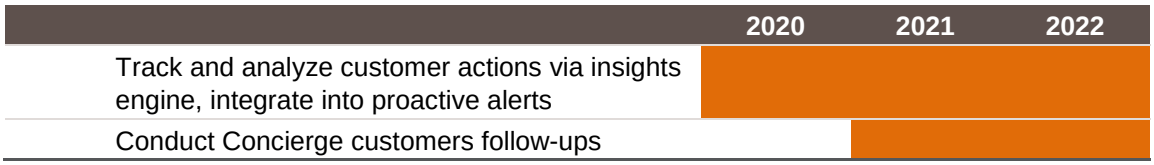
- **Stage 1: Prepare** by training PSEG Long Island employees to be conduct Energy Concierge in-home consultations and develop the tablet-based tool.
- **Stage 2: Engage** target customers through outreach announcing the Energy Concierge program and develop pre-visit tools for customers such as an online scheduling site and a questionnaire for creating a customer energy use profile. Follow-up tools should also be created at this stage, such as a survey and an online interactive report that includes the Concierge's notes and recommendations from this visit.
- **Stage 3: Conduct** 2,000 in-home consultations through the Energy Concierge program, carefully tracking all the data collected onsite and completing follow-up conversations with individual customers.
- **Stage 4: Enhance** the Energy Concierge program by expanding the online customer-interactive portal and providing customers with even more data and information on their property and energy profile, easy access to concierge-recommended products and services with links to marketplace and other PSEG Long Island sites and allowing customers a place to interact with a concierge regularly on custom solutions.

Project Schedule

The Energy Concierge services proposed in this filing will be focused on residential apartments and single-family homes and the funding requested will go towards training personnel, developing tools for conducting the in-home consultation, and an online platform specifically for viewing results. All online tools and links related to the Energy Concierge program will connect to the other offerings that make up the Next Generation Customer Experience. The Energy Concierge program also has the potential to be expanded to multifamily, new construction, and even larger commercial and industrial customers in the future.

Table 3-11. Project Schedule – Energy Concierge

	2020	2021	2022
Program Design and Preparation			
Develop detailed Energy Concierge program			
Develop training materials			
Acquire FTEs			
Train Concierge Advisors			
Develop Tools			
Implement appointment scheduling solution			
Create customer-facing materials for during visit (survey, opt-in form, educational pamphlets)			
Develop post-visit customer report			
Create tools for conducting home visit			
Refine tools based on initial experience			
Engage and Conduct Consultation Visits			
Establish Outreach and Marketing Plan			
Revise Outreach and Marketing Plan			
Identify customers			
Conduct consultation visits			



Communications Plan

The strategic communications engagement approach to the Energy Concierge program will be a phased-in communications plan. The service provides in-home visits and consultations with residential customers on their energy profile, applicable products and/or services that may create energy savings and the opportunity for an in-home energy assessment to identify ways to improve their home energy management.

A phased-in communications plan will help support the soft launch and then full roll-out of this service to PSEG Long Island customers interested in receiving this level of personal customer engagement. The goal of this service is to provide up to 2,000 in-home visits over the course of a year utilizing 6 field representatives.

The communications plan is built around developing customer leads or interest in driving these 2,000 visits over the course of a year in order to manage customer expectations, customer satisfaction and PSEG Long Island resource management. The plan uses a digital and non-digital multi-channel approach that provides targeted doorstep communications using direct mail, email, targeted social and print collateral. The target prospect base to deliver on 2,000 confirmed and completed in-home energy assessments is estimated to be around 48,000.

The communications engagement plan allows for the targeted education and increased program awareness to a small prospect population. A small group of customers will be targeted monthly to generate a lead flow appropriate for the field resources allocated to the Concierge program. Prospects for this service program will receive multiple touchpoints over the course of the month in which they are targeted for service enrollment. This approach balances customer awareness, expectations and satisfaction along with program resources.

Messaging around this program will include educational and background information on the services available to Residential customers, in addition to a call to action for customers interested in an in-home consultation.

The soft launch allows for learning and course correction before the formal full launch of the Concierge service begins. While a targeted communications approach is planned, print collateral in the form of a program service brochure will be created for use at external customer-facing events.

This communication approach will be reviewed each year to ensure proper structure, messaging, lead generation and engagement. The estimated pilot launch of the Concierge Service is Q4 of 2020.

3.2.2.6 *Principles of REV Demo Projects*

The proposed pilot aligns with several principles of REV demos, as described in Table 3-12.

Table 3-12. Principles of REV Demos – Energy Concierge

Principle	Description
Includes partnership between utility and third-party service providers	Concierge is a means to connect third party solutions (EVs, BTM, Heat Pumps) to customers. PSEG Long Island will partner with a third-party company to develop the Concierge tools and link it to Next Generation Insights (3.2.1)
Demonstrations should delineate how the generated economic value is divided between the customer, utility, and third-party service provider(s)	Customer value is derived from the access to insights and solutions that result in energy savings, PSEG LI benefits from increased customer acquisition and customer satisfaction, third party solutions have an additional channel to customers
Offers competitive markets for grid services	Interactions with customers may inform which products and services that provide grid services are most attractive to customers
Informs rules that will help create competitive markets	Concierge is agnostic to solution provider offering diverse third-party solutions to customers
Identifies questions it hopes to answer or problems or situations on the grid and the market should respond with solutions	Focus on customer wants and needs informs the solutions and means of delivery that customers value
Informs pricing and rate design modifications	Pricing will be informed by customer preferences
Includes various customer participants	Concierge will be targeting diverse customer segments

3.2.2.7 *Budget Request*

PSEG Long Island is seeking sufficient funding to launch a pilot phase of the Energy Concierge program with an initial staffing level of six full-time equivalents (FTEs) to establish the program and test design and hypotheses. See Table 3-13 for a summary of the budget request.

Table 3-13. Budget Request Summary for Energy Concierge

	Added Capital Costs ($M)				Added O&M Costs ($M)			
Cost Type	***3-Year Total***	**2020**	**2021**	**2022**	***3-Year Total***	**2020**	**2021**	**2022**
IT Upgrades	*0.51*	0.51	-	-	-	-	-	-
Marketing and Outreach	-	-	-	-	*0.12*	0.02	0.10	-
Materials and Equipment	*0.10*	0.07	0.03	-	*0.08*	0.04	0.04	-
Ongoing O&M	-	-	-	-	*0.11*	0.05	0.05	-
Project Management (PM), Labor, and Training	*0.10*	0.10	0.00	-	*2.18*	0.84	0.84	0.50
Third Party Support	*0.88*	0.88	-	-	-	-	-	-
Total	***1.59***	***1.56***	***0.03***	***-***	***2.49***	***0.96***	***1.03***	***0.50***

3.2.3 FlexPay Implementation Plan – An Enhanced Prepay Program Concept

Customers have difficulties understanding how their equipment and lifestyle decisions influence their bill. Feedback on a monthly billing cycle is delivered in total and hard to attribute to specific activities conducted in the household throughout the entire month. End of the month total bill surprises often catch customers off guard and contribute to a negative experience.

Additionally, PSEG Long Island's customers use various payment methods to pay their utility bill including cash-only or in-person checks. These payment methods require considerable effort as there are currently limited locations accepting these methods. At the same time, customers cash inflow cycles could range over an entire month.

Most customers with arrears desire to pay their outstanding balance; however, the prospect of the amount of money owed and threat of collections adds stress to an already tenuous position in their lives.

PSEG Long Island believes that its customers should have an option that enables greater billing and payment schedule flexibility enabling greater control over usage and spend. PSEG Long Island is seeking an approval to develop an implementation plan for a FlexPay Pilot, based on a prepay concept with adapted requirements that would ensure Home Energy Fair Practices Act (HEFPA) compliance.

The premise of FlexPay is that it would empower customers by giving them freedom to choose and the information they need to understand and control their electric usage. With FlexPay, customers could purchase energy in advance, monitor their energy use and associated costs daily, and receive alerts as they use electricity and reload their account to continue with service. The availability of this information would provide participating customers better control over their costs for electricity.

FlexPay would also enable customers to make payments in amounts and on schedules that best aligns to their cash flow. The program would enable customers with low to moderate outstanding balances to participate by splitting their payments between new usage and current arrears. Customer protections would be built into the core of the program and clearly communicated to customers at both sign up and throughout the participation lifecycle.

3.2.3.1 *Goals and Objectives*

While the proof of concept is intended to assess feasibility and help ensure a robust pilot design, ultimately, PSEG Long Island is looking to assess affinity of PSEG Long Island customers to FlexPay, and the resulting potential changes in customer energy usage and payment behavior and evaluate effects to community partnerships as a result of the pilot communications and customer engagement.

The Pilot program will be designed to provide valuable lessons learned to inform future pay-ahead programs. The project can help demonstrate:

- If viewing electric usage in dollars and days changes behavior
- How aware customers are of their energy costs
- How often customers want to receive notifications
- How often voluntary disconnections would be selected
- How often customers revert to post pay
- If the pilot drives participation in EE programs and associated savings

The pilot could help quantify:

- Energy savings
- Education impacts on usage and cost per customer
- How often customers add money to their account
- Payment amounts added to their account
- Ease and frequency of payments at expanded neighborhood vendor locations

3.2.3.2 *Value Proposition*

If approved, the pilot would look to prove value added to a wide variety of stakeholders, as detailed in Table 3-14.

Table 3-14. Value Proposition – FlexPay Pilot

Stakeholder	Value Proposition
Participating Customers	• Certainty of budget and a sense of control • Ability to decrease energy use and energy bill • More payment options improving convenience and ease of pay • Increased understanding of energy usage and how it impacts customer's bill, with lower usage common among participants • Phased reduction of arrears • No late fees or reconnections fees while on program • Increased customer satisfaction
Non-Participating Customers	• Lowering of total net bad debt which positively impacts all customers through lower Delivery Service charges • Expected energy usage reduction from the participating customers will act as an energy efficiency measure helping avoid peak load restrictions or additional generation requirements that can affect all customers
PSEG Long Island	• This project aligns with the U2.0 Roadmap to empower customer with energy data and products and services • By offering customers billing and payments optionality and greater control, PSEG Long Island will be able to improve customer satisfaction • Expected contribution to energy conservation would help PSEG Long Island to avoid load capacity investments • Decreased levels of arrears and the overall bad debt
LIPA	• Potential for improved customer satisfaction and decarbonization

Stakeholder	Value Proposition
New York State	• This project addresses the REV objectives to enhance customer knowledge and capabilities (choice, control, convenience, and lower cost) and reduce carbon emissions
Third-Party Partners	• Increase use of local retail store fronts as authorized payments agents

3.2.3.3 *Scope of FlexPay Proof of Concept*

PSEG Long Island is proposing to conduct a proof of concept in 2020. This would include business requirements and HEFPA compliance due diligence, adapted pilot program design, and an RFQ (Request for Qualification) with best-in-class prepay SaaS providers. The intent behind the proof of concept is to assess legal, regulatory, operational, and technical feasibility of an enhanced prepay program that would incorporate best practices of the leading, mature prepay programs in the country while remaining compliant with the state's HEFPA rules. PSEG Long Island respects the long-held principles of HEFPA and the criticality to protect the interests of low- to moderate- and fixed-income customers. PSEG Long Island has evaluated other prepay programs across the country and found that participating customers reduce energy usage, sometimes as high as 12% below baseline, and express satisfaction with the program. As a result, the proposed program design for FlexPay will adopt industry best practices married with unique features to protect customers and honor HEFPA.

Table 3-15. Prepay Industry Case Studies and Lessons Learned

Utility	Customer Impacts	Energy Conservation	Solution Aspects	Financial Parameters	Other Factors
SNP	92% satisfied/very satisfied 97% feel that prepay could help a lot of others if they were aware of its benefits	12% avgerage energy usage reduction; 81% agree they use a lot less electricity; 91% agree they use energy more wisely	In-home display with low balance alert at $10; meter holds the balance and controls disconnect; upgrading to a web-based platform	New rate, mimicking basic rate applies Minimum start amount: $30 Portion of payment can be allocated toward arrears (35%)	73% customers; gaining control had a lot to do with them enrolling ; No disconnects 8 p.m.-8 a.m.
Georgia Power	CSAT increased for those enrolled in PrePay	Company reports reduction in usage for those enrolled	PayGo solution (web/smartphone); multiple payment channels and alert channel options and frequency	Basic rate applies Minimum start amount: $40 Portion of payment can be allocated toward arrears (25%)	Collected >$10 million past due since the inception 2013 CSR morale increased
DUKE ENERGY	50% Perfect 10 score. 80% customers increased CSAT. 79% paid off a deferred balance while on program.	Energy Conservation: 8.5%	PayGo solution (web/smartphone); multiple payment channels and alert channel options and frequency dynamic interface and dashboard for CSRs	Eligibility: Non-TOU schedules, no Riders or “special need” or “medical cert” Minimum start amount: $40	0.6 average disconnections per participant while on program.
BGE An Exelon Company	Customers not required to have checking or credit card on file; med. Certificates, net metering or solar ineligible.	New program, savings not yet assessed	PayGo solution (partially integrated); multiple options for alerts Additional alerts sent when balance zero and disconnected. First two payments no processing fees	Basic rate applies; Minimum start amount: $40 Arrears: $600, 25% of payment No sec. deposit assessed if reverted to “post-pay.”	5-day extension period to pay arrears if customer requests to switch back to “post-pay” No impact on credit score
Ameren ILLINOIS	Goal is to enhance CSAT and promote greater energy savings; strictly voluntary	Pending pilot outcome	Must have AMI meter; prepaid displays use and payments in “Estimated Days of Paid Service”; text or email alerts. No fee to participate.	Residential only and must be current Minimum start amount: $50 If negative, several days grace with min $25 payment before reverting to collections	No impact on credit score; If account goes to negative balance, transitioned to post pay, can re-enroll 7 months later

Source: PSEG Long Island Customer Experience and Marketing group Prepay Market Research, 2019

3.2.3.4 *Principles of REV Demo Projects*

The proposed pilot aligns with several principles of REV demos, as described in Table 3-16. As a pilot, this technology demonstration does not necessarily directly satisfy all principles. It does, however, enable better understanding of the values prior to developing a more scalable model in the future especially as the online customer portal expands.

Table 3-16. Principles of REV Demos – FlexPay Pilot

Principle	Description
Includes partnership between utility and third-party service providers	Collaboration between Prepayment Engine operator and PSEG Long Island
Demonstrations should delineate how the generated economic value is divided between the customer, utility, and third-party service provider(s)	Identifies and quantifies associated costs and benefits, supporting subsequent development of more scalable business models for residential customers that effectively allocate costs and benefits between stakeholders.
Offers competitive markets for grid services	Informs opportunities to increase energy conservation, energy efficiency and customer satisfaction.
Informs rules that will help create competitive markets	May provide insights that inform future prepay rules, and rules regarding grid disconnection, which would support the market for companies in this space.
Identifies questions it hopes to answer or problems or situations on the grid and the market should respond with solutions	Hypotheses and testing plans will be developed as part of the request for funding for 2020.
Informs pricing and rate design modifications	May inform rates based upon flexible timing of bill payments.
Includes various customer participants	Potential participating customers include seasonal customers, customers that are budget conscious and would like to have the power to choose when and where they pay, low-income customers, seasonal as well as rental property customers.

3.2.3.5 *Budget Request*

PSEG Long Island is working closely with LIPA and consulting with DPS staff regarding the regulatory treatment of a FlexPay program. PSEG Long Island is seeking regulatory guidance with this filing and is requesting funding to advance the program implementation plan, and determine final business requirements accordingly, for an initial test pilot of FlexPay in accordance with DPS and LIPA decisions. See Table 3-17 for a summary of the budget request.

Table 3-17. Budget Request Summary for FlexPay Pilot

	Added Capital Costs ($M)				Added O&M Costs ($M)			
Cost Type	***3-Year Total***	**2020**	**2021**	**2022**	***3-Year Total***	**2020**	**2021**	**2022**
Third Party Support	-	-	-	-	*0.25*	0.25	-	-
Total	***-***	***-***	***-***	***-***	***0.25***	***0.25***	***-***	***-***

3.2.4 On-Bill Financing Implementation Plan

PSEG Long Island proposes to develop an implementation plan for an on-bill financing pilot program to provide residential customers with the option of paying for investments in clean energy (EE and DER) upgrades through on-bill charge. The financing program will allow customers to overcome up-front cost of expensive upgrades and conveniently make repayments over time through their monthly bills.

Current financing options available to PSEG Long Island customers include the Green Jobs – Green New York Program and On Bill Recovery Program for solar photovoltaic (PV) systems. Unlike these existing financing programs that use state-funded incentives or capital from third-party financial institutions, the pilot will leverage lower cost capital from LIPA.

The program will target heat pumps as the primary technology, with BTM storage and EV chargers as secondary. While incentives for these technologies will be provided through separate programs, this pilot will focus specifically on providing loans to overcome the cost barrier to technology implementation.

Additionally, PSEG Long Island is investigating other financing structures, such as service agreements, which may provide alternative benefits to customers. For example, such service agreements could provide customers with a performance-based financing option to offset the upfront cost of clean energy upgrades.

3.2.4.1 *Goals & Objectives*

The overall objective of this pilot program is to increase customer satisfaction by providing customers with cost-effective loans that will help offset upfront costs of technology upgrades. This pilot will help PSEG Long Island to better understand how offering on-bill financing can help technology upgrades be more affordable for customers, support beneficial electrification, and reduce carbon emissions by encouraging adoption of heat pumps, BTM storage, and EV chargers. This pilot program ultimately facilitates achievement of New York State's overall 2025 energy efficiency goals, which includes a minimum state-wide target of 5 trillion British thermal units of energy savings from heat pumps.

3.2.4.2 *Value Proposition*

The proposed pilot offers value to a wide variety of stakeholders, as detailed in Table 3-18.

Table 3-18. Value Proposition – On-Bill Financing

Stakeholder	Value Proposition
Participating Customers	• Reduced up-front cost of clean energy upgrades • Potential energy savings • Lower interest loans • Simpler payment process • Improved customer satisfaction
Non-Participating Customers	• Reduced carbon emissions • Reduced electricity costs from beneficial electrification

Stakeholder	Value Proposition
PSEG Long Island	• Increased customer demand for EE/DER measures • Aligned with goals for demand management, DER utilization, and reduced emissions • Aligns to U2.0 Roadmap goals to develop DSP capabilities and realize a more flexible grid
LIPA	• Decarbonization for beneficial electrification • Potentially lower rebate costs

New York State	• Addresses the following REV objectives:
	  ○ Reduce carbon emissions
	  ○ Improve system-wide efficiency
	• Furthers the DSP vision with the introduction of more distributed energy resources

Third-Party Partners	• Increased sales for trade allies (e.g., through Lockheed Martin)

3.2.4.3 *Scope of On-Bill Financing Initial Tranche*

One major challenge to widespread adoption of DERs and EE measures is overcoming up-front cost of installing technologies. Residential homeowners experience difficulty obtaining funding or loans to install costly technology upgrades. While incentives for many of these technologies are currently available and offered to PSEG Long Island customers, most still lack sufficient financial resources to implement the upgrades. Thus, PSEG Long Island is proposing an On-Bill Financing program that will provide customers with not only a viable but affordable financing option to help pay for the upgrades through their utility. On-bill financing will be available for three technologies: heat pumps, BTM storage, and EV chargers. The focus of this pilot is on heat pumps with the latter two as secondary.

Customers who participate in the On-Bill Financing program will be able to repay the loan amount over time through their monthly electric bill. This process simplifies the overall financing process and provides customers with a convenient method of repayment. Customers will remit payments utilizing PSEG Long Island's On-Bill Recovery mechanism, to be developed.

LIPA will be the capital provider and PSEG Long Island will manage all parts of the loan program itself or in partnership with qualified third-parties.
PSEG Long Island is proposing to deploy a tranche of capital sourced by LIPA for the pilot. Potential distribution among the three technologies is described in Table 3-19. Bulk of the funding will be allocated towards heat pumps, approximately 72% of the total deployment amount, with approximately additional capital available to finance BTM storage and EV charges.

Table 3-19. Potential Target Deployments

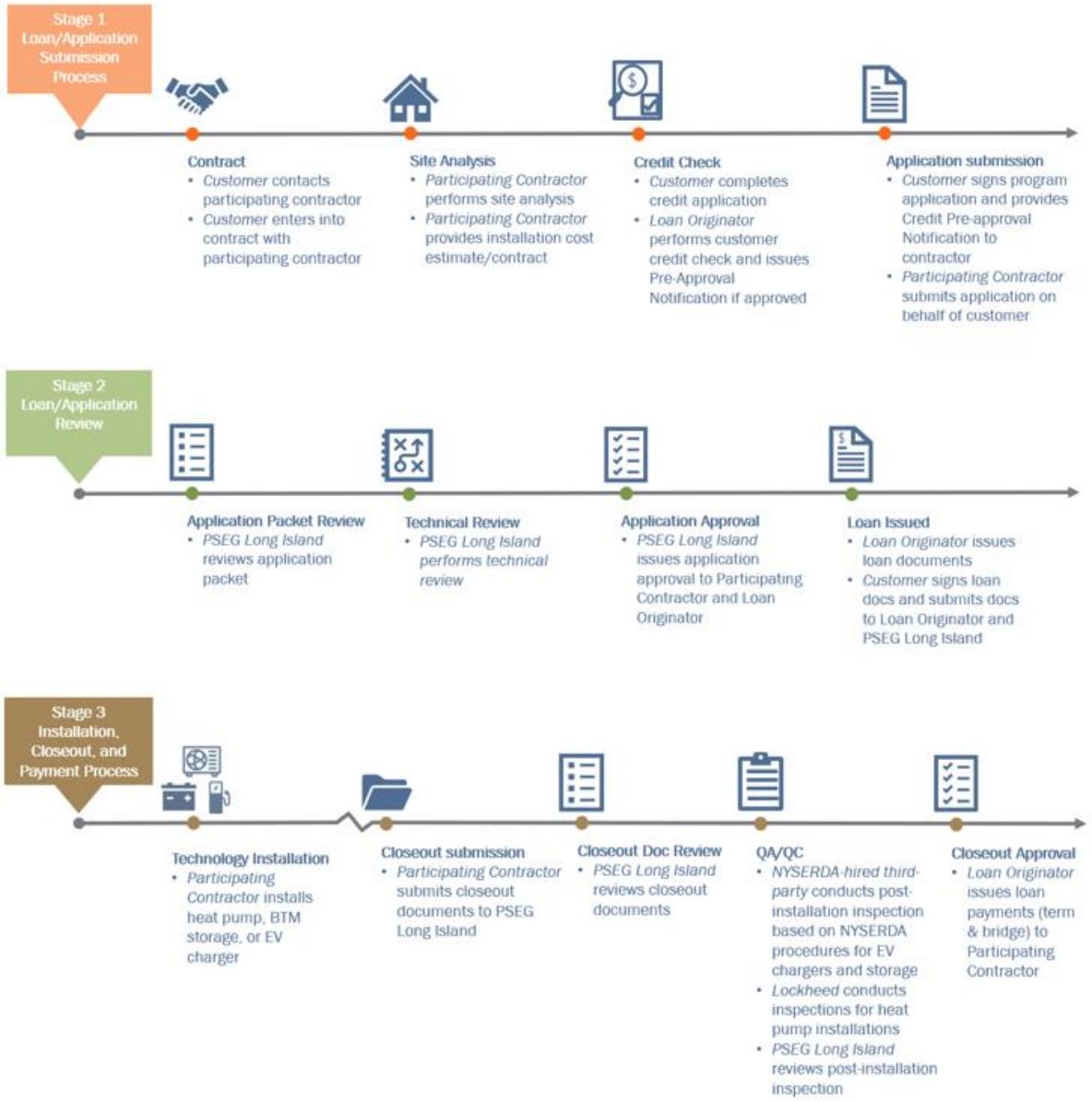
Technology	Loan Amount	Percent of Capital Available
EV Chargers	$500	3%
BTM Storage (+ solar)	$37,500	25%
Heat Pumps	$8,000	72%

Structure of the loan program will be consistent with the existing program for solar PV. The application process is divided into three stages:

- **Stage 1 Loan/Application submission process**: PSEG Long Island will use existing trade allies (e.g., Lockheed Martin for heat pumps and NYSERDA participating contractors for storage) to perform site analyses, provide installation cost estimates, and submit program applications on behalf of customers. PSEG Long Island expects that a third-party loan originator will be contracted to perform credit checks and approve loans.
- **Stage 2 Loan/Application review**: PSEG Long Island will be responsible for review of all applications and will approve or issue notices of missing information accordingly. Following application review, PSEG Long Island will conduct technical reviews by leveraging existing models and tools. Loan is issued once all parts of the application are approved.
- **Stage 3 Installation, closeout, and payment process**: Once application is approved, trade allies will install the technology upgrade of consideration at residential customer site. It is expected that interconnection of DERs will increase with the launch of the program. PSEG Long Island will coordinate with internal T&D team for planning of any anticipated interconnection. At the end of the loan term, closeout documents will be submitted for approval. PSEG Long Island expects that a NYSERDA-hired third-party contractor will perform post-installation QA/QC inspection for battery storage and EV charger installations, and a Lockheed employee or trade ally will do the inspections for heat pump installations.

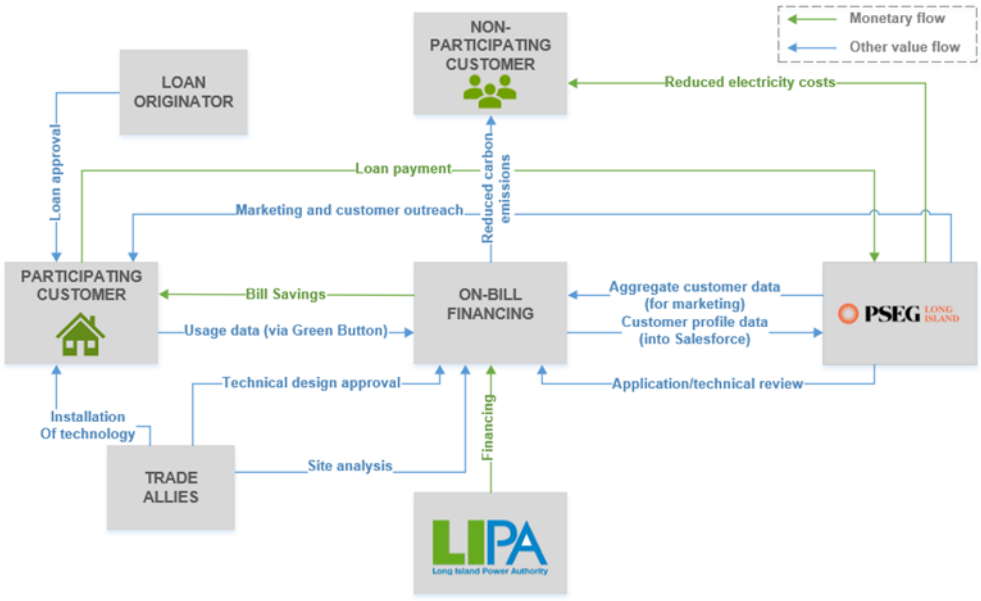
Details of each stage are illustrated in Figure 3-6.

Figure 3-6. Loan Program Application Process



PSEG Long Island envisions this pilot as the first phase for exploring an innovative financing option for its customers. This pilot may be coupled with existing incentives offered through separate programs to provide customers with additional support. Figure 3-7 highlights the business model employed for this pilot.

Figure 3-7. Business Model Diagram – On-Bill Financing



3.2.4.4 *Principles of REV Demo Projects*

The proposed pilot aligns with several principles of REV demos, as described in Table 3-20. As a pilot, this program does not necessarily directly satisfy all principles. It does, however, enable better understanding of the values prior to developing a more scalable model in the future.

Table 3-20. Principles REV Demos – On-Bill Financing

Principle	Description
Includes partnership between utility and third-party service providers.	Collaboration with third party technology provider, loan originator, and NYSERDA-hired third parties.
Demonstrations should delineate how the generated economic value is divided between the customer, utility, and third-party service provider(s).	Informs value to different parties, enabling subsequent development of more scalable model in the future that reduces reliance on technology incentives.
Identifies questions it hopes to answer or problems or situations on the grid and the market should respond with solutions.	Hypotheses and testing plans will be developed as part of the request for funding for 2020.
Informs pricing and rate design modifications	Informs ability to reduce future reliance on incentives, impact of EE measures and DERs on rates, and opportunities to offer financing for other technologies.
Includes various customer participants	Actively engages residential customers.

3.2.4.5 *Budget Request*

PSEG Long Island is working closely with LIPA and consulting with DPS staff regarding the regulatory treatment of an on-bill financing program. PSEG Long Island is seeking regulatory guidance with this filing and is requesting funding to advance the program implementation plan, and determine final business requirements accordingly, for an initial tranche of on-bill financing in accordance with DPS and LIPA decisions. See Table 3-21 for a summary of the budget request.

Table 3-21. Budget Request Summary for On-bill Financing

	Added Capital Costs ($M)				Added O&M Costs ($M)			
Cost Type	***3-Year Total***	**2020**	**2021**	**2022**	***3-Year Total***	**2020**	**2021**	**2022**
Third Party Support	-	-	-	-	*0.25*	0.25	-	-
Total	**-**	**-**	**-**	**-**	***0.25***	***0.25***	**-**	**-**

3.3 Funding Request for Grid-Interactive Pilots

Grid-interactive DER projects use customer-sited resources to provide valuable services to the distribution grid, society, and customer. Such projects do this by deferring/avoiding infrastructure investments and providing beneficial electrification that improves system utilization and reduces carbon emissions while potentially putting downward pressure on electricity rates. Grid-interactive DER play a pivotal role in PSEG Long Island's vision for a customer-centric DSP, enabling customer-sited solutions to better address grid needs. To better use DER and maximize value to the grid, PSEG Long Island is proposing the following projects in this filing:

- **Electric School Bus V2G Demonstration:** A V2G pilot to demonstrate the use of electric school buses as mobile batteries to address specific locational needs on the distribution network.
- **Controllable Heat Pumps Pilot:** A technology pilot to deploy new smart thermostat technology that increases use of underutilized ductless mini-split heat pumps for winter heating.

These projects focus on beneficial electrification and improved system efficiency by offering new solutions that use DER and enable PSEG Long Island to monitor and interact with those resources to realize grid benefits.

Supporting Initiatives

The following initiatives are already under way and could support successful implementations of the proposed grid-interactive projects:

- **NWS Projects:** PSEG Long Island is in the middle of various NWS projects, including the Super Savers program and utility-scale storage to target constrained circuits to defer or avoid distribution infrastructure investments. These constrained circuits may provide promising sites for the e-bus V2G pilot. For the heat pump pilot, the targeted outreach efforts for Super Savers could help facilitate customer acquisition.
- **PSEG Long Island Home Comfort Program:** Existing rebate programs for air source and ductless mini-split heat pumps to maximize customer energy savings. This may help provide target customers with existing mini-splits for the heat pump pilot and/or support collaborative outreach for customers deploying new mini-split heat pumps.
- **Heat Pump Customer Outreach Campaign:** In advance of this pilot, PSEG Long Island is planning a customer outreach campaign to inform customers of their energy usage for heating and value of electrification of heating systems. This effort will be funded through existing resources but will nonetheless provide value to support customer engagement for this pilot.
- **Dynamic Load Management:** PSEG Long Island is currently undertaking efforts to deploy smart thermostats for DLC and DLM through separate programs. These other programs are outside the scope of these pilot proposals, but the synergies can enable collaborative customer outreach and potential reductions in cost for the heat pump pilot by targeting customers with existing compatible thermostats.
- **Energy Concierge:** The Energy Concierge, as described previously, will support customer outreach and acquisition by identifying promising customers to target and including pilot participation eligibility assessment in Energy Concierge services.

Strategic Fit

The objectives of PSEG Long Island's grid interactive pilots reflect the overall strategy for this Utility 2.0 filing, as presented in Table 3-22.

