2023 Integrated Resource Plan

November 15, 2023

LIPA

AGENDA

01 Background

02 Key Findings

03 Key Initiatives

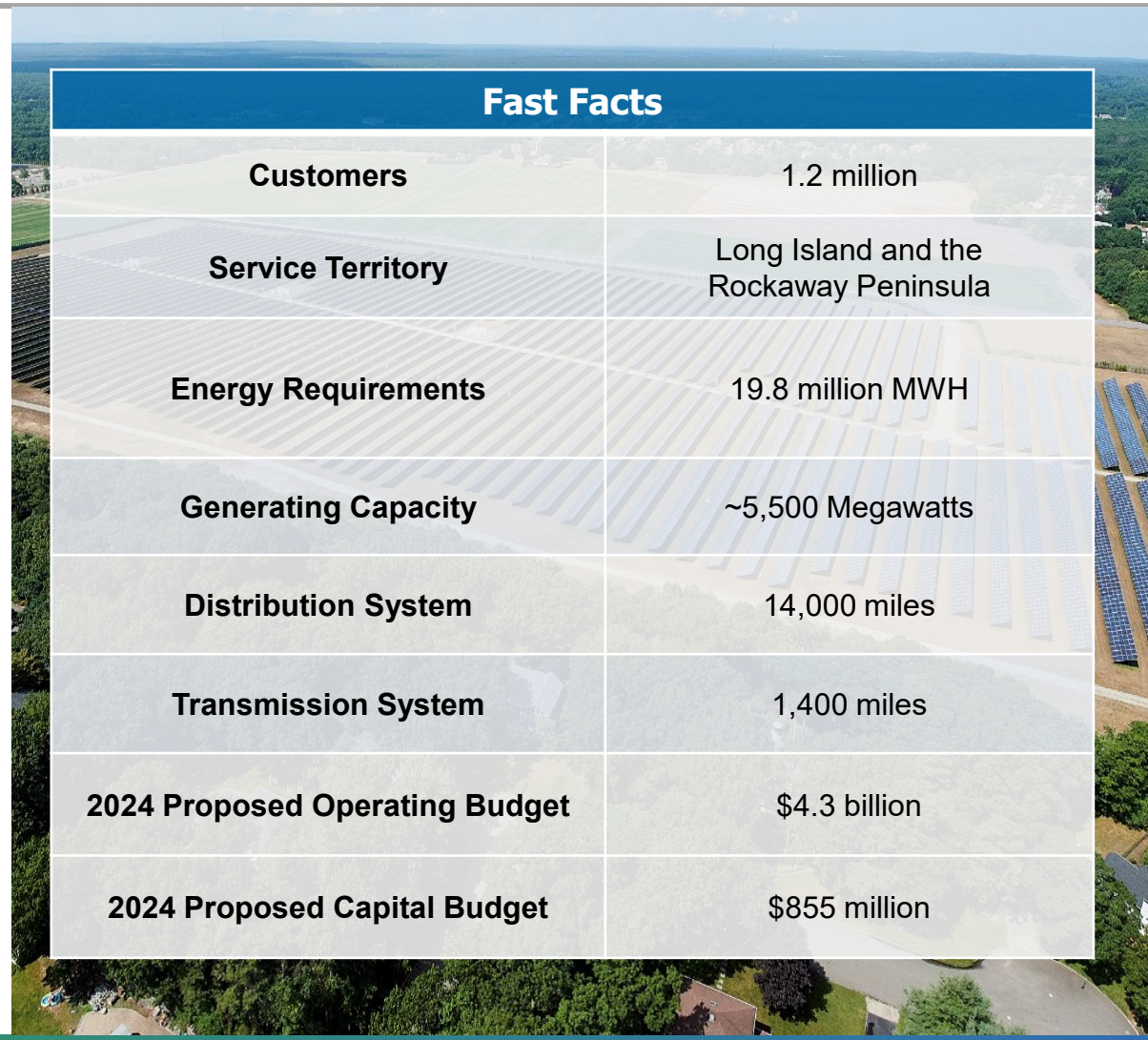
04 Next Steps & Public Participation

05 Acknowledgements

LIPA

ABOUT LIPA

- LIPA is the third-largest not-for-profit public power utility in the U.S.
- LIPA owns the electric transmission and distribution system that provides electrical service to customers on Long Island and the Rockaways.
- Since 2014, LIPA has contracted with PSEG Long Island for management services, and LIPA provides service under the PSEG Long Island brand name.

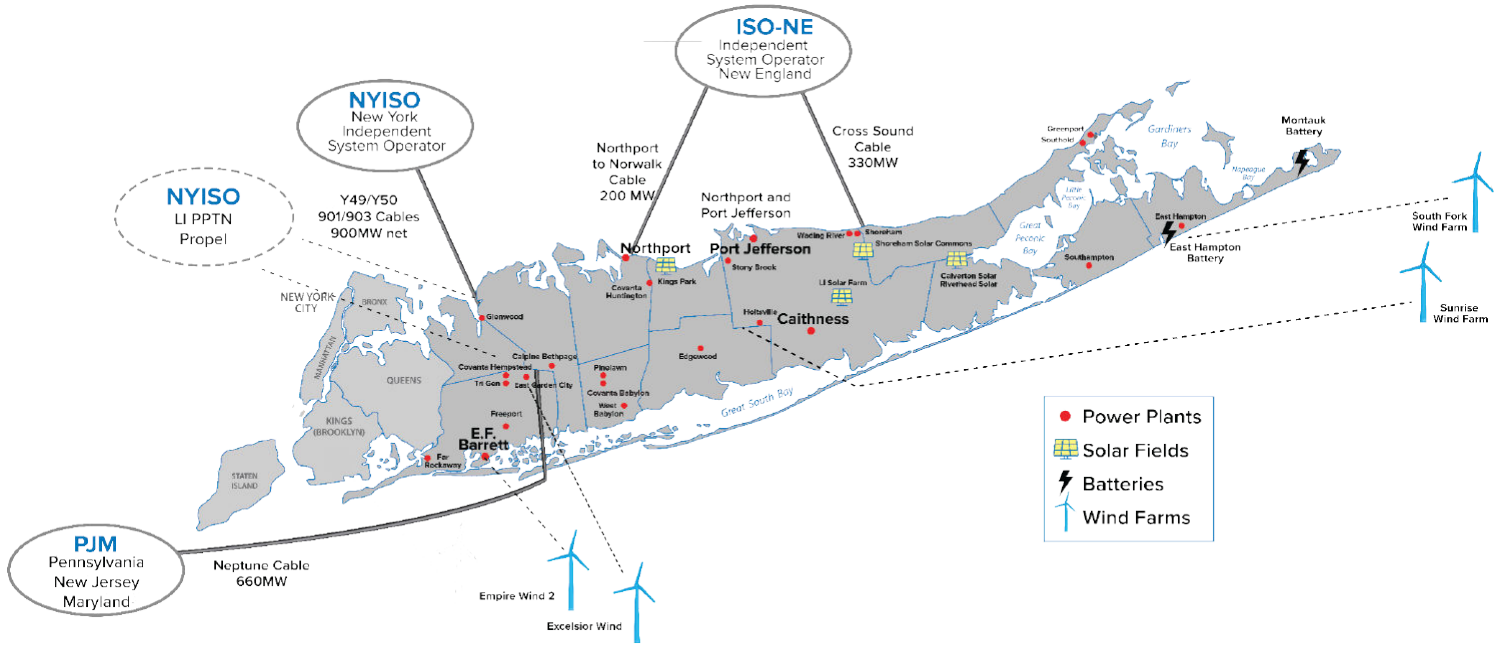


Fast Facts	
Customers	1.2 million
Service Territory	Long Island and the Rockaway Peninsula
Energy Requirements	19.8 million MWH
Generating Capacity	~5,500 Megawatts
Distribution System	14,000 miles
Transmission System	1,400 miles
2024 Proposed Operating Budget	$4.3 billion
2024 Proposed Capital Budget	$855 million

