Chapter 13. Electricity

13.1 State of the Sector

Overview

New York's electricity sector comprises traditional fossil fuel-fired power generation facilities and nuclear generation facilities, along with clean energy generation such as wind, solar, hydropower, energy storage, and transmission infrastructure. In 2021, renewable resources accounted for approximately 27% of the State's electricity generation. Meanwhile, nuclear resources contributed about 24% of the electricity generation in the State. Fossil fuel generation, including fossil natural gas, oil, and dual fuel generation produced more than 47% of statewide electricity.[224] The reliance on coal has decreased significantly in recent years (see Figure 26) with the last remaining coal-fired power plant closing in 2020, following New York State Department of Environmental Conservation's (DEC) adoption of revisions to 6 NYCRR Part 251 in 2019 to establish carbon dioxide (CO_2) emission limits for existing power plants.[225]

Emissions Overview

The electricity sector comprised 13% of statewide emissions in 2019, including electricity generation within the State (44%), imported electricity (15%), emissions from imported fuels (41%), and the SF6 used in electricity distribution and transmission (<1%). Electricity sector emissions have declined 46% since 1990.

Vision for 2030

The Climate Act requires that 70% of statewide electricity come from renewable energy sources by 2030 (70x30). The Climate Act also requires 6,000 megawatts (MW) of distributed solar by 2025 and that 3,000 MW of energy storage be installed by 2030. The State has since set increased targets to deploy 10,000 MW of distributed solar and 6,000 MW of energy storage by 2030.[226] The renewable electricity requirement can be accomplished by aggressive deployment of existing renewable energy technologies

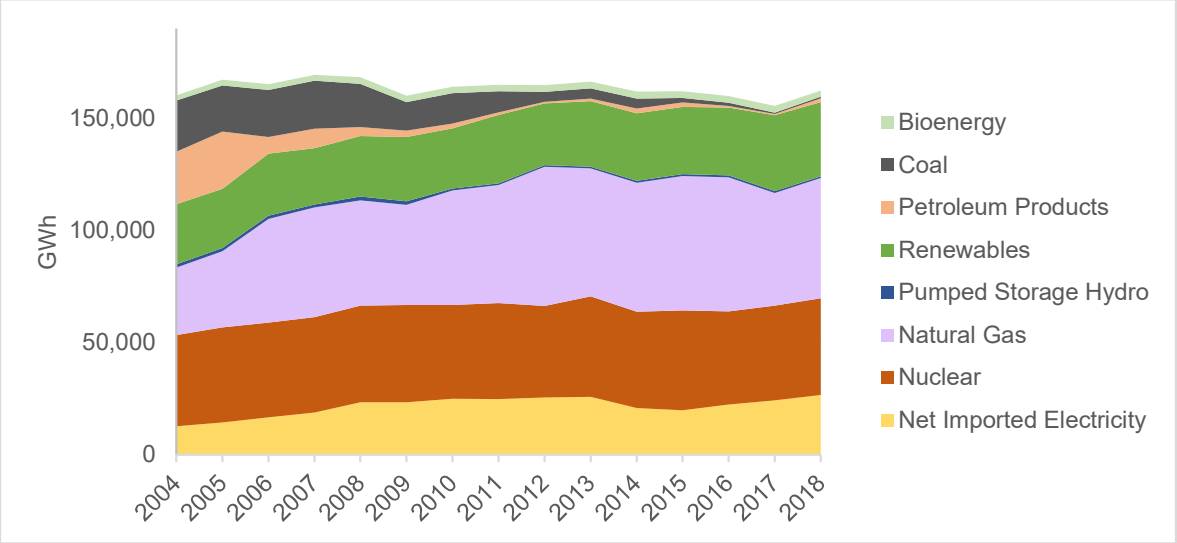
[224] New York Independent System Operator. 2022. "Power Trends 2022, The Path to a Reliable, Greener Grid for New York." Accessed at https://www.nyiso.com/documents/20142/2223020/2022-Power-Trends-Report.pdf/d1f9eca5-b278-c445-2f3f-edd959611903.

[225] NYSERDA. 2022. "Patterns and Trends: New York State Energy Profiles, 2004–2018." Albany. Accessed at https://www.nyserda.ny.gov/about/publications/ea-reports-and-studies/patterns-and-trends.

[226] In September 2021, Governor Hochul called for an expansion of the State's distributed solar program from 6,000 MW to 10,0000 MW and tasked NYSERDA and DPS with developing a distributed solar roadmap to outline a framework to advance the expanded goal in a resilient, cost-effective and responsible manner. In April 2022, the PSC approved this new framework for the State to achieve at least 10,000 MW of distributed solar by 2030. In January 2022, Governor Hochul directed DPS and NYSERDA to update New York State's Energy Storage Roadmap to double deployment, reaching at least 6 gigawatts of energy storage by 2030.

such as wind, solar, and energy storage. With the primary procurement mechanisms already established, the recommendations included here for 2030 seek to address barriers in the construction and operation of renewable energy, accelerate the pace of development, and reduce the cost of decarbonizing the electric grid. These include support for the Clean Energy Standard (CES) and storage deployment, refined electric grid modeling to improve decision-making, and improved coordination across State agencies.

Figure 26. Electric Generation by Fuel Type (2004–2018)



Source: NYSERDA Patterns and Trends – New York State Energy Profile.