Table 3-22. Strategic Fit – Grid-interactive Projects

Project/Pilot	Customer Satisfaction	System Efficiency	Reduced GHG
Electric School Bus V2G Demonstration	Facilitates clean transportation for schools and may inform future offerings for broader customer base	Utilizes buses as mobile batteries to serve targeted system needs	Promotes adoption of EVs
Controllable Heat Pumps Pilot	Smart controls and optimal energy usage provide potential bill savings	Supports beneficial electrification by increasing electric load in winter	Electrification of heating replaces fossil-fueled furnaces and boilers

3.3.1 Electric School Bus Vehicle-to-Grid Pilot

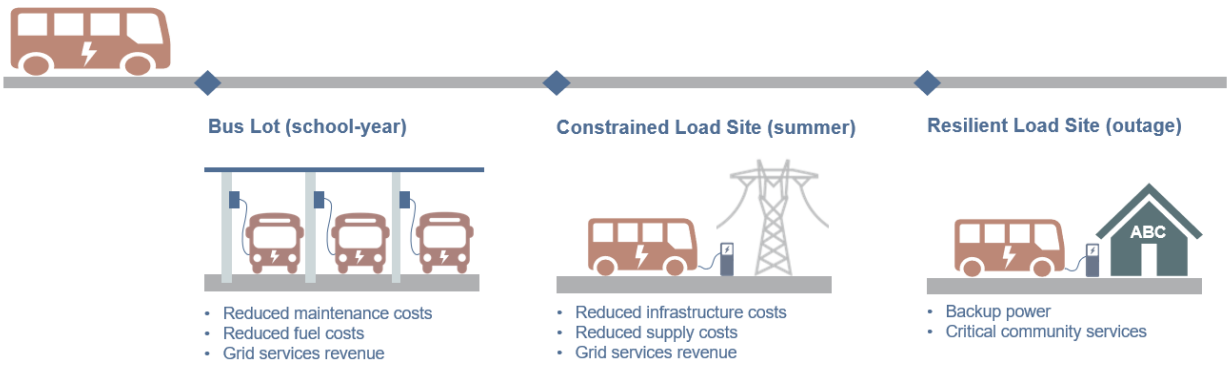
The proposed pilot will support the deployment of electric school buses (e-buses) that will provide V2G services for PSEG Long Island and provide backup power to critical loads. The buses will be used by Suffolk Transportation Services (STS) to transport children during the school year and then be used by PSEG Long Island during the summer to address specific locational needs on the distribution network.

This project represents PSEG Long Island's first V2G pilot while simultaneously demonstrating mobile storage capabilities. The project may also be the first successful demonstration of V2G buses with on-board inverters in New York State by using buses specifically designed to provide V2G services.

Electric vehicle supply equipment (EVSE) with V2G capabilities will be located on a constrained circuit, thus offering value as an NWS for infrastructure investment deferral. The EVSE (i.e., chargers) used for grid services in the summer may be sited at a different location than where the e-buses are charged during the school year, enabling the buses to function as mobile batteries. For example, chargers may be discharged on a constrained circuit during the summer months to provide value as an NWS. This constrained circuit may be the parking lot used during the school year or a different location. Furthermore, charging of batteries would likely occur overnight avoiding any constraints on the circuit.

In addition, one or more chargers may be located at a site with critical loads to provide resiliency services in case of a prolonged grid outage. For example, chargers may be placed at a school to provide shelter, or at a gas station to support fueling and emergency transportation. This project will provide benefits to a variety of stakeholders, as illustrated in Figure 3-8.

Figure 3-8. V2G Pilot Project Concept and Benefits



3.3.1.1 *Goals and Objectives*

This pilot will help PSEG Long Island understand how EVs can be better utilized for the grid, supporting beneficial electrification through new program offerings for customers that improve system efficiency and reduce carbon emissions. The pilot focuses on school buses due to their ability to serve as large mobile batteries, as well as the coincidence between peak load and the summer availability of the buses.

Implementation and operation of e-bus V2G infrastructure will provide valuable lessons learned to inform future V2G investments and offerings that can enhance the value of EVs to both customers and the grid. Understanding of e-bus charging patterns will help to inform offerings for bus fleet operators, while use of e-buses for V2G services can inform offerings for other types of EVs as well. Identification of barriers and development of standardized processes during this pilot will support effective future implementation of related activities.

The project can demonstrate several stacked applications, including localized distribution peak reduction, system peak reduction, customer bill savings, backup power, and ancillary services. Furthermore, information obtained about costs and benefits from this pilot will provide insight into potential future business models that will support scalable growth of V2G infrastructure, for e-buses and other EVs. For example, future projects/programs could use LIPA financing or employ ownership models with varying ownership between e-buses, e-bus batteries, and/or EVSE. Additionally, this pilot will help to identify target costs for e-buses and related infrastructure to become economical at scale.

3.3.1.2 *Value Proposition*

The proposed pilot offers value to a wide variety of stakeholders, as detailed in Table 3-23.

Table 3-23. Value Proposition – Electric Bus V2G Pilot

Stakeholder	Value Proposition
Participating Customers	• Reduced ownership cost of e-buses • Lower fuel and maintenance costs • Potential new revenue streams • Competitive advantage with health- and environment-conscious municipal and school customers • Improved driver satisfaction
Non-Participating Customers	• Reduced carbon and tailpipe emissions • Increased access to e-buses • Insight for future adoption of e-buses for school districts • Access to resiliency services
PSEG Long Island	• Development of V2G and mobile battery capabilities • Informs use of new type of asset for current and future programs • Increased customer demand for e-buses • Aligned with goals for demand management, DER utilization, and reduced emissions • Aligned with U2.0 Roadmap goals to develop DSP capabilities and realize a more flexible grid • Increased load factor • Offers dynamic load management in a constrained area • Improved reliability • Improved customer satisfaction
LIPA	• Decarbonization of transportation through electrification

New York State	• Addresses the following REV objectives:
	  ○ Enable new energy markets and leverage ratepayer contributions
	  ○ Reduce carbon emissions
	  ○ Improve system-wide efficiency
	• Furthers the DSP vision with the introduction of more distributed energy resources providing grid services
	• Improved system resiliency
	• Supports statewide EV Roadmap

3.3.1.3 *Scope*

Electric school buses offer a promising use case for V2G services due to their availability during system peaks in the summer. This pilot will help STS, which provides school transportation services to multiple school districts in Long Island, to procure V2G-capable buses and utilize them for grid services during the summer. While others (e.g., Con Edison) have made investments in e-buses, the buses were not designed with built-in V2G capabilities, and the projects do not take full advantage of the opportunities offered by mobile batteries.

Blue Bird, an e-bus manufacturer, is developing its V2G capabilities and expects to be able to provide V2G-capable buses by the summer of 2020. Three buses are proposed for this pilot, each with 148 kWh usable energy and capable of 50 kW V2G output with bidirectional inverters on board. The buses have a range of approximately 100 miles, which supports about four routes; evening charging is expected, which will primarily be during the winter and shoulder seasons. The buses may be branded for PSEG Long Island to promote its commitment to clean transportation.

The project proposes to propose several services to different parties:

- **Customer bill savings:** The buses will be charged during the school year at one of STS's facilities during off-peak hours on a TOU rate to minimize energy and demand charges.
- **Distribution investment deferral/NWS:** During the summer, the buses will be parked at a grid location with V2G-capable EVSE. The buses will be dispatched when needed to relieve grid constraints. As part of the planning stage, PSEG Long Island will identify one or more optimal sites for the EVSE where it would provide the greatest system value (see Section 3.3.1.4). The chargers will be discharged on constrained circuits, which may be the STS lot used during the school year, the resilient load site, or a separate site, which may be a customer or utility site.
- **System peak reduction:** During the summer, the buses will also be able to provide system peak reduction during coincident peak hours to reduce generation and transmission capacity costs.
- **Backup power/resiliency:** Bidirectional EVSE may be sited at a critical load site (e.g., school, gas station) to provide resiliency services in case of a prolonged grid outage. Year-round, the buses will be able to respond when called to provide backup power, provided charge is managed for other needs such as transporting students. This application is dependent upon costs and capabilities of the equipment.
- **Ancillary services:** The buses may provide ancillary services when parked during the school-year and throughout the summer. Tentatively, the project is envisioned to provide operating reserves during the summer only, which will provide additional revenue without requiring frequent dispatch and avoid accelerating degradation of the batteries. This application is dependent upon the costs and capabilities of the equipment, though STS has identified a third party with experience providing V2G services to wholesale markets.

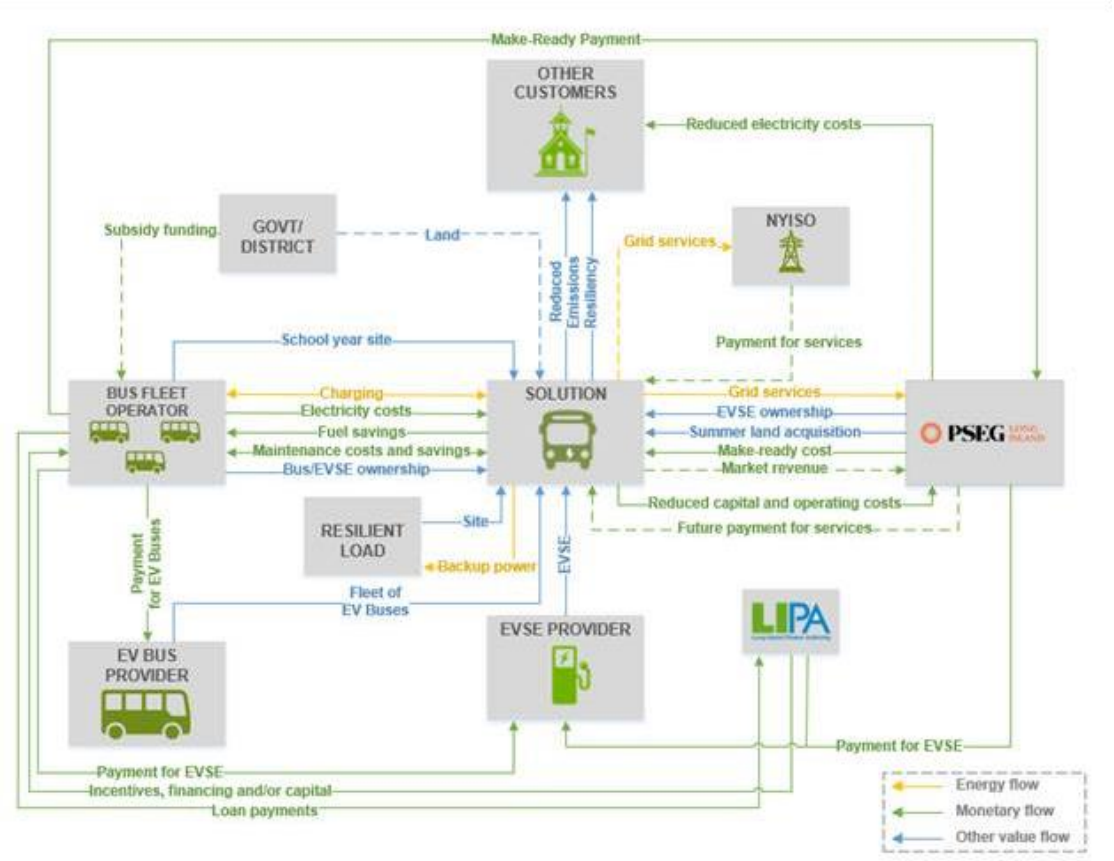
PSEG Long Island expects that a third-party EVSE provider will be contracted to provide the chargers and associated control capabilities. The proposed EVSE supports charge and discharge at 19.2 kW at the bus parking lot and resilient load site, requiring approximately 8 hours each to fully charge or discharge. The proposed EVSE at the summer location will have 50 kW of capacity, requiring approximately 3 hours for a full charge or discharge.

The incremental investment required for a V2G-capable e-bus is approximately $275,000 more than a traditional school bus. For this pilot, PSEG Long Island will help to cover this additional cost by $100,000 in exchange for the ability to use the buses during the summer to provide grid services. STS will own the buses and operate them during the school year to provide transportation services to local school districts.

STS will cover the cost of required infrastructure upgrades (i.e., make-ready infrastructure) to support installation and operation of the EVSE at the school bus lot. PSEG Long Island will cover the make-ready, equipment, installation, and operating costs for EVSE located at the summer and resilient load sites.

Beyond the scope of this proposal, PSEG Long Island is considering a second phase following this pilot that would explore innovative and scalable business models in partnership with third-party partners. Figure 3-9 highlights the business model employed for this pilot (solid lines), along with potential additional and future value flows (dashed lines). Such models could include novel ownership, financing, leasing, and performance payments structures that allocate costs and benefits between multiple parties (e.g., bus fleet operator, EVSE network operator, PSEG Long Island, and LIPA) with variable ownership by asset (e.g., bus, battery, EVSE). Subsequent projects may also explore managed charging for the bus fleet operator to reduce charging costs while maximizing grid value.

Figure 3-9. Business Model Diagram – E-Bus V2G Pilot



An area of uncertainty is the role of local government or school district. The local government could potentially provide subsidy funding for the e-buses, while the school districts of interest may provide sites for summer peak reduction and/or resilient load.

3.3.1.4 *Hypotheses Testing*

PSEG Long Island believes the electric school buses will provide grid services the ability to deliver locational and system value and resiliency services to support critical loads during an outage. Because of

the lack of precedence for V2G programs, PSEG Long Island believes this technology pilot will allow for the development of standardized processes for future planning and operations.

Hypothesis

The hypotheses to support this vision and relevant targets are detailed in Table 3-24.

Table 3-24. Hypotheses – E-Bus V2G Pilot

Hypothesis	Metric	Measure of Success
Fully integrated V2G bus can successfully support bidirectional power flow	Injection of power	Successful injection of power
Electric buses with V2G capabilities can provide grid services to provide locational and system value	Locational coincident peak reduction	Reduction in distribution circuit peak load (MW) from e-buses Target: 37 kW per bus[18]
	System coincident peak reduction	Reduction in system peak load (MW) from e-buses Target: 37 kW per bus
V2G capabilities can make electric buses more financially attractive to fleet owners	Marginal impact on electric bus net cost	Identification of the net present value of V2G services, after accounting for marginal increases in both costs and benefits
A mobile V2G project can be used to develop standardized processes for PSEG Long Island to incorporate in future planning and operations	Standard processes with relevance for V2G, EVSE, NWS, storage, and other DER	Development of standard processes including site selection, interconnection, commissioning, and operation

Measurement and Reporting

In advance of system operation, PSEG Long Island will establish a detailed evaluation plan to ensure that sufficient data is acquired and that any test procedures have been designed. From summer 2020 through summer 2022, STS will provide data for all sites to PSEG Long Island to facilitate evaluation of project performance, benefits, and hypothesis testing. Analysis and reporting will occur during and following each summer season, with a final evaluation report provided by the end of 2022.

Data to be collected may include the following:

- EVSE load at all sites (hourly or less) to measure charging and discharging rates and profiles, total energy throughput, and duration of discharge
- Load at STS meter to assess bill impact
- Load at resilient customer meter to assess ability to island and duration of islanding
- Circuit load to assess coincidence with local peak
- System load to assess coincidence with system peak

[18] Target based upon assumed 4-hour duration requirement and 148 kWh usable energy per bus

- Battery health/state of charge (as feasible) to measure degradation over time
- Survey data to asses customer satisfaction (e.g., bus drivers, parents of bus riders)
- Cost data to assess cost-effectiveness of the program

3.3.1.5 *Implementation Plan*

The implementation plan is divided into four main stages:

- **Stage 1 Planning:** The first step in planning is for PSEG Long Island to identify potential EVSE sites based upon optimal locations for grid services and considerations for resiliency purposes. Additionally, charger sites need to be identified for STS and for the customer(s) receiving resiliency services.
- **Stage 2 Implementation:** The first step in implementation is procurement of buses and customer-sited EVSE by STS, which may begin in 2019.[19] Once sites have been identified, PSEG Long Island must procure additional EVSE and support deployment and commissioning to prepare for delivery of the buses.
- **Stage 3 Operation:** Once commissioned, the e-buses and EVSE will be operated by STS during the school-year and by PSEG Long Island during the summer. A third party will provide controls to help manage charging at each location. In the summer, PSEG Long Island will call on STS to request same-day or day-ahead load relief when needed for peak events.
- **Stage 4 Measurement and Reporting:** Throughout operation, data will be collected to support performance evaluation and hypothesis testing, which will be reported at the end of the program.

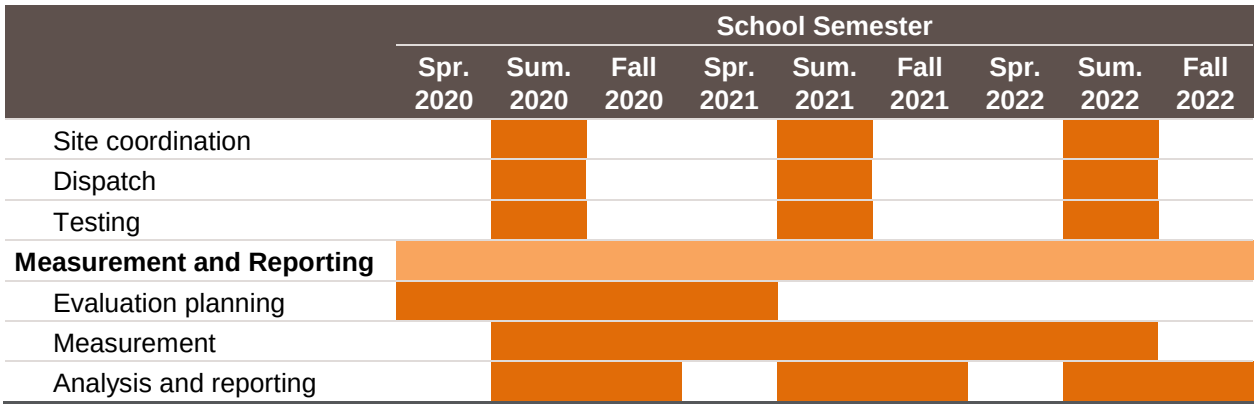
Project Schedule

The V2G pilot proposed in this filing includes an initial technology pilot of three electric school buses. Following the pilot, the program could be expanded into a REV demo which could test 6-12 buses with a business model for scale. The proposed project schedule is outlined in Table 3-25. This preliminary project schedule is contingent upon the ability of e-buses to be ordered, manufactured, and delivered according to schedule (by summer 2020).

Table 3-25. Project Schedule – E-Bus V2G Pilot

	School Semester								
	Spr. 2020	Sum. 2020	Fall 2020	Spr. 2021	Sum. 2021	Fall 2021	Spr. 2022	Sum. 2022	Fall 2022
Planning									
Site identification									
Customer acquisition									
Implementation									
Procurement									
Deployment									
Commissioning									
Operation									

[19] STS may initiate the e-bus procurement in 2019 to help ensure delivery by summer 2020. PSEG Long Island will not disburse any funds to STS or initiate procurement of other equipment until after the pilot project is approved.



Planning

In the planning stage, PSEG Long Island will focus on identifying the sites where EVSE will be deployed, including customer/site acquisition at three types of locations: (1) STS facility for school-year charging, (2) summer location on constrained circuit, and (3) resilient customer location for critical load support during a prolonged outage. PSEG Long Island will coordinate with STS to identify a suitable district and charging location for school-year charging that is reasonably proximate (within bus driving range) to a suitable constrained circuit (near-term deferral need that buses can help to relieve and where parking and interconnection is feasible). PSEG Long Island will also reach out to potential resilient customers that are reasonably proximate to both the school-year charging location and the summer constrained circuit location. It is possible that one location may serve multiple purposes (e.g., summer site and resilient load site).

PSEG Long Island's target for securing sites for EVSE locations is end of Q1 2020.

Implementation

PSEG Long Island will coordinate with STS on procurement of e-buses and EVSE. STS will procure and own the buses, and its procurement process may begin in 2019. PSEG Long Island will provide a one-time payment of $100,000 per bus to STS. STS will procure and own the EVSE for the school-year charging location and will cover all equipment, installation, and operation costs. In addition, STS will make a payment to PSEG Long Island for any make-ready costs incurred up to the point of interconnection. PSEG Long Island will procure and own the EVSE sited at all secondary/supplementary sites (e.g., summer constrained circuit location and the resilient load location), covering all make-ready, equipment, installation, and operation costs. The target for completing procurement is the end of Q1 2020.

Once sites have been identified, PSEG Long Island and STS may proceed with site preparation and installation of the EVSE. The buses are targeted for delivery by the beginning of summer 2020 to provide peak support throughout the summer season. Therefore, the EVSE must be commissioned by the beginning of summer 2020. The target for commissioning EVSE is the end of Q2 2020.

Any delays in actual or expected delivery of the buses (past summer 2020) may lead to delays in other portions of schedule, including implementation, operation, and measurement and reporting.

Operation

During the summer, buses will be dispatched to relieve peak load on the constrained circuit, as well as reduce system coincident peak load. To provide load relief, PSEG Long Island will call on STS to coordinate the dispatch of the buses; this process will be manual for the pilot.

During the school year, STS will operate the buses and manage the charging of the buses, with the intention of charging only during off-peak hours to minimize electricity costs.

PSEG Long Island will coordinate with STS the movement of the buses between locations at the beginning and end of each summer season (2020, 2021, and 2022).

Depending upon ability to do so, PSEG Long Island may also coordinate movement of the buses to resilient load sites for testing to demonstrate the capability of the bus to serve critical load. In the event of an actual prolonged outage duration the pilot, PSEG Long Island will have a prepared plan in place to coordinate movement of the buses to the resilient load site.

3.3.1.6 *Principles of REV Demo Projects*

The proposed pilot aligns with several principles of REV demos, as described in Table 3-26. This pilot will inform the development of a more scalable and market-based model for provision of V2G services by e-buses and other EVs. At present, the relatively high costs of e-buses and other equipment relative to traditional alternatives requires additional incentives to make the investment viable for customers. However, costs are expected to decline significantly, and this project will help PSEG Long Island to ensure that it is able to help facilitate market growth as costs fall.

Table 3-26. Principles of REV Demos – E-Bus V2G Pilot

Principle	Description
Includes partnership between utility and third-party service providers	Collaboration between STS, Blue Bird, EVSE providers, and PSEG Long Island, based upon an idea submitted through REV Connect
Demonstrations should delineate how the generated economic value is divided between the customer, utility, and third-party service provider(s)	Identifies and quantifies associated costs and benefits, supporting subsequent development of more scalable business models for e-buses and other EVs that effectively allocate costs and benefits between stakeholders
Offers competitive markets for grid services	Informs opportunities to develop competitive markets for distribution services, which may use mobile batteries
Informs rules that will help create competitive markets	May provide insights that inform future interconnection rules, establishment of distribution markets, and rules regarding utility and DER participation in wholesale markets
Identifies questions it hopes to answer or problems or situations on the grid and the market should respond with solutions	See 3.3.1.4 for hypotheses being tested for this pilot
Informs pricing and rate design modifications	May inform rates based upon EVs charging during off-peak periods, as well as pricing for distribution-level grid services

Principle	Description
Includes various customer participants	Potential participating customers include bus fleet operators, which provide services to schools and their students; additional participating customers may include critical load sites, which provide value to the local community during prolonged outages

3.3.1.7 *Budget Request*

PSEG Long Island is seeking sufficient funding to launch an electric school bus V2G pilot program. The pilot program will provide a $100,000 incentive for three electric school buses in the PSEG Long Island service territory. Additionally, PSEG Long Island will invest in charging infrastructure and program management associated with the pilot. See Table 3-27 for a summary of the budget request.

Table 3-27. Budget Request Summary for E-Bus V2G Pilot

	Added Capital Costs ($M)				Added O&M Costs ($M)			
Cost Type	***3-Year Total***	**2020**	**2021**	**2022**	***3-Year Total***	**2020**	**2021**	**2022**
Customer Incentives	-	-	-	-	*0.30*	0.30	-	-
Materials & Equipment	*0.08*	0.08	-	-	*0.08*	0.08	-	-
Third Party Support	-	-	-	-	*0.27*	0.12	0.07	0.07
Total	***0.08***	***0.08***	***-***	***-***	***0.64***	***0.50***	***0.07***	***0.07***

3.3.1.8 *Discussion of Costs and Benefits*

The largest benefit category is Net Non-Energy Benefits, which accounts for reduced diesel consumption per electric bus. The primary grid benefit is Avoided Distribution Capacity Infrastructure. Nonetheless, the benefits are not driven by any one benefit stream, so multitude of benefits captured here helps to substantially improve the benefit cost ratio. Costs include electric bus costs, make-ready infrastructure, EVSE, program management, and measurement and verification (M&V). Details of benefits and costs are described in Table 3-28, with a graphical representation in Figure 3-10.

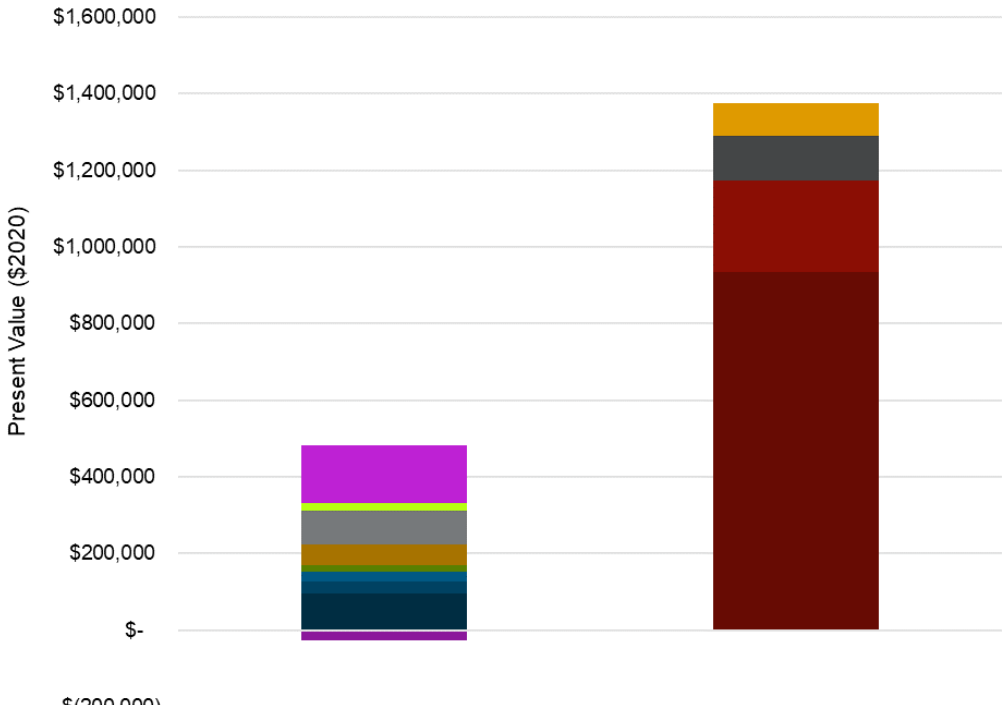
PSEG Long Island's proposed e-bus V2G pilot project has a societal cost test (SCT) benefit to cost ratio of 0.33. Although this may not appear favorable in isolation, the purpose of this project is to provide valuable insights that will prepare PSEG Long Island to facilitate market growth and better utilization of e-buses and other EVs for the grid as costs become more competitive. As costs fall and e-buses become more economically attractive, PSEG Long Island can use lessons from this pilot to help accelerate the market and ensure that these assets are effectively utilized for grid benefits.

Figure 3-11 illustrates what this BCA could look like at scale, yielding a SCT benefit-to-cost ratio of 1.09. In this case, costs fall significantly. The pilot BCA's costs are driven primarily by participant DER costs, then secondly by program administration costs. Currently, the incremental cost of the V2G-capable e-bus (~$275,000) versus a traditional diesel is expected to fall significantly as the market matures, likely below

about $50,000 per bus.[20] At scale, program administration and evaluation costs should be minimal. The analysis at scale focuses only on the bus fleet location and the summer location, eliminating both costs and benefits associated with backup power. Instead of paying an up-front incentive to customers for the bus, PSEG Long Island can instead simply pay for grid services provided or pay a summer lease to use the buses for grid services.

This pilot project provides a reasonable BCA for an initial pilot and provides valuable lessons to enable PSEG Long Island to develop future programs that will generate significant benefits for PSEG Long Island and its customers.

Figure 3-10. Present Value Benefits and Costs of SCT – E-Bus V2G Pilot



	Benefits	Costs
Incremental T&D and DSP Costs	$-	$84,000
Added O&M	$-	$117,075
Net Non-Energy Benefits	$151,967	$-
Net Avoided CO2	$20,100	$-
Avoided Outage Costs	$87,192	$-
Avoided O&M	$53,193	$-
Avoided Ancillary Services	$16,806	$-
Avoided Energy (LBMP)	$(25,442)	$-
Avoided Generation Capacity Cost (AGCC)	$27,251	$-
Avoided Transmission Capacity Infrastructure	$30,960	$-
Avoided Distribution Capacity Infrastructure	$95,095	$-
Program Administration Costs	$-	$238,619
Participant DER Cost	$-	$935,337
Total	$457,122	$1,375,031

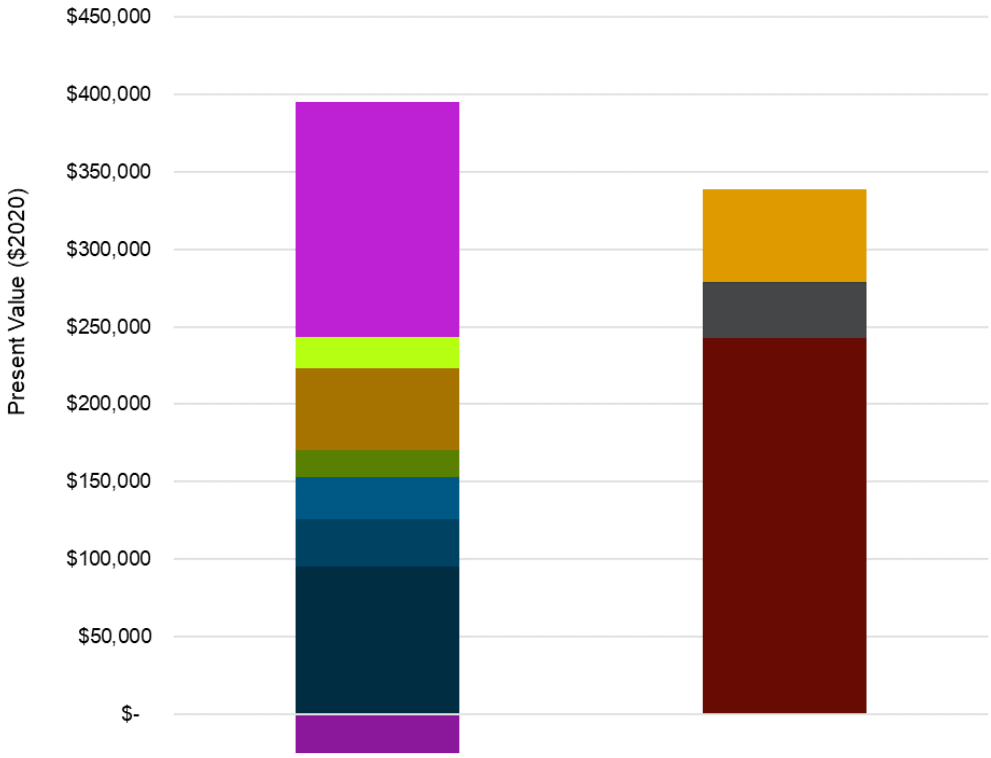
[20] Roughly assuming $250/kWh for batteries x 160 kWh and $100/kW x 50 kW for the inverter, key costs are approximately $45,000.