LONG ISLAND AND ROCKAWAYS ELECTRIC GRID

- LIPA's service territory spans Nassau and Suffolk Counties in Long Island and the Rockaway Peninsula in Queens County.
- Much of Long Island is interconnected for reliability and commercial purposes, forming a redundant, resilient network that is planned, controlled, and operated centrally by the local utility and the New York State Independent System Operator (NYISO).

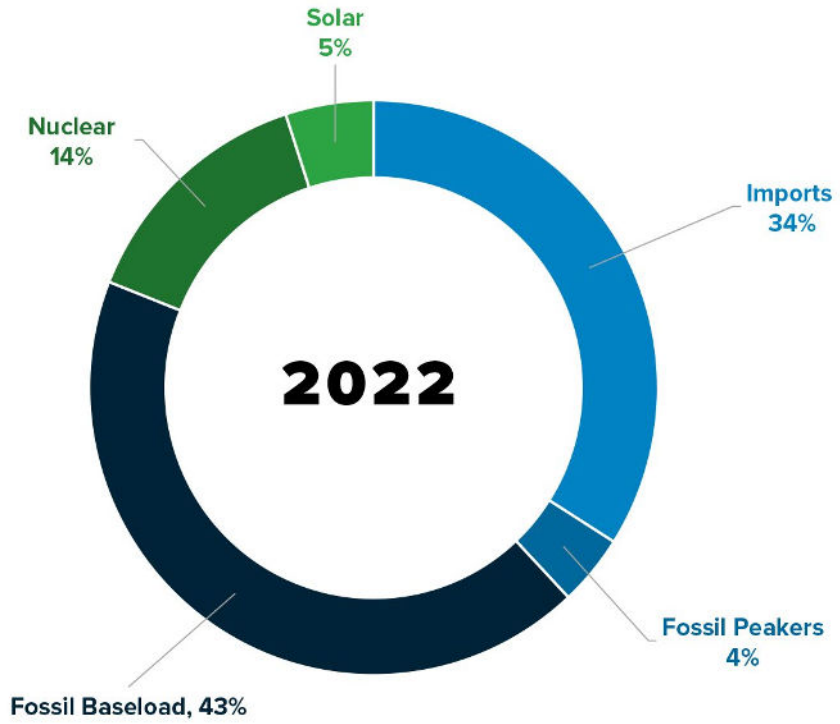
Figure 3: Long Island and the Rockaways Electric Grid



SOURCES OF ENERGY PRODUCTION TODAY

- LIPA's power supply is sourced from:
  - LIPA's 250 megawatt (MW) share of Nine Mile Point nuclear unit #2, plus energy from FitzPatrick nuclear
  - A power supply contract with National Grid for 3,550 MW
  - Contracts with other on-island providers for 1,750 MW
  - Purchases from electric markets in New York, New England, and the mid-Atlantic states
- Generation and imports must be controlled to match customer demand minute-by-minute.
- The most efficient or economical power plants run all day long and are known as "baseload plants."
- Smaller generating plants that can be started up quickly, but with higher operating costs, are run only to meet the peak loads of each day – these are known as "peakers."

Figure 4: Sources of Long Island Energy Production in 2022



WHAT IS AN INTEGRATED RESOURCE PLAN?

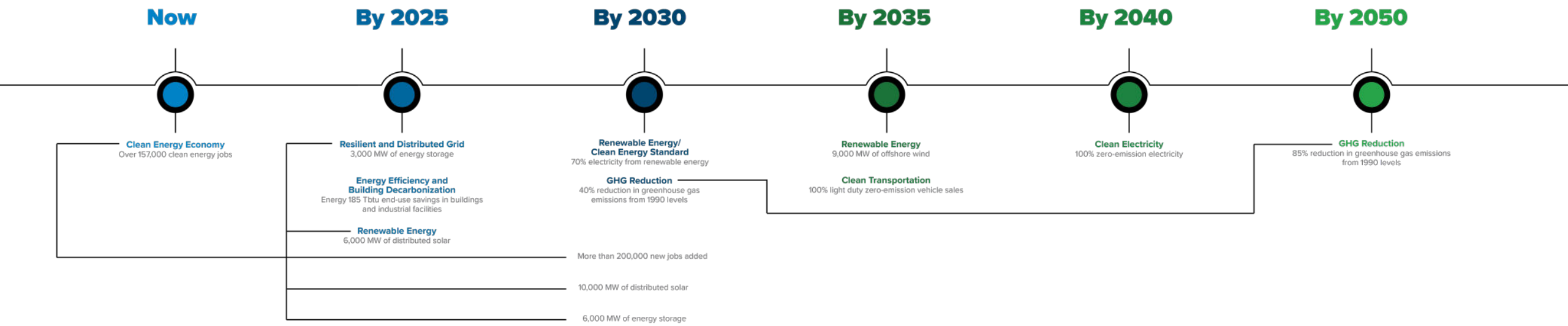
- An IRP studies the supply-side (i.e., generation, energy storage), demand-side (i.e., energy efficiency, demand response, distributed energy resources), and transmission **investments that LIPA may need to make over the next 10 to 20 years** to provide clean, reliable, cost-effective service to customers under a range of scenarios.
- LIPA's **last IRP was released in 2017** and determined that LIPA would not need to add generation to meet load growth through at least 2035, mainly due to increased energy efficiency and renewable energy. The decision was made to **forego new or repowered fossil-fueled generation** and instead concentrate on a clean energy future.
- An IRP considers customer usage trends, existing resources, policy and regulatory requirements, changing technology, risks, and opportunities, among other factors.

2023 IRP Summary Guide

NEW YORK STATE'S CLIMATE ACT GOALS

- In 2019, New York's **Climate Act** established goals for economywide carbon reduction and clean resource additions.
- LIPA's 2023 IRP aims to provide an **action plan through 2030** to meet interim milestones established in the Climate Act, while framing resource decisions that will need to be made later to achieve 100% zero-emission electricity by 2040.

Figure 1: New York's Climate Act Goals



WHAT SCENARIOS ARE MODELED IN THE IRP?

- The IRP's recommendations are based on scenario modeling that assesses the impacts of planning uncertainties and considers alternative solutions to achieve Climate Act targets while satisfying system reliability requirements.

- The starting point for the scenarios is a base case that includes the **clean resource objectives in the Climate Act** and follows trajectories for renewable energy development and beneficial electrification of heating and transportation similar to those detailed in the **Scoping Plan** produced by the New York Climate Action Council.