Vision for 2050

By 2040, the Climate Act requires that the State achieve a zero-emission electricity system (100x40) as well as 9,000 MW of offshore wind by 2035. Achieving this will require all of the actions identified for 2030, plus further renewable energy capacity additions and a focus on developing new technology solutions. The State will also need market solutions that better align with the 100% zero-emission requirement, allow for a rapid transition away from fossil fuel generation, and maintain reliability and affordability.

As the transportation and buildings sectors transition to electric – due to zero-emission vehicle (ZEV) sales requirements and incentives and zero-emission building codes – the increased demand will impact the amount of renewable electric generating capacity needed to meet the 70x30 and 100x40 requirements. The State anticipates annual electricity demand growth of 100% to 110% by 2050, dependent on the scale and timing of electrification and whether there are other clean alternatives for the transportation and building sectors. The level of electrification needed to achieve the statewide greenhouse gas (GHG) emissions reduction requirements will increase overall electric load and shift the system peak demand

from the summer to the winter. Given the large amounts of renewable energy that must be procured and developed to reach the Climate Act requirements, the State needs to incorporate load flexibility and controllability into the electric grid as sectors electrify in order to create a more manageable system. New and upgraded transmission and distribution systems will be needed statewide, including specific transmission and distribution investments that will be necessary to deliver energy from where the generation is located to where the load demand exists.

Recommendations include advancing long-duration storage and designing market mechanisms that promote, support, and do not disadvantage those clean resources needed to meet the requirements.

Table 13. Sector Spotlight: Timelines for a Just Transition in the Electricity Sector

- The JTWG Jobs Study found that in the electricity sector, more mature subsectors like transmission, distribution, and solar will see strong growth between 2019 and 2040, while more nascent subsectors like offshore wind, storage, and hydrogen are expected to experience exponential growth. This finding indicates that parts of the growing sector will be able to build upon their current established workforce, while other parts of this sector will almost need to start from the beginning as these subsectors have little, if any, workforce development infrastructure.
- Emissions are projected to decline by roughly 67% by 2030 and 100% by 2040. By 2050, across all modeled pathways, New York will install over 60 GW of solar capacity (both utility-scale and distributed resources), between 16-17 GW of new land-based wind capacity (including imported wind from neighboring ISOs), and between 16-19 GW of offshore wind resources.
- The 2021 Jobs Study found that major occupational groups in electricity growth subsectors will experience consistent growth with the largest increase occurring within installation and repair, which occupies more than 45% of electricity. Management and professional occupations represent more than 25% of electricity occupations and will experience the second largest growth.
- As described in *Chapter 7. Just Transition*, in cases when continued operation of a power plant or other facility or system is needed, even as it winds down, the State should focus efforts on retaining workers while retraining them for new, clean energy jobs. In other cases, when facility closures and system transitions are known ahead of time, training and supportive services should be implemented while individuals are still working to prepare workers for the transition to clean energy.
- Coordination across the New York State Energy Research and Development Authority (NYSERDA), New York State Department of Labor (DOL), other State entities including the Office of Just Transition and other Climate Action Council agencies will be critical to coordinate all funding and financial incentives for workforce development, community support, existing worker support, and new worker support related to the transition away from fossil fuel electric generation sources.

Growing Subsector (solar, offshore wind, onshore wind, hydropower, hydrogen, biomass, distribution, transmission, and storage) jobs:	113,200	Potential job growth by 2030: 2040:	+57,200 +88,700
Displaced Subsector (fossil fuel and nuclear generation) jobs:	17,800	Potential job loss by 2030: 2040:	-4,000 -12,400
		Potential net job creation by 2030: 2040:	+53,200 +76,300

Note: Job impact data from JTWG Jobs Study (Scenario 2 Initial Employment Outputs), rounded to the nearest hundred. Jobs figures here may be partial due to differences in sectoral breakdown between Scoping Plan Chapters and Jobs Study; additional analysis found in the Jobs Study.

Existing Sectoral Mitigation Strategies

Prior to the adoption of the Climate Act, the State had existing policy mechanisms and programs in place to achieve electricity system decarbonization, including the New York State Energy Research and Development Authority's (NYSERDA) extensive procurement programs for land-based and offshore renewable energy resources. These efforts continue and have been expanded where necessary to meet the 2030 requirements in the Climate Act. For instance, in the fall of 2020, the New York State Public Service Commission (PSC) implemented key provisions to align the CES and Offshore Wind Standard with the Climate Act and provide NYSERDA with the authorization to procure the renewable energy needed. These provisions included increased annual Tier 1 renewables procurement targets under the CES for NYSERDA to align with the 70x30 mandate, the adoption of the 9,000 MW offshore wind procurement directive, and the creation of Tier 4 to deliver renewable energy to New York City.[227] NYSERDA's procurement for Tier 1 will need to average almost 4,500 gigawatt hours annually over the 2021 to 2026 period to meet the Climate Act's 2030 directive (which includes calculation for load growth). The CES also includes the Tier 2 Maintenance Resource program, which is an important mechanism to keep existing renewable facilities operational. These polices will be updated and adjusted over the course of the next decade by the PSC through the required biennial review of the CES Program, so that the PSC and NYSERDA can adjust program requirements and procurement targets as necessary to meet both the 2030 and 2040 directives and to protect the future of our existing renewable energy base.