Table 3-28. Benefits and Cost Details – E-Bus V2G Pilot

#	Value Stream	Calculation Methodology	Benefits (NPV)	Costs (NPV)
1	Avoided Generation Capacity Cost	Based upon PSEG Long Island capacity price forecast and estimated peak generation coincidence factor.	$27,251	
2	Net Non-Energy Benefits	Calculated using diesel savings per bus and diesel price.	$151,967	
3	Avoided Transmission Capacity Infrastructure	Based upon PSEG Long Island transmission capacity price forecast and estimated peak coincidence factor.	$30,960	
4	Avoided Distribution Capacity Infrastructure	Based upon PSEG Long Island distribution capacity price forecast for North Bellmore as a proxy and estimated peak coincidence factor.	$95,095	
5	Avoided Energy[21]	Negative benefits due to bus operation during the school year. Calculation based upon bus usage during the school year and weekly energy consumption per bus.	$(25,442)	
6	Avoided Outage Costs	Based upon major power outages and value per outage from Lawrence Berkeley National Laboratory's Interruption Cost Estimate Calculator.	$87,192	
7	Net Avoided CO_2	Reduced carbon emissions from diesel and increased emissions from electricity consumption.	$20,100	
8	Avoided O&M	Based upon maintenance cost savings from operating electric over diesel bus.	$53,193	
10	Avoided Ancillary Services	Based upon operating reserves price forecast.	$16,806	
11	Utility Costs	See Table 3-27 for details. Note that the value shown in this table is present value, while the values shown in the Table 3-27 are annual. This does not include incentives.		$439,694
12	Participant DER Cost	Accounts for benefit of avoided cost of traditional bus ($275,000/bus) and licensing fees.		$935,337
	Total SCT Benefits		**$457,122**	
	Total SCT Costs			**$1,375,031**
	SCT Ratio			**0.33**

[21] Value based upon Locational Based Marginal Price (LBMP)

Figure 3-11. Present Value Benefits and Costs of SCT – E-Bus V2G Pilot at Scale

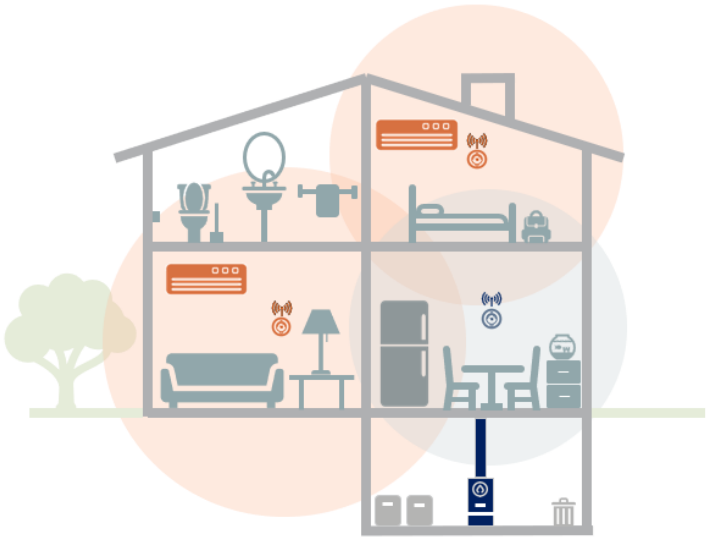


	Benefits	Costs
Incremental T&D and DSP Costs	$-	$60,000
Added O&M	$-	$36,469
Net Non-Energy Benefits	$151,967	$-
Net Avoided CO2	$20,100	$-
Avoided O&M	$53,193	$-
Avoided Ancillary Services	$16,806	$-
Avoided Energy (LBMP)	$(25,442)	$-
Avoided Generation Capacity Cost (AGCC)	$27,251	$-
Avoided Transmission Capacity Infrastructure	$30,960	$-
Avoided Distribution Capacity Infrastructure	$95,095	$-
Participant DER Cost	$-	$242,469
Total	$369,931	$338,937

3.3.2 Heat Pump Controls Pilot

PSEG Long Island proposes a technology pilot to demonstrate integrated smart thermostat controls for ductless mini-split heat pumps, targeting customers with central oil-fueled heating systems. These thermostats could lead to more efficient, low-carbon heating that provides participating customers with energy bill savings while supporting beneficial electrification. The smart thermostats will enhance control capabilities and allow for increased heat pump utilization for winter heating. Figure 3-12 illustrates the pilot concept.

Figure 3-12. Heat Pumps Controls Pilot Concept



Of PSEG Long Island customers, an estimated 3% have existing ductless mini-split heat pumps, which are often only used for summer cooling, leaving them underutilized for winter heating. Even if used for winter heating, the lack of communication with the central heating system may also lead to underutilization of the mini-split heat pumps. This pilot will target both customers with existing ductless mini-split heat pumps and customers that do not currently have mini-split heat pumps. Incentives for heat pumps will be provided through separate programs, and this pilot will focus specifically on supporting the deployment of thermostats and controls to support displacement of oil heating in winter through increased utilization of ductless mini-split heat pumps.

PSEG Long Island will coordinate this pilot with other efforts related to smart thermostats, home comfort programs, and electrification of heating to support effective implementation, including customer acquisition and evaluation.

3.3.2.1 *Goals and Objectives*

The pilot will help PSEG Long Island better understand how smart thermostats can be used to support beneficial electrification by optimizing heat pump usage, thereby reducing carbon emissions from winter heating. Lessons from this pilot will help to inform how controls may be used to support beneficial electrification and to identify how costs and benefits can be effectively allocated between participating customers and PSEG Long Island to support a more scalable model in the future that reduces reliance on rebates to support large-scale deployment of heat pumps and associated controls.

3.3.2.2 *Value Proposition*

The proposed pilot offers value to a variety of stakeholders, as shown in Table 3-29.

Table 3-29. Value Proposition – Heat Pump Controls Pilot

Stakeholder	Value Proposition
Participating Customers	• Potential energy cost savings from efficient management of energy usage in the homes, especially heating during the winter • Possible additional incentives for participation in DLM programs to control heat pumps • Reduced up-front cost of purchasing smart thermostats • New abilities to program ductless mini-splits and control them remotely
Non-Participating Customers	• Reduced electricity costs from beneficial electrification • Reduced carbon emissions from reduced use of fossil fuels
PSEG Long Island	• Increased opportunities to empower customers with education and additional energy options • Increased customer satisfaction from energy bill savings
LIPA	• Informs opportunities to provide on-bill financing for thermostats and heat pumps • Decarbonization through beneficial electrification of residential heating
New York State	• Addresses REV objectives of reducing carbon emissions, enhancing customer knowledge and capabilities, ensuring fuel and resource diversity, and improving system-wide efficiency

3.3.2.3 *Scope*

Nearly one-third of New York State's GHG emissions originate from heating and cooling activities. To reduce these emissions, the State is focused on energy efficiency initiatives targeting the heating sector, namely the implementation of heat pumps. Electric heat pumps can be attractive and cost-effective alternatives to fossil-fueled furnaces and boilers, which represent the majority of heating sources for New York's customers.

In PSEG Long Island's territory, approximately 50% of customers depend on fuel oil for heating. To encourage adoption of high-efficiency electric heat pumps, PSEG Long Island currently offers rebates for air source heat pumps and ductless mini-split heat pumps. These new heat pumps, however, may not be integrated with the central heating system, so heat pumps may often be underutilized for winter heating. Thus, PSEG Long Island is proposing a technology pilot to test the use of smart thermostats to develop a better understanding of the benefits that these controls offer to PSEG Long Island, participating customers, and non-participating customers.

PSEG Long Island is proposing to deploy smart thermostats for both new and existing ductless mini-split heat pumps. The smart thermostats for both the central heating system and the mini-splits would allow heat pumps to communicate with central HVAC systems via Wi-Fi to optimize utilization. Smart thermostats for each currently exist, while Resideo is currently developing new controls to integrate the two and expects these controls to be available by the end of 2019.

These controls intelligently adjust mini-split and central heating usage in a way that optimizes utilization of heat pumps and initiates central heating only when the heat pumps are unable to supply sufficient heat to maintain the setpoint. Running on cloud-based software, smart thermostats allow customers to remotely control heating/cooling in their homes in addition to managing setpoint control. In addition, customers may have the option of enrolling in a DLM program, in which PSEG Long Island will have the ability to control temperature setpoints on peak days. Thus, deployment of the smart thermostats would provide efficient and economic energy usage control for PSEG Long Island customers.

PSEG Long Island expects that a third-party provider (Resideo) will be contracted to provide and deploy the smart thermostats to 70 target customers. The rebate value per customer for the thermostats is approximately $780. A larger-scale program may be rolled out following a successful pilot.

3.3.2.4 *Hypotheses Testing*

PSEG Long Island believes that deployment of smart thermostats will be cost-effective for customers in the long-term and has designed the hypotheses to test that theory.

Hypotheses

The hypotheses and relevant targets are described in Table 3-30. A post-project BCA will provide insight into the benefits and costs prior to the program's full rollout.

Table 3-30. Hypotheses - Heat Pump Controls Pilot

Hypothesis	Metric	Measure of Success
Usage of the heat pumps will increase with customer education and outreach	Winter heat pump usage	Baseline: Percentage of existing ductless mini-split heat pumps used in the winter
Enhanced controls (via smart thermostats) will enable higher utilization for winter heating	Fuel savings	Percent reduction in fuel use for winter heating Target: 25%
Deployment of enhanced controls will be cost-effective for customers	Energy cost savings	Reduction in energy costs Target: ~$780/customer/winter heating season

Measurement and Reporting

In advance of installation, PSEG Long Island will establish a detailed evaluation plan to ensure that sufficient data is acquired. PSEG Long Island will begin collecting data in 2020 to facilitate evaluation of project performance, benefits, and hypothesis testing. Analysis and reporting will follow data collection.

Data to be collected may include the following:

- Heat pump usage from interval thermostat data
- Interval customer load data from AMI
- Weather data
- Current and historical fuel oil bills (as feasible)

The evaluation may involve the use of control and test groups/conditions which will be determined during the evaluation planning stage.

3.3.2.5 *Implementation Plan*

PSEG Long Island is proposing a three-stage approach for pilot of the smart thermostats:

- **Stage 1 Customer Engagement:** The first step is to identify the target customer population for the pilot and then reach out to the target population to acquire customers for the pilot.
- **Stage 2 Installation:** Once the target population is identified, smart thermostats will be deployed for customers with existing ductless mini-split heat pumps.
- **Stage 3 Evaluation:** An evaluation of program performance will be conducted at the end of the program.

Project Schedule

The thermostats are proposed to be deployed in the first year (2020). Data collection and initial analysis are expected to begin in the same year. A full evaluation of the program is to be conducted in the following year (2021) to assess savings during the full 2020-2021 winter heating season. A schedule of project activities is shown in Table 3-31.

Table 3-31. Project Schedule – Heat Pump Controls Pilot

	2020	2021	2022
Customer Engagement			
Identification of target population for pilot			
Customer/marketing plan			
Customer outreach/acquisition			
Installation			
Technology deployment			
Evaluation			
M&V planning			
Data collection			
Analysis and reporting			

Customer Engagement

This stage is divided into two main components, customer identification and outreach:

- **Customer identification:** The third-party controls provider and PSEG Long Island will work together to identify potential target customers.
    - The primary approach is for the third-party controls provider (Resideo) to collaborate with trade partners to identify suitable customers.
    - As needed, PSEG Long Island will support this effort by using its resources (e.g., Energy Concierge, prior incentive programs, outreach efforts for related programs).

  The target population for the pilot is approximately 70 customers.
- **Customer outreach:** Once potential customers are identified, Resideo, with support from PSEG Long Island as needed, will acquire participants for the pilot program. Outreach may occur via trade partners, the Energy Concierge program, email, direct mail, door-to-door visits, or local

media. The customer outreach approach will be dependent upon the characteristics of target population and key insights from the customer identification stage.

Installation

Resideo will dispatch technicians to each customer's home and install the smart thermostats. Technicians will be the primary point of contact for any customer support. Additional customer support may be provided by Resideo or PSEG Long Island as necessary. The pilot project plan is to install 70 thermostats in 2020 for evaluation of the 2020-2021 heating season.

3.3.2.6 *Principles of REV Demo Projects*

The proposed pilot aligns with several principles of REV demos, as described in Table 3-32. New technology is being developed for this pilot (integrated controls for multiple thermostats), and PSEG Long Island seeks to learn quickly from a targeted sample of customers whether and how such technology could scale to meet utility and state objectives. From this pilot, PSEG Long Island will be able to better understand the magnitude of costs and benefits associated with this technology in order to design a more scalable future program that shifts from technology incentives toward a more market-based solution.

Table 3-32. Principles of REV Demos – Heat Pump Controls Pilot

Principle	Description
Includes partnership between utility and third-party service providers	Collaboration with third-party thermostat provider (Resideo), who submitted this idea to PSEG Long Island through REV Connect and is assuming the development risk for the controls technology, not passing on the cost of development to PSEG Long Island
Demonstrations should delineate how the generated economic value is divided between the customer, utility, and third-party service provider(s)	Informs value to different parties, enabling subsequent development of more scalable, market-based models in the future that reduce reliance on rebates
Offers competitive markets for grid services	Potential to include DR services in summer
Identifies questions it hopes to answer or problems or situations on the grid and the market should respond with solutions	See Section 3.3.2.4 for hypotheses being tested for this pilot
Informs rules that will help create competitive markets	Informs ability for heat pumps to be able to provide grid services
Informs pricing and rate design modifications	Informs ability to reduce future reliance on rebates, impact of heat pumps and related controls on rates, and opportunities to offer financing for heat pumps and related controls
Includes various customer participants	Actively engages residential customers and potentially some small commercial customers

3.3.2.7 *Budget Request*

PSEG Long Island is requesting sufficient funding to run a Heat Pump Controls Pilot program. The funding would cover incentives for an estimated 70 customers, as well as program management and measurement and verification costs. The funding request is summarized in Table 3-33.

Table 3-33. Budget Request Summary for Heat Pump Controls Pilot

	Added Capital Costs ($M)				Added O&M Costs ($M)			
Cost Type	***3-Year Total***	**2020**	**2021**	**2022**	***3-Year Total***	**2020**	**2021**	**2022**
Customer Incentives	-	-	-	-	*0.05*	0.05	-	-
PM, Labor & Training	-	-	-	-	*0.25*	0.15	0.10	-
Total	***-***	***-***	***-***	***-***	***0.30***	***0.20***	***0.10***	***-***

4. Evolving to a Customer-Centric DSP

PSEG Long Island is evolving to a customer centric DSP consistent with the key development areas mentioned in the distributed system implementation plans (DSIP) guidance document.[22]

As a future DSP, PSEG Long Island will plan for and operate a dynamic grid that encompasses both sides of the utility meter and relies increasingly on distributed resources and dynamic load management. However, achieving this vision requires enhancing the platforms, tools, and information available to PSEG Long Island planning engineers and grid operators. PSEG Long Island is currently investing in foundational projects and programs that can deliver such platforms, tools, and information, in alignment with PSEG Long Island's overall Utility 2.0 Roadmap (Section 1.3).

PSEG Long Island has many initiatives underway, some funded through Utility 2.0 (see Section 4.1) and some as part of normal utility operation and budgeting (see Appendix D.3). These initiatives support the vision to evolve to a customer-centric DSP but are only a subset of the overall portfolio of DSP-enabling projects. PSEG Long Island will continue looking for ways to support its vision of evolving to a customer-centric DSP through other channels and in business-as-usual operations. Some of which are defined below:

- **Integrated System Planning** – Funded by PSEG Long Island's 2018 filing, the Utility of the Future team has been established to support and facilitate the integration of DER onto the T&D system. See update on progress of the Utility of the Future team in Section 4.1.1.
- **Advanced Forecasting** – As more data analysis from AMI meters is conducted, the results will feed into continuous improvements to PSEG Long Island's forecasting methodology. See update on progress of the Utility of the Future team in Section 4.1.1.
- **Grid Operations/Modernization** – PSEG Long Island is in the process of deploying capabilities and advanced technologies on distribution circuits to evolve to the DSP. Though some of these initiatives have or will be funded through Utility 2.0, many have or will be funded from other means. For examples of such initiatives, see Appendix D.3.2 for information on Grid Modernization, Appendix D.3.2 for information on ADMS and D.3.4 for information on DERMS.
- **Energy Storage** – PSEG Long Island has installed two 5 MW batteries on the South Fork system, which is the fastest growing region in Long Island with an ~2.4% annual growth. See update on progress of Miller Place in Section 4.1.3 and see Section 4.2.1 for details on the 2019 request for utility-scale storage at Brightwaters.
- **EV Integration** – PSEG Long Island is conducting studies to understand the loads added by electric vehicles to the distribution pole top transformers feeding them. The purpose of the analytics is to capture the impact that electrical vehicle will have on the distribution transformers. For progress on this study, see Section 3.1.3.
- **DER Interconnections and Beneficial Locations for DER** – Hosting Capacity Maps (proposed in Section 4.2.2) combined with IOAP enhancements (progress update in Section 4.1.4) will provide information to DER providers on locations, size, number of projects in the queue and the remaining capability on the particular circuit. To identify the value of these resources, PSEG Long

[22] On February 26, 2015 in the REV proceedings, the PUC issued an *Order Adopting Regulatory Policy Framework and Implementation Plan* known as "Track One" order. The purpose of the order is to transform future electric industry in New York State that will allow for integration of DR and DLM. Part of this initiative required utilities to provide DSP services to enable or promote DERs to deliver its value to the customers and the utility. On March 9, 2017 the PUC issued an order on the DSIP filing identifying key areas of development to transition utilities from the historic model of unidirectional electric system to a dynamic model of a grid that encompasses both sides of the utility meter and relies on distributed resource and dynamic load management. Subsequently on April 26, 2018 DPS issued a whitepaper guiding the utilities to address key development areas as part of their DSIP filings.

> Island will prepare a locational value study that will identify the marginal cost of DER at interconnection locations. For more details on this study, see Section 4.1.2.

Further to these initiatives, PSEG Long Island is continuously considering new initiatives and projects that can progress its capabilities, in alignment with its DSP vision. Some selection of future DSP initiatives that are currently being considered include a smart wire technology pilot and a dynamic voltage control pilot. Both solutions would provide flexibility on the grid to accommodate congested circuits and potentially increased intermittent, renewable energy.

4.1 Progress to Date

The programs approved in 2018 focused on Evolving to the DSP include the Utility of the Future team and the volt-VAR optimization (VVO) study at North Bellmore that it has completed, the Locational Value Study, the NWS Planning Tools, utility-scale storage at Miller Place, and the interconnection portal, or IOAP. Details can be found in the Utility 2.0 Outcomes Dashboard (See Appendix C).

4.1.1 Utility of the Future

The Utility of the Future (UoF) group will primarily be responsible for developing and implementing the PSEG Long Island DSP vision and functionality. The group will take ownership for and proactively drive the development of REV-related capabilities to meet NY State REV objectives and State policy goals. The 2018 filing indicated six core functional areas for the UoF team. These have been expanded to include:

- Distribution load forecast modelling
- Special studies and technical support
- Pilots and demonstration projects
- Coordination on energy efficiency and renewable energy
- Advanced Distribution planning analyses utilizing AMI data (Volt Var Optimization (VVO) transformer load monitoring [TLM], VVO, etc.)
- Joint Utilities of New York membership
- DER Integration
- Identifying/Conducting key analyses needed to achieve DSP vision
- Participating in NYISO/DPS sponsored working groups to support DSP initiatives
- Integrating market rules into grid planning practices
- Supporting VDER initiatives
- Identifying and integrate new technology into distribution system
- Building/Propose NWS to defer capital investments

As such, the group will improve infrastructure planning functions and make strategic decisions towards the T&D grid of the future. It will support selecting distribution grid technologies, conducting technical and market demonstrations, developing policies, integrating DER, developing market rules, and conducting key planning analyses. The team will provide input on the selection of technology platforms and use cases to ensure that the tools/platforms align with NY State REV goals.

The group has started off with a manager and two engineers in 2019 and is expected to grow to support incremental workload associated with DSP initiatives. The group's accomplishments to date include volt-VAR optimization in North Bellmore using AMI data, as described below.

Engagement with the Joint Utilities of New York

PSEG Long Island is in the process of becoming a member of the Joint Utilities of New York and is expected to participate in Joint Utility working groups, as well as direct contact with peers in the New York State IOUs to ensure that it leverages lessons learned and implements best practices around DSP initiatives.

Specifically, PSEG Long Island is currently participating in the Market Design and Integration working group and sitting in various knowledge dissemination workshops with the Joint Utility facilitators. The UoF group has already used these forums to inform its proposed development of hosting capacity maps, as well as its ongoing work to deliver a locational value study.

PSEG Long Island will continue its attendance and participation in Joint Utility working groups, as well as direct contact with peers in the New York State IOUs to ensure that it leverages lessons learned around DSP initiatives.

VVO Study in North Bellmore

The UoF team completed an initial VVO study, proving that AMI data can be used to optimize distribution system voltages, identify phase imbalances, and feasibly implement conservation voltage reduction. The study established an infrastructure and pathway to use AMI data to enhance power quality and reliability and generate potential customer savings.

In this study, the UoF group utilized granular AMI data to improve power quality for customers in the North Bellmore area. The group validated phase balancing issues on North Bellmore circuits using AMI. It also discovered low voltage issues in the area not previously known. This insight led to corrective actions including revising the substation voltage and balancing the circuits, to give customers optimal voltages in the summer season.

With the introduction of AMI in PSEG Long Island's service territory, the company is gaining visibility into distribution grid characteristics, enabling advanced capabilities in grid planning and grid operations. before. Without AMI, PSEG Long Island had limited visibility into the distribution system downstream of the substation. As such, voltage was managed on a substation basis instead of on each circuit individually. As the North Bellmore study showed, AMI data has the power to provide insights into customer voltages, prevent power outages and predict equipment failures.

Table 4-1 summarizes the 2019 study of the three feeders in North Bellmore.

Table 4-1. North Bellmore Study Initiatives, 2019

Initiative	Description
Volt/VAR Optimization (VVO)	Circuit-by-circuit study of voltage and voltage management operating principles.
Conservation of Voltage Reduction (CVR)	Using the AMI data, planning engineers were able to run software simulations to assess the feasibility of reducing voltages at the substation to reduce energy consumptions.
Transformer Load Monitoring (TLM)	TLM uses data from the AMI system to estimate the loading on transformers with much greater accuracy than previously done. With TLM, the UoF team is working to identify the thermal loadings of the pole-top transformers.
Phase Balancing	Planning engineers use AMI data to identify significant loading imbalances on the distribution system. These imbalances cause excessive line losses and uneven voltage profiles.

Fuse Sizing	Fuse sizing is a review of the distribution protection system, which primarily consists of fuses, with a goal to minimize momentary outages and service interruptions. The UoF team is working to identify potentially overloaded fuses using power flow solutions.

While the North Bellmore study validated the analysis approach and demonstrated the benefits of using AMI data to optimize individual feeders, it also illustrated the complexity of manually creating network models for distribution feeders. One of the key conclusions from the study in North Bellmore was the need for faster feeder modelling that can be implemented system-wide. In 2019, PSEG Long Island will invest in a model builder that will enable PSEG Long Island planning engineers to quickly replicate AMI-enabled planning analyses across multiple feeders.

Advance Forecasting

PSEG Long Island's load forecasting function is continuously evolving with increased penetrations of DERs into the T&D system. Consistent with 2018 filing, Utility of future team is working with forecasting team to develop a more granular regional (and sub-regional) level of demand forecasts to be utilized in various planning analyses. Going forward, PSEG Long Island will improve this methodology by studying consumption patterns in AMI meter data and by comparing forecasted and actual summer peak values. Once AMI is fully deployed, this methodology will reflect a comprehensive forecast at regional level for the entire Long Island system.

Future Scope

Leveraging best practices developed by the New York Joint Utilities, the team will coordinate among business functions in PSEG Long Island and engage appropriate stakeholders where needed to build and support the customer-centric DSP vision. The team will support and collaborate with the analytics group. A key focus will be improved coordination of DSIP-like initiative deployment among various internal groups.

The UoF group will spearhead the transition away from system level planning to granular, more location-based T&D planning, capital investment, and innovative tariff design. New forecast models are necessary to evolve to the PSEG Long Island DSP vision. This effort entails the development of temporal and locational substation and feeder forecasts, modified to address new DER and lump loads. It also includes using AMI data for planning analyses and other insights into customer usage behavior and voltage issues. The UoF will work closely with the load forecasting group and with the distribution planning group to achieve this transition.

The UoF group will conduct technical studies to recommend operating and system efficiencies. These include a comprehensive locational value study which would provide PSEG Long Island with more precise information to incentivize DER and evaluate potential NWS projects. The team will also identify and initiate innovative and demonstration projects consistent with NY State clean energy goals.

4.1.2 Locational Value Study and Non-Wires Solution Planning Tools

In the first quarter, PSEG Long Island met with third parties to develop a detailed scope of work and data requirements for the Locational Value Study and Non-Wires Implementation Planning Tool. The utility also engaged with the Joint Utilities of New York, gathering helpful insight in terms of best practices for foundational DSP development.

In the future, this study will form the basis for the value stack tariff and the locational system relief value (LSRV) values will also be used for the NWS tool. This initiative will align the performance characteristics of the technology with the load shape of the circuit/area that needs the load relief.

4.1.3 Utility-Scale Storage Program – Miller Place

Miller Place substation was identified as a potential site to connect 2.5 MW battery. As of the first quarter, PSEG Long Island has planned to develop the request for proposal (RFP) for a utility scale storage program later in 2019.

4.1.4 Interconnection Online Application Portal

An important component of PSEG Long Island's DSP vision is to develop information sharing capabilities that will enable its customers to interconnect DER in a quicker and more cost-effective way. All these initiatives are already implemented by the Joint Utilities of New York, and their implementation will align PSEG Long Island with the overall New York State vision for the DSP.

Budget allocation for the Interconnection Online Application Portal (IOAP) enhancements were deferred by LIPA in fall 2018, further phases have been deferred accordingly by PSEG Long Island for 2020 implementation.

4.1.5 Related Initiatives Outside of Utility 2.0

PSEG Long Island is undertaking several activities for evolution to a customer-centric DSP that are outside the scope of Utility 2.0. These include but are not limited to: grid modernization to achieve alignment in DSP processes, and the deployment of generation-sited energy storage. See more details on these initiatives in Appendix D.3.

4.2 Funding Request for DSP-Enabling Capabilities

The initiatives included in the funding request for 2019 build on the existing DSP-enabling investments, while also aligning PSEG Long Island with initiatives undertaken by utilities in New York State to support overall State policy.

In 2018, PSEG Long Island decided to invest in the deployment of utility-scale storage to defer the need for investment in traditional infrastructure on the distribution grid, in what was the first project of an ongoing program for utility-scale storage deployment in Long Island. In the present filing, PSEG Long Island is proposing the expansion of the utility-storage program with the deployment of a 3 MW / 18 MWh storage system in Brightwaters. The proposed project will defer the need for investment in traditional grid infrastructure, while also adding flexibility in the way PSEG Long Island operates the distribution grid in Long Island. The deployment of storage will support the overall target for deployment of 1,500 MW of storage in New York State by 2025.

PSEG Long Island is also proposing the development of hosting capacity maps that will direct its customers to locations on the distribution grid where DER interconnection will be quicker and more cost-effective. The development of the hosting capacity maps will be done in a way that aligns with the hosting capacity maps development roadmap that the New York State Joint Utilities have developed and will build on analysis PSEG Long Island will conduct as part of its ongoing locational value study.

4.2.1 Utility-Scale Storage Program – Brightwaters

Initially launched by PSEG Long Island in its 2018 Utility 2.0 Filing, the Utility-Scale Storage program involves the deployment of storage systems in congested parts of the T&D grid to defer or avoid the need for traditional grid infrastructure investments. The procured energy storage systems will be owned by LIPA and used primarily for reducing load during the relevant T&D peak period to keep electric current safely within operational limits. This generally requires the storage system to be charged during lower load times and made available for discharge to offset loads at the distribution system operator's discretion (peak shaving).

Storage will help integrate clean energy into the grid, reduce costs associated with meeting peak electric demands, and increase overall efficiency on the distribution system. Additionally, energy storage can stabilize supply during peak electric usage and help keep critical systems online during an outage.

4.2.1.1 *Goals and Objectives*

The Utility-Scale Storage program is intended to provide the grid flexibility required to transition to an electric grid with high renewable energy penetration, supporting the Governor's goals of supplying 70% of the state's energy needs with renewable energy by 2030. PSEG Long Island is currently deploying a 2.5 MW system in Miller Place and is proposing the deployment of an additional 3 MW in Brightwaters to defer the need for traditional grid infrastructure investments.

4.2.1.2 *Value Proposition*

The proposed pilot offers value to a variety of stakeholders, as shown in Table 4-2.

Table 4-2. Value Propositions – Utility-Scale Storage

Stakeholder	Value Proposition
Non-Participating Customers	• The deferral of the need for grid infrastructure investment will reduce future impact on customer rates and can potentially reduce costs for interconnection of renewable energy.
PSEG Long Island	• The Utility-Scale Storage program aligns with the U2.0 Roadmap to evolve to a customer-centric DSP, which uses flexible grid resources, maximizes the utilization of grid assets, and enables effective integration of DER on the distribution system.
LIPA	• The program helps align Long Island with the REV vision and objectives by maximizing asset utilization and enabling adoption of renewable energy. • Uses LIPA's low cost of capital to deploy flexible assets on the grid.
New York State	• Contributes to statewide goal for the deployment of 1,500 MW of energy storage by 2025. • Supports statewide mandate to get 70% of electricity from renewable sources by 2030.

4.2.1.3 *Scope*

In the 2018 Utility 2.0 Filing, PSEG Long Island proposed to deploy a 2.5 MW/12.5MWh battery storage system in Miller Place to defer the need for distribution bank upgrades in the local substation. PSEG Long Island has evaluated upwards of 20 different possible sites across its territory and identified one suitable site where energy storage will be able to defer traditional investment and provide the best BCA of the feasible sites considered (see Table 4-3.). Possible sites were evaluated based on deferral need, property availability, and siting considerations.

Table 4-3. Project Description – Utility-Scale Storage

Project Name	Energy Capacity (MWh)	Power Capacity (MW)	Estimated Deferred Cost ($)	Grid Need
Brightwaters	18	3.0	~$9.9 million	Substation has forecast load growth over the planning limit starting in 2022, requiring a new bank to be installed.

The Brightwaters distribution substation is a two-bank, 28 mega volt-amps (MVA), 69/13 kV substation located in Suffolk County. The substation is operating near its maximum capacity and, based on forecasted load growth, the substation is expected to be operating above its emergency rating by 2022 in the case where one distribution bank is lost (N-1).

After reviewing planning load estimates, PSEG Long Island determined that the deployment of a 3MW/18 MWh battery storage system at Brightwater substation will defer the need to install a new substation transformer bank by five years. The five-year deferral is based on the assumption that there is no major lump load addition in the area after the expansion of existing hospital in the area which will add an additional 3 MW of load to the Brightwaters substation in 2021-2023. Given that the need for investment in Brightwaters is expected to become critical in 2022, the storage system will need to be in place by then.

Load peaks in Brightwaters are generally correlated to weather and temperature, and PSEG Long Island grid operators can accurately forecast the need for the storage system to provide peak shaving. This means that the storage system can be used for secondary use cases in non-summer months, such as participation in the NYISO wholesale markets, providing an additional value stream that would not be available with a traditional grid upgrade. Furthermore, the battery storage system may potentially contribute to other system needs, such as reduction in generation capacity during peak load conditions.

4.2.1.4 *Implementation Plan*

The implementation of the battery storage system in Brightwaters is organized in three main stages:

- **Stage 1 Engineering, Procurement, and Construction (EPC):** The first step is to design the specifications of the battery storage system and obtain permits. Once permits have been obtained, the battery must be procured and commissioned.
- **Stage 2 Operation:** Once commissioned, the battery is expected to be operational for the next 10 years.
- **Stage 3 Measurement and Reporting:** Throughout operation, data will be collected to support performance evaluation, which will be reported at the beginning and end of the program.