- Besides the base case, the following additional scenarios were assessed in the IRP:
  - **Accelerated economywide decarbonization**
  - **Expanded interties from Long Island to other regions**
  - **Accelerated transition away from fossil fuel combustion**
  - **Expanded demand-side measures**
  - **Advanced technologies**

Key Findings

WHAT ARE THE KEY FINDINGS OF THE IRP?

1. By 2030, the addition of solar and offshore wind resources will cause LIPA's carbon footprint to decline by over 70% from 2010 levels.

- LIPA and New York State are taking actions on both the demand- and supply sides to achieve a zero-carbon electric grid.
- Clean energy resources under development will add thousands of megawatts of new clean resources to the Long Island and Rockaways electric grid by the early 2030s.
- Projects in development include:
  - 1,419 MW of customer-owned solar and local solar farms
  - 3,628 MW of offshore wind
  - 750 MW of battery storage

Figure 5: Long Island Clean Energy Projects in Service by the Early 2030s

Solar (1,419 MW)	**Size** (MW_{AC})	**In-Service** (Est./Act.)
Long Island Solar Farm	32	2011
Eastern Long Island Solar Project	11	2013
Shoreham Solar Commons	25	2018
Riverhead Solar	20	2019
Kings Park Solar 1 and 2	4	2019
Solar Feed-in Tariffs I-III	89	2021-2022
LI Solar Calverton	23	2021
Behind-the-Meter	1,200	2030
Solar Communities (FIT V)	15	2025
Offshore Wind (3,628 MW)	**Size** (MW_{AC})	**In-Service** (Est./Act.)
South Fork Wind Farm	130	Early 2024
Sunrise Wind	924	Mid-to-Late 2020s
Empire Wind 2	1,260	Late 2020s
Excelsior Wind	1,314	2030s
Energy Storage (750 MW)	**Size** (MW_{AC})	**In-Service** (Est./Act.)
East Hampton & Montauk Storage	10	2018 & 2019
2023 RFP Awards (Pending)	175+	2025
Future Storage Additions	565	2030
TOTAL	**5,797** (MW_{AC})	

WHAT ARE THE KEY FINDINGS OF THE IRP?

1. **By 2030, the addition of solar and offshore wind resources will cause LIPA's carbon footprint to decline by over 70% from 2010 levels.**

   - By 2030, nearly half of the power supply to Long Island will be sourced from offshore wind, with an additional 19% from zero-carbon solar and nuclear.

Figure 4: Sources of Long Island Electricity Production in 2022 | 20,444 GWh

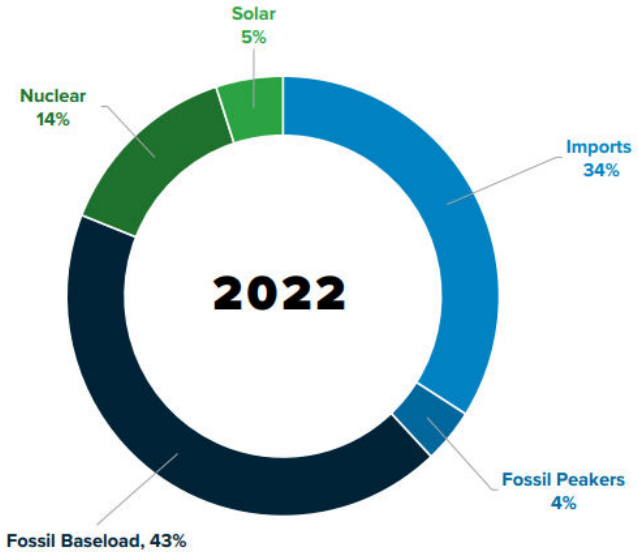
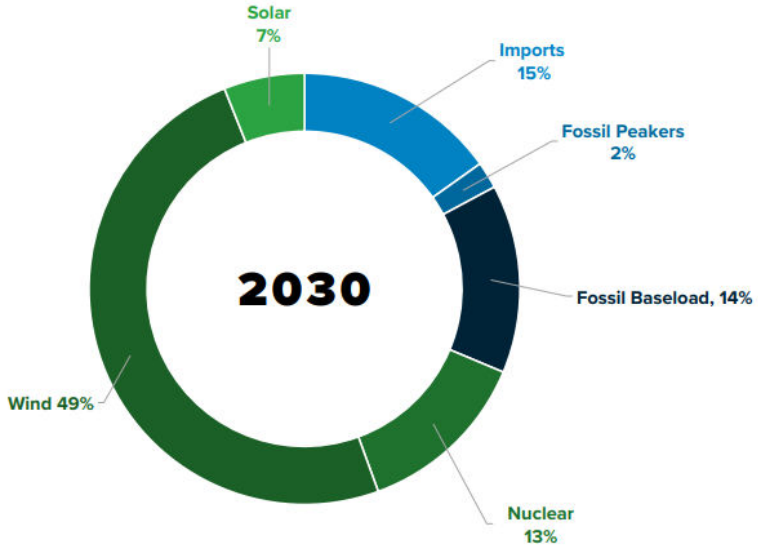


Figure 6: Sources of Long Island Electricity Production in 2030 | 22,011 GWh

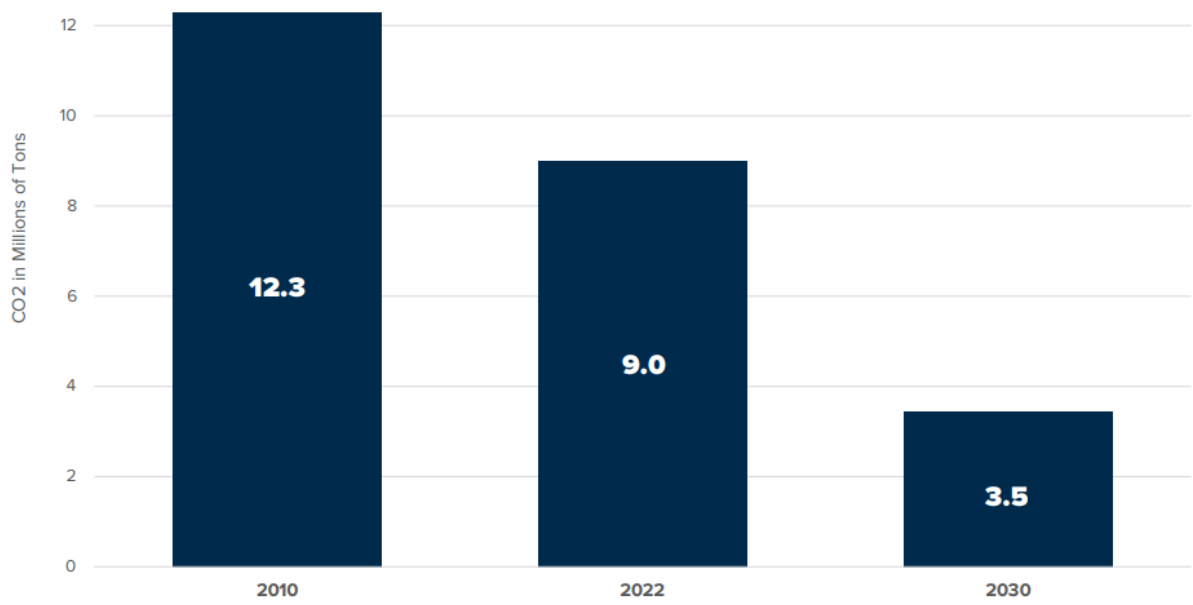


WHAT ARE THE KEY FINDINGS OF THE IRP?