The New York State Department of Environmental Conservation (DEC) also has environmental policies in place to address GHG emissions from the electricity sector. While 6 NYCRR Part 242, the CO_2 Budget Trading Program (RGGI), implementing regulations have been in place for this sector-specific cap-and-invest program since 2009, the most recent revisions extended the cap reductions out to 2030. In addition to reducing the RGGI cap by 30%, New York expanded the compliance obligation under these revisions to cover peaking units 15 MW and larger. DEC also regulates new, modified, and non-modified existing major electric generating facilities under 6 NYCRR Part 251, CO_2 Performance Standards for Major Electric Generating Facilities. The most recent revisions to 6 NYCRR Part 251 were critical to ensuring the State met its commitment to eliminating coal from the electric generating sector by 2020. The regulations also ensure that any new and/or modified sources meet stringent CO_2 emissions standards.

[227] New York State Department of Public Service. "Case 15-E-0302, Implementation of a Large-Scale Renewable Program and Clean Energy Standard, Order Adopting Modifications to the Clean Energy Standard." Issued October 15, 2020.

Under the Clean Air Act, DEC has also been permitting and regulating emissions of co-pollutants from power plants for over 50 years to address the local and regional impacts from the emissions of particulate matter, nitrous oxides (NO_X), and sulfur dioxide (SO_2). Current DEC regulations that target emissions of fossil fuel-fired facilities include:

- Ozone Season Oxides of Nitrogen (NO_X) Emission Limits for Simple Cycle and Regenerative Combustion Turbines (6 NYCRR Subpart 227-3 – The "Peaker Rule"): Adopted in early 2020, this regulation contains ozone season NO_X emission limits for affected sources for calendar years 2023 and 2025. It also contains provision to extend the compliance dates if the New York Independent System Operator (NYISO) or Local Distribution Owner determine there is a reliability need. For Subpart 227-3, the primary pollutant of concern is NO_X because the peakers regulated are an order of magnitude dirtier than clean combined cycle units. From a climate perspective the targeted peakers represent less than 3% of the CO_2 from all regulated electric generating units.
- CO_2 Budget Trading Program (6 NYCRR Part 242): Part 242 is New York's regulation for implementing the RGGI program. The regulation was recently revised in December 2020 to further reduce the CO_2 emissions budget or cap by 30% through 2030 and expand applicability to peaking units. Another regional program review is scheduled to begin toward the end of this year. Due to the recent expansion, Part 242 now covers more peaking units of 15 MW and above (previously 25 MW and above).
- CO_2 Performance Standards for Major Electric Generating Facilities (6 NYCRR Part 251): DEC adopted revisions to Part 251 to establish CO_2 emission rate limits for non-modified existing electric generating facilities. The current emission limits are 1,800 lbs/megawatt hour or 180 lbs/million British thermal unit (Btu). The regulations were adopted in 2019. Part 251 created CO_2 emission rate limits. Though this regulation helped to retire the last of New York's coal plants, currently all peaking units meet those rate limits.

DEC's emissions regulatory programs combined with the PSC's significant investments in utility ratepayer-funded programs, which includes NYSERDA's procurement programs, as well as Long Island Power Authority (LIPA) and New York Power Authority (NYPA) procurement activities are the purposeful combination of incentives and regulations that are designed to safely phase out the use of fossil fuel for electricity and gradually replace it with renewable technologies. Under Section 7(2) of the Climate Act, all decisions, including permitting decisions, pertaining to electric generation facilities, State entities will need to ensure that the proposed actions are not inconsistent with and will not interfere with the attainment of the statewide GHG emission limits. Additionally, under Section 7(3) of the Climate Act,

State entities must ensure such decisions do not disproportionately burden Disadvantaged Communities and prioritize reductions of GHG emissions and co-pollutants in Disadvantaged Communities. Until the regulations required under the Climate Act to ensure compliance with the statewide emission limits are promulgated by DEC, agencies will ensure compliance with Section 7(2) by reviewing a decision's consistency with the statewide GHG emission limits established under the Climate Act.[228]

Key Stakeholders

Key stakeholders include NYSERDA, New York State Department of Public Service (DPS) and the New York State Public Service Commission (PSC), DEC, NYPA, LIPA, Empire State Development (ESD), other State entities including the Office of Just Transition and Climate Action Council (Council) agencies, the NYISO, utility owners and operators, affected workers and unions, host communities (community-based organizations, school districts, local governments), and both fossil and clean energy generation owners and operators. These groups will have to work together to ensure an effective and efficient transition to a zero-emission electricity grid, while maintaining reliability and cost-effective implementation.

13.2 Key Sector Strategies

The key strategies within this sector are organized into three themes, as shown in Table 14. As described there in greater detail, the labor standards discussed in *Chapter 7. Just Transition* are intended to apply throughout this Scoping Plan, including for the electricity sector, as a means of promoting good, family-sustaining, union jobs accessible to all New Yorkers and achieving a true just transition.

[228] 6 NYCRR § 496.4.