Details on the overall implementation schedule and the individual stages are described in the following sections.

Schedule

The battery storage system design, permitting, and procurement process are expected to commence in 2020. Since the need for additional capacity in Brightwaters is expected to become critical in 2022, PSEG Long Island is targeting commissioning the system prior to the summer of 2022. PSEG Long Island will use lessons learned from the planned storage procurement in Miller Place to expedite the procurement in Brightwaters so that the timeline shown in Table 4-4 is met.

Table 4-4. Project Schedule – Utility-Scale Storage (Brightwaters)

Stage	2020	2021	2022	2023+
EPC				
Spec design				
Permitting process and customer engagement				
Market solicitation				
Installation and commissioning				
Operation				
Facilities operational				
Ongoing operation				
Measurement and Reporting				
Evaluation planning				
Measurement				
Analysis and reporting				

Engineering, Procurement, and Construction

The EPC stage is divided into four main components:

- **Spec design:** PSEG Long Island will determine the battery system specifications based on system and site constraints (e.g., space availability in the Brightwaters substation).
- **Permitting process and customer engagement:** Once spec designs are complete, PSEG Long Island will coordinate with local authorities to obtain approval for the storage project. The permitting process will also include engagement with local stakeholders and customers to ensure full support from the local community.
- **Market solicitation:** PSEG Long Island will procure the storage system for the proposed site in an open market solicitation. While it is expected that a lithium ion battery storage system will be used in Brightwaters, PSEG Long Island is open to other options if they are proven and can meet the specified operational and technical requirements. To improve the efficiency of the upcoming procurement, PSEG Long Island will use lessons learned from the planned storage procurement in Miller Place, as well as other storage procurements that may take place in the interim. The target for completing procurement is Q4 2020.
- **Installation and commissioning:** Once a storage vendor has been selected, PSEG Long Island will work with the vendor to install and commission the system. The storage system must be commissioned by the summer of 2022 to meet critical needs at the site.

Operation

The storage system is planned to be in operation by 2022. PSEG Long Island will manage ongoing operation of the battery system through its lifetime of approximately 10 years. A third-party will provide ongoing maintenance of the battery system.

Measurement and Reporting

PSEG Long Island will establish a detailed evaluation plan in advance of storage system operation to ensure that sufficient data is acquired over the duration of the system's lifetime. Starting in 2022, PSEG Long Island will collect data to evaluate project performance and benefits, with analysis and reporting occurring at the end of each year going forward.

Data to be collected may include the following:

- Storage load at the system site to measure charging and discharging rates and total energy throughput
- Circuit load to assess coincidence with local peak
- System load to assess coincidence with system peak
- Battery health/state of charge (as feasible) to measure degradation over time

4.2.1.5 *Budget Request*

The funding request below in Table 4-5 details the funding necessary for a 3 MW battery and associated interconnection, program management, maintenance, and third-party support costs. The cost for grid storage will be updated in the future filings to reflect the actual bids that are received in response to the RFP that is intended to be issued for Brightwater grid storage project.

PSEG Long Island intends to work with NYSERDA to secure seed money to support the Brightwaters project. NYSERDA has allocated $53M to support storage on Long Island of which approximately $38M is available upon NYSERDA approval. Approximately $11.7M would be needed to support this project and minimize customer impact – i.e. to yield the equivalent of a 1.0 B/C ratio in net present value terms. This NYSERDA funding would assist PSEG Long Island in gaining experience with battery storage technology and operation and help NY State to achieve its goal of 3,000 MW of storage. If such funds were made available by NYSERDA, the net capital request to LIPA would be $0.62M.

Table 4-5. Budget Request Summary for Utility-Scale Storage

	Added Capital Costs ($M)				Added O&M Costs ($M)			
Cost Type	***3-Year Total***	**2020**	**2021**	**2022**	***3-Year Total***	**2020**	**2021**	**2022**
Materials & Equipment	11.56	2.60	7.86	1.10	-	-	-	-
Ongoing O&M	-	-	-	-	0.61	-	-	0.61
PM, Labor & Training	0.46	0.18	0.17	0.11	-	-	-	-
Third Party Support	0.30	0.15	0.15	-	-	-	-	-
Total	**12.32**	**2.93**	**8.18**	**1.21**	**0.61**	**-**	**-**	**0.61**

4.2.1.6 *Discussion of Costs and Benefits*

To generate a benefit-cost analysis for the proposed project in Brightwaters, the project's value streams were mapped to the New York State BCA Handbook SCT, similar to the approach followed in the 2018 Utility 2.0 filing. As described above (Section 4.2.1.5), PSEG Long Island intends to work with NYSERDA to source additional funding that would reduce the impact to customers.

The largest benefit stream is avoided distribution capacity infrastructure, which aligns with the deferral of the new distribution bank in Brightwaters for five years.

The costs for the project include: the costs of the battery system that is to be procured, permitting and engineering costs, interconnection costs, and annual O&M costs. A list of the value streams considered in the benefit-cost analysis is detailed in Table 4-6, with a graphical representation of the costs and benefits shown in Figure 4-1.

Figure 4-1. Present Value Benefits and Costs of SCT – Utility-Scale Storage Program

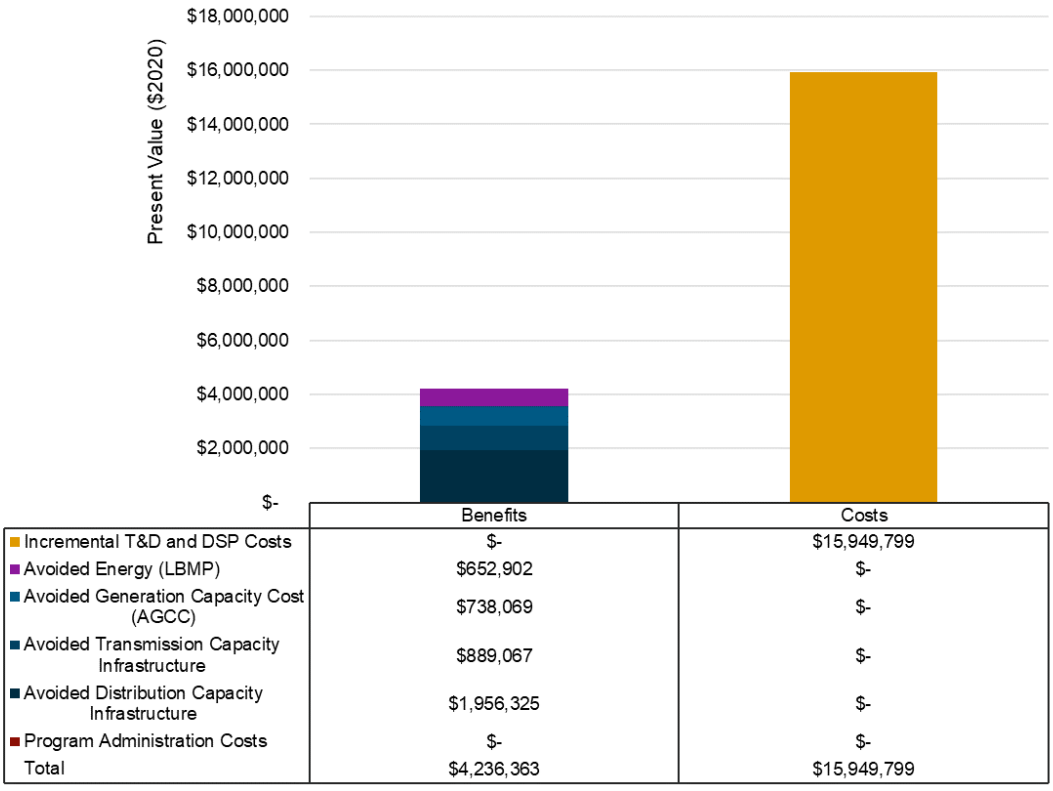


Table 4-6. Benefits and Cost Details – Utility-Scale Storage Program

#	Value Stream	Calculation Methodology	Benefits (NPV)	Costs (NPV)
1	**Avoided Generation Capacity Cost**	While not participating directly in the wholesale capacity markets, the system will be under utility control and is expected to coincide highly with system peak. Calculated by multiplying the reduction in peak by a general input for levelized avoided capacity cost in each year.	$738,069	

#	Value Stream	Calculation Methodology	Benefits (NPV)	Costs (NPV)
2	**Avoided Transmission Capacity Infrastructure**	Used the same methodology as the DLM tariff to calculate the per kilowatt value of peak load reduction. For LSRV areas, this is increased by 50%. Applied a coincidence factor between distribution and transmission peak.	$889,067	
3	**Avoided Distribution Capacity Infrastructure**	Calculated using capital recovery factor for conventional utility asset based on project cost, lifespan, and cost of capital. Calculated the cost for each year of the life and assigned this value to each year the storage resource is required for deferral. Assumed the full capacity of the resource is available for this use case as it is under utility control.	$1,956,325	
4	**Wholesale Energy Arbitrage**	Based on battery dispatch analysis of location based marginal pricing (LBMP) during discharging and charging periods.	$652,902	
5	**Battery Cost**	Hardware, balance of plant, systems integration, site installation, and project development fees.		$6,898,267
6	**Permitting and Engineering**	Includes project specs design and permitting costs in the first two years of the project.		$291,296
7	**Interconnection Costs**	Costs associated with storage system interconnection at the Brightwaters substation, based on historical costs for East Hampton and Montauk storage systems.		$1,463,432
8	**Battery O&M Costs**	2.5% of total battery system costs to cover battery operation and maintenance annually, as well as system insurance.		$1,238,537
9	**Reserve and Contingency**	15% of total battery system costs added as reserve and contingency.		$2,618,267
10	**Program Admin Cost**	Based on expected management costs.		$437,740

#	Value Stream	Calculation Methodology	Benefits (NPV)	Costs (NPV)
11	**Labor O&M Costs**	Accounts for maintenance and training support, power asset management contract coordination efforts, Utility of the Future team, and operations contract support.		$3,002,260
	Total Benefits		**$4,236,363**	
	Total Costs			**$15,949,799**
	SCT Ratio			**0.27**

4.2.2 Hosting Capacity Maps

Hosting capacity is defined as the amount of additional DER capacity that can be accommodated on a certain location on the distribution grid without adversely impacting power quality or reliability. This is typically calculated under existing operational configurations (e.g., switching positions), and without considering incremental infrastructure upgrades. Once DER additions to the circuit exceed the hosting capacity, additional investment would be required on the circuit to maintain power quality, safety, and reliability.

PSEG Long Island recognizes the importance of providing customers and DER developers with information that can help achieve quick and cost-effective interconnection. Therefore, it is proposing to develop hosting capacity maps that will direct DER developers to locations on the grid where hosting capacity is available.

4.2.2.1 *Goals and Objectives*

The goal of the proposed investment is to develop hosting capacity maps that will be made available through PSEG Long Island's website and will be regularly updated to inform DER developers and customers of locations with available hosting capacity. The hosting capacity maps will ultimately lead to quicker and more cost-effective interconnection of DER such as solar PV and EV chargers, contributing to the achievement of statewide clean energy goals.

4.2.2.2 *Value Proposition*

The proposed pilot offers value to a variety of stakeholders, as shown in Table 4-7.

Table 4-7. Value Proposition – Hosting Capacity Maps

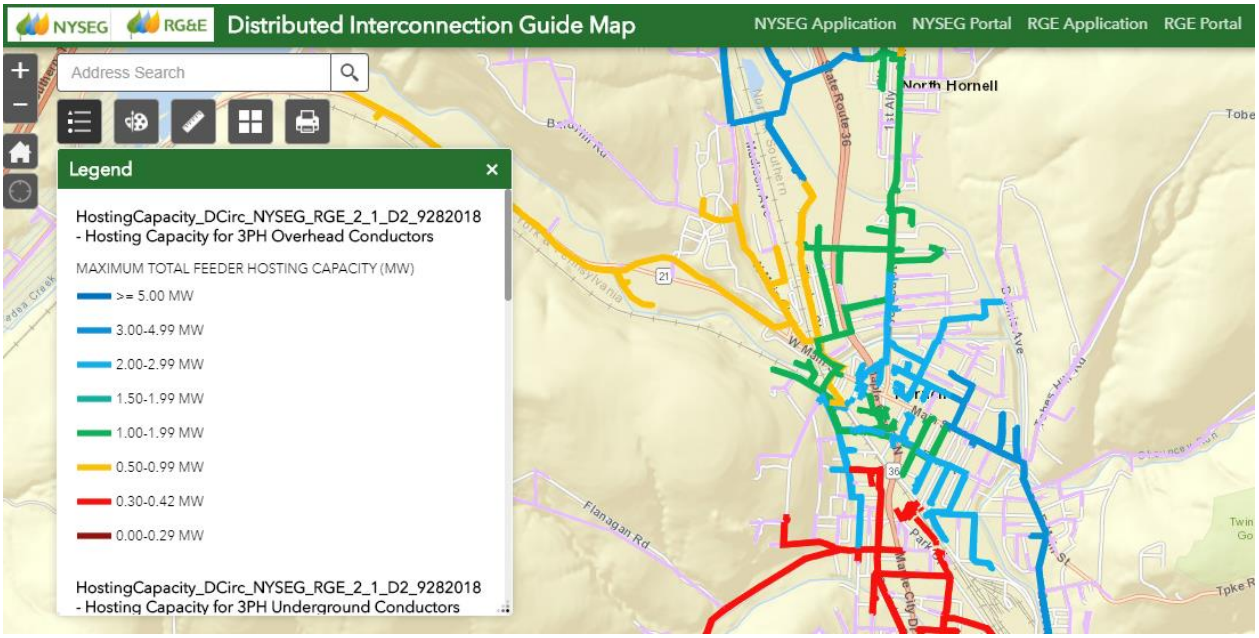
Stakeholder	Value Proposition
Non-Participating Customers	• DER developers and PSEG Long Island customers will have access to information that will make them aware of—and can direct them to—locations that will have quicker, more cost-effective DER interconnection.
PSEG Long Island	• Hosting capacity maps are an important part of PSEG Long Island DSP capabilities that will allow the company to manage the distribution grid and enable DER cost-effectively. • They support PSEG Long Island in improving its performance against its metrics for Interconnection performance.

LIPA	• The maps facilitate the interconnection of DER and renewable energy, in support of economic development in Long Island and statewide renewable energy goals.
New York State	• Implementation of hosting capacity maps will enable quicker DER interconnection and higher adoption of renewable energy, in line with the State's goal of meeting 70% of its electricity needs from renewable sources by 2030. • This effort will also improve alignment with the processes followed by the New York State Joint Utilities, all of which currently maintain hosting capacity maps.

4.2.2.3 *Scope*

Hosting capacity maps are interactive heatmaps that display locations on the distribution grid with DER interconnection limitations. Various colors indicate different levels of available capacity, making it easier for customers to identify favorable locations on the grid for DER interconnection, while also promoting transparency in the interconnection process. The development of such maps will support DER integration and DER market growth in Long Island by guiding investments and marketing activities to the locations where capacity is available without the need for additional grid infrastructure investment. An illustrative example of the hosting capacity maps developed by New York State Electric and Gas Corporation (NYSEG) and Rochester Gas and Electric Corporation (RG&E) is shown in Figure 4-2.

Figure 4-2. NYSEG and RG&E's Hosting Capacity Map



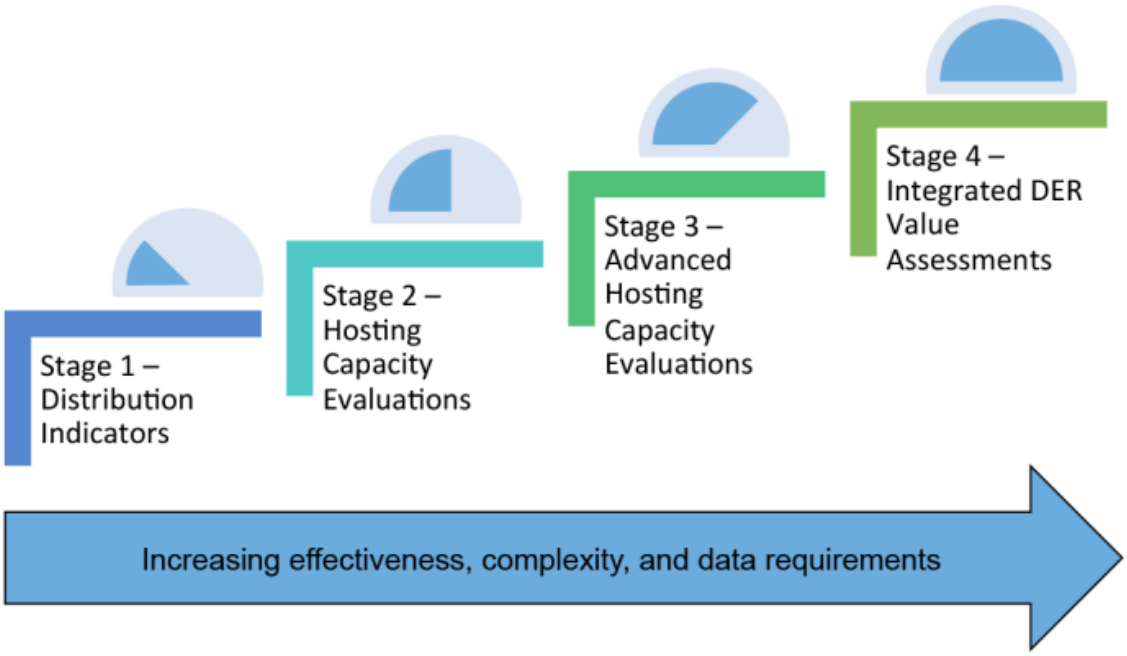
Source: New York State Electric and Gas Corporation and Rochester Gas and Electric Corporation Distributed Interconnection Guide Map (link)

In addition to the value the maps will bring to customers, they will also be a valuable tool for PSEG Long Island to identify locations on the grid that are near or at capacity limits to accommodate additional DER. Rather than addressing congestion and peak loads through infrastructure investment and requiring a detailed interconnection study for each project over a certain size, the presence of hosting capacity maps can enable proactive system planning in advance of potential overloads (e.g., launching targeted demand management programs in areas with low hosting capacity).

The Joint Utility roadmap for the development of hosting capacity maps

With the rapid increase in the deployment of DER over the last few years, utilities nationwide have started developing hosting capacity maps to better direct customers, including New York State's IOUs. To help guide the development of such maps, the New York Joint Utilities adopted a hosting capacity roadmap[23] (see Figure 4-3.), which consists of four development stages.

Figure 4-3. The Joint Utilities' Hosting Capacity Roadmap



Source: Electric Power Research Institute

- **Stage 1: Distribution Indicators**
  The first stage in the development process consists of assessing indicators to identify locations on the distribution system with available DER hosting capacity. The assessment gives a high-level understanding of the constraints that exist on different parts of the distribution system. A red zone map can be developed to indicate areas where interconnection costs may be higher. Example indicators include estimated level at which substation transformer back feed may occur, feeder voltage class, and whether the system is radial versus networked.
- **Stage 2: Hosting Capacity Evaluations**
  The second stage consists of identifying system criteria for determining hosting capacity, developing an analytical framework, conducting analysis, and illustrating results through maps. The maps developed at this stage indicate feeder-level hosting capacity.
- **Stage 3: Advanced Hosting Capacity Evaluations**
  In the third stage, the maps are upgraded to include operational flexibility through additional modeling and analysis. The maps developed at this stage indicate node/section-level hosting capacity.

[23] Electric Power Research Institute (EPRI). *Defining a Roadmap for Successful Implementation of a Hosting Capacity Method for New York State*. 2016.

- **Stage 4: Integrated DER Value Assessments**
  The final stage builds on the hosting capacity analysis by identifying locations with not only minimal impact but maximum benefits from added DER.

In 2016 and early 2017, the New York State IOUs developed Stage 1 hosting capacity maps and released their respective red zone locations. Stage 2 maps were commenced in October 2017 and completed in April 2018 for all circuits 12 kV and above, with the maps made publicly available on the IOUs' websites.

The frequency at which the hosting capacity maps are updated varies by utility. For example, Central Hudson Gas & Electric updates the maps on a yearly basis but updates interconnection queue data on a monthly basis. Orange & Rockland, on the other hand, makes monthly map updates. Currently, the Joint Utilities are working on the development of Stage 3 maps, which will provide sub-feeder level hosting capacity incorporating existing installed DER. Future development plans include enhancements to the Stage 3 analysis, such as increased refresh frequency, and Stage 4 maps, which are not defined at this time.

PSEG Long Island's Development Plan

PSEG Long Island plans to align its development process to the Joint Utilities' Hosting Capacity Roadmap and is proposing to develop Stage 2 maps for all 13 kV distribution circuits in 2020. A third-party developer will be contracted to develop the maps in a way that is transparent and sustainable, with ongoing updates to the maps being managed by PSEG Long Island's internal Utility of the Future team.

The hosting capacity maps will be made available on PSEG Long Island's website and will be updated at least annually; the exact frequency for data updates will be determined in consultation with internal and external stakeholders during the development process. The maps will be developed in a way that allows future expansion into Stage 3 and Stage 4 capabilities, although these will not be pursued immediately to manage the complexity of the implementation.

4.2.2.4 *Implementation Plan*

The implementation plan is divided into four main stages:

- **Market Solicitation for Qualified Third Party:** PSEG Long Island will develop a detailed scope of work and a plan for the development of the maps and conduct a market solicitation for a qualified third-party developer to develop the maps.
- **Data Collection and Analysis:** After selecting a third-party developer through the market solicitation, PSEG Long Island will coordinate with the developer to collect data and deliver the required analysis of distribution indicators and hosting capacity.
- **Map Development:** Once the hosting capacity analysis is completed, it will be overlaid graphically in maps of PSEG Long Island's service territory, which will be hosted on a secured portal maintained by PSEG Long Island.
- **Ongoing Updates to Map Data:** The underlying hosting capacity data and DER interconnection queue data will be updated regularly, at a frequency that will be determined following consultation with internal and external stakeholders.

The development of the hosting capacity maps will also leverage the locational value study which is expected to be completed by 2019. Additional detail is provided below on the overall implementation schedule, as well as the individual stages outlined above.

Project Schedule

The schedule of activities associated with the development of the hosting capacity maps is shown in Table 4-8. Even though it is not explicitly within the scope of this proposed investment, PSEG Long Island highlights (in the overall schedule) its ongoing work on conducting a locational value study, given the interrelation between the two initiatives.

Table 4-8. Project Schedule – Hosting Capacity Maps

	2019	2020	2021	2022+
Completion of Locational Value Study[1]				
Market Solicitation for Qualified Third Party				
Data Collection and Analysis				
Data collection				
Assessment of distribution indicators				
Hosting capacity analysis				
Map Development				
Development of hosting capacity maps				
Integration to PSEG Long Island website				
Ongoing Updates to Map Data				

[1] *Not in scope but interrelated to the development of the hosting capacity maps.*

Completion of Locational Value Study

In its 2018 Utility 2.0 filing, PSEG Long Island proposed the development of a locational value study to define the costs and benefits of potential NWS to offset and defer T&D system upgrades, considering temporal and location-specific parameters. The following are key development steps for the locational value study:

1. Actively engage the Joint Utilities group to understand existing locational value analyses
2. Analyze current capital plan drivers
3. Forecast DER with granular, bottom-up methodology
4. Develop locational values map
5. Make the analysis methodology repeatable

Steps 2 and 3 above are considered foundational for developing hosting capacity maps; PSEG Long Island will be leveraging data and analysis from these steps to support the development of the hosting capacity maps in 2020. The locational value study is currently in progress and is scheduled to be completed by the end of 2019.

Market Solicitation for Qualified Third Party

PSEG Long Island will select a third-party developer through an open market solicitation. The third-party developer will be expected to develop a methodology for calculating hosting capacity based upon the specifications developed by PSEG Long Island and visualize the hosting capacity onto maps of PSEG Long Island's service territory.

Data Collection and Analysis

PSEG Long Island will work alongside the selected third-party developer to collect the required data to perform an assessment of distribution indicators. This will support the identification of locations on the

distribution system with available DER hosting capacity. Once this initial analysis is completed, PSEG Long Island will identify system criteria for determining hosting capacity and derive the hosting capacity values at 13 kV distribution feeders.

Map Development

Once the hosting capacity methodology and values are developed, the third-party developer will overlay the data onto maps of PSEG Long Island's service territory. In parallel, PSEG Long Island will determine the appropriate location on its website through a secured sign on portal to host the maps so that they are available to the DER developer community and customers at large by Q4 2020. PSEG Long Island's internal IT team will support the development of the hosting capacity maps; the exact roles and responsibilities will be determined during the market solicitation stage.

Ongoing Updates to Map Data

Following the development of the maps in 2020, PSEG Long Island's Utility of the Future team will be responsible for ongoing updates to the maps' underlying data, including both the hosting capacity and the DER interconnection queue. As mentioned previously, the frequency by which the maps will be updated will be determined when the maps are designed, using input from maps' ultimate users (i.e., DER developers). However, the frequency at which the maps will be updated will also need to consider any potential technical limitations that may exist in internal IT and OT systems (e.g., frequency of updates of internal databases).

4.2.2.5 *Budget Request*

PSEG Long Island is requesting funding to implement and manage hosting capacity maps which will be available on their website. See Table 4-9 for a summary of the budget request.

Table 4-9. Budget Request Summary for Hosting Capacity Maps

	Added Capital Costs ($M)				Added O&M Costs ($M)			
Cost Type	***3-Year Total***	**2020**	**2021**	**2022**	***3-Year Total***	**2020**	**2021**	**2022**
IT Upgrades	*0.81*	0.81	-	-	-	-	-	-
Ongoing O&M	-	-	-	-	*0.23*	0.08	0.08	0.08
Third Party Support	*0.77*	0.77	-	-	-	-	-	-
Total	***1.59***	***1.59***	***-***	***-***	***0.23***	***0.08***	***0.08***	***0.08***

5. Budget and Funding Objectives

5.1 Budget Request Summaries

Table 5-1 summarizes the capital and O&M budget requests for each initiative proposed in this filing.

Table 5-1. Budget Request Summary for All Initiatives

	CAPEX Request (Added)				OPEX Request (Added)			
Initiative	***3-Year Total***	**2020**	**2021**	**2022**	***3-Year Total***	**2020**	**2021**	**2022**
Next Gen Insights Pilot	0.71	0.71	-	-	2.56	0.69	0.93	0.93
Energy Concierge Pilot	1.59	1.56	0.03	-	2.49	0.96	1.03	0.50
FlexPay Plan	-	-	-	-	0.25	0.25	-	-
On-Bill Financing Plan	-	-	-	-	0.25	0.25	-	-
Electric School Bus V2G Pilot	0.08	0.08	-	-	0.64	0.50	0.07	0.07
Heat Pump Pilot	-	-	-	-	0.30	0.20	0.10	-
Storage - Brightwaters	12.32	2.93	8.18	1.21	0.61	-	-	0.61
Hosting Capacity Maps	1.59	1.59	-	-	0.23	0.08	0.08	0.08
Total	**16.29**	**6.87**	**8.21**	**1.21**	**7.33**	**2.92**	**2.21**	**2.19**

5.2 Rate Impact Analysis

The customer bill impacts for this year's filing are small due to the modest amount of incremental funding requested. As seen in Figure 6, the increase in average residential customer bill rates is primarily due to the Next Generation Insights and Energy Concierge Pilots from 2020 through 2022 as well as the Brightwaters utility scale storage project from 2022 through 2031.

Table 5-2 and Table 5-3 below present the estimated rate impact on residential and commercial customers, respectively, due to the net capital, O&M, and F&PP funding requirements and revenue impacts for each program, initiative and project included in this filing.

Table 5-2. Residential Rate Impacts

PSEG Long Island Utility 2.0 Program, Initiative or Project	2020	2021	2022	2023	2028	2033	2039
Next Gen Insights Pilot	0.04%	0.05%	0.05%	0.00%	0.00%	0.00%	0.00%
Energy Concierge Pilot	0.05%	0.06%	0.03%	0.00%	0.00%	0.00%	0.00%
FlexPay Plan	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
On-Bill Financing Plan	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Electric School Bus V2G Pilot	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heat Pump Pilot	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%
Storage - Brightwaters	0.00%	0.01%	0.03%	0.03%	0.01%	0.00%	0.00%
Hosting Capacity Maps	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Total	0.12%	0.12%	0.11%	0.04%	0.01%	0.00%	0.00%

Table 5-3. Commercial Rate Impacts

PSEG Long Island Utility 2.0 Program, Initiative or Project	2020	2021	2022	2023	2028	2033	2039
Next Gen Insights Pilot	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Energy Concierge Pilot	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
FlexPay Plan	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
On-Bill Financing Plan	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Electric School Bus V2G Pilot	0.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Heat Pump Pilot	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Storage - Brightwaters	0.00%	0.01%	0.03%	0.03%	0.01%	0.00%	0.00%
Hosting Capacity Maps	0.00%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%
Total	0.04%	0.02%	0.05%	0.04%	0.01%	0.00%	0.00%

APPENDIX A. LIPA and PSEG Long Island Structure

As the owner of the system, LIPA has the means to raise capital and plays an extensive oversight role. Oversight is bolstered by New York DPS, the New York State utility regulatory authority that provides a due diligence and advisory role to LIPA regarding retail rates and the content and direction of the Utility 2.0 programs.

Figure A-1 summarizes how PSEG Long Island addresses New York State policy across its various filings and activities.

Figure A-1. PSEG Long Island addressing New York State Policy

	2018 and 2019 Utility 2.0 (July 1)	EE and Renewables Plan (target August 1)	Power Markets and T&D (as needed)
Storage Roadmap	• BTM Storage • Utility-Scale Storage for T&D Deferral	n/a	• Utility-Scale Storage for Generation Deferral
Beneficial Electrification – Electric Vehicles	• Incentives for EV charging • V2G Pilot	n/a	n/a
Beneficial Electrification – Heat Pumps	• HP Controls Pilot	• HP incentives	n/a
New Efficiency: NY	• Customer offerings to encourage EE adoption	• EE programs	n/a
Clean Energy Standard	• Customer offerings to encourage DER adoption	• Ongoing support for NY-Sun, BTM incentives for solar PV	• Ongoing support for NY-Sun, BTM incentives for solar PV
Other REV Activities	• AMI and customer engagement • Super Savers NWS • IOAP, Locational value study, Utility of the Future • Advanced planning analysis	n/a	• Grid modernization

A.1 The Long Island Power Authority (LIPA or the Authority)

LIPA is a New York Public Authority that owns the electric T&D system on Long Island, New York. LIPA provides electric service to approximately 1.1 million customers in Nassau and Suffolk Counties and on the Rockaway Peninsula in Queens on Long Island. LIPA acquired responsibility for electric services on Long Island in 1998. At that time, LIPA acquired the electric T&D assets of Long Island Lighting Company (LILCO), KeySpan Corporation acquired LILCO's natural gas distributions assets, and LILCO's electric generating assets on Long Island. Exhibit I-1 provides an overview of the service territory. LIPA does not provide natural gas service or own any on-island generating assets.

LIPA as the owner of the utility plant retains the ultimate authority and control over the assets comprising the T&D System and as such has continuing oversight responsibilities and obligations with respect to the operation and maintenance of the T&D System, under the direction of the LIPA Board of Trustees. LIPA must obtain approval from the New York State Comptroller's Office for contracts in excess of $50,000. LIPA is also subject to the State Administrative Procedure Act, the Public Authorities Law, the State Finance Law, and various New York State Executive Orders.

A.2 LIPA Board of Trustees

LIPA is governed by a Board of Trustees (LIPA Board) consisting of nine members appointed by the Governor, the President of the Senate, and the Speaker of the Assembly. The LIPA Board approves the electric charges and budgets and has policy making, oversight and regulatory obligations for the Long Island T&D system.