1. By 2030, the addition of solar and offshore wind resources will cause LIPA's carbon footprint to decline by over 70% from 2010 levels.

- Long Island's clean energy portfolio is expected to total about 5,800 MW by 2030, compared to the 2023 peak demand of approximately 5,000 MW.
- Some fossil fuel generation will be needed to serve as backup to intermittent generation until new technologies for long-duration, dispatchable, emissions-free resources become available at scale.
- This fossil generation will run less, serving to balance renewables, so the carbon emissions of the Long Island grid will decline steeply.

Figure 7: Carbon Emissions Footprint for LIPA's Power Supply from 2010 to 2030



WHAT ARE THE KEY FINDINGS OF THE IRP?

2. **Offshore wind projects already under development will connect 3,600 megawatts to the Long Island grid, out of a statewide goal of 9,000 MW by 2035, with more to come as forecasts show as much as 18,000 MW or 18 gigawatts of offshore wind by 2050.**

Figure 12: Current Procurements for Offshore Wind Development | 3,600 MW of Offshore Wind to Connect to Long Island

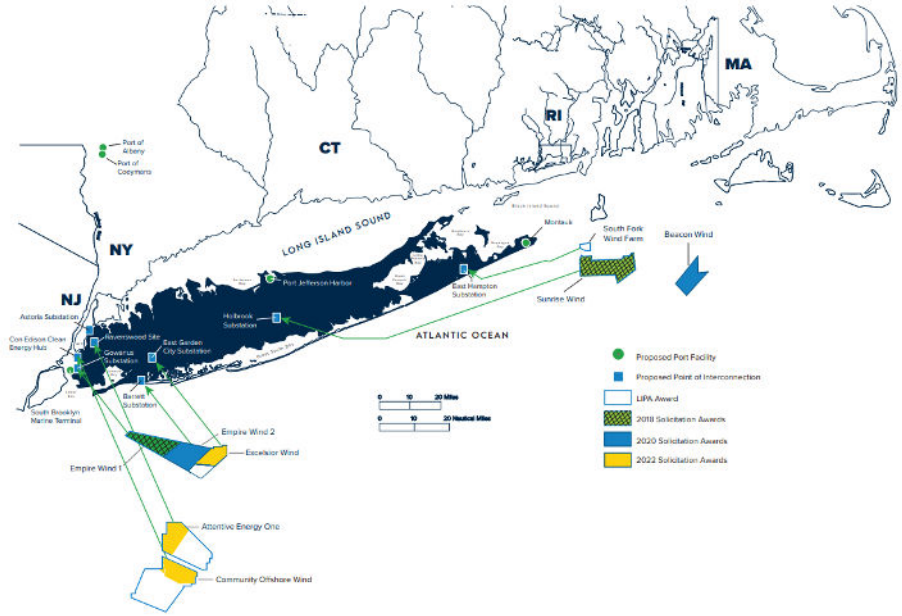


Figure 13: Contracted New York Offshore Wind Projects

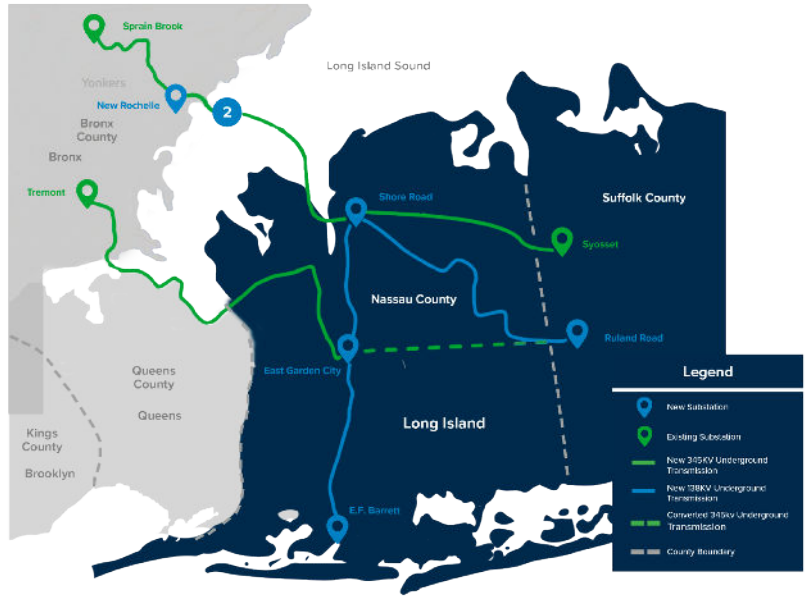
Project Name	Owner	Size (MW)	Contract Off-Taker	Contract Award Date	Interconnect Utility	In-Service Date
South Fork Wind	Ørsted and Eversource	130 MW	LIPA	2017	LIPA	Early 2024
Empire Wind 1	Equinor Wind US LLC	816 MW	NYSERDA	2019	Con Edison	Mid-to-late 2020s
Sunrise Wind	Ørsted and Eversource	924 MW	NYSERDA	2019	LIPA	Mid-to-late 2020s
Empire Wind 2	Equinor Wind US LLC	1,260 MW	NYSERDA	2021	LIPA	Late 2020s
Beacon Wind	Equinor Wind US LLC	1,230 MW	NYSERDA	2021	Con Edison	Late 2020s
Attentive Energy One	TotalEnergies, Rise Light & Power, Corio Generation	1,404 MW	NYSERDA	2023	Con Edison	2030s
Community Offshore Wind	RWE Offshore Renewables and National Grid Ventures	1,314 MW	NYSERDA	2023	Con Edison	2030s
Excelsior Wind	Vineyard Offshore	1,314 MW	NYSERDA	2023	LIPA	2030s

WHAT ARE THE KEY FINDINGS OF THE IRP?

3. Long Island's high-voltage transmission grid will need to be built out to integrate the large amounts of offshore wind, some of which will be exported to the rest of New York. The Propel NY Energy project will meet these transmission needs through 2030 and beyond, although further study is required to assess transmission needs for a zero-carbon electric grid by 2040.

- In 2020, LIPA and Con Edison conducted technical studies to assess the need for system expansion and recommended to the PSC that additional transmission cables would be needed to enable the transmission of offshore wind from Long Island.
- In 2021, the PSC declared a Public Policy Transmission Need and directed the NYISO to procure the necessary transmission development, with costs to be shared by electric customers statewide.
- The Propel NY Energy project was selected by the NYISO in June of 2023 and will include:
  - Three new high-voltage cables from Long Island to New York City and Westchester.
  - Capacity to handle the full output of 3,000 MW of offshore wind interconnected to Long Island without curtailment.
  - Corresponding increases in transfer capability between Long Island and the rest of the state for the import and export of energy, with improved system operational flexibility.