Table 14. Electricity Sector Key Strategies by Theme

Theme	Strategies
Transform Power Generation	E1. Retirement and/or Repurposing of Fossil Fuel Fired Facilities E2. Accelerate Growth of Large-Scale Renewable Energy Generation E3. Facilitate Distributed Energy Resources E4. Support Clean Energy Siting and Community Acceptance E5. Promote Community Choice Aggregation
Enhance the Grid	E6. Deploy Existing Storage Technologies E7. Invest in Transmission and Distribution Infrastructure Upgrades E8. Improve Reliability Planning and Markets E9. Advance Demand Side Solutions
Invest in New Technology	E10. Explore Technology Solutions

Transform Power Generation

With fossil natural gas currently being the principal fossil fuel source for electricity generation in the State, a significant transformation of the power sector is necessary to meet the Climate Act's 70x30 and 100x40 requirements. To decrease the use of emitting fuels in the electricity sector, New York must deploy clean energy resources such as land-based wind and solar, offshore wind, hydropower, fuel cells that use renewable fuels, and energy storage. While many programs are already in place to support and encourage these types of resources and significant progress has been made, aggressive deployment of clean resources must continue, and the effectiveness of programs and policies should be continually evaluated and changed if renewable energy is not being deployed at the pace necessary to achieve the requirements on time. This will require investment in training and retraining of the existing workforce as well as supporting workforce development actions, in a manner that is responsive to industry needs and job placement opportunities and is supportive of applicable labor standards and the promotion of equitable access to family-sustaining jobs, including union jobs, consistent with the discussion in *Chapter 7. Just Transition.*

E1. Retirement and/or Repurposing of Fossil Fuel Fired Facilities

Achieving a 100% zero-emission power grid will require phasing out the use of fossil fuel for power generation over time. During the same period, New York will also need to maintain a completely safe and reliable power grid.

Currently, to meet daily electricity demand, a combination of generation assets (i.e., power plants) is reserved and then dispatched to meet electricity demand at the lowest achievable cost. This combination of resources is called the "supply stack." Typically, renewable generators run whenever they

have supply available from their fuel sources, such as wind and sunlight. "Baseload" generators are those generators with low per-unit running cost and serve as the bottom of the supply stack (chosen to run first and most often); typically these are large nuclear, hydroelectric, and some of the more economic fossil fuel power plants. Other generation is used to meet energy demand beyond that served by baseload plants, which fluctuates throughout the day. When demand increases beyond minimum and average daily load, or baseload supply resources are interrupted, other "peaking" generators are used to provide the remaining amount of power requirements. While these peak generators are typically the most expensive and polluting units on the system (on an emission rate basis), they run infrequently and are able to respond to demand in real time.[229] Peaking generators may also be used in certain locations (load pockets) where energy delivery into the load pocket may become congested, requiring electricity to be produced and delivered locally (e.g., within the load pocket itself, including areas within sub-transmission and distribution networks).

Transitioning to zero-emission electricity will require addressing emissions from both baseload and peaking facilities and balancing the electricity system with integration of dispatchable and zero-emission resources as intermittent renewable energy generation penetration increases. To facilitate and enable retirement and/or repurposing (meaning use of this space for siting clean energy transition activities such as energy storage, operations and maintenance activities, training facilities, etc.) of fossil fuel-fired facilities, New York needs to continue and accelerate its deployment of new renewable generators (e.g., wind, solar, hydro), maintain the fleet of renewable generators it has now, upgrade its transmission and distribution system to allow for the maximum use of the renewable generators (i.e., get the power where it needs to go), improve management on the demand side of electricity use, and invest in energy storage technologies. Pursuant to existing policies and procedures, any retirement and/or repurposing of existing fossil fuel generation must be done in coordination with the PSC, the NYISO planning process, the required reviews under Section 7(2) and 7(3) of the Climate Act, and consistent with New York State Reliability Council criteria. These significant climate investments will assist with meeting the requirements of the Climate Act, while also supporting increasing New York's renewable energy supply, reducing its reliance on fossil fuels, reducing energy price volatility, increasing system resiliency, and improving power quality.

[229] A majority of these units are traditional peaking units that operate less than 10% of the time on an annual basis. See Case 18-E-0130, In the Matter of Energy Storage Deployment Program, "*The Potential for Energy Storage to Repower or Replace Peaking Units in New York State*." July 2, 2019.

As described in more detail below as the components of Strategy E2, New York should also have a detailed process in place to ensure that the fossil fuel generators are gradually and safely retired while still maintaining reliability. Studies such as the NYISO Reliability Needs Assessment and overall Comprehensive Reliability Plan will inform this process to ensure consumer energy reliability while transitioning away from fossil fuel electricity generation. If a reliability need or risk is identified, zero-emission solutions should be fully explored, such as storage, transmission upgrades or construction, energy efficiency, demand response, or another zero-emission, dispatchable resource. Evaluation of alternative fuels such as green hydrogen and renewable natural gas (RNG) for this strategic use should include an analysis of the air quality impacts, health impacts, and full life cycle GHG emissions impacts, in addition to avoiding localized pollution in Disadvantaged Communities.