A.3 PSEG Long Island (Service Provider)

PSEG Long Island is a wholly owned subsidiary of PSE&G headquartered in Newark, New Jersey. PSEG Long Island is fully dedicated to LIPA's operations and provides operations, maintenance, and related contract services for the T&D system, including:

- T&D operations to include electric transmission, distribution, engineering, system planning, and load serving activities for the safe and reliable operation and maintenance of the T&D system
- Capital planning development and execution of approved annual capital budget
- Management of rates, tariffs, and load forecasting functions, including: performance of system revenue requirement
- Planning, deployment, and oversight of EE programs
- Management of all financial systems and reporting related to T&D operation
- Legal and regulatory related to T&D operation
- Energy markets
- Contract administration for LIPA owned or contracted generation assets
- Community and governmental relations related to T&D operation
- Performance measurement and reporting
- Treasury related to T&D operation
- Customer care, billing, and collections

The costs of operating and maintaining the Authority's T&D system incurred by PSEG Long Island are paid by the Authority. PSEG Long Island is paid a management fee and may earn incentives related to specified performance metrics outlined in the Operation Services Agreement (OSA). The structure is symmetrical where PSEG Long Island can earn an upward incentive and can, under certain circumstances, be assessed a penalty against the fixed component of the Management Services Fee.

The Amended & Restated Operating Services Agreement has a term of 12 years expiring on December 31, 2025, with a provision allowing for an 8-year extension.

In its role as Service Provider, PSEG Long Island is the face to the customer of the LIPA system with responsibility for all external branding, customer, and public communications.

The operating business is divided between the PSEG Long Island ManageCo that contains the senior management personnel and ServeCo that contains the balance of the employees. By design, the

ManageCo is in place as long as PSEG Long Island remains in the role of Service Provider, while the ServeCo is directed by the ManageCo, would remain in place to support a successor Service Provider.

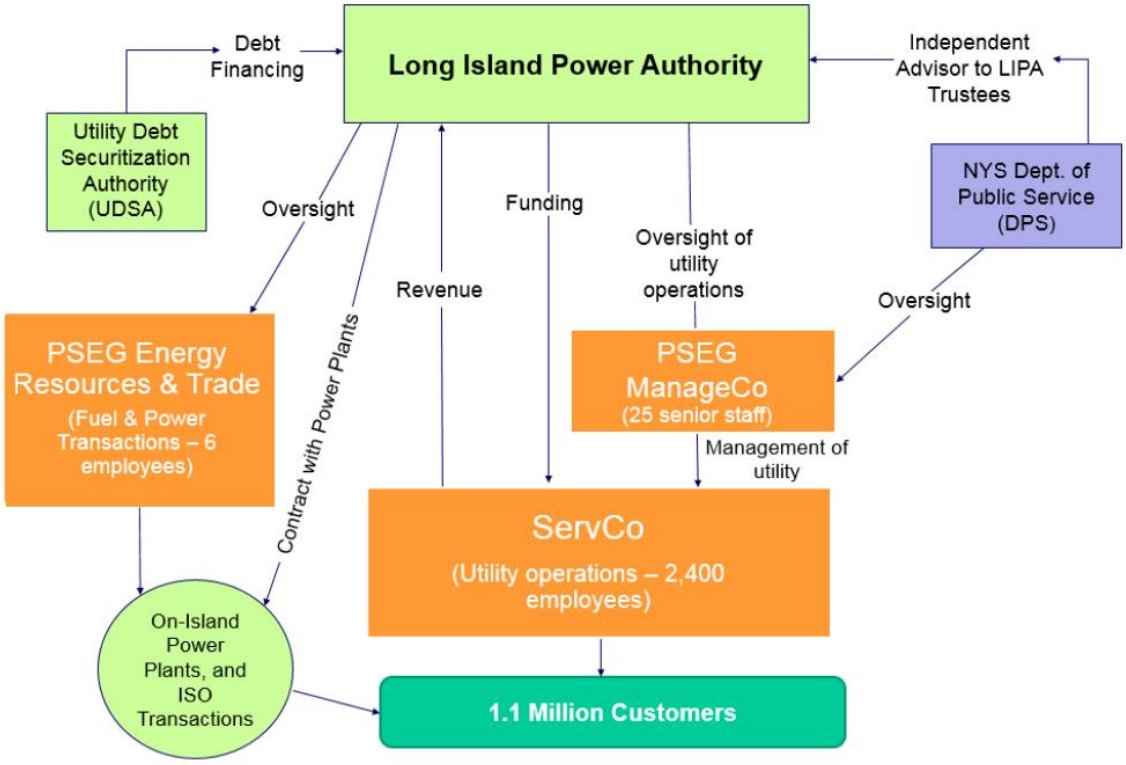
A.4 New York Department of Public Service

New York DPS, as the state utility regulator and implementing agency for REV, plays a vital advisory role with respect to the Utility 2.0 program. The amended LIPA Reform Act provides for LIPA to submit its annual Utility 2.0 Plan to the New York DPS for review. Public Service Law §§3-b(3)(a) and (g), authorizes New York DPS to review and make recommendations to LIPA with respect to rates and charges, including those related to energy efficiency and renewable energy programs, and more specifically, to review and make recommendation with respect to any proposed plan submitted by LIPA or its Service Provider related to implementation of such plans.

Consistent with the direction set out in the Amended OSA, PSEG Long Island actively engages with New York DPS in the development of each year's plan update, seeking input throughout to foster alignment in terms of the direction of the plan across LIPA, New York DPS, and PSEG Long Island. Each year the findings and recommendations provided by New York DPS is a critical step to the advancement of the program.

A.5 LIPA's Public-Private Partnership Structure

Figure A-2. LIPA's Public-Private Partnership Structure



Risks Managed by the Parties

Ultimately, LIPA owns all risks of the utility: those managed by PSEG Long Island as service provider and those that are managed by LIPA.

Managed by LIPA:

- Strategic direction of the organization, electric rates, and budgets
- Risk management – ultimately responsible to protect the value of the system
- System ownership – ultimately responsible for the condition of the system
- Cash management – including issuance and management of debt to fund capital expenditures
- Long-term contracts – execute long-term power supply contracts
- Grant eligibility – qualify for and comply with federal and state grants

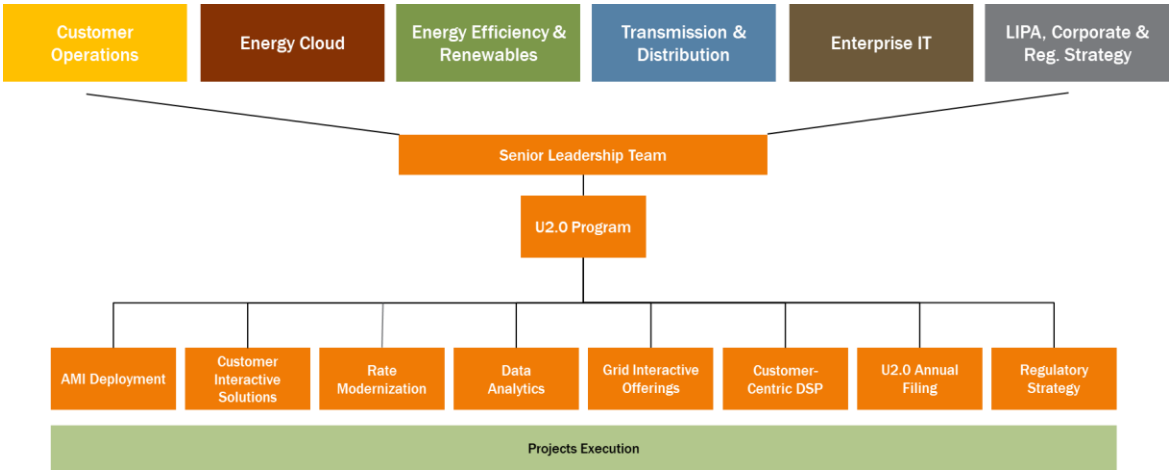
Managed by the Service Provider:

- Customer and Brand Reputation – face of the utility
- Electrical System reliability and service standards within OSA metrics
- Customer Experience and Satisfaction within OSA metrics
- EE and DG within OSA metrics
- Administers Power Supply and Clean Energy Standard Procurements

APPENDIX B. Utility 2.0 Governance

PSEG Long Island's U2.0 program includes more than $300 million in value of projects across multiple functional groups with considerable amount of departmental interdependencies, regulatory oversight, and impacts to organization, processes, and technology. In 2018, an organizational structure was developed to help with coordination and information sharing across customer service, T&D, and information technology, and other key stakeholders. The vision for this governance model led to the senior leadership team instituting a U2.0 Steering Committee in 2019 to provide executive oversight and governance over the progress of the various projects and initiatives. The mandate of the Steering Committee is to: *Unite the broader set of functions that influence the customer experience to realize PSEG Long Island's U2.0 vision*.

Figure B-1. Utility 2.0 Governance



Source: PSEG Long Island Senior Leadership and Navigant Consulting Collaboration

The U2.0 Steering Committee provides strategic direction on the initiatives and the necessary approvals to proceed. Key stakeholders from the relevant business areas participate in an exchange information and represent a variety of perspectives to inform decision-making. A critical objective of the Steering Committee is to be an integrated committee for coordination but also to share information and learnings that will help deliver the benefits outlined in the U2.0 BCA.

Figure B-2. Utility 2.0 Steering Committee Charter

Mission & Objectives

- Provide governance & executive oversight over the progress of the U2.0 program
- Be an integrated committee for coordination among the various U2.0 projects
- Share information & learnings and deliver the benefits outlined in the U2.0 BCA

Scope of Responsibilities

- Responsibilities:
  - Make key business decisions
  - Help mitigate program risks
  - Resolve project issues & conflicts
  - Enable project resources
  - Communicate information to employees
  - Assist with operational readiness
  - Support the implementation of the U2.0 projects
- Role:
  - Attend Steering Committee meetings
  - Participate in project status updates
  - Represent your Department's needs

Core SC Team

- VP Customer Service
- VP Electric Operations
- Ex. Director Customer Operations, PSE&G
- Director Customer Experience
- Director Meter Services
- Director IT
- Director PSE&G Utilities Technology
- Director Energy Efficiency
- Director T&D Planning

The Steering Committee's scope of responsibilities include: making key business decisions; helping to mitigate program risks; resolving project issues and conflicts; enabling project resources; communicating information to employees; assisting with operational readiness; and supporting the implementation of the U2.0 projects. Executives from the PSEG Long Island's Senior Leadership Team and Directors from customer operations, T&D, and information technology represent the committee's core. Extended team membership includes representatives from legal and government affairs, corporate communications, and human resources.

The U2.0 Steering Committee meets monthly to review projects' status and budget as well as to discuss issues/risks and determine operational readiness in advance of project implementations. A process has been developed to surface issues for awareness, discussion, decision, guidance, or governance. Additionally, the 2019 filing and planned/proposed projects are reviewed/discussed as part of the standing agenda to facilitate cross-functional communication.

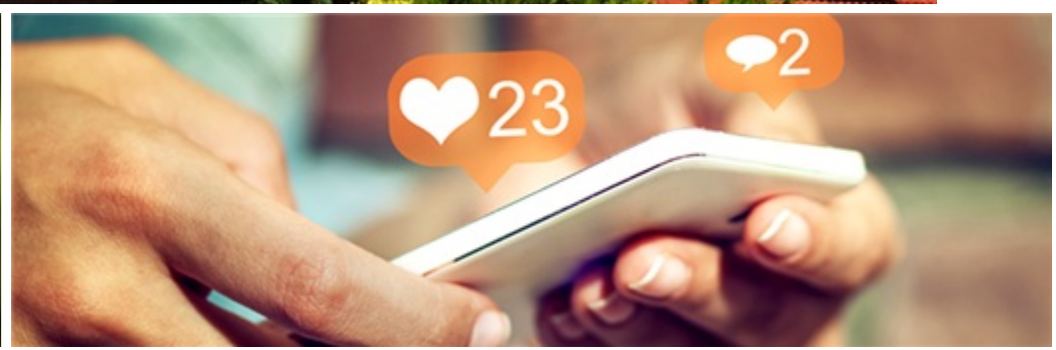
APPENDIX C. 2018 Utility 2.0 Q1 Outcomes Dashboard

See attached PSEG Long Island's Q1 Outcomes Dashboard.

PSEG LONG ISLAND

Utility 2.0 Outcomes Dashboard

Quarter 1
April 30, 2019



PSEG LONG ISLAND

TABLE OF CONTENTS

- WELCOME TO THE UTILITY 2.0 OUTCOMES DASHBOARD
- KEY INSIGHTS FROM THIS QUARTER
- EMPOWERING CUSTOMERS THROUGH AMI AND DATA ANALYTICS
  - Meter Deployment
  - Customer Engagement
  - Data Privacy
  - AMI-Enabled Capabilities
- EXPLORING INNOVATIVE OFFERINGS
  - Super Savers Program
  - Electric Vehicle Program
  - Behind the Meter Storage
- EVOLVING TO A CUSTOMER-CENTRIC DISTRIBUTED SYSTEM PLATFORM
  - Distributed System Platform-Enabling Initiatives
- APPENDIX
  - Meter Deployment by Township
  - NIST/FIPP Compliance Definitions

PSEG LONG ISLAND

GLOSSARY OF ACRONYMS AND ABBREVIATIONS

AMI - Advanced Metering Infrastructure
BTM - Behind the Meter
C&I - Commercial and Industrial
Com - Commercial
CSRP - Commercial System Relief Program
DER - Distributed Energy Resources
DLC - Direct Load Control
DLRP - Distribution Load Relief Program
DSIP - Distributed System Implementation Plan
DSP - Distributed System Platform
EE - Energy Efficiency
EV - Electric Vehicle
FIPP - Fair Information Practice Principles
HERs- Home Energy Reports
LED - Light-Emitting Diode
LIPA - Long Island Power Authority
LSE- Life Support Equipment
NIST - National Institute of Standards and Technology
NYISO - New York Independent System Operator
O&M - Operations and Maintenance
OMS- Outage Management System
Plan - Utility 2.0 Long Range Plan
RCS - Remote Connect Switch
Resi - Residential
REV - Reforming the Energy Vision
UoF - Utility of the Future
YTD - Year to Date

Welcome to the Utility 2.0 Outcomes Dashboard

What is Utility 2.0?

Annually, PSEG Long Island submits a Utility 2.0 Long Range Plan (Plan) in accordance with Public Authorities Law Section 1020-f(ee) and the Amended and Restated Operations Services Agreement (OSA) dated December 31, 2013, for review by the Long Island Power Authority (LIPA) and the New York State Department of Public Service (DPS).

In each Utility 2.0 Plan Update we propose new initiatives that are part of our vision to transform the Long Island energy system while providing updates on the progress of previously approved initiatives.

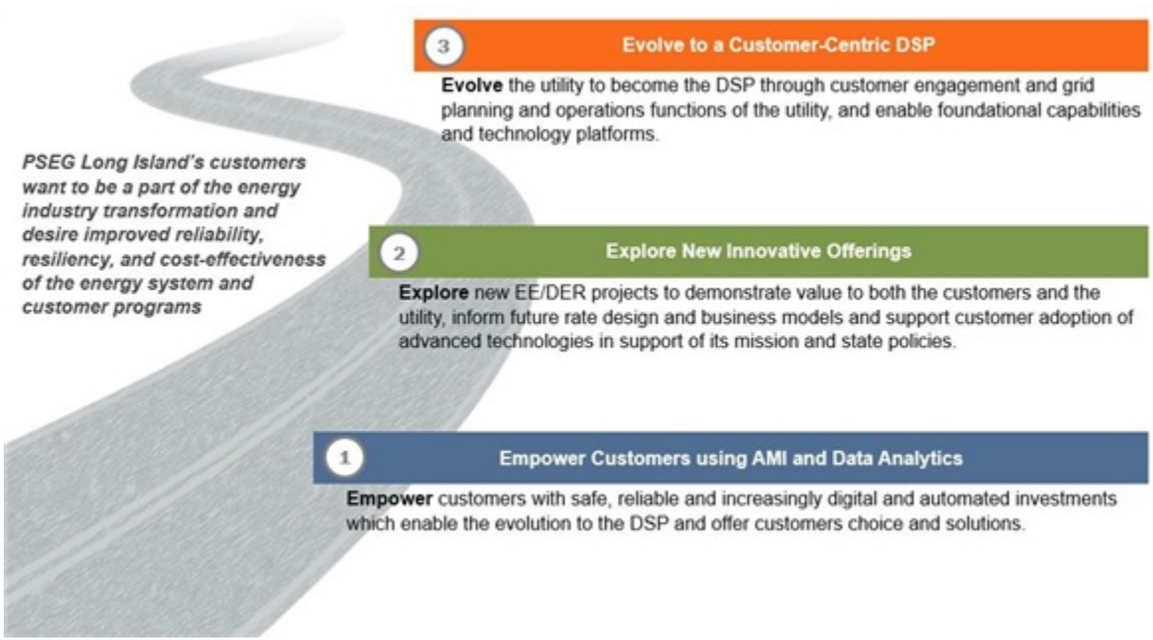
Purpose and Design of the Dashboard:

The DPS recommended PSEG Long Island to provide quarterly updates detailing the progress of various approved Utility 2.0 projects as well as annual reporting of realized benefits from the overall program. DPS reporting expectations were detailed in the November 1, 2018 letter "Recommendations Regarding PSEG LI Annual 2018 Update".

This Dashboard is designed to provide a presentation of our execution of Utility 2.0., including goals and achievements as well as challenges and lessons learned. We have shaped our Utility 2.0 program in the spirit of Reforming the Energy Vision (REV) with an emphasis on learning, setting a path based on what we believe, identifying challenges and overcoming them.
The Dashboard is divided according to our three strategic pathways:

- Empower Customers using AMI & Advanced Data Analytics
- Explore New Innovative Offerings
- Evolve to a Customer-Centric DSP

The Utility 2.0 Roadmap



Source: Utility 2.0 Long Range Plan 2018 Annual Update, June 29, 2018

PSEG LONG ISLAND

Key Insights from Q1 2019

- **Empower Customers using AMI and Data Analytics:**
  PSEG Long Island launched and exceeded the quarterly target for full-scale smart meter deployment. The AMI-related customer communication and engagement campaigns scaled-up to parallel the meter installation effort, including direct, community-based, and media-based outreach.

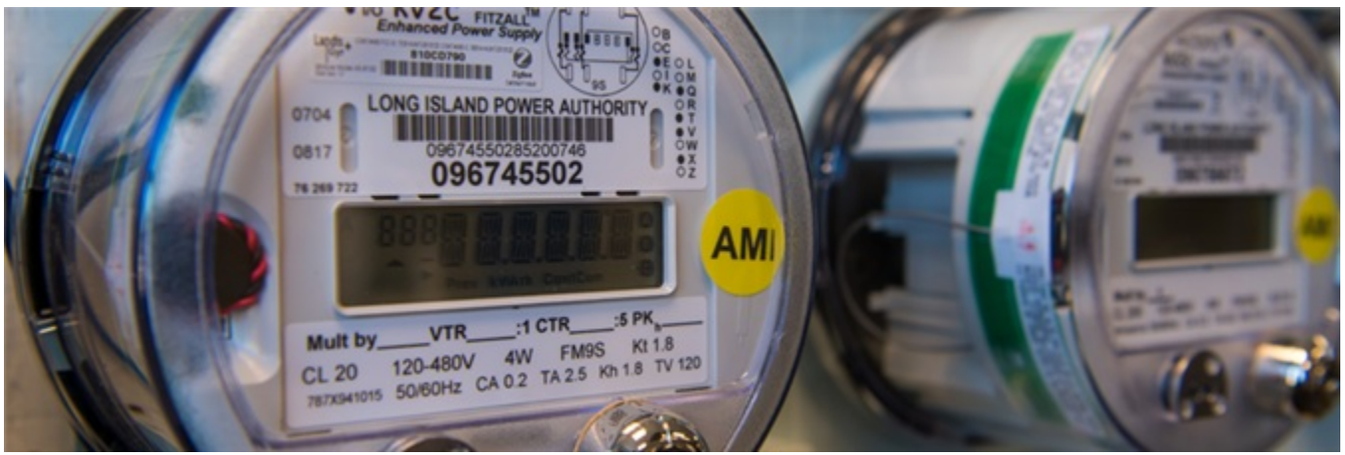
  PSEG Long Island also began the development of multiple AMI-enabled capabilites, including integration of Remote Connect Switch and Outage Management Systems. AMI and Data Analytics provide PSEG Long Island insight into grid conditions to increase reliability and customer experience. This data also informs PSEG Long Island's AMI portal, giving customers insight into their energy use and trends.

- **Explore New Innovative Offerings:**
  PSEG Long Island continues implementation of the Super Saver pilot program in North Bellmore and the Electric Vehicle program, which will launch a residential charging program this year. Newly introduced in 2019 is the Behind the Meter Storage program, which has proposed a storage tariff available to both residential and commerical customers.

- **Evolve to a Customer-Centric DSP:**
  PSEG Long Island began to form the Utility of the Future team and distributed system platform-enabling initiatives, beginning with a locational value study and non-wires solution implementation planning tool. The Volt/VAR Optimization study has identified how AMI data can identify opportunities to both increase system reliability and decrease customer energy use.

PSEG LONG ISLAND

Empower Customers using AMI and Data Analytics



YouTube

PSEG Long Island
Utility 2.0 AMI Video

Empowering customers with safe, reliable and increasingly digital and automated investments which enable the evolution to the Distributed System Platform and offer customers choice and solutions.

PSEG LONG ISLAND Q1 - 2019

Meter Deployment

PSEG Long Island is deploying smart meters across its service territory to maximize customer benefits and operational savings. Between 2019 and 2022, PSEG Long Island will deploy approximately 1 million meters.

PSEG Long Island successfully installed more than 77,000 smart meters in the first quarter, exceeding the 60,000 meter target.

Achievements

• PSEG Long Island exceeded their planned installation target due to coordination efforts amid the increase in installation field crews, the seasoned teams, and hands-on leadership.

• Many meter reader employees went through accelerated and focused training in late 2018 to become meter technicians for installation beginning January 2019.

• PSEG Long Island's positive partnership with IBEW 1049 allows for meter deployment with an entirely internal labor force.

Challenges and Learnings

• The work flow processes used for early deployment were inefficient at large scale. To achieve the needed meter installations per day, the deployment team updated work flow processes.

• The IT team addressed outages in the work management system that kept meter technicians from installing meters for several days in January and February.

• Barriers to installation (inaccessible meter, installer asked to return later) slow the efficiency of installation.

Next Steps

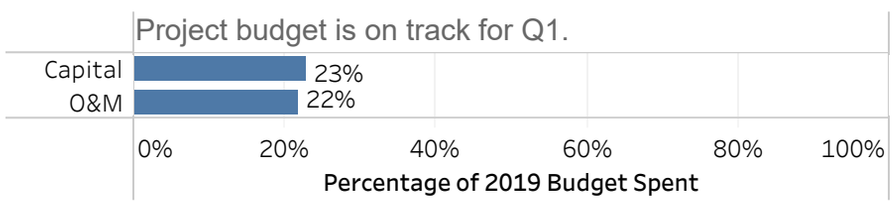
• Pilot a flexible work schedule for field installation teams to sustain a high installation rate by maintaining team moral and reducing road time and safety risk.

• Identify how to most efficiently return to initially inaccessible customer sites.

Success Snapshot

After a reported outage by one of their largest customers, PSEG Long Island confirmed immediately and remotely that the smart meter of the critical communication center in question was receiving power. By confirming that the issue was on the customer side, the customer was able to focus efforts and quickly resolve the internal issue.

2019 Budget



Q1

• Launched full-scale smart meter deployment in the Rockaways and South Fork

Q2

• Begin deployment in the North Fork and East End

Q3

• Begin deployment in Northwest Nassau County and Central Suffolk

Q4

• Continue deployment in Northwest Nassau County, Central Suffolk, and East End

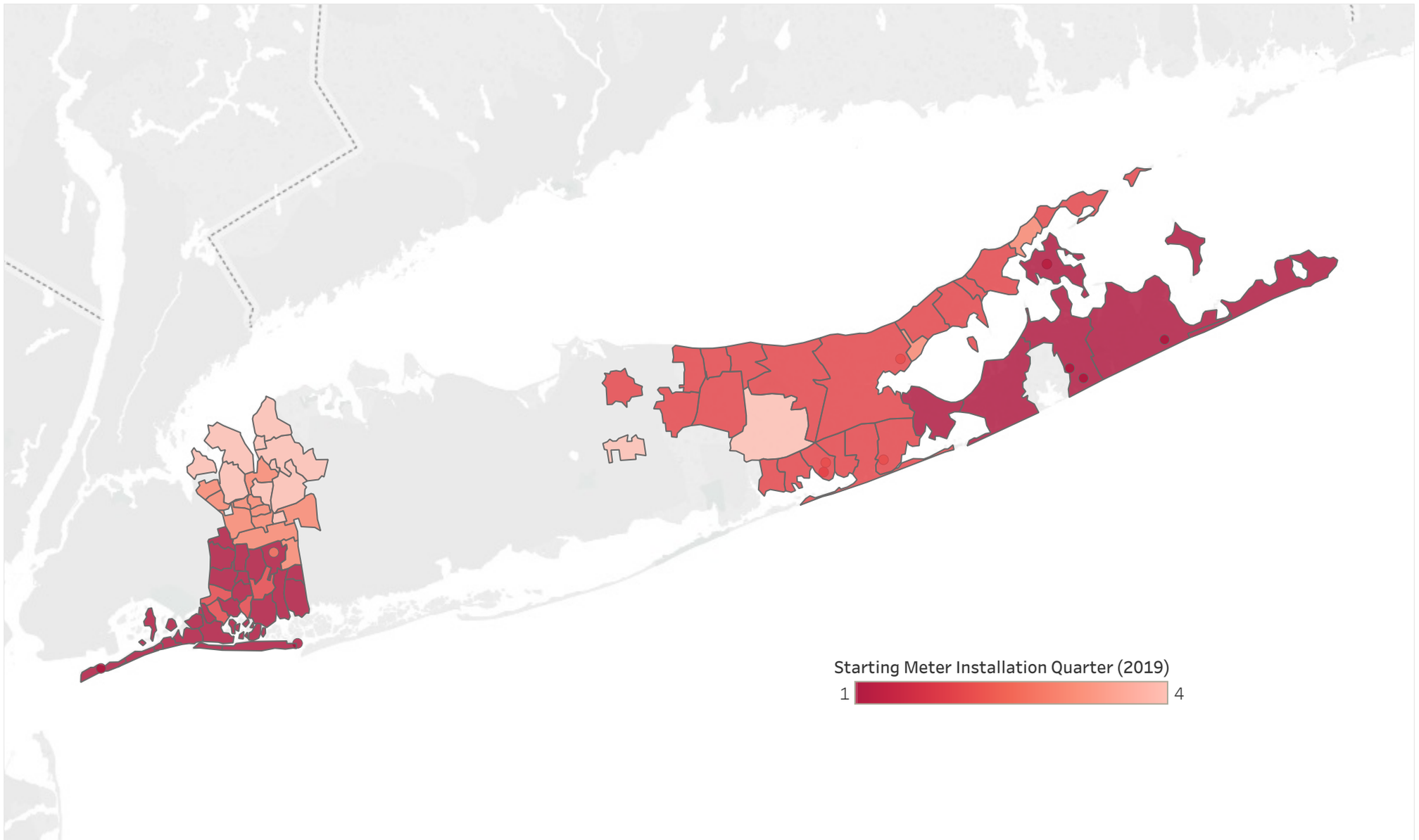
The expected meter deployment schedule by township is available in the appendix.

PSEG LONG ISLAND

Q1 - 2019

Meter Deployment Schedule

Below shows PSEG Long Island's planned meter deployment by zip code through the end of 2019. Zip codes with darker red shading show earlier starting installation quarters (Darkest red = Q1 2019, Lightest red = Q4 2019). This deployment schedule is exclusive to Utility 2.0 funded smart meters. Specific township quarter start and end dates are provided in the 'Meter Deployment Metrics' tables in the Appendix. The projected Utility 2.0 smart meter deployment schedule is subject to change.

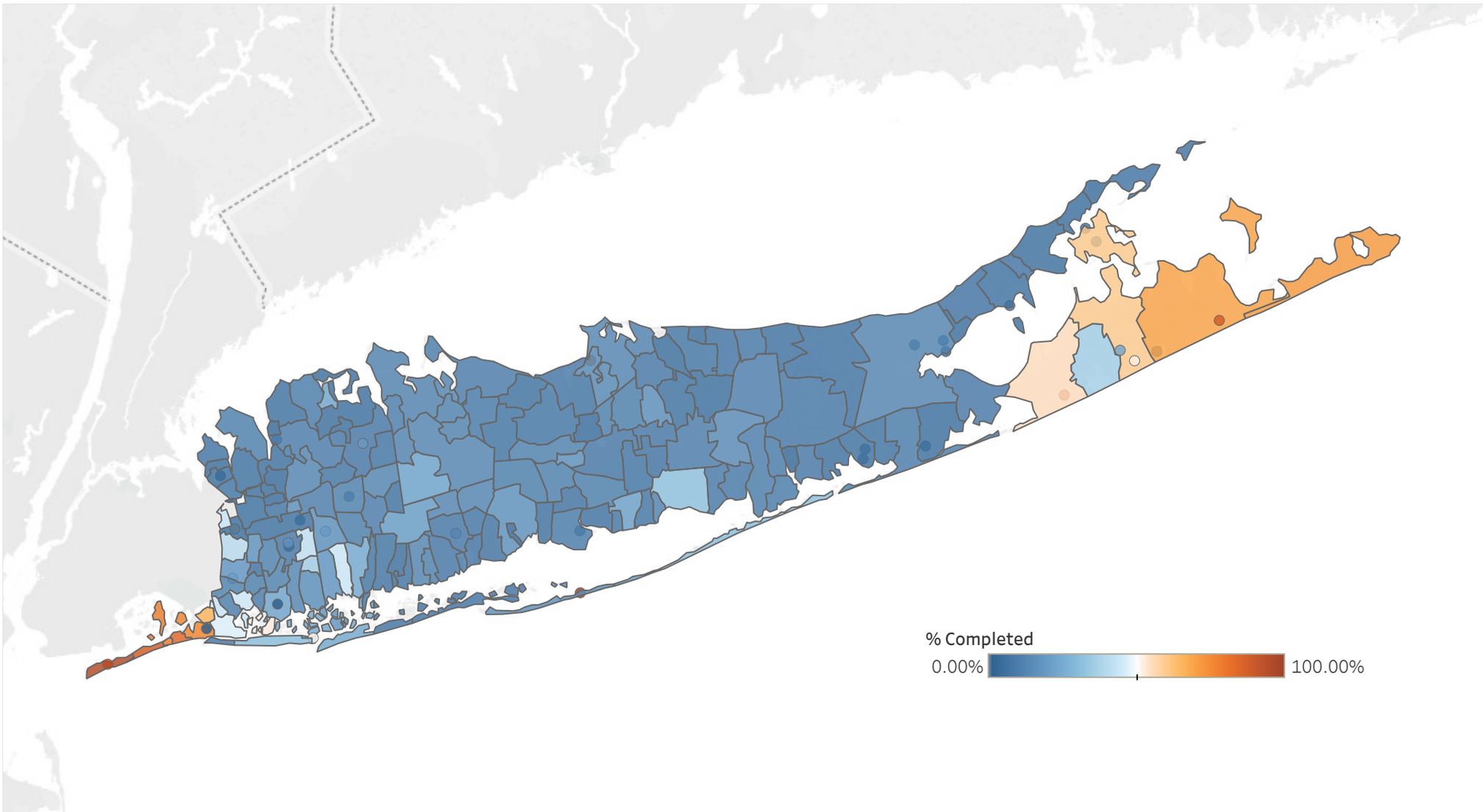


PSEG LONG ISLAND Q1 - 2019

Meter Deployment Metrics

PSEG Long Island is starting the majority of smart meter installations on the eastern and western ends of the island, moving inward over time. Due to this strategy, the zip codes with higher levels of smart meter deployment are shown below in orange in the Rockaways and South Fork regions.