Figure 14: Improving the Long Island Transmission Backbone for Offshore Wind

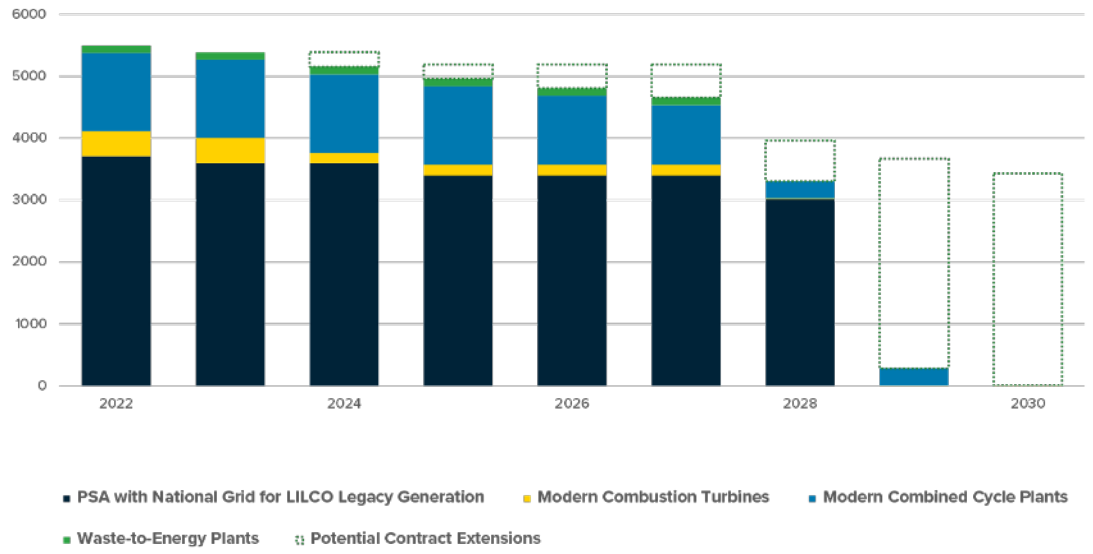


WHAT ARE THE KEY FINDINGS OF THE IRP?

4. As offshore wind and battery storage resources come online, LIPA will be able to retire up to 800 MW of existing Long Island power plants by 2030.

- As new clean energy sources are added to the grid, LIPA will ramp down its fossil fuel power purchase agreements.
- Contracts for selected units will be extended into the 2030s to support system operating flexibility and reliability, balance the intermittency of renewables and serve as backup during lulls in offshore wind production and when the sun goes down.
- Nearly all of LIPA's power purchase agreements are subject to renewal by 2030, so the portfolio can be re-shaped based on need.

Figure 8: Phase-Out of Fossil Fuel Power Contracts



WHAT ARE THE KEY FINDINGS OF THE IRP?

4. As offshore wind and battery storage resources come online, LIPA will be able to retire up to 800 MW of existing Long Island power plants by 2030.

- LIPA's single largest fossil fuel purchase agreement is the Power Supply Agreement (PSA) with National Grid Genco for 3,550 MW of Long Island Lighting Company-era legacy generation.
- Under the PSA, LIPA has the right to cease purchasing electricity from selected units before the contract's expiration in April 2028. LIPA has retired 420 MW to date, with around 200 MW of additional combustion turbine retirements pending.
- The exact order, amount, and timing of steam turbine retirements has not yet been determined and will depend on new resources being interconnected to the grid.

Figure 9: Phase-Out of Fossil Fuel Power Contracts

Retired Unit	Technology	Size (MW)	Retirement Date
E.F. Barrett Gas Turbine ("GT") #7 (Island Park)	Gas Turbine	18	2011
Far Rockaway	Steam	100	2012
Glenwood Landing	Steam	228	2012
Montauk Diesels 2 to 4	Diesel	6	2013
Planned Near-Term Retirements	**Technology**	**Size (MW)**	**Retirement Date**
Shoreham GT #1 and #2	Gas Turbine	71.5	2025
Glenwood GT #1	Gas Turbine	15	2025
Glenwood GT #3	Gas Turbine	55	2025
West Babylon GT #4	Gas Turbine	52	2025
E.F. Barrett (Island Park)	Steam Turbine	188-376	by 2030
Port Jefferson	Steam Turbine	188-376	by 2030
Northport	Steam Turbine	up to 387	by 2030

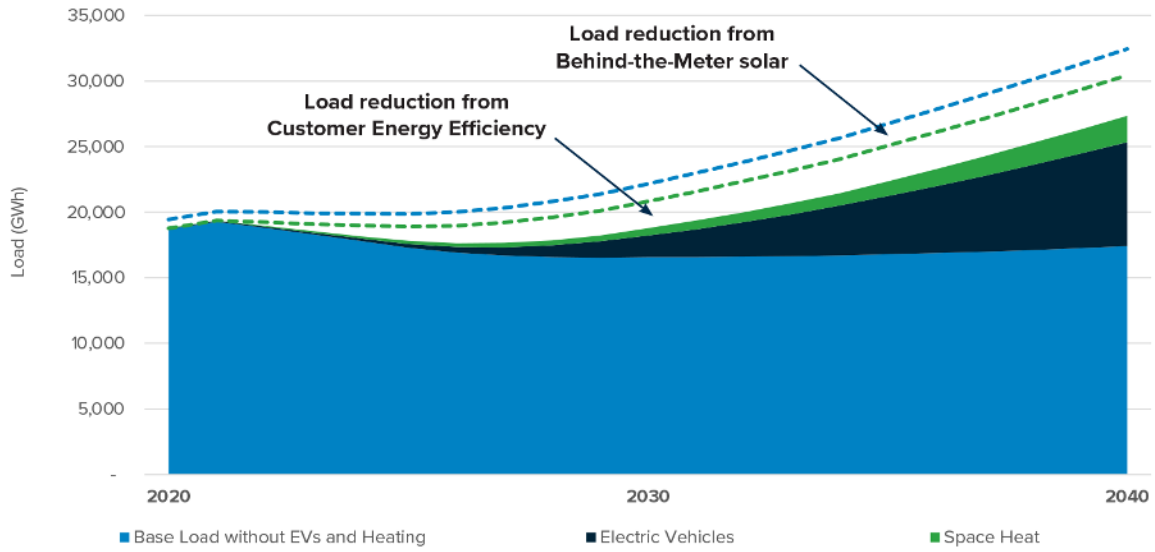
Note: The exact order, amount, and timing of steam turbine retirements to be determined.

WHAT ARE THE KEY FINDINGS OF THE IRP?

5. Demand-side measures, such as LIPA's energy efficiency rebate programs and customer installations of solar photovoltaic systems, are projected to effectively offset economy-driven growth in electricity sales between now and 2030.

- Electricity sales are expected to remain steady through 2030 as energy efficiency and rooftop solar continue to moderate growth driven by the economy
  - Energy efficiency and demand-side management are crucial to achieving New York's objective of an 85% reduction in economywide GHG emissions by 2050.
  - The Climate Act requires 185 trillion Btu of energy efficient savings by 2025.
  - LIPA spends ~$90 million annually on EE programs that incentivize customers to save energy.
  - Long Island is on track to exceed its 1,300 MW share of the statewide 10,000 MW solar goal for 2030.
- Electrification of transportation and heating will result in significant load growth post-2030.

Figure 28: LIPA Electricity Sales Projection Through 2040



WHAT ARE THE KEY FINDINGS OF THE IRP?