Only after these zero-emission and alternative fuel resources are fully analyzed and determined to not be able to reasonably solve the identified grid reliability need shall retention of existing or construction of new or repowered fossil fuel-fired generation facilities be considered. These should only be considered if the NYISO and local transmission operators confirm that the fossil fuel-fired facility is required to maintain system reliability and that need cannot reasonably be met with the alternatives listed above. Even in those cases, the fossil-fueled generation facility should assist in meeting the goals of the Climate Act, including the need to ensure safe and reliable electric service. That is, its deployment should result in one or more of the following: a greater integration of zero-emission resources, a reduction in fossil fuel generation, a significant reduction of GHG and co-pollutant emissions, a benefit to an environmental justice community, or a benefit to the electric system that addresses the identified reliability need or risk.

In addition, public and stakeholder input must be incorporated into the decision-making process and a thorough analysis of compliance with Section 7(2) and 7(3) of the Climate Act including equity considerations, as mandated by the Climate Act, should be completed by DEC and/or other relevant State agencies. The Climate Justice Working Group (CJWG) is supportive of strategies to facilitate retirement of fossil fuel-fired generation facilities and recommends the Council take the additional step of placing a moratorium on the permitting of new fossil fuel plants until there is a demonstrated system reliability need that can only be addressed with fossil fuel generation. To address this recommendation, the State should leverage the use of regulations and transparent resource planning processes to properly phase out the use of fossil fuel generation facilities while maintaining electric system reliability.

Components of the Strategy

- **Assessment and determination of emissions reduction targets:** The PSC, DEC, NYSERDA, and the New York State Energy Planning Board should work in coordination to determine the potential for GHG emission and co-pollutant reductions from fossil fuel generation by 2030 and set a corresponding timeline for interim emissions reduction targets in alignment with the 70x30 and 100x40 requirements. The timeline from present to 2030 for possible emission reductions should be determined in conjunction with the renewable energy procurement and interconnection schedule and should represent a continual decline in emissions from present to 2040 while ensuring the reliability of the energy system is maintained. The process should include effective mechanisms for input and comments by stakeholders (including but not limited to generators, utilities, and environmental, environmental justice, public health, labor, and electricity consumer advocates and organizations, as well as local communities) and the public. When setting interim emission reduction targets, consideration should be given to the location and emissions profile from fossil generating units across the State, as well as relevant planning studies from involved organizations (the Power Grid Study, NYISO reliability analyses and other planning processes, New York State Reliability Council, etc.) to inform decisions to address these emissions in the most efficient and effective manner possible. Disadvantaged Communities shall be considered when determining the interim emissions reduction targets, as required by the Climate Act. The effectiveness of the interim emissions reduction targets and progress toward achieving the 2030 goals shall be evaluated every two years starting in 2024 and adjusted accordingly to ensure the subsequent 2040 zero-emission target is achieved. Reviews should coincide with the requirements in the Climate Act, State Administrative Procedures Act (SAPA) three-year review requirement, and resource planning review (see below).
- **Promulgation of emissions regulations:** DEC should assess regulatory options to reduce emissions from fossil fuel-fired generating units to the maximum extent practicable to achieve the requirements of the Climate Act while maintaining system reliability. Consistent with the above analysis, and in coordination with PSC, NYSERDA and other interested stakeholders, DEC should examine all potential regulatory options, including new regulations and/or permit requirements or amendment of current regulations and/or permitting requirements, to determine the most efficient, effective, and enforceable format to achieve the determined interim emissions reduction targets described above and the Climate Act directives. The process should consider other regulatory programs, including a potential economywide program as discussed in *Chapter 17. Economywide Strategies*, as well as RGGI, and include effective mechanisms for input and comments from stakeholders prior to a formal proposal under SAPA, similar to the

process used in promulgating the DEC "Peaker Rule," 6 NYCRR Subpart 227-3. Once completed, DEC should follow SAPA in promulgating the identified regulation(s).

- Consistent with SAPA, the effectiveness of the regulations should be evaluated every three years. This evaluation should coincide with the resource planning review (see below on planning).
- Coordination of closures and the necessary reliability assessments should take place between State Agencies (e.g., DEC, PSC, NYSERDA, ESD) and other key stakeholders (e.g., the NYISO, utilities and fossil fuel facility owners and operators; see below on planning).
- Evaluation of GHG emissions and co-pollutants, benefits, reliability needs, cost, and available replacements (and their subsequent impacts) must be executed (see below on planning).
- Specific focus should also be given to emissions of co-pollutants in disadvantaged and environmental justice communities, as required by the Climate Act.

- **Regular and transparent resource planning:** The PSC will conduct biannual reviews of the renewable energy program and electric system resource mix starting in 2024 as required by the Climate Act in order to support and ensure the achievement of the emissions reduction targets and compliance with the promulgated regulations by DEC, as well as achievement of the 70x30 and 100x40 requirements. As part of this review process, the PSC should evaluate options to retire and/or repurpose existing fossil fuel electric generation facilities. In 2022, the State initiated the development of a blueprint to guide the retirement and redevelopment of New York City's oldest and most-polluting fossil fuel facilities and their sites by 2030. This blueprint is being developed by DPS, NYSERDA, and DEC and will be completed in 2023 to serve as a critical input into future CES, State Energy Plan, and/or Scoping Plan updates and to coincide with the review of any related regulations or Climate Act requirements, including the biannual review described above. These State agencies will also coordinate the development of this blueprint with the NYISO and utilities, including consideration of relevant studies by these organizations and requirements of the Climate Act. Although this blueprint is focused on New York City, the recommendations and considerations in this blueprint will be useful in evaluating options for retirement and/or repurposing of fossil fuel facilities located throughout the State.