% Smart Meter Installations Complete by **Zip Code**



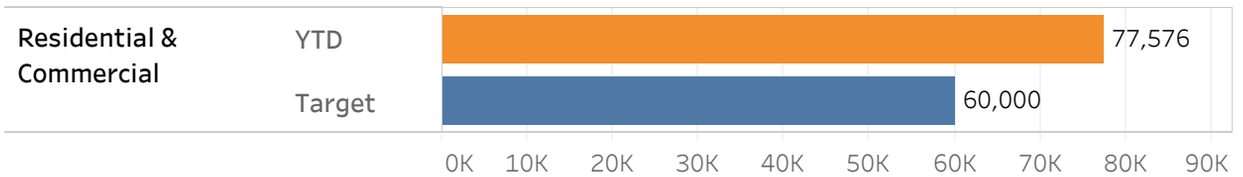
PSEG LONG ISLAND

Q1 - 2019

Meter Deployment Metrics

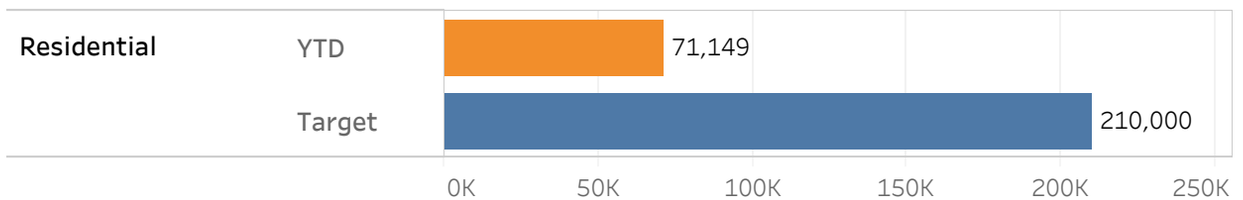
Q1 AMI Installation Metrics

Residential Smart Meter Installations - YTD vs. **Quarterly** Target

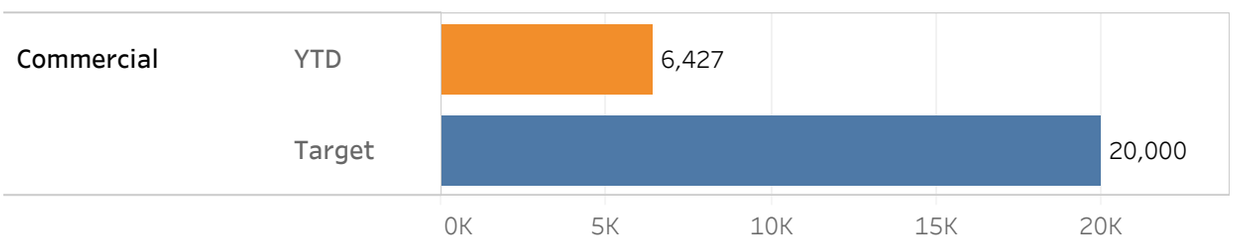


Yearly AMI Installation Metrics

Residential Smart Meter Installations - YTD vs. **Yearly** Target



Commercial Smart Meter Installations - YTD vs. **Yearly** Target



Average AMI Installation Costs Per Unit

		Q1	Q2	Q3	Q4
Commercial	Installation Costs	$110	-	-	-
	Meter Purchasing	$202	-	-	-
	Total Meter Costs	$312	-	-	-
Residential	Installation Costs	$31	-	-	-
	Meter Purchasing	$98	-	-	-
	Total Meter Costs	$129	-	-	-

AMI Installation Summary

2019 Installation - Resi.	71,149
2019 Installation - Com.	6,427
2019 Installation Total	77,576
AMI Saturation - Resi.	171,663
AMI Saturation - Com.	33,472
AMI Saturation Total	205,135
Remaining AMI Installation - Resi.	860,930
Remaining AMI Installation - Com.	100,407
Remaining AMI Installation Total	961,337
Grand Total	1,166,472
% to Goal	17.59%
Opt Out	1,316
% Opt Out	0.77%

*% Opt Out = Total Opt Outs ÷ Total Residential Installs

PSEG LONG ISLAND

Q1 - 2019

Customer Engagement

The Customer Engagement plan includes Voice of the Customer input to ensure effective communication, the Communication Campaign to inform customers about smart meter installation, and Customer Engagement to educate and promote the benefits of smart meters and PSEG Long Island offerings.

At this stage in meter deployment, the customer engagement focus is the communication campaign supporting meter installation to educate and avoid pre- or post-installation opt-outs. As more customers have smart meters installed, focus will increasingly shift towards post-installation engagement around benefits and offerings due to AMI.

Achievements

- Communication schedule is on time, using multiple channels of digital and non-digital communication.
- Call center volume remained level while meter installs scaled up to full deployment.
- Low negative media coverage.
- Low opt-out rate both in-field and post-installation.

Challenges and Learnings

- Q3 2018 customer focus groups and surveys indicated that customers prefer less frequent outreach.
- The initial engagement plan was modified to slightly reduce outreach in response to feedback.
- PSEG Long Island developed further training, scripts, and other material and created a Smart Meter Advisor Team in response to gaps in inital customer service training.

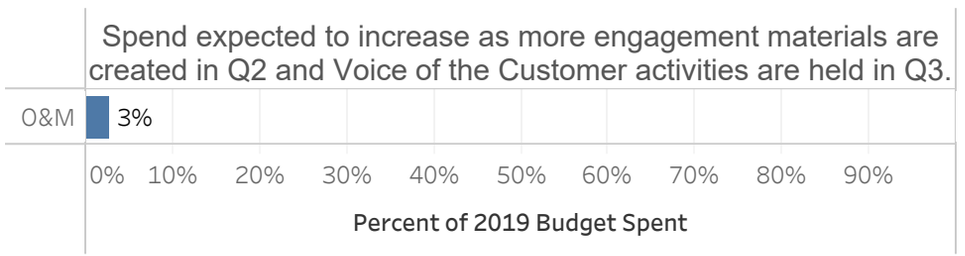
Next Steps

- Q2 launch of My Smart Energy Lab, formerly referred to as the Smart Technologies Mobile Education Center.
- Meet with elected officials for upcoming meter deployment areas.
- Continue employee education.
- Continue execution of the customer engagement plan with additional customer research in Q3.

Success Snapshot

After initially refusing installation of nearly 300 smart meters, the Shinnecock leadership met with PSEG Long Island and was provided information on smart meter installation and benefits. Shinnecock leadership now welcomes AMI and has requested a visit from the My Smart Energy Lab to further inform the community.

2019 Budget



Q1

- Launched TV commercial about innovation and smart technology
- Provided additional materials and training to customer service representatives

Q2

- Launch My Smart Energy Lab
- Develop educational videos

Q3

- Conduct customer focus group
- Launch mobile app

Q4

- Continue customer engagement efforts
- Incorporate learnings from customer focus group feedback as required

PSEG LONG ISLAND Q1 - 2019

Customer Engagement

Customer Process Flow

	Pre Install Letters	Pre Intsall Emails	Pre Install Calls	Post Install Postcards	Post Install Emails
Total*	157,649	81,279	144,204	44,872	25,410
Critical Facility	369	166	263	122	78
Low Income	2,831	1,432	2,827	1,176	636
Senior	4,562	1,840	4,069	1,051	520
Spanish	695	284	712	288	115

AMI Customer Opt Outs	
Opt Out	1,316
AMI Saturation - Resi.	171,663
% Opt Out	0.77%
Target Opt Out %	0.50%

*% Opt Out = Total Opt Outs ÷ Total Residential Installs

Customer Segment Definitions:
Critical Facility (LSE) - A commercial or residential customer or resident of the customer's premises who suffers from a medical condition requiring utility to operate a life-sustaining device.
Low Income - Customers who (based on income, household size etc.) qualify and receive benefits from select assistance programs.
Senior - Customer self-defined condition.
Spanish - Customer self-defined; customer requests Spanish speaking representatives and materials/information written in Spanish.

*Note - Total is the entire count of customers who received the different customer engagement materials. These customers could fall into zero, one or more of the other segments listed in the table.

PSEG LONG ISLAND Q1 - 2019

Community Engagement

In addtion to meter installation communications sent to each customer, PSEG Long Island continues to engage Long Island communities through various public channels to inform and educate customers and foster community support for smart meters and AMI-enabled customer benefits.

Meetings with Elected Officials

• E-mail notifications are sent to Town and Village officials, beginning in areas likely to have FY2019 smart meter deployment. In response to request, PSEG Long Island met with the Town of Southampton Deputy Supervisor to answer questions and provide more specifics about the AMI deployment program. The town acknowledged that some residents had questions on topics including environmental implications, privacy, and opting out of the program.

• Meetings with state-level elected officials were incorporated into district-specific updates on various PSEG Long Island initiatives. There were no immediate questions on deployment or the technology being used, however information on smart meter deployment and benefits was provided should the legislators or their staff have any follow up questions.

• PSEG Long Island provided information on smart meter deployment and benefits and where to find additional information on the PSEG Long Island webpage. Responses to all questions have been and continue to be provided in coordination with the AMI Deployment team until deployment is complete.

Community Engagement

• The My Smart Energy Lab has been requested to appear at several community events throughout Long Island.

• Monthly meetings are held in each county with state agencies to inform low income customers on topics including AMI. A consumer advocate at these meetings answers any questions.

• Low income information will be available in the My Smart Energy Lab, and specific low-income educational material continues to be provided.

Customer Feeback

• The large majority of customer feedback that PSEG Long Island has received regarding smart meter installation has been communicated by customers that choose to opt out.

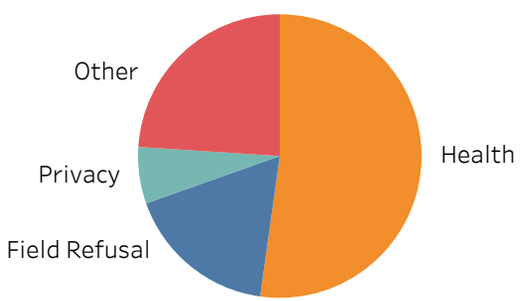
• For more than half of the opt outs in Q1, customers cited health concerns as the reason. The next most common reasons for customer opt out are field refusals at time of installation, and privacy concerns.

• Example health concern: A customer opts out, saying he has done research and has health concerns. The customer doesn't carry a cell phone due to health concerns, has a family history of cancer, and is concerned about having the smart meter nearby.

• Example privacy concern: A customer expresses concerns that the smart meter is a privacy issue and requests to opt out for the time being until he does more research on the meter.

• Example other concern: A customer opts out, citing concerns that the smart meter is a fire safety hazard.

Reasons for Smart Meter Installation Opt Outs



PSEG LONG ISLAND Q1 - 2019

Data Privacy

With the increase in digital information transfer, data privacy is an increasingly integral part of utility operations. PSEG Long Island assesses its Data Privacy framework, practices and procedures as recommended by the National Institue of Standards and Technology (NIST) and the Fair Information Practice Principles (FIPP).

PSEG Long Island is in complete alignment with 12 out of 18 NIST and FIPP recommendations, partially aligned with 5 recommendations, and not aligned with one recommendation at this time. Since July 2018, PSEG Long Island data privacy practices around Management and Accountability and Openness, Monitoring, and Challenging Compliance have been addressed to align with recommendations.

● **- Categories in alignment prior to July 2018:**

Accuracy and Quality
Awareness and Training
Choice and Consent
Collection and Scope
Individual Access
Notice and Purpose
Personal Information in the Smart Grid
Security and Safeguards
Use and Retention
Wireless Access to Smart Meters and Secondary Devices

Status of Alignment with NIST/FIPP Standard:

● – Currently in alignment
◐ - Partially in alignment
○ – Not in alignment

Recommendation	Status (July 2018)	Status (Q1 2019)	Comment
Commissioning, Registration, and Enrollment for Smart Devices	◐	●	Implemented Zigbee pilots to keep data secure when transmitted from the meter to a wireless device.
Disclosure and Limiting Use	◐	◐	Currently evaluating the Green Button Standards.
Emerging Smart Grid Privacy Risks	◐	●	Enterprise Risk Management identifies emerging smart grid privacy risks.
Management and Accountability	◐	●	IT Security incident response policy is scoped to manage incident response.
Mitigating Privacy Concerns within the Smart Grid	◐	◐	Currently devising controls to address concerns with the Smart Grid.
Openness, Monitoring, and Challenging Compliance	◐	●	Process to address customer requests or complaints, performs regular privacy impact assessments, and has established procedures to identify breaches and misuse of smart grid data and notifying affected customers.
Plug-In Electric Vehicles (PEV) Privacy Concerns	○	◐	Customer EV/Drive Clean Rebate profile information authorized to be shared with PSEG Long Island.
Smart Grid Data Access by Third Parties	◐	●	PSEG Long Island provides access to third-party for AMI data via MY Account. Secure policies in practice for accessing MY Account.

Definitions for each of the NIST and FIPP data privacy recommendation categories can be found in the appendix.

PSEG LONG ISLAND

Q1 - 2019

AMI-Enabled Capabilities

The presence of AMI enables added and improved functionality to empower PSEG Long Island customers, including customer experience, system reliability, revenue protection, innovative rates and data insights for customers.

PSEG Long Island began AMI-enabled projects including the Remote Connect Switch (RCS) integration and Outage Management System (OMS) to AMI Integration. While focusing on RCS and OMS capabilities, PSEG Long Island is also working on the C&I portal, Advanced Billing Engine and Green Button Connect and are currently in the vendor procurement process and finalizing contracts.

Achievements

- Teams of business, functional, IT, and change management experts defined business and IT requirements and developed to-be business process flows to automate RCS and OMS.
- Change management team completed RCS and OMS Stakeholder and Change Need Assessments, developed a Communications Plan, and launched a Change Agent Network across impacted teams.
- The new Data Analytics team is using AMI data to identify grid system conditions and inform transformer load monitoring to improve reliability.

Challenges and Learnings

- The RCS and OMS teams identified best practices by meeting with utilities that have implemented these AMI-enabled capabilities.
- As deployment ramps up, a challenge emerges to align vendor solutions with planned capabilities and the integration requirements of current IT systems.
- To address this, technical meetings with vendors helped to define project scope and integration requirements for the Advanced Billing Engine solution.

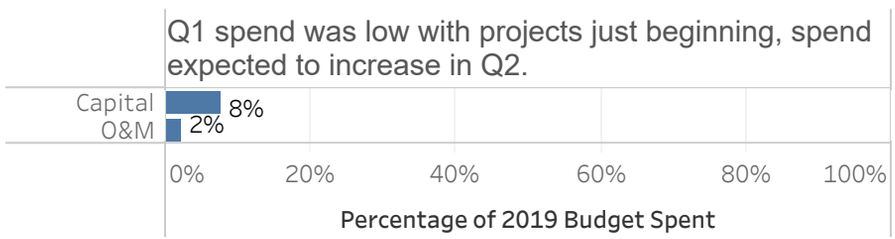
Next Steps

- Obtain vendor scopes of work for RCS integration, OMS integration, and Advanced Billing Engine initiatives.
- Complete Customer Experience Enhancements business process design.
- Begin technical design and IT Development phase for RCS and OMS integration initiatives via Agile (Sprints).

Success Snapshot

Using AMI data, customers can easily view energy use at 15-minute intervals, track usage, and spot trends. Customers can also receive MyAlerts texts or emails to alert them of a nearing usage threshold or weekly usage summary.

2019 Project Budget



Q1

- Team kickoffs
- Business process design

Q2

- RCS and OMS specification buildout and process design
- Advanced Billing Engine system set up
- Customer Experience Enhancements iterative development

Q3

- RCS and OMS platform and integration implementation
- Model pilot customer rates via Advanced Billing Engine
- Enhance customer web portal

Q4

- Test and implement RCS and OMS production
- Test billing operations, complete user training for pilot rate via Advanced Billing Engine
- Go live with Customer Experience Enhancements

PSEG LONG ISLAND

Explore Innovative Offerings

Exploring new Energy Efficiency/Distributed Energy Resource projects to demonstrate value to both the customers and the utility, inform future rate design and business models and support customer adoption of advanced technologies in support of its mission and state policies.

PSEG LONG ISLAND

Q1 - 2019

Super Savers

Through the North Bellmore Super Savers pilot, PSEG Long Island is learning how to best encourage customer participation in a community program to adopt energy efficiency and demand response measures, and whether these efforts can avoid sufficient load to defer infrastructure upgrade. The Patchogue Super Savers program has been deferred to 2020.

This quarter, the Super Savers team responded to low program participation in North Bellmore with further customer outreach and more rebate offers. The team is pursuing a cost-effective solution for low-cost to no-cost products such as smart thermostats.

Achievements

· New Smart AC kit initiative launched to enable room ACs to be controlled remotely by the customer and by ThinkEco during demand response events.

· The newly developed Power to Save time-of-use rate comparison tool identifies customers to target for promotion of the new rate.

· The Commercial Free Lighting initiative launched using a Fast Track Application released to five Prime Efficiency Partners in the area.

Challenges and Learnings

· The Super Saver participant area is based on circuit boundaries and does not align with community boundaries, limiting the ability for community-centered outreach.

· Coordination of communication and rollout of multiple utility offerings, many of which are being offered for the first time to customers, has been a challenge.

· Lower than anticipated participation in the smart thermostats rebate, direct load control (DLC) program, and Power to Save rate option puts the 4MW deferral goal at risk.

Next Steps

· Finalize low or no cost WiFi thermostat offering for enrollment in the Smart Savers DLC program.

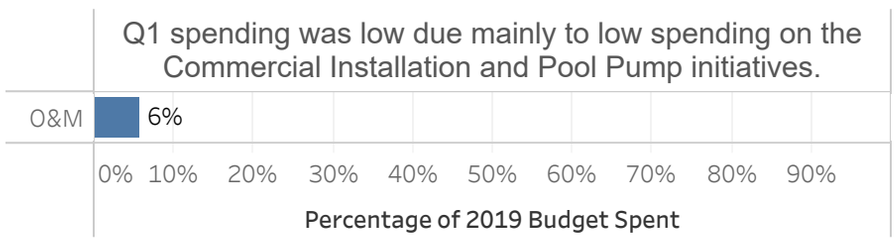
· Consider letting customers assign the DLC enrollment rebate to their installation contractor.

· Consider a telemarketing campaign for the Power to Save rate.

Success Snapshot

The new time-of-use rate comparison tool was used to send Power to Save FAQs to customers identified as able to save using the new rate and straight-forward shifts in energy use.

2019 Project Budget



Q1

· Monthly HERs and rebates
· SmartAC initiative launch
· Commercial Free Lighting Initiative launch
· Targeted promotion of TOU rate

Q2

· Monthly HERs and rebates
· Free Thermostat Direct Install Launch
· Enhanced pool pump rebate promotion

Q3

· Monthly HERs and rebates
· Post summer promotion of TOU rates

Q4

· Monthly HERs and rebates
· Data Validation
· Measurement and Evaluation

PSEG LONG ISLAND

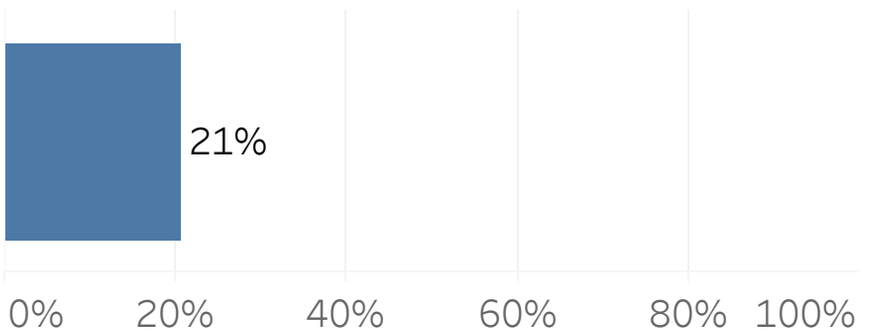
Q1 - 2019

Super Savers

The North Bellmore pilot of the Super Savers program is behind its schedule of achieving 25% of the 2019 4MW savings goal in Q1 2019. The majority of MW savings to date are achieved due to Smart Savers program enrollment and monthly home energy reports (HERs) sent to program participants.

North Bellmore Super Saver Program Area

Progress Towards 2019 Goal of 4MW



Energy Savings by Program Component

	Count	Per unit kWh	Per Unit kW	KWh Total	kW Total
Unique HERs Mailed	9,003	138	0.07	1,245,021	630
New Thermostats ($100 Code)	258	140	0.00	35,999	0
Smart Savers Enrollment	88	0	1.22	0	107
($20 Code) LED Common	134	25	0.01	3,342	1
($20 Code) LED Specialty	115	34	0.01	3,930	1
Refridge Recycle - pre 2001	14	1,108	0.16	15,512	2
Refridge Recycle -post 2001	14	667	0.10	9,338	1
Incremental Pool Pump Rebate	7	2,438	1.41	17,066	10
Commercial Efficiency Upgrades*	5			208,192	31
CSRP & DLRP Enrollment	1	262	41.50	262	42
ThinkEco SmartAC kits	15	329	0.18	4,935	3
Total				1,543,597	829

*Commercial Efficiency Upgrades per unit kW and kWh savings vary
**CSRP: Commercial System Relief Program; DLRP: Distribution Load Relief Program

PSEG LONG ISLAND

Q1 - 2019

Electric Vehicle Program

The current Electric Vehicle (EV) program consists of outreach and marketing, residential and commercial workplace charging programs, and a Direct Current Fast Charging (DCFC) program aligned with the Joint Utilities DCFC program. The program aims to: enhance penetration of EVs in Long Island; align EV customer adoption strategy with reducing GHG emissions, empower customers, animate the EV charging infrastructure market, and deploy smart EV charging systems.

PSEG Long Island prepared the Residential Smart Charging program for an early Q2 launch and developed multiple customer marketing and outreach channels for the residential and commercial programs.

Achievements

- 40 of the 2019 goal of 100 commercial workplace ports were installed.
- PSEG Long Island developed charger rebate marketing channels, including website updates, social media, partnerships with EV dealerships and car websites, and live events.
- The EV and Data Analytics teams are using AMI data-informed transformer load monitoring to understand how networks of EV chargers will impact the distribution system.

Challenges and Learnings

- The EV team collaborated with other NYISO utilities to learn best practices for EV programs.
- PSEG Long Island must learn how to effectively and securely collect EV charging equipment and network data shared by various third-party providers. This is the first step in using charging data to understand the impact of EVs on load and provide EV customer rates.

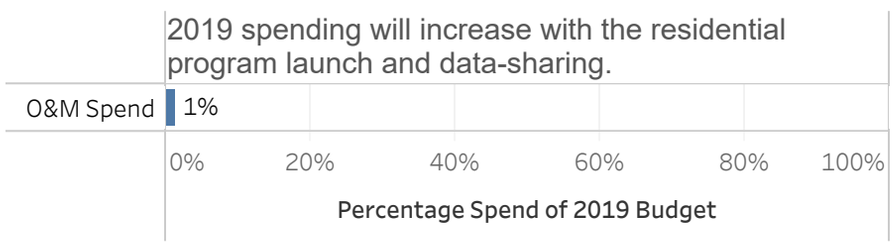
Next Steps

- Launch residential smart charging rebate program.
- Gather data from marketing to improve as needed.
- Explore vendors and data systems for collecting EV data from varying vehicles and chargers.

Success Snapshot

PSEG Long Island is collaborating with its largest workplace charging participant to learn about charger data-sharing and develop a solution.

2019 Project Budget



Q1

- Ongoing commercial workplace charging program

Q2

- Residential smart charging rebate launch
- Updated website with digital outreach and marketing

Q3

- Residential smart charging off-peak incentive launch at end of quarter
- Launch DCFC program Q3/Q4

Q4

- Vendor data-sharing capability in Q3/Q4
- Complete workplace charging program

PSEG LONG ISLAND

Q1 - 2019

Behind the Meter Storage Program

The Behind the Meter (BTM) Storage program will offer a solicitation opportunity for third party aggregators to install batteries for customers using a 10-year tariff incentive. This will alleviate overloading in targeted areas, increase customer engagement and energy literacy, and support state storage goals.

The program focused on incorporating DPS recommendations into the program design and expanding to include stand-alone and solar-paired storage for all commercial and industrial customers throughout PSEG Long Island's service territory.

Achievements

· Load modification tariff proposed and awaiting approval.

· New baseline method allows net metered customers to participate in the BTM storage program.

· Collaborated with NYSERDA on a storage rebate program that will allow residential customer participation by also requiring participation in PSEG Long Island's demand load management program.

Challenges and Learnings

· Stand-alone storage participation is hindered by a high price point and lack of storage only vendors in the area.

· PSEG Long Island interviewed manufacturers and vendors to create the baseline for the tariff design.

Next Steps

· Conduct market research on the stand-alone storage market potential in service territory an develop BTM storage participation target.

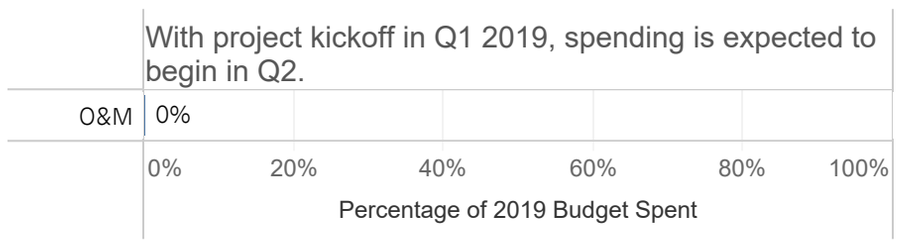
· Identify the most successful delivery mechanisms for storage installation.

· Develop marketing material and prepare for launch of NYSERDA rebate program (being implemented by PSEG Long Island on NYSERDA's behalf) in conjunction with the BTM storage tariff program.

Success Snapshot

Using the new baseline method, PSEG Long Island allows net-metered customers to participate in demand response with batteries or other resources.

2019 Project Budget



Q1

· Program Design
· Load Modification Tariff Design
· Peer Utility Research
· Third-party engagement

Q2

· Tariff Approval
· Third-party Engagement
· Develop marketing material
· Customer Enrollment

Q3

· Customer Engagement
· Customer Enrollment

Q4

· Customer Engagement
· Customer Enrollment

PSEG LONG ISLAND

Evolve to a Customer-Centric Distributed System Platform

Evolving the utility to become the Distributed System Platform through customer engagement and grid planning and operations functions of the utility, and enable foundational capabilities and technology platforms.

PSEG LONG ISLAND

Q1 - 2019

Distributed System Platform (DSP)-Enabling Initiatives

The REV Track One Order defines the DSP as:
"an intelligent network platform that will provide safe, reliable and efficient electric services by integrating diverse resources to meet customers' and society's evolving needs. The DSP fosters broad market activity that monetizes system and social values, by enabling active customer and third party engagement that is aligned with the wholesale market and bulk power system."

In this quarter, the focus has been to begin staffing and standing up the Utility of the Future Team (UoF), set in motion the foundational studies that will inform the integration of DER, and advancing the strategic and operational construct of the DSP that is informed by REV DSIP guidance that is adapted for Long Island.

Achievements

- Developed a detailed scope of work for the Locational Value Study and Non-Wires Implementation Planning Tool.
- Completed Phase I Volt/VAR Optimization (VVO) study for North Bellmore area.
- Developed and filled a position for the UoF group; two more positions are expected to be filled in April and May.
- Engaged with the Joint Utilities of New York, gathering helpful insight in terms of best practices for foundational DSP development.

Challenges and Learnings

- Met with third parties that have locational value study experience to develop scope, data requirements, and deliverable requirements.
- A key learning was the importance and impact of granularity of the locational value study in affecting marginal cost findings.

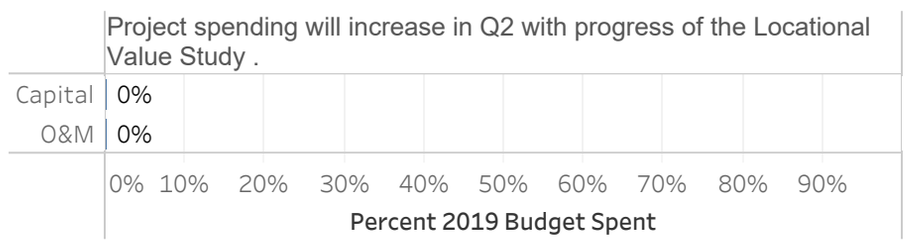
Next Steps

- Confirm the role of transmission constraint in the Locational Value Study
- Hire consultant to complete Locational Value Study and build Non-Wires Implementation Planning Tool
- Finalize and onboard UoF team hires
- Conduct Phase II of VVO study and enable VVO studies in other areas
- Develop utility scale storage RFP

Success Snapshot

Phase I of the VVO study proved that AMI data can be used to optimize distribution system voltages, identify phase imbalances, and feasibly implement conservation voltage reduction. The study established an infrastructure and pathway to use AMI data to enhance power quality and reliability and generate potential customer savings.

2019 Project Budget



Q1

- Develop study and subsequent tool scope
- Begin creating UoF group

Q2

- Select consultant
- Launch Locational Value Study

Q3

- Complete Locational Value Study and Launch Non Wires Implementation Planning Tool Q3/Q4

Q4

- Complete Non Wires Implementation Planning Tool

The Interconnection Online Application Portal (IOAP) Phase 1 enhancements have been deferred to 2020. Updates on Phase 1 enhancements and Phase 2 and 3 planning and costs will be provided as available.