6. LIPA's transition to TOD rates in 2024 and 2025 will encourage customers to shift energy use outside of peak hours and thereby help moderate growth in peak electric demand, which is a main driver of the need for investments to upgrade the transmission and distribution system. LIPA will need to further expand on TOD rates with managed charging solutions in future years.

- Developing and implementing new or enhanced electric rate designs is crucial to managing the sales growth and peak demand from the electrification of transportation and heating.
- LIPA has introduced a standard offer Time-of-Day Rate to take effect in 2024. Most customers will be transitioned to this new rate in 2025.
- When customers choose to shift their usage to less costly times of the day, it decreases the amount of generation capacity and delivery infrastructure needed during peak times, reducing carbon emissions, and lowering system costs, with the cost savings passed back to customers through electric rates.

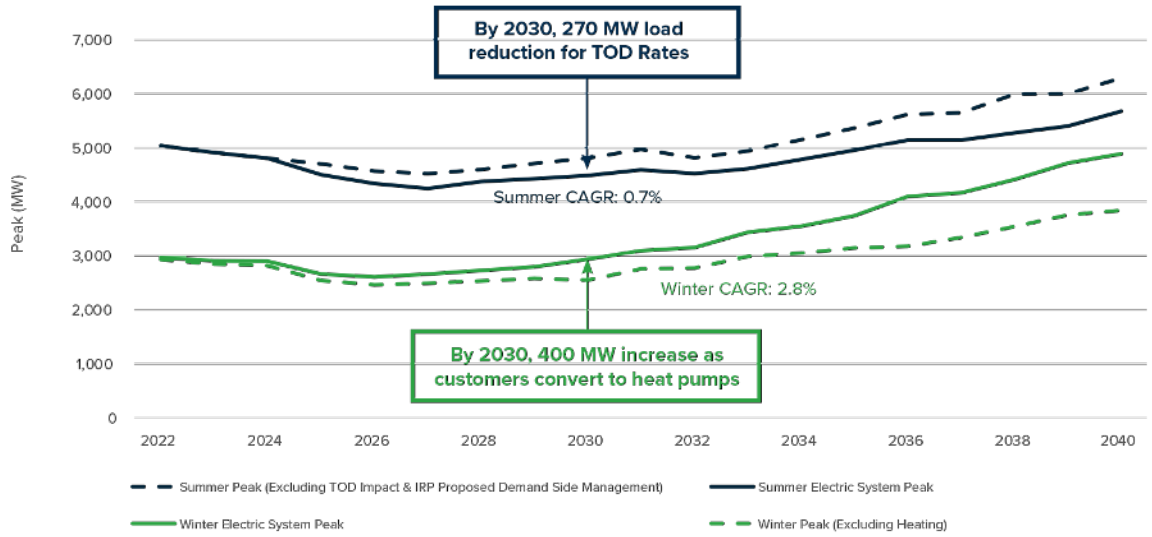
Figure 30: Customer Bill Savings on the TOD Rate and Super Off-Peak Rates vs. the Flat Rate

	TOD Rate (Save before 3 p.m. or after 7 p.m.)	**Super Off-Peak Rate** (Smaller savings before 3 p.m. or after 7 p.m. and larger discounts between 10 p.m. and 6 a.m.)
Initial Savings (Before any Changes to Electric Use)	**Save $3.50 per month**	**Save $5.75 per month**
Dishwasher	Save $0.50 per month	Save $1.50 per month
Washing Machine	Save $1.75 per month	Save $4.50 per month
Electric Dryer	Save $2.25 per month	Save $6.00 per month
Pre-Cool Home (Before 3 p.m.)	Save $12.75 per month (in the summer)	Save $13.75 per month (in the summer)
Pool Pump	Save $4.00 per month (in the summer)	Save $6.50 per month (in the summer)
Battery Storage Optimized Use	Save $40.00 per month	Save $51.25 per month
Electric Vehicle	Save $43.50 per month	Save $56.50 per month
Total Savings (including changes)	`Save up to $91.50 per month ($108.25 in the summer)	`Save up to $125.50 per month ($147.75 in the summer)

7. Significant growth in electricity consumption is expected post-2030 as heating and transportation are increasingly electrified.

- The IRP estimates that changing customer usage patterns in response to TOD rates will result in a peak load reduction of 270 MW by 2030 or 6% of the total load.
- Beyond 2030, electrification will drive growth in the system's peak load. The effect can be mitigated if customers adopt smart EV charging practices, which LIPA is encouraging through TOD rates and future managed charging programs.
- Despite increasing electrification, the 2040 system peak is not expected to exceed the record peak of 5,915 MW experienced in July 2011.
- Additionally, while heating electrification will drive significant growth in winter peak load, LIPA is projected to remain a summer-peaking utility through 2040.

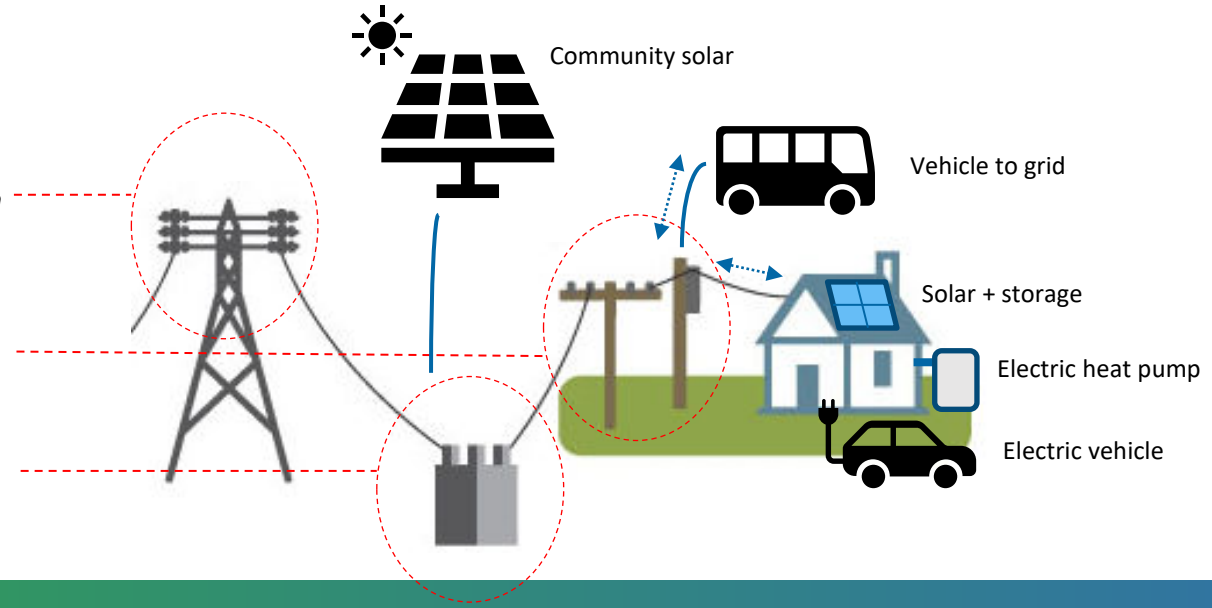
Figure 29: Summer and Winter Peak Electric Demand Through 2040



8. Clean, distributed resources will transform the local electric grid into a two-way street, requiring upgrades in distribution capacity and controls, including the associated information technology systems to intelligently manage the grid.