  In developing this blueprint and as part of regular and transparent resource planning processes, the State will examine options to reduce or eliminate emissions from fossil fuel-fired generation facilities, including behind-the-meter fossil resources as expeditiously as practicable but not later

than 2040, identifying the nature, feasibility, cost and avoided costs, risks and risk mitigants, and impacts on emissions and health as well as reliability. These options may include efficiency, storage, load flexibility, distributed energy resources (DERs), and transmission and distribution upgrades, among others. The blueprint will also describe the existing policies and procedures for the retirement and/or repurposing of existing fossil fuel generation including PSC rules and regulations, the NYISO planning process, and with New York State Reliability Council criteria.

The blueprint will also include detailed analysis and planning to address the impacts on communities and workers. Specifically, the blueprint will:

- Assess the revenue impacts on school districts and municipalities of fossil fuel plant closures and ensure adequate funding of the Electric Generation Facility Cessation Mitigation Program as plants are retired[230]
- Ensure the retirement and/or repurposing of these facilities is done in coordination with the transition of the gas system, as described in *Chapter 18. Gas System Transition*, to ensure electric grid reliability needs are met
- Ensure that plant owners are responsible for costs of site remediation
- Focus on repurposing these facilities as necessary to take advantage of their location and infrastructure to ensure reliability while meeting the Climate Act requirements, including consideration of these facilities for zero-emission alternative uses such as energy storage
- Support a process involving local stakeholders to determine redevelopment of sites as plants are retired, including those workers at sites and their collective bargaining representatives
- Examine options to reduce emissions impacts in environmental justice and Disadvantaged Communities, including prioritizing facilities located in Disadvantaged Communities for retirement and/or repurposing (see Appendix B for details)
- Investigate and implement options to develop market mechanisms to assist in the removal of fossil fuel-fired generating facilities from the system. These options include, but are not limited to, the valuing of environmental attributes either within or external to NYISO markets. Specifically, the State should consider a clean dispatch program that creates Clean Dispatch Credits. Zero-emission, fully dispatchable assets that can dispatch to fulfill the role of peaking units would generate Clean Dispatch Credits. Consideration should be given to both capacity and per-megawatt hour payment structures. Load-serving entities would be required to purchase increasing amounts of Clean Dispatch Credits annually to ensure

[230] As of April 2021, New York State has appropriated a cumulative total of $140 million for the program.

progress is being made. In developing any such market mechanisms, per the requirements of Section 7(3) of the Climate Act in agency decision-making, New York must ensure Disadvantaged Communities are not disproportionately burdened and prioritize reductions of GHG emissions and co-pollutants in Disadvantaged Communities.

- Assess workforce impact through existing data collection processes such as information collected in the New York State Worker Adjustment and Retraining Notification (WARN) Act processes, and any other data not already collected through existing closure response efforts.
- Identify and suggest measures to limit negative impact on current workforce, consistent with the discussion in *Chapter 7. Just Transition*.

E2. Accelerate Growth of Large-Scale Renewable Energy Generation

New York needs to get new renewable energy projects built. This points to the need for efficient processes to deploy large-scale renewable generation and improved transmission and distribution systems. To achieve this, the PSC and NYSERDA have administered successful CES procurement programs such as Tier 1, Offshore Wind, and Tier 4 which looks to increase renewables penetration in Zone J, and the Build Ready program that prioritizes the pre-construction development of existing but less desirable, abandoned, or underutilized sites for auction, to provide a de-risked project for developers to construct and operate at these locations. New York will continue to rely on the CES to reach the 70x30 and 100x40 requirements.

As previously discussed, the October 2020 CES Order increased the annual targets of renewable energy to be procured in order to meet the Climate Act requirements. NYSERDA's current procurement programs, including Tier 1, Offshore Wind, and Tier 4, will expand and continue to procure the renewable energy needed to reach these requirements and a zero-emission grid. The State also recently created a dedicated office, Office of Renewable Energy Siting (ORES), to streamline and expedite the siting of major renewable energy projects. As noted, the PSC also created a comprehensive grid planning process pursuant to which local system upgrades are being proposed by utilities and approved. The PSC continues to participate in existing planning processes related to bulk transmission projects and recently identified the need for several public policy transmission needs through the NYISO Public Policy Transmission Planning Process. One of these projects (Empire State Line) completed construction in 2022, a second project (A/C Transmission) is currently under construction, and a third project (Long Island-to-New York City Intertie) is being solicited by the NYISO. The PSC has also created a process to authorize NYPA

priority transmission projects. The recently approved Smart Path Connect is going through permitting under Public Service Law Article VII.

The CJWG is generally supportive of accelerating the deployment of large-scale renewable energy systems; however, it also stresses the need to balance this approach to large-scale renewables with significant investment and technical support for Disadvantaged Communities to develop zero-emission, behind-the-meter microgrids to reduce grid strain, increase resiliency and affordability, and diversify the State's energy portfolio. The strategies included in this Scoping Plan are aimed at doing just that and emphasize the need for support for underserved, low- to moderate-income (LMI), and environmental justice communities in the strategies related to DERs and Community Choice Aggregation (CCA), including development of zero-emission microgrids and district clean energy systems.