PSEG LONG ISLAND

Appendix

PSEG LONG ISLAND

Q1 - 2019

Meter Deployment by Township

Township	Zip Code	2019 Installation - Resi.	2019 Installation - Com.	2019 Installation Total	AMI Saturation - Resi.	AMI Saturation - Com.	AMI Saturation Total	Remaining AMI Installation - Resi.	Remaining AMI Installation - Com.	Remaining AMI Installation Total	Grand Total	% Completed	Opt Out	Deployment Starting Qtr (2019)*	Deployment Ending Qtr (2019)*
ALBERTSON NY	11507	10	10	20	113	54	167	2,412	257	2,669	2,836	5.89%		3	4
AMAGANSETT NY	11930	2,181	196	2,377	2,390	228	2,618	257	129	386	3,004	87.15%	9		
AMITYVILLE NY	11701	61	20	81	1,124	318	1,442	8,309	1,103	9,412	10,854	13.29%	10		
	11708			0			0	1	1	2	2	0.00%			
AQUEBOGUE NY	11931	4	3	7	97	28	125	1,154	149	1,303	1,428	8.75%	1		
ARVERNE NY	11692	2,983	146	3,129	3,493	228	3,721	645	88	733	4,454	83.54%	5		
ATLANTIC BEACH NY	11509	16	11	27	108	32	140	1,160	111	1,271	1,411	9.92%	5	1	2
BABYLON NY	11702	35	11	46	394	114	508	5,414	710	6,124	6,632	7.66%	2		
BALDWIN NY	11510	788	50	838	1,491	195	1,686	9,506	879	10,385	12,071	13.97%	20	1	3
BAY SHORE NY	11706	137	34	171	3,180	725	3,905	17,068	2,229	19,297	23,202	16.83%	14		
BAYPORT NY	11705	17	4	21	231	62	293	2,803	306	3,109	3,402	8.61%	3		
BAYVILLE NY	11709	9	1	10	160	13	173	2,530	159	2,689	2,862	6.04%	6		
BELLEROSE NY	11426			0		7	7		9	9	16	43.75%			
BELLMORE NY	11710	47	16	63	5,359	393	5,752	6,277	922	7,199	12,951	44.41%	37		
BELLPORT NY	11713	37	5	42	331	114	445	3,638	532	4,170	4,615	9.64%	3		
BETHPAGE NY	11714	37	2	39	695	233	928	7,264	495	7,759	8,687	10.68%	12		
BLUE POINT NY	11715	60	5	65	220	61	281	1,745	184	1,929	2,210	12.71%	1		
BOHEMIA NY	11716	22	23	45	273	368	641	3,586	1,489	5,075	5,716	11.21%	4		
BREEZY POINT NY	11697	2,404	59	2,463	2,653	69	2,722	125	45	170	2,892	94.12%	5		
BRENTWOOD NY	11717	98	18	116	1,279	228	1,507	10,794	1,107	11,901	13,408	11.24%	5		
BRIDGEHAMPTON NY	11932	463	45	508	631	125	756	1,950	527	2,477	3,233	23.38%	8		
BRIGHTWATERS NY	11718	4	2	6	52	13	65	1,122	128	1,250	1,315	4.94%	3		
BROOKHAVEN NY	11719	7	3	10	115	27	142	1,162	126	1,288	1,430	9.93%	2		
CALVERTON NY	11933	20	6	26	190	86	276	3,132	339	3,471	3,747	7.37%	1	3	4
CARLE PLACE NY	11514	1	9	10	134	235	369	1,619	287	1,906	2,275	16.22%	1	4	4
CEDARHURST NY	11516	800	439	1,239	996	552	1,548	1,740	226	1,966	3,514	44.05%	9	2	3
CENTER MORICHES NY	11934	37	7	44	241	90	331	2,857	400	3,257	3,588	9.23%	7	3	4
CENTEREACH NY	11720	113	6	119	748	351	1,099	8,200	403	8,603	9,702	11.33%	8		

Note: Table continues on next page

PSEG LONG ISLAND

Q1 - 2019

Meter Deployment by Township

Township	Zip Code	2019 Installation - Resi.	2019 Installation - Com.	2019 Installation Total	AMI Saturation - Resi.	AMI Saturation - Com.	AMI Saturation Total	Remaining AMI Installation - Resi.	Remaining AMI Installation - Com.	Remaining AMI Installation Total	Grand Total	% Completed	Opt Out	Deployment Starting Qtr (2019)*	Deployment Ending Qtr (2019)*
CENTERPORT NY	11721	9	7	16	313	25	338	2,158	105	2,263	2,601	13.00%	4		
CENTRAL ISLIP NY	11722	82	8	90	1,050	181	1,231	8,515	731	9,246	10,477	11.75%	11		
COLD SPRING HARBOR NY	11724	4	1	5	115	28	143	992	145	1,137	1,280	11.17%	5		
COMMACK NY	11725	36	11	47	607	309	916	9,026	1,100	10,126	11,042	8.30%	13		
COPIAGUE NY	11726	42	10	52	718	127	845	5,465	762	6,227	7,072	11.95%	6		
CORAM NY	11727	97	10	107	780	146	926	10,616	1,022	11,638	12,564	7.37%	7		
CUTCHOGUE NY	11935	15	4	19	144	43	187	2,023	302	2,325	2,512	7.44%		3	4
DEER PARK NY	11729	68	32	100	1,137	360	1,497	8,348	1,724	10,072	11,569	12.94%	5		
EAST HAMPTON NY	11937	7,665	435	8,100	9,173	1,018	10,191	3,607	964	4,571	14,762	69.04%	65		
EAST ISLIP NY	11730	59	10	69	526	80	606	4,753	502	5,255	5,861	10.34%	1		
EAST MARION NY	11939	5	0	5	54	7	61	897	70	967	1,028	5.93%		3	3
EAST MEADOW NY	11554	84	5	89	2,017	204	2,221	10,370	771	11,141	13,362	16.62%	15		
EAST MORICHES NY	11940	15	2	17	145	26	171	2,125	259	2,384	2,555	6.69%	2	3	4
EAST NORTHPORT NY	11731	58	14	72	857	272	1,129	9,589	849	10,438	11,567	9.76%	18		
EAST NORWICH NY	11732	7	0	7	101	6	107	1,313	159	1,472	1,579	6.78%			
EAST QUOGUE NY	11942	21	20	41	149	37	186	2,677	173	2,850	3,036	6.13%	6	3	4
EAST ROCKAWAY NY	11518	32	13	45	430	64	494	4,059	311	4,370	4,864	10.16%	1	2	3
EAST SETAUKET NY	11733	43	20	63	764	222	986	5,584	794	6,378	7,364	13.39%	9		
EASTPORT NY	11941	9	2	11	85	16	101	1,185	172	1,357	1,458	6.93%		3	4
ELMONT NY	11003	3,342	170	3,512	4,742	268	5,010	6,693	658	7,351	12,361	40.53%	21	1	4
FAR ROCKAWAY NY	11691	9,950	806	10,756	12,602	1,083	13,685	3,936	456	4,392	18,077	75.70%	26	2	3
	11693	1,513	180	1,693	1,713	273	1,986	454	121	575	2,561	77.55%	7	2	3
	11695	12	3	15	13	3	16		1	1	17	94.12%			
	11690			0			0		1	1	1	0.00%			
FARMINGDALE NY	11735	50	40	90	1,818	1,154	2,972	9,568	1,815	11,383	14,355	20.70%	6		
FARMINGVILLE NY	11738	58	6	64	439	95	534	4,917	414	5,331	5,865	9.10%	1	4	4
FLORAL PARK NY	11001	27	6	33	410	111	521	7,515	742	8,257	8,778	5.94%	4	1	4
	11005			0			0		1	1	1	0.00%			
	11002			0		2	2		1	1	3	66.67%			

Note: Table continues on next page

PSEG LONG ISLAND

Q1 - 2019

Meter Deployment by Township

Township	Zip Code	2019 Installation - Resi.	2019 Installation - Com.	2019 Installation Total	AMI Saturation - Resi.	AMI Saturation - Com.	AMI Saturation Total	Remaining AMI Installation - Resi.	Remaining AMI Installation - Com.	Remaining AMI Installation Total	Grand Total	% Completed	Opt Out	Deployment Starting Qtr (2019)*	Deployment Ending Qtr (2019)*
FRANKLIN SQUARE NY	11010	563	108	671	1,321	220	1,541	6,569	708	7,277	8,818	17.48%	25	1	4
FREEPORT NY	11520		1	1	10	10	20	98	10	108	128	15.63%		1	2
GARDEN CITY NY	11530	21	17	38	398	398	796	8,946	1,347	10,293	11,089	7.18%	4	3	4
	11599			0			0	4		4	4	0.00%			
GLEN COVE NY	11542	74	12	86	516	367	883	9,847	1,195	11,042	11,925	7.40%	5	4	4
GLEN HEAD NY	11545	48	3	51	432	72	504	3,895	436	4,331	4,835	10.42%	7	4	4
GLENWOOD LANDING NY	11547			0	15	11	26	378	49	427	453	5.74%	1		
GREAT NECK NY	11021	26	14	40	378	236	614	7,713	1,378	9,091	9,705	6.33%	1	3	4
	11024	25	4	29	191	34	225	2,379	202	2,581	2,806	8.02%		4	4
	11023	10	3	13	163	50	213	3,119	274	3,393	3,606	5.91%	2		
	11020	10	1	11	111	88	199	1,998	201	2,199	2,398	8.30%	1	3	4
	11022			0			0	1		1	1	0.00%			
GREAT RIVER NY	11739	3	1	4	49	8	57	449	51	500	557	10.23%	1		
GREENLAWN NY	11740	17	4	21	392	76	468	3,129	216	3,345	3,813	12.27%	2		
GREENPORT NY	11944	5	2	7	61	16	77	1,044	102	1,146	1,223	6.30%		3	4
GREENVALE NY	11548	3	2	5	32	39	71	395	225	620	691	10.27%		4	4
HAMPTON BAYS NY	11946	401	31	432	750	110	860	7,172	899	8,071	8,931	9.63%	14	3	4
HAUPPAUGE NY	11788	24	12	36	434	509	943	5,670	1,025	6,695	7,638	12.35%	5		
HEMPSTEAD NY	11550	99	13	112	1,390	326	1,716	15,202	1,742	16,944	18,660	9.20%	4	1	4
	11551			0			0	1	1	2	2	0.00%			
	11549			0		2	2	1	8	9	11	18.18%		3	4
HEWLETT NY	11557	102	6	108	1,409	221	1,630	1,624	359	1,983	3,613	45.11%	7	1	3
HICKSVILLE NY	11801	65	27	92	1,171	614	1,785	11,695	1,825	13,520	15,305	11.66%	13		
	11802			0		1	1	1	7	8	9	11.11%			
HOLBROOK NY	11741	42	11	53	658	270	928	9,189	1,045	10,234	11,162	8.31%	4		
HOLTSVILLE NY	11742	34	5	39	286	119	405	4,380	426	4,806	5,211	7.77%	5		
HUNTINGTON NY	11746	109	46	155	2,610	490	3,100	18,833	1,699	20,532	23,632	13.12%	44		
	11743	78	44	122	1,933	425	2,358	14,232	2,148	16,380	18,738	12.58%	48		

Note: Table continues on next page

PSEG LONG ISLAND

Q1 - 2019

Meter Deployment by Township

Township	Zip Code	2019 Installation - Resi.	2019 Installation - Com.	2019 Installation Total	AMI Saturation - Resi.	AMI Saturation - Com.	AMI Saturation Total	Remaining AMI Installation - Resi.	Remaining AMI Installation - Com.	Remaining AMI Installation Total	Grand Total	% Completed	Opt Out	Deployment Starting Qtr (2019)*	Deployment Ending Qtr (2019)*
INWOOD NY	11096	1,313	213	1,526	1,524	242	1,766	755	200	955	2,721	64.90%	10	1	3
	11696	74	36	110	104	54	158	205	42	247	405	39.01%	1		
ISLAND PARK NY	11558	1,498	74	1,572	1,742	182	1,924	1,419	376	1,795	3,719	51.73%	4	2	2
ISLANDIA NY	11749	7	2	9	121	139	260	915	433	1,348	1,608	16.17%			
ISLIP NY	11751	25	2	27	359	73	432	5,040	513	5,553	5,985	7.22%	5		
ISLIP TERRACE NY	11752	26	1	27	240	43	283	3,073	236	3,309	3,592	7.88%			
JAMESPORT NY	11947	6	1	7	39	19	58	884	147	1,031	1,089	5.33%	1	3	3
JERICHO NY	11753	26	5	31	302	93	395	3,909	304	4,213	4,608	8.57%	4		
KINGS PARK NY	11754	21	11	32	426	107	533	6,365	489	6,854	7,387	7.22%	6		
LAKE GROVE NY	11755	22	0	22	280	269	549	4,003	267	4,270	4,819	11.39%	3		
LAUREL NY	11948	5	2	7	41	6	47	723	67	790	837	5.62%	1	3	3
LAWRENCE NY	11559	1,203	56	1,259	1,455	178	1,633	1,499	348	1,847	3,480	46.93%	3	2	3
LEVITTOWN NY	11756	107	7	114	1,476	196	1,672	12,214	601	12,815	14,487	11.54%	10		
LINDENHURST NY	11757	113	26	139	1,238	280	1,518	14,052	1,480	15,532	17,050	8.90%	7		
LOCUST VALLEY NY	11560	13	3	16	270	56	326	2,352	382	2,734	3,060	10.65%	8		
LONG BEACH NY	11561	4,800	202	5,002	5,400	388	5,788	11,771	878	12,649	18,437	31.39%	33	1	3
LYNBROOK NY	11563	33	18	51	858	241	1,099	7,436	962	8,398	9,497	11.57%	5	1	4
MALVERNE NY	11565	77	6	83	212	37	249	3,019	176	3,195	3,444	7.23%		2	3
MANHASSET NY	11030	34	13	47	305	238	543	5,819	863	6,682	7,225	7.52%	6	4	4
MANORVILLE NY	11949	26	11	37	421	107	528	4,974	382	5,356	5,884	8.97%	9	4	4
MASSAPEQUA NY	11758	112	24	136	1,390	270	1,660	16,959	1,392	18,351	20,011	8.30%	15		
MASSAPEQUA PARK NY	11762	23	6	29	420	73	493	7,100	305	7,405	7,898	6.24%	7		
MASTIC BEACH NY	11951	93	1	94	535	30	565	4,720	211	4,931	5,496	10.28%	6		
MASTIC NY	11950	65	13	78	513	44	557	4,562	281	4,843	5,400	10.31%	7		
MATTITUCK NY	11952	38	19	57	196	80	276	2,755	521	3,276	3,552	7.77%	2	3	4
MEDFORD NY	11763	107	39	146	872	278	1,150	8,663	1,197	9,860	11,010	10.45%	8		
MELVILLE NY	11747	44	11	55	1,562	480	2,042	6,355	590	6,945	8,987	22.72%	19		
	11773	1	0	1	1		1	3	1	4	5	20.00%			

Note: Table continues on next page

PSEG LONG ISLAND

Q1 - 2019

Meter Deployment by Township

Township	Zip Code	2019 Installation - Resi.	2019 Installation - Com.	2019 Installation Total	AMI Saturation - Resi.	AMI Saturation - Com.	AMI Saturation Total	Remaining AMI Installation - Resi.	Remaining AMI Installation - Com.	Remaining AMI Installation Total	Grand Total	% Completed	Opt Out	Deployment Starting Qtr (2019)*	Deployment Ending Qtr (2019)*
MERRICK NY	11566	52	13	65	2,156	207	2,363	9,825	728	10,553	12,916	18.30%	22		
MIDDLE ISLAND NY	11953	18	8	26	303	84	387	5,336	650	5,986	6,373	6.07%	4	3	4
MILL NECK NY	11765	5	3	8	80	6	86	252	28	280	366	23.50%			
MILLER PLACE NY	11764	22	4	26	376	50	426	4,012	414	4,426	4,852	8.78%	8		
MINEOLA NY	11501	90	13	103	564	265	829	8,056	1,312	9,368	10,197	8.13%	3	3	4
MONTAUK NY	11954	3,660	391	4,051	3,924	496	4,420	821	1,027	1,848	6,268	70.52%	18		
MORICHES NY	11955	11	6	17	46	23	69	1,583	148	1,731	1,800	3.83%			
MOUNT SINAI NY	11766	25	7	32	252	44	296	4,159	490	4,649	4,945	5.99%	3		
NESCONSET NY	11767	22	6	28	240	54	294	4,611	445	5,056	5,350	5.50%	2		
NEW HYDE PARK NY	11040	51	22	73	680	310	990	12,016	1,275	13,291	14,281	6.93%	13	3	4
	11042			0		47	47	3	46	49	96	48.96%			
NEW SUFFOLK NY	11956	7	1	8	22	3	25	275	34	309	334	7.49%			
NORTH BABYLON NY	11703	36	4	40	466	99	565	5,586	362	5,948	6,513	8.67%	4		
NORTHPORT NY	11768	32	11	43	667	323	990	7,698	505	8,203	9,193	10.77%	14		
OAKDALE NY	11769	19	5	24	271	73	344	3,803	380	4,183	4,527	7.60%	1		
OCEAN BEACH NY	11770	1	2	3	1,436	139	1,575	1	4	5	1,580	99.68%	1		
OCEANSIDE NY	11572	1,833	46	1,879	2,440	374	2,814	8,365	1,089	9,454	12,268	22.94%	29	2	4
OLD BETHPAGE NY	11804	12	1	13	88	35	123	1,463	70	1,533	1,656	7.43%	3		
OLD WESTBURY NY	11568	10	0	10	151	28	179	1,055	160	1,215	1,394	12.84%	2	4	4
ORIENT NY	11957	9	0	9	62	11	73	779	104	883	956	7.64%		3	3
OYSTER BAY NY	11771	21	6	27	240	89	329	3,940	633	4,573	4,902	6.71%	4		
PATCHOGUE NY	11772	109	57	166	5,142	1,321	6,463	12,587	1,297	13,884	20,347	31.76%	34		
PECONIC NY	11958	4	1	5	33	20	53	491	100	591	644	8.23%		3	4
PLAINVIEW NY	11803	150	28	178	1,013	475	1,488	8,989	986	9,975	11,463	12.98%	12		
POINT LOOKOUT NY	11569	422	17	439	441	40	481	437	41	478	959	50.16%	1	1	2
PORT JEFFERSON NY	11777	8	6	14	467	113	580	3,447	629	4,076	4,656	12.46%	2		
PORT JEFFERSON STATION NY	11776	45	35	80	682	240	922	7,899	1,071	8,970	9,892	9.32%	6	2	4
PORT WASHINGTON NY	11050	18	3	21	1,295	269	1,564	10,371	1,372	11,743	13,307	11.75%	18	4	4

Note: Table continues on next page

PSEG LONG ISLAND

Q1 - 2019

Meter Deployment by Township

Township	Zip Code	2019 Installation - Resi.	2019 Installation - Com.	2019 Installation Total	AMI Saturation - Resi.	AMI Saturation - Com.	AMI Saturation Total	Remaining AMI Installation - Resi.	Remaining AMI Installation - Com.	Remaining AMI Installation Total	Grand Total	% Completed	Opt Out	Deployment Starting Qtr (2019)*	Deployment Ending Qtr (2019)*
QUOGUE NY	11959	29	7	36	131	30	161	1,658	276	1,934	2,095	7.68%	2	3	4
REMSENBURG NY	11960	15	0	15	62		62	904	32	936	998	6.21%	1	3	4
RIDGE NY	11961	36	3	39	702	41	743	5,581	272	5,853	6,596	11.26%	9	4	4
RIVERHEAD NY	11901	92	37	129	663	1,034	1,697	9,879	1,337	11,216	12,913	13.14%	7	3	4
ROCKAWAY PARK NY	11694	5,421	356	5,777	6,153	487	6,640	866	199	1,065	7,705	86.18%	10		
ROCKVILLE CENTRE NY	11570	3	0	3	93	11	104	719	28	747	851	12.22%	4	2	3
	11571			0			0		1	1	1	0.00%			
ROCKY POINT NY	11778	50	5	55	360	70	430	4,652	400	5,052	5,482	7.84%	1	2	4
RONKONKOMA NY	11779	258	37	295	945	484	1,429	12,629	2,064	14,693	16,122	8.86%	7		
ROOSEVELT NY	11575	156	15	171	1,541	115	1,656	2,668	279	2,947	4,603	35.98%	5	1	3
ROSLYN HEIGHTS NY	11577	21	0	21	214	56	270	4,200	486	4,686	4,956	5.45%	1	4	4
ROSLYN NY	11576	24	3	27	272	97	369	4,382	507	4,889	5,258	7.02%	3	3	4
SAG HARBOR NY	11963	3,356	190	3,546	3,591	238	3,829	2,124	499	2,623	6,452	59.35%	36		
SAGAPONACK NY	11962	406	25	431	488	29	517	439	39	478	995	51.96%	2		
SAINT JAMES NY	11780	17	9	26	404	113	517	5,262	654	5,916	6,433	8.04%	4		
SAYVILLE NY	11782	38	11	49	1,476	215	1,691	5,438	639	6,077	7,768	21.77%	7		
SEA CLIFF NY	11579	6	0	6	80	14	94	1,979	276	2,255	2,349	4.00%	2	4	4
SEAFORD NY	11783	35	7	42	575	94	669	6,808	447	7,255	7,924	8.44%	8		
SELDEN NY	11784	109	3	112	1,024	338	1,362	6,984	384	7,368	8,730	15.60%	8		
SHELTER ISLAND HEIGHTS NY	11965			0	7	7	14	177	53	230	244	5.74%	1		
SHELTER ISLAND NY	11964	22	10	32	186	23	209	2,453	337	2,790	2,999	6.97%	2	4	4
SHIRLEY NY	11967	114	16	130	839	202	1,041	7,750	541	8,291	9,332	11.16%	5		
SHOREHAM NY	11786	19	1	20	175	23	198	1,860	113	1,973	2,171	9.12%	4	3	4
SMITHTOWN NY	11787	52	24	76	797	411	1,208	11,392	1,554	12,946	14,154	8.53%	10		
	11745			0			0		13	13	13	0.00%			
SOUND BEACH NY	11789	24	0	24	176	4	180	2,769	84	2,853	3,033	5.93%	3		
SOUTH JAMESPORT NY	11970			0	8	1	9	219	25	244	253	3.56%			
SOUTHAMPTON NY	11968	5,612	488	6,100	5,774	725	6,499	4,203	1,173	5,376	11,875	54.73%	50		
	11969	6	1	7	7	1	8	1		1	9	88.89%			

Note: Table continues on next page

PSEG LONG ISLAND

Q1 - 2019

Meter Deployment by Township

Township	Zip Code	2019 Installation - Resi.	2019 Installation - Com.	2019 Installation Total	AMI Saturation - Resi.	AMI Saturation - Com.	AMI Saturation Total	Remaining AMI Installation - Resi.	Remaining AMI Installation - Com.	Remaining AMI Installation Total	Grand Total	% Completed	Opt Out	Deployment Starting Qtr (2019)*	Deployment Ending Qtr (2019)*
SOUTHOLD NY	11971	28	6	34	235	71	306	3,796	548	4,344	4,650	6.58%	5	3	4
SPEONK NY	11972	5	3	8	43	23	66	531	167	698	764	8.64%		3	3
STONY BROOK NY	11790	23	7	30	707	97	804	4,302	494	4,796	5,600	14.36%	5		
	11794			0		4	4		1	1	5	80.00%			
SYOSSET NY	11791	65	9	74	645	206	851	7,707	939	8,646	9,497	8.96%	15		
UNIONDALE NY	11553	50	4	54	2,524	267	2,791	3,386	423	3,809	6,600	42.29%	7	3	3
	11556			0			0		2	2	2	0.00%			
	11555			0	1		1		2	2	3	33.33%			
VALLEY STREAM NY	11580	1,321	75	1,396	2,233	343	2,576	10,437	1,205	11,642	14,218	18.12%	14	2	4
	11581	39	12	51	679	248	927	6,426	332	6,758	7,685	12.06%	8	2	4
	11582			0		1	1	1	1	2	3	33.33%			
WADING RIVER NY	11792	13	1	14	247	35	282	3,389	311	3,700	3,982	7.08%	6	3	4
WAINSCOTT NY	11975	36	7	43	99	23	122	760	205	965	1,087	11.22%	1		
WANTAGH NY	11793	72	8	80	2,681	152	2,833	7,978	694	8,672	11,505	24.62%	17		
WATER MILL NY	11976	585	99	684	743	93	836	1,223	267	1,490	2,326	35.94%	8		
WEST BABYLON NY	11704	74	26	100	957	431	1,388	12,497	1,527	14,024	15,412	9.01%	2		
	11707			0	2	1	3	3	3	6	9	33.33%			
WEST HEMPSTEAD NY	11552	413	9	422	905	126	1,031	6,881	655	7,536	8,567	12.03%	12	2	4
WEST ISLIP NY	11795	50	8	58	581	114	695	7,825	572	8,397	9,092	7.64%	5		
WEST SAYVILLE NY	11796	12	1	13	114	16	130	1,218	108	1,326	1,456	8.93%	5		
WESTBURY NY	11590	86	37	123	1,376	409	1,785	13,174	1,554	14,728	16,513	10.81%	5	3	4
WESTHAMPTON BEACH NY	11978	61	18	79	307	125	432	3,301	553	3,854	4,286	10.08%	4	4	4
WESTHAMPTON NY	11977	19	6	25	121	30	151	1,673	176	1,849	2,000	7.55%	5	3	4
WILLISTON PARK NY	11596	15	1	16	189	45	234	3,579	407	3,986	4,220	5.55%	3	3	4
WOODBURY NY	11797	25	6	31	149	174	323	3,136	436	3,572	3,895	8.29%			
WOODMERE NY	11598	90	5	95	491	58	549	3,880	334	4,214	4,763	11.53%	3	2	3
WYANDANCH NY	11798	62	9	71	532	104	636	3,836	351	4,187	4,823	13.19%	2		
YAPHANK NY	11980	27	11	38	210	151	361	1,772	341	2,113	2,474	14.59%	1		

PSEG LONG ISLAND

Q1 - 2019

NIST/FIPP Compliance Definitions

Category	Description
Accuracy and Quality	Keep information accurate and complete. Any organization collecting energy data from or about customer locations should establish policies and procedures to ensure that the smart grid data collected from and subsequently created about recipients of services is accurate, complete, and relevant for the identified purposes for which they were obtained, and that it remains accurate throughout the life of the smart grid data within the control of the organization.
Awareness and Training	Privacy and information security training. Organizations should support training by ongoing awareness communications, to their workers that have job responsibilities involving customer and energy usage data. Organizations should also consider providing information to their customers and the public to help them to better understand the privacy issues related to the smart grid, along with how the organization is working to mitigate the associated risks, and also steps the public can take to better protect their own privacy.
Choice and Consent	Provide notification about choices. The customer notification should include a clearly worded description to the recipients of services notifying them of (1) any choices available to them about information being collected and obtaining explicit consent when possible; and (2) explaining when and why data items are or may be collected and used without obtaining consent, such as when certain pieces of information are needed to restore service in a timely fashion.
Collection and Scope	Limit the collection of data to only that necessary for smart grid operations, including planning and management, improving energy use and efficiency, account management, and billing. Obtain the data by lawful and fair means and, where appropriate and possible, with the knowledge or consent of the customer.
Commissioning, Registration, and Enrollment for Smart Devices	Privacy issues that should be addressed related to the registration of these devices with third parties include: determining the types of information that are involved with these registration situations; controlling the connections which transmit the data to the third party, such as wireless transmissions from home area networks; and determining how the registration information is used, where it is stored, and with whom it is shared. At each step in this process, the customer, utility, and third party provider should ensure that data flows have been identified and classified, and that privacy issues are addressed throughout, from initial commissioning up through service delivery.
Disclosure and Limiting Use	Limit information use. Data on energy or other smart grid service activities should be used or disclosed only for the authorized purposes for which it was collected. Disclosure. Data should be divulged to or shared only with those parties authorized to receive it and with whom the organizations have told the recipients of services it would be shared.
Emerging Smart Grid Privacy Risks	Entities should remain aware of emerging smart grid privacy risks.
Individual Access	Access to energy usage data. Any organization possessing energy data about customers should provide a process to allow customers access to the corresponding energy data for their company's account. Dispute resolution. Smart grid entities should establish documented dispute resolution procedures for energy customers to follow.

Note: Some definitions were cut off due to length. Please see PSEG Long Island's Utility 2.0 Long Range Plan - 2018 Annual Update for full definitions.

PSEG LONG ISLAND

Q1 - 2019

NIST/FIPP Compliance Definitions

Category	Description
Management and Accountability	Assign privacy responsibility. Each organization collecting or using smart grid data from or about customer locations should create (or augment) a position or person with responsibility to ensure that privacy policies and practices exist and are followed.
	Establish or amend incident response and law enforcement request policies and procedures. Organizations accessing, storing, or processing energy data should include specific documented incident response procedures for incidents involving energy data.
	Establish privacy audits. Audit functions should be modified to monitor all privacy related energy data access.
Mitigation Privacy Concerns within the Smart Grid	PIAs. Any organization that collects personal information, or information that can reveal information about personal activities, can identify areas where privacy protections are necessary by performing a PIA. A PIA can be performed internal to the organization, or by an objective outside entity. Audits. An audit is a structured evaluation of a person, organization, system, process, enterprise, project or product. Among other mitigations, audits can be used to determine compliance levels with legal requirements and to identify areas where policies are not being followed. An audit should ideally be performed by an objective entity that is not a member of the area being audited. Privacy use cases. Use cases can help smart grid architects and engineers build privacy protections into the smart grid. The Privacy Use Cases in the NISTIR document are focused on data privacy in selected smart grid scenarios, making them unique amongst the many tools, frameworks, and standards that are noted above.
Notice and Purpose	Provide notification for new information use purposes and collection. Organizations should update consumer notifications whenever they want to start using existing collected data for materially different purposes other than those the customer has previously authorized.
	Provide notification for the personal information collected. Any organization collecting energy data from or about consumers should establish a process to notify customer account inhabitants and person(s) paying the bills (which may be different entities), when appropriate, in a clearly worded description of the data being collected, why it is necessary to collect the data, and the intended use, retention, and sharing of the data.
Openness, Monitoring, and Challenging Compliance	Policy challenge procedures. Organizations collecting energy data, and all other entities throughout the smart grid, should establish procedures that allow customers to have the opportunity and process to challenge the organization's compliance with their published privacy policies as well as their actual privacy practices. Perform regular privacy impact assessments (PIA). Any organization collecting energy data from or about customer locations should perform periodic PIAs with the appropriate time frames, to be determined by the utility, based upon the associated risks and any recent process changes and/or security incidents. Establish breach notice practices. Any organization with smart grid data should establish policies and procedures to identify breaches and misuse of smart grid data, along with expanding or establishing procedures and plans for notifying the affected individuals.
Personal Information in the Smart Grid	Determine which data items will significantly lessen or remove the ability to link to specific addresses or individuals whenever they perform their data anonymization activities.

Note: Some definitions were cut off due to length. Please see PSEG Long Island's Utility 2.0 Long Range Plan - 2018 Annual Update for full definitions.

PSEG LONG ISLAND

Q1 - 2019

NIST/FIPP Compliance Definitions

Category	Description
Plug-In Electric Vehicles (PEV) Privacy Concerns	Specific solutions or mitigations for PEV potential privacy issues should be explored as technology solutions are deployed going forward. System and infrastructure architects and engineers should stay aware of potential issues.
Security and Safeguards	Associate energy data with individuals only when and where required. For example, only link equipment data with a location or customer account when needed for billing, service restoration, or other operational needs. De-identify information. Energy data and any resulting information, such as monthly charges for service, collected as a result of smart grid operations should be aggregated and anonymized by removing personal information elements wherever possible to ensure that energy data from specific customer locations is limited appropriately. This may not be possible for some business activities, such as for billing. Safeguard personal information. All organizations collecting, processing, or handling energy data and other personal information from or about customer locations should protect all information collected and subsequently created about the recipients of smart grid services from loss, theft, unauthorized access, disclosure, copying, use, or modification. Do not use personal information for research purposes. Any organization collecting energy data and other personal information from or about customer locations should refrain from using actual customer data for research until it has been anonymized and/or sufficiently aggregated to assure to a reasonable degree the inability to link detailed data to individuals.
Smart Grid Data Access by Third Parties	Provides data privacy recommendations for third parties in accessing smart grid data
Use and Retention	Review privacy policies and procedures. Every organization with access to smart grid data should review existing information security and privacy policies to determine how they may need to be modified. Limit information retention. Data, and subsequently created information that reveals personal information or activities from and about a specific customer location, should be retained only for as long as necessary to fulfill the purposes that have been communicated to the energy customers. After the appropriate retention period, data should be aggregated or destroyed.
Wireless Access to Smart Meters and Secondary Devices	If future wireless technology is used to transmit aggregate home or business energy consumption information for a unique location or dwelling, then that usage data should also be protected from unauthorized use, modification, or theft prior to sufficient aggregation to protect privacy.

Note: Some definitions were cut off due to length. Please see PSEG Long Island's Utility 2.0 Long Range Plan - 2018 Annual Update for full definitions.

APPENDIX D. Related Initiatives Outside of Utility 2.0

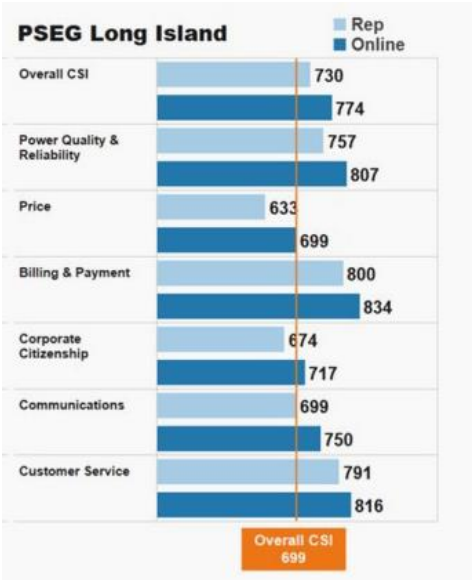
The following section summarize initiatives that support PSEG Long Island's vision and strategy for the future, but which are not currently funded through past or current Utility 2.0 filings. In the future, PSEG Long Island may seek Utility 2.0 funding to further support these or other related initiatives.