- LIPA will pursue a federal grant for $250 million toward $550 million of upgrades to the distribution system to allow for additional interconnection capacity for distributed solar and storage.
- Develop new approaches to incorporate DER forecasts in planning for local feeder capacity
- Deploy a DER Management System platform to monitor and manage DERs larger than 1 MW

- *Expanded transmission network for clean power and load growth*
- *Two-way flow for customer-sited solar and storage*
- *Greater distribution capacity for EV charging and electric heating*



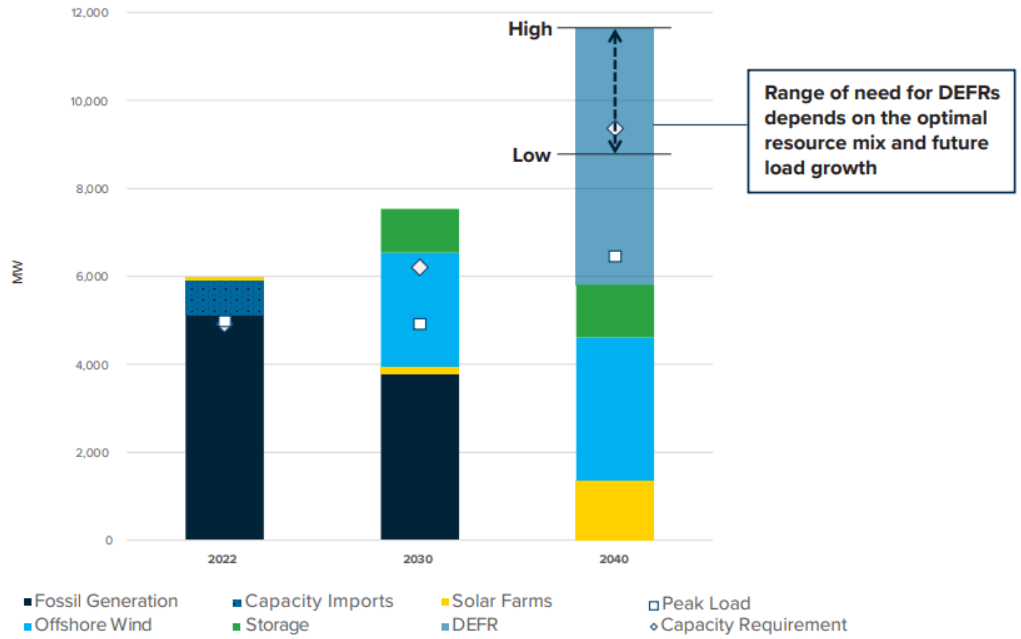
9. For the post-2030 period, the industry will need to develop new solutions and technology to balance electric supply and demand on an hourly, daily, and seasonal basis to fully replace dispatchable fossil units.

Climate Act-mandated additions of offshore wind and energy storage plus new interties to rest-of-state will be sufficient up to 2030

For the post-2030 period:

- Renewables and short-duration storage exhibit declining contribution to system reliability at high penetration levels
- Post-2030 mix of storage, renewables and dispatchable emissions-free resources (DEFRs) requires further study
- Research is already underway on DEFR technologies, including fuel cells and turbines that use biogas and hydrogen, modular nuclear units, and CO2 capture and sequestration

Figure 19: Long Island Generation Capacity

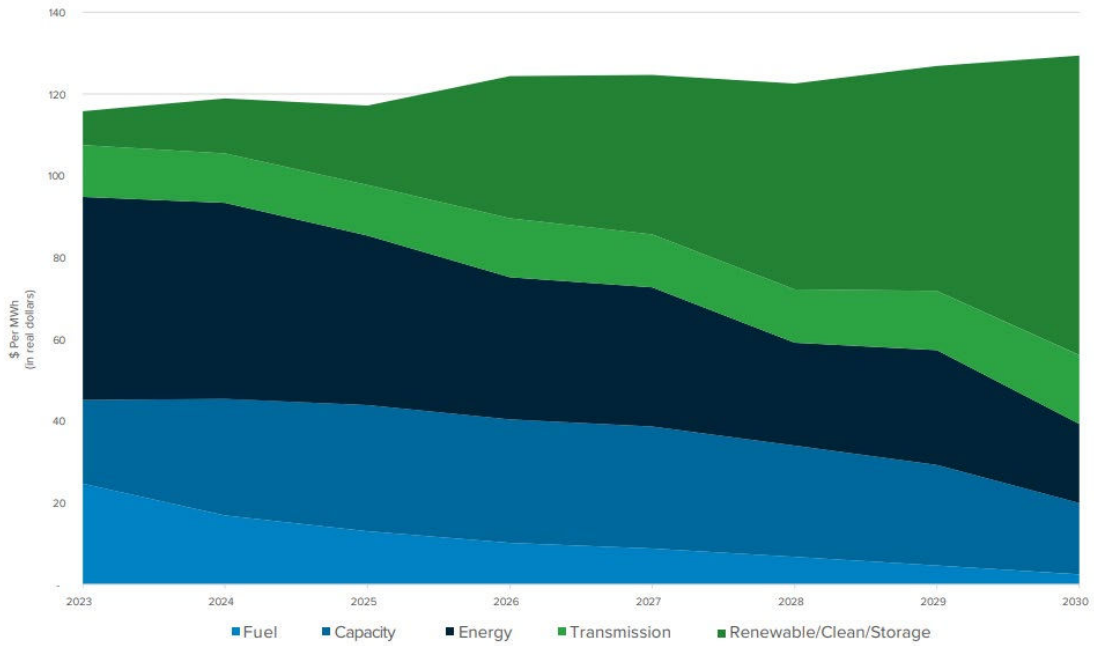


Note: The chart does not include customer-owned solar and other behind-the-meter resources, which help to reduce the load that LIPA needs to serve.

MANAGING THE COSTS OF THE CLEAN ENERGY TRANSITION

- Most of the costs for the state's clean energy transition will be paid by electric load-serving entities, such as LIPA, according to their proportionate share of the statewide load.
- The changes in LIPA's Power Supply Charges between now and 2030 are relatively predictable (excluding volatile commodity prices) as we have reasonable cost estimates for much of the clean resource buildout that is currently under development and will be placed in service over the next seven years.
- As clean energy resources are added through 2030, LIPA estimates that the cost associated with transmission upgrades will grow from less than 10% of the Power Supply Charge today to over 50% by 2030. Much of these increases in clean energy costs will be offset by declining commodity costs and the associated cost of fossil-fueled infrastructure.
- Based on what we know today, the Power Supply Charge, which accounts for about half of LIPA's total electricity charge, is expected to grow at about 2% per year in real dollars through 2030, assuming reasonably stable commodity costs.