Components of the Strategy

- **Evaluate and adjust:** The PSC should continue to evaluate and adjust policies and procurement targets as necessary in order to achieve the Climate Act requirements and goals to deploy and maintain existing renewable energy systems including solar, land-based wind, hydropower, and offshore wind. The evaluation should include a review of the cost and benefits of these renewable energy investments. In addition, it is recommended that PSC assess, through its transparent processes, mechanisms to minimize rate impacts in the context of other related policies, such as its Energy Affordability Policy program.
- **Support successful programs:** The State should continue to support successful programs and regulatory changes, such as Build Ready and the Accelerated Renewable Energy Growth and Community Benefit Act through funding and hiring adequate staff in ORES and other relevant State agencies (including NYSERDA, DPS, New York State Department of State [DOS], and DEC) to ensure a rigorous but efficient and timely procurement and permitting process.
- **Identify facilitating transmission and distribution needs:** The PSC should continue to identify the key transmission and distribution upgrades, improvements, and new line construction needed to deliver renewable energy from where it is built to where it is needed to complement other transmission and distribution activities described later.
- **Establish permitting goals:** ORES should establish a non-binding metric or goal with respect to MWs of renewable energy that should be permitted each year in such an amount that complements the Tier 1 request for proposals procurements.

- **Explore:** The State should explore additional areas of openness and engagement with the NYISO and other stakeholders to improve the interconnection/Class Year process.[231]
- **Labor and workforce development:** As part of clean energy infrastructure development and as new technologies and solutions emerge, workforce development actions should include local and targeted hiring provisions, particularly to incentivize the hiring of workers from Disadvantaged Communities, as well as to support displaced and transitioning workers.

E3. Facilitate Distributed Energy Resources

Clean DERs will continue to be pursued alongside the expansion of large-scale renewables. These resources generate electricity closer to end users, thereby increasing the efficiency and reducing carbon pollution compared with other generation facilities as well as improving grid resiliency and potentially curtailing the need for costly transmission investments.

DER is also a primary way (alongside energy efficiency) to meet the social equity requirements of the Climate Act. In some areas, clean energy from DERs can help to provide some of the reliability attributes that would otherwise be met by running existing fossil fuel generation, thereby improving local air quality. When properly developed, clean DER projects can also allow communities to participate in the process, providing economic development and workforce development opportunities, and bolstering resiliency. Increases in distribution system hosting capacity and the pace of interconnection will be important factors in facilitating deployment of DERs.

The CJWG is supportive of this strategy. It suggests that there needs to be a process in place to assure that LMI community solar savings do not conflict, interfere, or in any way prevent access to the other LMI energy savings programs such as the Home Energy Assistance Program. The CJWG highlighted that when designing incentives, use of grants over tax credits is preferred as tax credits may not be beneficial for LMI consumers. These concepts have been included below.

[231] The NYISO interconnection/Class Year Process is part of the NYISO's Comprehensive System Planning Process that focuses on the NYISO's responsibility to prepare for the impact of expected changes in supply and demand of power on the reliable operation of the New York transmission system over a ten-year period. The NYISO's Interconnection processes enable parties to pursue construction and interconnection of generation, transmission, and load facilities to the New York State Transmission System and Distribution System.

Components of the Strategy

Physical Needs

- **Hosting Capacity:** The PSC should work with the utilities and the NYISO to make proactive and timely investments in local transmission and distribution infrastructure and evaluate the associated cost-sharing/allocation borne by the utility ratepayers in these upgrades, including an evaluation of potential non-infrastructure or non-wire alternatives that could potentially delay or eliminate the need for conventional infrastructure investments.[232] The Regional Economic Development Councils (REDCs) should participate in utility and NYISO planning processes to identify sites in Disadvantaged Communities and legacy/rust belt cities that present economic development opportunities for consideration in these infrastructure investments, with particular emphasis on fulfilling supply chain needs to meet the Climate Act emissions reductions requirements. The PSC should also accelerate adoption of innovative technologies and programs that increase hosting capacity, such as flexible interconnection, hybrid systems, and coupling with energy storage or controlled load, smart inverters, and solutions that enable maximum back-feeding at the substation level from distribution to transmission as part of the local transmission and distribution planning process.
- **Interconnection:** The PSC should work with the utilities to speed up the pace of processing interconnection applications and need for right-sizing human resources at utilities, State agencies, and other relevant organizations to mitigate delays in application processing. This includes enhanced coordination among state agencies having jurisdiction for permitting to streamline the siting, permitting, and interconnection processes.

Financial Support

- **Rate Design:** The PSC should consider improvements to electric rate structures and programs (such as the Value of DER Value Stack[233] compensation or the Standby and Buy-back service

[232] The PSC directed the electric IOUs to develop a set of suitability criteria against which each traditional capital infrastructure project would be compared to determine the suitability for such project to be delayed or eliminated through successful implementation of a NWA project. See New York State Department of Public Service. "Case 16-M-0411, Distributed System Implementation Plans, Order on Distributed System Implementation Plan Filings." Issued March 9, 2017.