D.1 Empowering Customer Initiatives

These enhancements to customer channels are aimed at increasing customer engagement in self-service channels through increased ease of use. PSEG Long Island records show that enhanced navigation and customer digital experiences result in a self-service registration growth rate of 51% and a payment success rate of 90%.

J.D. Power graphic (Figure D-1.) shows a 6% increase in overall CSI (Customer Satisfaction Index), and points to when customers use online communications channels rather than phone calls or in-person communication with a representative. This increase in CSI is mirrored in other segments as well.

Figure D-1. J.D. Power Customer Satisfaction, Q12019



Source: J.D. Power Briefing for PSEG Long Island, Q12019

The goal of PSEG Long Island is to implement and integrate enhancements to existing digital communication channels between the company and the customer. By developing and using digital tools, PSEG Long Island will be able to achieve the following:

- Improve CSAT and J.D. Power scores
- Improve self-service registration rates
- Decrease frequency of late payments

The enhancements include the addition of another customer communication channel (i.e., mobile app), enhancements to existing self-serve channels, and increased integration of customer communications and data across multiple channels.

D.1.1 Mobile Application Rollout

The mobile application is set to launch in fall 2019 and will allow customers to view their usage, view their bill, make payments, report and view outages, login to My Account, and in general be able to access all fundamental My Account features--all with the ease and convenience of smartphones. Eventually, enhancements to the mobile application will include integrating it to the enhanced marketplace and process rebates within the mobile application.

D.1.2 Introducing Voice Assistant Channel - Alexa Skill

Alexa Skill launched in November of 2018 and allows My Account customers to pay bills, review usage history, get bill summary, check meter reading dates, and get energy saving and safety tips through voice activation of their Amazon Alexa device.

D.1.3 Modernizing Customer Relationship Management

In 2018, PSEG Long Island began implementation of a market-leading customer relationship management solution, Salesforce. Initial release of this solution, the Salesforce web chat service, launched in April 2019, and uses an automated chat-bot to streamline the process for both customer service representatives (CSRs) and customers. By enhancing an existing customer communication channel, PSEG Long Island offers more convenient digital communication to the customer as the chat-bot is responsive outside of regular business hours.

D.2 Exploring New Innovative Offering Initiatives

The projects proposed in this filing are related to a broader set of activities underway by PSEG Long Island to support grid modernization and improved customer offerings. There are various other customer offerings and PSEG Long Island initiatives related to the projects proposed in this filing; however, they are outside the scope of Utility 2.0. For example, the heat pump pilot builds upon incentives from existing EE programs to support controls that better use ductless mini-split heat pumps. Additionally, both the heat pump pilot and electric bus (e-bus) pilot built upon ideas submitted from market partners through REV Connect.

D.2.1 Energy Efficiency and Renewable Plan

PSEG Long Island funds its energy efficiency program through a separate annual filing. PSEG Long Island's EE programs make a wide array of incentives, rebates, and programs available to PSEG Long Island residential and commercial customers to assist them in reducing their energy usage and thereby lowering their bills, as well as improving the environment through the success of the programs.

Historically, PSEG Long Island has filed its Utility 2.0 filing in the summer and its Energy Efficiency and Renewable Plan in the fall. However, planning for both filings similarly engages stakeholders across the organization to ensure that these are coordinated efforts. To better align coordination and communication of these filings, PSEG Long Island is moving its Energy Efficiency and Renewables filing forward to immediately follow its Utility 2.0 filing this year, with planned submission in August 2019. This approach is consistent with the approaches of other utilities in New York State, which have integrated their DSIPs and Energy Efficiency Transition Implementation Plans.

Activities in the Utility 2.0 filing build on other EE activities. These EE activities include the Super Savers program which provides enhanced incentives due to locational value, and the heat pump pilot which incents controls to maximize the value of heat pumps that may receive separate incentives. While these filings are interrelated, most EE and renewable energy activities are addressed within the Energy Efficiency and Renewable Plan, including plans for supporting New York State energy savings targets defined in the *New Efficiency: New York* and continued support of NY-Sun.

PSEG Long Island's energy efficiency program has recently expanded offerings to include:

- Rebates and incentives for the installation of EE measures that save oil and propane in residential homes and commercial buildings.
- Incentives and outreach strategies to enable the development of a market for CHP projects in commercial buildings.
- Higher incentives and increased program outreach for geothermal heating and cooling technologies.
- Higher incentives for air-source heat pumps replacing electric heat or in new construction.
- A targeted commercial EE program.
- Customer engagement through a behavior-based Home Energy Management Program.
- An online marketplace where customers can purchase LED lamps, smart thermostats, and other efficient appliances.[24]

PSEG Long Island's program philosophy and delivery is structured to respond to market changes and to respond to available cost-effective EE opportunities throughout any given year. PSEG Long Island will continue to offer residential and commercial customers established programs and incorporate additional innovative programs and measures to add to their energy savings opportunities. In 2018, the portfolios continued their transition from a demand savings focus to an energy savings focus. The evaluated energy savings were 306,545 MWh and the evaluated demand savings were 67.5 MW in 2018. In an effort to better align with New Efficiency: New York goals, the 2019 goals were established on a gross basis at site (rather than on a net basis at the generator) at levels of 276,500 MWh for energy savings and 58.18 MW for demand, on a total budget of $88.79 million dollars.

D.2.2 REV Connect

PSEG Long Island and LIPA have been active participants in REV Connect, a New York State program that connects utilities with market players to accelerate the implementation of scalable, market-based solutions through partnerships between utilities and solution providers. This year, PSEG Long Island participated in the Connected Communities Innovation Sprint, specifically soliciting ideas for e-buses and heat pumps.

The grid-interactive DER projects proposed here, both the e-bus and heat pump pilots, stem from submissions to REV Connect addressing these interest areas. The e-bus V2G pilot is based upon a submission from Suffolk Transportation Services and its partner, Edgewise Energy. The heat pump pilot is based upon a submission from Resideo, a spin-off of Honeywell.

[24] http://www.energyfederation.org/psegliny

Furthermore, PSEG Long Island has been engaged with submitters who previously participated in REV Connect to help inform various different Utility 2.0 initiatives planned or underway, including Nuvve for the e-bus V2G project and Bidgely for the Energy Concierge.
PSEG Long Island also received submissions that it may consider for future efforts, including ideas related to its marketplace, stationary BTM storage and energy efficiency programs. For example, PSEG Long Island is considering a partnership with Sealed to offer Long Island customers Sealed's HomeAdvance Program.

PSEG Long Island intends to further integrate REV Connect into its planning process, including using the upcoming Innovation Sprint on energy storage and other future sprints to support its Utility 2.0 and other filings. In addition, PSEG Long Island may look to build upon REV Connect; for example, by offering a demo day that invites REV Connect submitters to present their ideas to a broader audience of PSEG Long Island and LIPA staff.

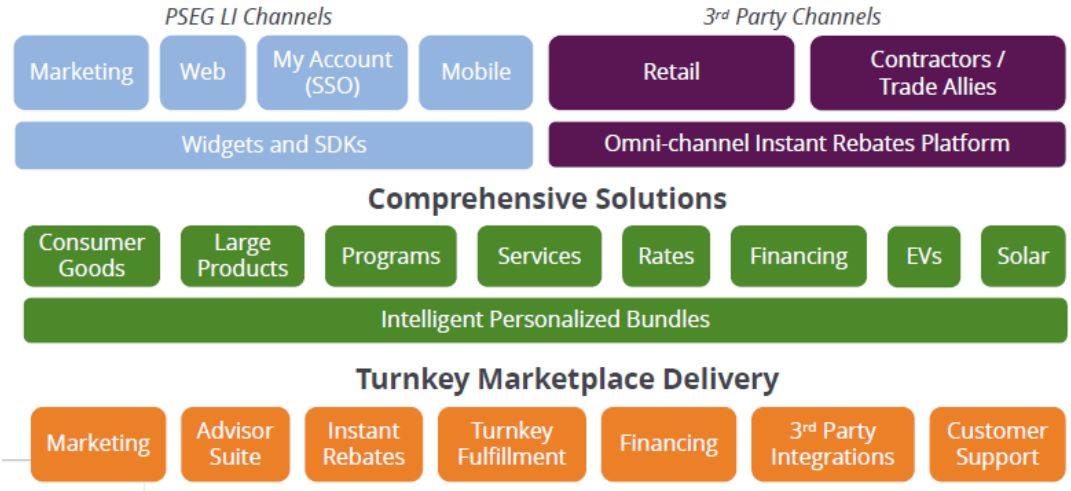
D.2.3 Enhanced Marketplace

Under REV, the New York State investor-owned utilities (IOUs) have each deployed an online marketplace to offer customers products and services that increase the adoption of clean energy solutions.

PSEG Long Island currently offers its customers a marketplace that consists of an online catalog with a limited number of energy efficient product offerings. Recent technological and e-commerce advancements, in addition to marketing innovations, have resulted in utility marketplace sites that are significantly more advanced and more robust than the current PSEG Long Island marketplace.

For PSEG Long Island, as more data is made available to the utility through AMI and the use of data analytics, sharing this data is key to empowering customers to understand and modernize the way they manage their energy needs. PSEG Long Island is in the process of considering how to modernize its online marketplace by using a best-in-class turnkey solution for an omni-channel integrated customer experience.

Figure D-2. Comprehensive Marketplace Solution



Source: Illustrative, need to confirm with third-party that image can be used before sending to DPS

D.3 Evolving to a Customer-Centric DSP Initiatives

PSEG Long Island is in the process of deploying DSP-enabling capabilities. Some of these initiatives have or will be funded through Utility 2.0 while others may be funded from other means.

D.3.1 Generation-Scale Energy Storage

Energy storage plays a crucial role in meeting New York State's ambitious clean energy goals, with a statewide mandate for the deployment of 1,500 MW of energy storage by 2025. PSEG Long Island is supporting this mandate with its existing BTM storage incentives (see Section 3.1.2) and Utility-Scale Storage program (see Section 4.2.1.) that targets load pockets in Long Island. The utility is also backing the mandate with the deployment of storage in support of renewables integration and peak demand management. LIPA recently approved a modification to its DLM tariffs to encourage the deployment of BTM energy storage systems.

As part of a wider effort to manage constraints on the local grid, PSEG Long Island deployed two storage systems of total capacity of 10 MW/80 MWh in South Fork in 2018 which is the fastest growing region in Long Island with an ~2.4% annual growth. The overall effort is supported by a targeted EE and DR program. All were in response to an RFP issued in 2015 for NWS on the South Fork.

PSEG Long Island sees a role for large-scale energy storage systems in managing peak demand in Long Island. With changes in environmental rules for gas emissions, PSEG Long Island expects that it will become more critical to deploy alternatives to fuel-based peaker units, which currently provide most of the peak generation capacity in Long Island.

Going forward, PSEG Long Island intends to develop set of criteria to identify locations on the system and circuits, which are suited for battery type of technology, for example for reducing peak or increasing hosting capacity of the distribution circuits. Additionally, by identifying the DERs on the circuits and coming up with ways to optimize the usage of the DER/renewables output, PSEG Long Island can combine DER with batteries to reduce carbon emissions, deferral investment, and provide insight into operational flexibilities that can be achieved with this combination. Also, with the new established market rules surrounding DER technology, PSEG Long Island can build appropriate flexibility into the systems to accommodate these new requirements.

D.3.2 Grid Modernization

In a decentralized yet integrated energy future, electricity networks must be responsive to the changing demands for traditional services while enabling new opportunities for energy resource sharing and balancing. By connecting thousands of customer-owned generators and energy storage systems to each other, networks act as platforms which help match supply and demand. Grid modernization investments help achieve these objectives by making the underlying infrastructure reliable and resilient.

PSEG Long Island's commitment to modernizing the grid is demonstrated by the completion of Federal Emergency Management Agency-sponsored grid reinforcement and an annual ~$400 million capital investment, including:

- Advanced asset management
- Operational data lake implementation on the Amazon Web Service platform
- Ongoing DSCADA implementation

- AMI-OMS integration for advanced outage management

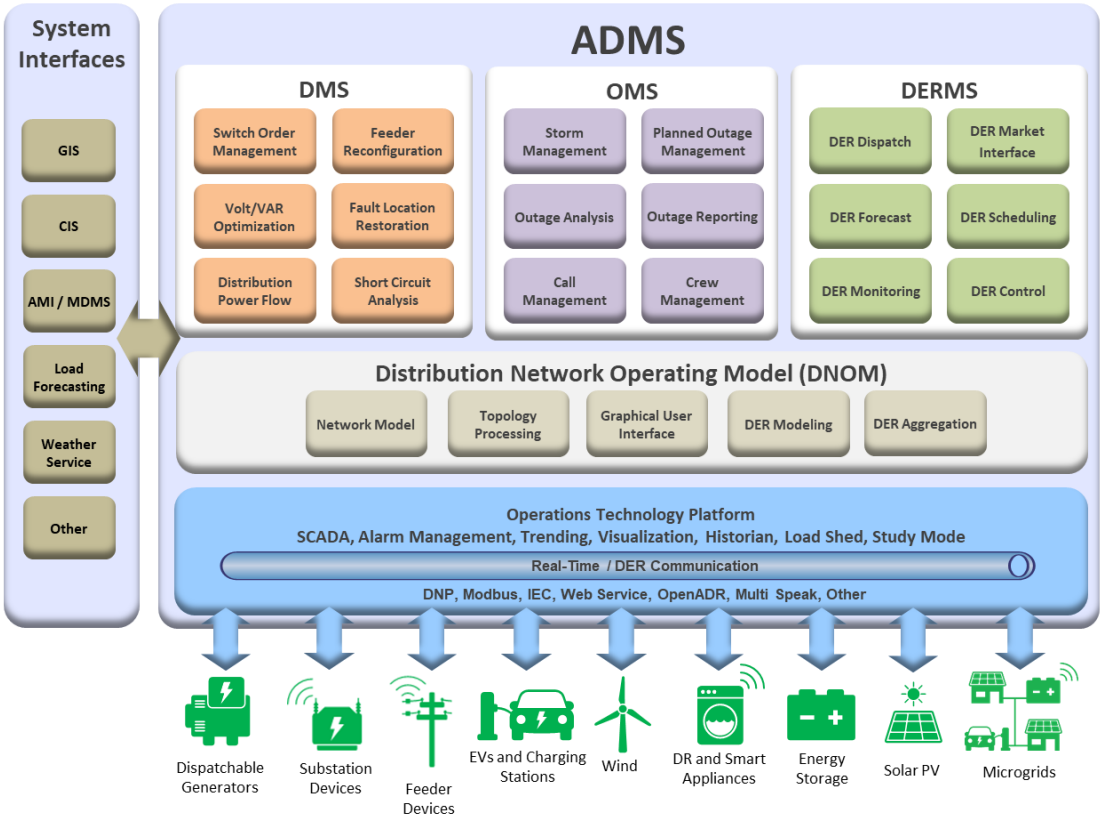
Going forward, PSEG Long Island is considering implementation of the following:

- An ADMS platform which will incorporate DMS and OMS for advanced grid operation
- Advanced relay coordination for safe and reliable DER integration at scale (currently addressed through interconnection process)
- DERMS to enable safe operation of high penetration of DER
- Advanced distribution planning and forecasting analysis for detailed feeder models
- An analytical tool for advanced transformer and fuse load management to maintain a prioritized queue of transformers and fuses deserving programmatic remediation

D.3.3 ADMS

ADMS is a real-time integrated solution for the active management of distribution networks, providing a platform for PSEG Long Island's future roadmap and vision. It will enable PSEG Long Island to improve system reliability, efficiency and safety, as well as provide timely and reliable information to internal and external stakeholders. Incorporating a full suite of advanced applications, ADMS represents a comprehensive and modern solution for the challenges facing distribution system operators and planners. Components of the ADMS are illustrated in Figure D-3.

Figure D-3. ADMS Architecture



Source: PSEG Long Island

The ADMS will support both the distribution management system (DMS) and the outage management system (OMS). The existing OMS system will be integrated into the new platform. The installed system will reach end of life within the next 5 years and will be replaced with a tightly integrated state-of-the-art outage management solution that empowers PSEG Long Island to better manage its outage restoration processes, minimize outage response times, keep customers, management and regulators well-informed about the scope, status and forecast for outage restoration efforts, and improve overall system reliability.

PSEG Long Island also plans to implement a DMS module as part of its ADMS, which will add key grid analysis applications and centralized distribution automation for more efficient system operations and asset utilization. Features of the DMS will include:

- a common, seamless user-interface with a standardized look and feel
- in-depth situational awareness
- real-time monitoring and control
- advanced analysis applications
- centralized distribution automation
- geographical and schematic views of the distribution system
- fully functional operational interface for distribution operators

The DMS will provide the following capabilities:

- Distribution Power Flow, to identify real-time voltage, capacity, and operational limit violations;
- Distribution State Estimator
- Short Circuit Analysis
- Fault Location, Isolation and Service Restoration (FLISR), to locate faults and determine the switching steps required to isolate damaged equipment and restore service to un-faulted sections
- Feeder Reconfiguration, to determine optimum load transfer switching procedures to improve the distribution system performance (e.g., relieve overloads, correct unacceptable voltage conditions)
- Fault Protection Analysis
- VoIt/VAR Control and Optimization
- Switching Order Management
- Load estimation based on real-time feeder measurements
- Modeling of various types of DG
- Modeling of real-time field device operations (capacitor banks, LTCs, voltage regulators, etc.)
- Study mode, to simulate "what-if" scenarios with different load models and system configurations.

D.3.4 DERMS

PSEG Long Island plans to implement DERMS as a component of the ADMS, but it provides key new capabilities worth a mention of their own. DERMS is a solution for real-time monitoring, management and optimal dispatch of DER. It enables safe operation of a higher penetration solar PV, EVs and battery

storage. DERMS will establish a control center for operational management of the increasing number and variety of DER on Long Island. DERMS will provide the following functionality:

- Aggregation of multiple DERs into a single net resource for more effective visualization, monitoring, scheduling and dispatch
- Visualization of DERs (or DER aggregations), including DER type, location, capability, and current and short-term forecasted output for situational awareness
- Monitoring and controlling DER, including:
    - Reverse power flow due to high levels of DG during periods of low load
    - Voltage issues particularly in the vicinity of PV
    - DER intermittency, which can pose issues with energy demands and voltage response
    - Switching flexibility (high DER penetrations have the potential to cause thermal and/or voltage issues)
    - Load masking, in which high DER levels can mask the true load of the feeder, leading to issues if the DER suddenly reduces (e.g., reduced PV output during a thunderstorm)
- Forecasting of future DER output, including forecasting of non-telemetered DER output (such as residential PV) in real time
- Scheduling and dispatching of controllable DER for various objectives including:
    - Peak shaving
    - Implementation of DR, including transmission of notification signals to thermostats and other energy controllers using industry-standard protocols
    - Cost minimization
    - Reverse power flow avoidance
    - Emissions reduction
    - VoIt-VAR optimization
- Management of battery energy storage, including managing the State of Charge to assure adequate energy when needed and creation of market -based charge/discharge schedules
- Management of microgrids, which are viewed as aggregate resources that can be scheduled and dispatched like any other DER type through communication with the local microgrid controller
- Data archival and analysis, to verify the amount of energy saved or produced by various DER programs
- Study/simulator mode for operator training and to study “what-if” scenarios

D.3.5 Advanced Relay Coordination

The constantly increasing amount of DER on feeders upends this assumption, and protection coordination must now be designed for possible two-way flow under a variety of contingencies. PSEG Long Island plans to develop a robust capability for advanced protection coordination which will provide superior distribution system reliability as it evolves into the Distributed System Platform.

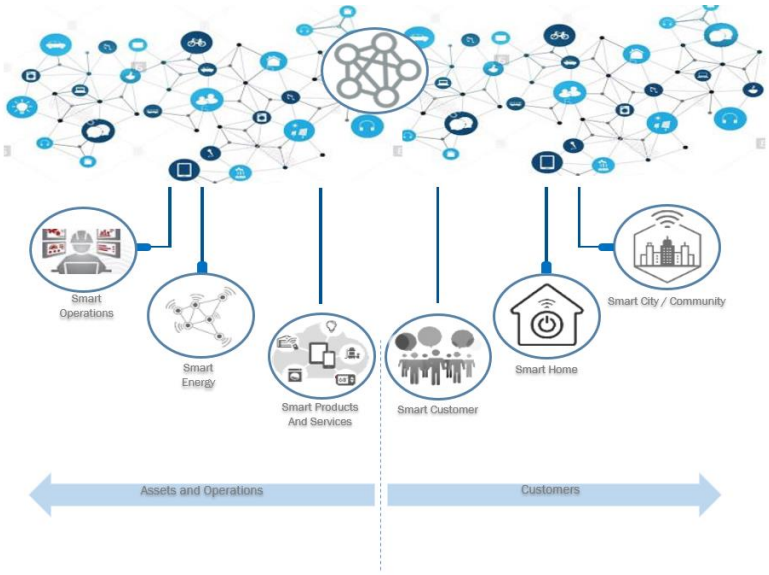
D.3.6 Energy Cloud

PSEG Long Island, along with its parent company PSE&G in New Jersey, recently established the Energy Cloud organization to evaluate and implement technology for a modern T&D system, including infrastructure services platform and different software and product solutions.

As it is envisioned, the Energy Cloud will:

- Provide solutions to automate advanced operations and effectively manage the electric grid of the future
- Support individuals and communities by analyzing large amounts of customer data to predict customer needs, develop tailored solutions, and automate customer interactions
- Optimize energy consumption and sustainability through intelligent demand management and grid operations
- Provide a platform for the utility and others to offer advanced energy service and products

Figure D-4. PSEG Long Island's Vision of the Energy Cloud



PSEG Long Island's Utility 2.0 initiatives, particularly around evolving to the DSP, are encompassed by the Energy Cloud. In this way, PSEG Long Island and PSE&G will be able to align in their objectives for developing the distributed platform of the future.

Under this effort, technology deployments will be unified under the Energy Cloud program. Standards on application compatibility, data availability and device interoperability will be put in place to ensure scalability and full value realization.

The Energy Cloud implementation will provide capabilities to operators, planners and maintenance groups a comprehensive real time assessment of the T&D system. Through an advanced ADMS system, the Energy Cloud will provide the following operational capabilities

- Distribution power flow, distribution state estimation, short circuit analysis and volt-VAR optimization analysis to operators;
- Advanced asset health, asset management, risk analysis and risk scoring to the maintenance organization.

APPENDIX E. Business Case Methodology

E.1 Funding Request Methodology

For each initiative's funding request, the team split out the capital and O&M costs by sub-category based on the definitions outlines in Table E-1.

Table E-1. Funding Request Cost Category Definitions

Benefit Stream	Definition
Customer Incentives	Monetary incentives provided to customers from PSEG Long Island to promote technology adoption.
IT Upgrades	Costs incurred by PSEG Long Island to upgrade their IT systems.
Marketing and Outreach	Costs for marketing, outreach, and customer engagement to promote the proposed initiatives.
Materials and Equipment	Avoided energy and capacity costs associated with reduction in the transmission system loss factor.
Ongoing O&M	Costs incurred in an ongoing basis to maintain assets, equipment, and software.
PM, Labor, and Training	Costs for program management, additional FTEs required, and various training activities (e.g., for Energy Concierge).
Third Party Support	Costs for third parties and consultants (i.e., outside services).

E.2 Benefit-Cost Analysis Methodology

The team applied New York DPS's BCA Framework to calculate the benefits and costs from the SCT, utility cost test (UCT), and rate impact measure (RIM) test perspectives. Table E-2 summarizes this overall framework by cost test, where value streams labeled as a benefit are counted in the numerator of the benefit-cost ratio, cost streams are counted in the denominator, and N/A streams are not included in the calculation.

Table E-2. Cost Test Definitions

Benefit or Cost Stream	SCT	UCT	RIM
Avoided Generation Capacity Cost (AGCC)	Benefit	Benefit	Benefit
Avoided Energy (LBMP)	Benefit	Benefit	Benefit
Avoided Transmission Capacity Infrastructure	Benefit	Benefit	Benefit
Avoided Transmission Losses	Benefit	Benefit	Benefit
Avoided Ancillary Services	N/A	Benefit	Benefit
Wholesale Market Price Impacts	N/A	Benefit	Benefit
Avoided Distribution Capacity Infrastructure	Benefit	Benefit	Benefit
Avoided O&M	Benefit	Benefit	Benefit
Avoided Distribution Losses	Benefit	Benefit	Benefit
Avoided Restoration Costs	Benefit	Benefit	Benefit
Avoided Outage Costs	Benefit	N/A	N/A
Net Avoided CO2	Benefit	N/A	N/A
Net Avoided SO2 and NOx	Benefit	N/A	N/A
Avoided Water Impacts	Benefit	N/A	N/A
Avoided Land Impacts	Benefit	N/A	N/A
Net Non-Energy Benefits	Benefit	N/A	N/A
Gained Utility Revenue	N/A	N/A	Benefit
Program Administration Costs	Cost	Cost	Cost
Utility Incentives	N/A	Cost	Cost
Added Ancillary Service Costs	Cost	Cost	Cost
Incremental T&D and DSP Costs	Cost	Cost	Cost
Participant DER Cost	Cost	N/A	N/A
Lost Utility Revenue	N/A	N/A	Cost
Shareholder Incentives	N/A	Cost	Cost
Net Non-Energy Costs	Cost	N/A	N/A

Some minor modifications were made to the original DPS BCA Framework to help add clarity to the model:

- Gained Utility Revenue was added as a benefit stream under the RIM test to capture the effect of increased revenue.
- Utility Incentives were broken out as its own cost category to provide clarity on the DER project analyses. This value stream was originally assumed to be embedded in the Program Administrative Costs category.

Table E-3 provides the definitions of each benefit stream considered in this filing's business case.

Table E-3. Benefit Stream Definitions

Benefit Stream	Definition
Avoided Generation Capacity Cost (AGCC)	Avoided generation capacity costs associated with a reduction in bulk system-coincident peak demand.
Avoided Energy (LBMP)	Avoided wholesale energy costs associated with a reduction in energy purchases at the wholesale level.
Avoided Transmission Capacity Infrastructure	Avoided infrastructure costs associated with a reduction in transmission system-coincident peak demand.
Avoided Transmission Losses	Avoided energy and capacity costs associated with reduction in the transmission system loss factor.
Avoided Ancillary Services	Avoided costs associated with a reduction in ancillary services requirements.
Wholesale Market Price Impacts	Benefit associated with downward pressure on energy and capacity prices due to energy and peak load reductions, respectively.
Avoided Distribution Capacity Infrastructure	Avoided infrastructure costs associated with a reduction in distribution system-coincident peak demand.
Avoided O&M	Benefit associated with reduced utility operations and maintenance costs.
Avoided Distribution Losses	Avoided energy and capacity costs associated with reduction in the distribution system loss factor.
Avoided Restoration Costs	Reduced restoration costs borne by the utility associated with restoring power during outages in a more efficient manner or avoiding outages events.
Avoided Outage Costs	Benefit to customers due to a reduction in the frequency and/or duration of outages.
Net Avoided CO2	Benefit to society associated with reduced carbon emissions due to reductions in wholesale energy or reduced direct emissions from gasoline vehicles and DER.
Net Avoided SO2 and NOx	Benefit to society associated with reduced sulfur oxide and nitrogen oxide pollutant emissions due to reduced direct emissions from gasoline vehicles and DER.
Avoided Water Impacts	Qualitative benefit associated with reducing water consumption.
Avoided Land Impacts	Qualitative benefit associated with reducing water consumption.
Net Non-Energy Benefits	Qualitative benefit associated with non-energy benefits such as customer satisfaction.
Gained Utility Revenue	Increase in utility revenue due to increased sales (e.g., from EVs) or revenue protection (e.g., theft detection)

Table E-4 provides the definitions of the cost streams considered in this filing's business cases.

Table E-4. Cost Stream Definitions

Cost Stream	Definition
Program Administration Costs	Costs borne by the utility to administer initiatives and projects. This cost category is generally applicable to the DER projects.
Utility Incentives	Incentives paid from the utility to customers.
Added Ancillary Service Costs	Costs associated with DER causing additional ancillary service costs onto the system.
Incremental T&D and DSP Costs	Costs of building additional T&D infrastructure and enabling DSP capabilities.
Participant DER Cost	Equipment and participation costs borne by DER providers/customers.
Lost Utility Revenue	Reduced revenue to the utility (i.e., bill savings).
Shareholder Incentives	Annual costs to ratepayers of utility shareholder incentives.
Net Non-Energy Costs	Qualitative assessment of non-energy costs.

APPENDIX F. Acronyms and Abbreviations

AC	Air Conditioning
ADMS	Advanced Distribution Management System
AFM	Advanced Fuse Management
AI	Artificial Intelligence
AMI	Advanced Metering Infrastructure
APT	Advanced Planning Technology
AWS	Amazon Web Services
BCA	Benefit Cost Analysis
BTM	Behind-the-Meter
CAPEX	Capital Expenditure
CHP	Combined Heat and Power
CIS	Customer Information System
CSAT	Customer Satisfaction
CSR	Customer Service Representative
CSRP	Commercial System Relief Program
CVR	Conservation Voltage Reduction
DCFC	Direct Current Fast Charging
DER	Distributed Energy Resource
DERMS	Distributed Energy Resource Management System
DG	Distributed Generation
DLC	Direct Load Control
DLM	Dynamic Load Management
DLRP	Dynamic Load Relief Program
DMS	Distribution Management System
DPS	Department of Public Service
DR	Demand Response
DSCADA	Distribution Supervisory Control and Data Acquisition
DSIP	Distributed System Implementation Plans
DSP	Distributed System Platform
e-bus	Electric Bus
EE	Energy Efficiency
EPC	Engineering, Procurement, and Construction

EV	Electric Vehicle
EVSE	Electric Vehicle Supply Equipment
FIPP	Fair Information Practice Principles
FLISR	Fault Location, Isolation and Service Restoration
FTE	Full-Time Equivalent
GIS	Geographic Information System
GHG	Greenhouse Gas
HVAC	Heating, Ventilation, and Air Conditioning
IOAP	Interconnection Online Application Portal
IT	Information Technology
IVR	Interactive Voice Response
kV	Kilovolt
KVAR	Kilowatt and Reactive Power
kW	Kilowatt
kWh	Kilowatt-Hour
LBMP	Location Based Marginal Pricing
LED	Light-Emitting Diode
LILCO	Long Island Lighting Company
LIPA	Long Island Power Authority
LSRV	Locational System Relief Value
LTC	Load Tap Changer
m	Meter
M&V	Measurement and Verification
MVA	Mega Volt-Amp
MW	Megawatt
MWh	Megawatt-Hour
MDT	Mobile Data Terminals
ML	Machine Learning
NIST	National Institute of Standards and Technology
NWS	Non-Wires Solutions
NYSERDA	New York State Energy Research and Development Authority
NYISO	New York Independent System Operator
O&M	Operations and Maintenance
OMS	Outage Management System
OSA	Operation Services Agreement

OT	Operational Technology
PM	Project Management
PSC	Public Service Commission
PV	Photovoltaic
RCS	Remote Connect Switch
REV	Reforming the Energy Vision
RFP	Request for Proposal
RIM	Ratepayer Impact Measure
SaaS	Software as a Service
SCT	Societal Cost Test
STS	Suffolk Transportation Services
T&D	Transmission and Distribution
TOU	Time-of-Use
TLM	Transformer Load Monitoring
UCT	Utility Cost Test
UoF	Utility of the Future
US	United States
V2G	Vehicle-to-Grid
VDER	Value of Distributed Energy Resources
VAR	Volts-Amp-Reactive
VVO	Volt-Var Optimization