Figure 34: Projected Power Supply Costs Through 2030



Key Initiatives

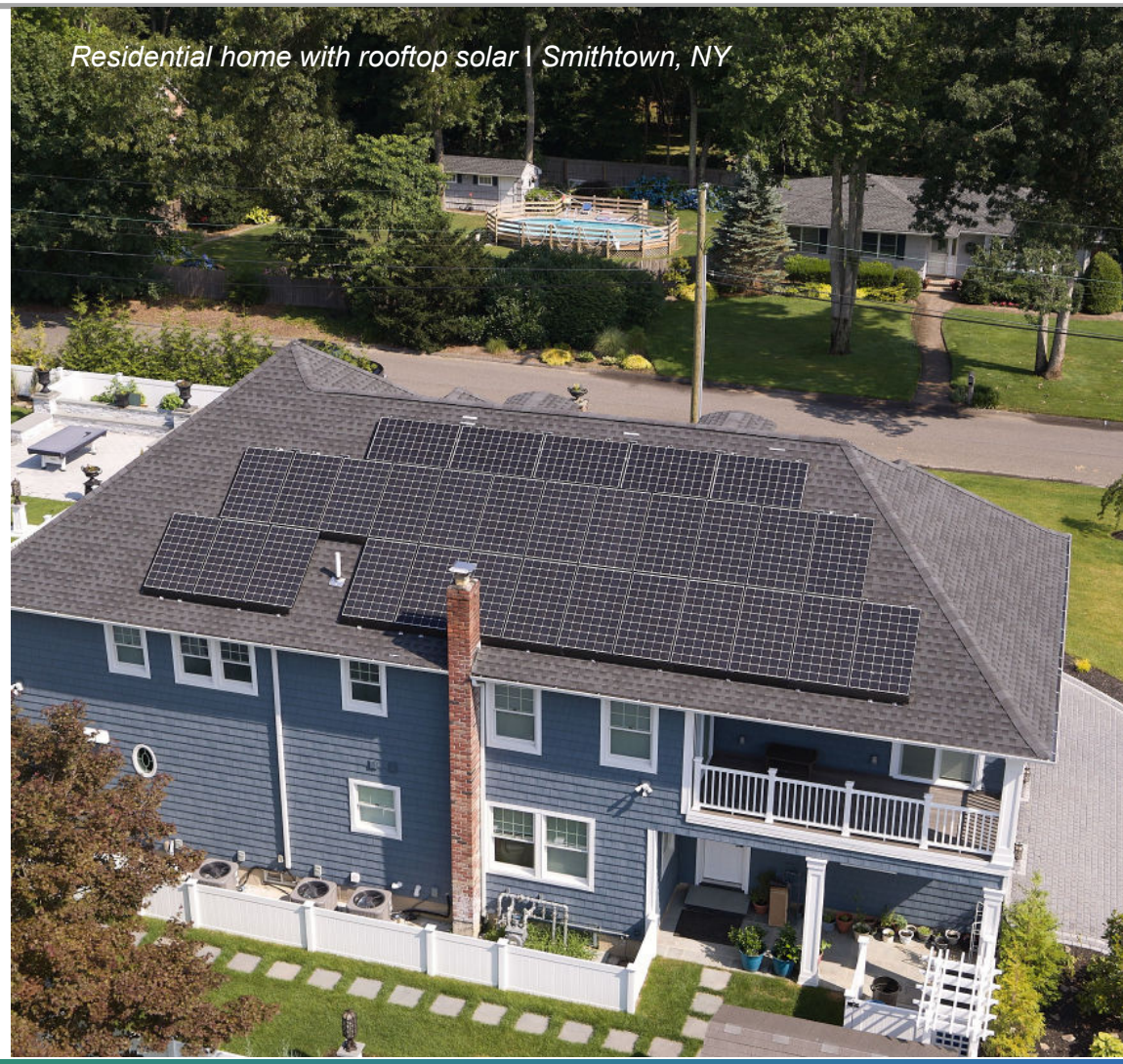
WHAT ARE THE KEY INITIATIVES OF THE IRP?

1. Participate in large-scale statewide clean energy procurements conducted by NYSERDA to achieve New York's 70% renewable by 2030 objective, selectively procured using LIPA's low cost of capital where there are likely to be savings or localized opportunities.
2. Procure additional energy storage to reach up to 750 MW on Long Island in cooperation with NYSERDA and through selective LIPA procurements.
3. Phase out power contracts with Long Island fossil generation owners to retire up to 800 MW of fossil-fueled generation.
4. Work with the project developer and stakeholders to complete the $3.3 billion Propel NY Energy project to build out the transmission "backbone" connecting Long Island to the rest of New York for offshore wind.

Monopile foundation installation for South Fork Wind | August 2023

WHAT ARE THE KEY INITIATIVES OF THE IRP?

5. Implement TOD rates in 2024 and 2025 along with managed charging programs to minimize the peak hour load increase expected from the increasing electrification of transportation.
6. Develop a multi-year energy efficiency, beneficial electrification, and demand response (EEBEDR) plan by July 2024 that maximizes opportunities for cost-effective EEBEDR programs, while investing in disadvantaged communities and supporting low and moderate-income customers.
7. Increase hosting capacity by 700 MW for distributed energy resources (DER) and continue to promote customer-owned DER including rooftop solar and storage.
8. Prioritize the retirement of fossil fuel generating stations and the siting of clean energy storage in areas within or near disadvantaged communities.



Residential home with rooftop solar | Smithtown, NY

WHAT ARE THE KEY INITIATIVES OF THE IRP?

9. Prepare the electric grid to meet the challenge of climate change by designing for the increasing frequency of extreme temperatures and severe weather, configuring supply resources to provide resiliency, and continuing investments to storm harden the electric grid.

10. Support research into zero-emission, dispatchable generation to enable the complete replacement of fossil-fueled generation by 2040.

Aerial view of LIPA's T&D System Wading River, New York

Next Steps and Public Participation

LIPA

NEXT STEPS

- The findings of the 2023 IRP offer a look at an evolving energy landscape of renewable technologies and decarbonization initiatives and illustrate how LIPA can meet and exceed the goals of New York's Climate Act while maintaining the two most critical aspects of service to customers – reliability and affordability.
- The energy landscape is certain to shift over the course of the next five years, and LIPA is well-positioned to navigate those changes.
- Follow-up studies to the IRP are currently underway, including:
  - Identifying any reliability deficiencies or operational concerns with expected generation retirements
  - Reviewing storage needs and identifying preferred Long Island and Rockaways points of interconnection
  - Establishing a new multi-year energy efficiency program
  - Reviewing the customer journey for EV and heat pump electrification and deploying new tools and programs to assist both customers and installers
  - Assessing projected resource margins for extreme weather events, including low renewable output, high summer temperatures, and increasing duration of heat waves
  - Completing the Climate Vulnerability Study and Resilience Plan

OPPORTUNITIES FOR PUBLIC PARTICIPATION

- The public can participate in the 2023 IRP planning process by attending of the informational sessions scheduled for Long Island and the Rockaways.
- Public comment session dates will be announced in November on lipower.org and through an email list.
- The public can also submit written comments and suggestions using the contact forms on the LIPA and PSEG Long Island websites.

Acknowledgements

ACKNOWLEDGMENTS

- LIPA's resource planning process is a collaborative effort, developed by LIPA's service provider, PSEG Long Island, with active involvement from LIPA staff and assistance from utility consultants and industry researchers, who provided input on emerging technologies such as advanced battery storage, including short- and long-term feasibility as well as risks and challenges to consider in model development.
- LIPA would like to recognize the valuable contributions provided by:
  - PSEG Long Island
  - The Brattle Group
  - M.J. Beck Consulting
  - Brookhaven Science Associates
  - Stony Brook University

Discussion

Questions?