[233] Value Stack compensation provides policy resources with utility bill credits that reflect the following grid values: energy, installed capacity, environmental value, and avoided distribution costs (local and system-wide). Value Stack was created through reforms to net energy metering in New York State Department of Public Service. "Case 15-E-0751." https://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=15-E-0751.

rates[234]) that provide appropriate cost-based price signals to customers to encourage DER deployment and usage, as well as building heating and hot water system electrification technologies.

- **Compensation:** The PSC should consider improvements to the Value of DER Value Stack to more accurately reflect value provided by DERs, such as a more granular (time and location) environmental value and avoided transmission costs, and include a review of the cost and benefits of these renewable energy investments.
- **Incentives:** The PSC and NYSERDA should target incentives to stimulate high-benefit DER projects (dual-use solar/agriculture, multifamily housing, heat pumps/geothermal, collective solar projects) paired with electrification serving LMI and Disadvantaged Communities. NYSERDA should expand the Solar Energy Equity Framework programs, Low Income Community Solar concept, and adder for Inclusive Community Solar Projects. The State should ensure that participation in incentive programs is effective for the target audiences (e.g., tax credits may not be as effective for LMI consumers) and does not preclude participation in other programs. The State should eliminate barriers to enrollment for the target populations by streamlining and automating the processes where possible.[235]
- **Ground-mounted siting:** The State should address resistance and concerns to siting of ground-mounted solar projects, particularly in upstate and western New York.
- **Rooftop, parking lot, and carport solar permitting:** The State should address the need for a streamlined permitting process across authorities having jurisdiction that reduces processing times and soft costs.
- **Zoning:** DOS and NYSERDA should provide model zoning laws to municipalities for residential/commercial properties to require new construction be designed as "solar-ready."
- **Resources & education:** The State should create or expand on regional discussion forums between itself, local communities, and projects to connect communities with resources, information, and address local concerns.
- **Aggregations:** Encouraging aggregations of DERs will provide additional value for grid management.

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[234] New York State Department of Public Service. "Case 15-E-0751, Allocated Cost of Service Methodology for Standby and Buyback Service Rates and Energy Storage Demand Charge Exemptions Order." Issued March 16, 2022.

[235] The Expanded Solar For All program authorized by the PSC in National Grid's service territory applies bill credits from participating Community Solar projects to all customers enrolled in the utility Energy Affordability Program on an opt-out basis.

E4. Support Clean Energy Siting and Community Acceptance

New York will need to accelerate the deployment of renewable energy projects (both large-scale renewables and DERs) in order to achieve the Climate Act's mandates. While NYSERDA's procurement programs and improved permitting processes are critical to deployment of new renewable facilities, other actions are needed to get projects successfully sited and accepted by host communities. New York needs a multi-pronged approach with communities to support the siting and acceptance of renewable energy facilities, including wind, solar, storage, and transmission upgrades. This multi-pronged approach should include strong communication, engagement, and public outreach to communities. It should also include promotion of the benefits that renewable energy projects will provide, while working with communities to maximize these local benefits and minimize impact on lands identified by communities with other competing uses such as farming and agricultural soils, forest preservation, or other cultural resources.

This approach to fostering community acceptance will differ for smaller, distributed projects in more densely populated locations to larger utility-scale wind and solar projects in more rural areas or offshore. The community concerns and the community benefits for these two types of projects are somewhat different, but both can provide energy cost savings for residents and businesses in the community, local infrastructure improvement, local tax revenue and economic benefits, local job creation, and cleaner air for New Yorkers.

The CJWG supports finding compromise around local control while achieving State targets and emphasizes the need for community education and engagement to inform New Yorkers about the climate crisis and the benefits of shifting to a clean energy economy.

Components of the Strategy

Clean Energy Development

- **Agrivoltaics:** NYSERDA and New York State Department of Agriculture and Markets (AGM) should commence a study on developing a comprehensive agrivoltaics program to research and incentivize the viability of agrivoltaics to integrate solar into agricultural communities and provide habitat improvement for threated and endangered species.[236]

[236] Agrivoltaics is the co-location of solar energy projects and agriculture.

- **Development Mapping:** The State should develop a Clean Energy Development Mapping tool to help municipal representatives and local communities make informed land use decisions and communicate local priorities to developers.
- **Fund planning:** The State should offer State support and funding for Regional Planning Associations to assist municipalities in planning for renewable energy development.
- **Refine NYSERDA processes:** NYSERDA should continually refine processes, evaluation, and incentives for determining buildable projects and selecting projects for procurement request for proposals.
- **Decommissioning:** The State should study and advise communities on how to best implement options for decommissioning of community-owned projects at the end of their production life.

Public Education and Outreach

- **Public education:** The State should launch a statewide public education campaign to inform New Yorkers about the climate crisis and the benefits of shifting to a clean energy economy. The campaign should focus on community-based outreach and education on climate science and solutions and could include a P-12 climate change curricula in schools, supporting nonprofits, increasing public awareness about the benefits of renewable energy, connecting people with clean energy programs job training and educational opportunities, providing support to local governments and indigenous populations to actively participate in the clean energy transition, and encouraging local and regional land use and decarbonization planning.
- **Nonprofit outreach:** Based on availability, the State should provide funding for nonprofits and community-based organizations to carry out education and outreach about clean energy benefits.

Equity & Local Benefits

- **Measure and publish benefits:** The State should ensure community benefits, including employment numbers and job quality information, and avoided costs are tracked and that this information is accessible through a platform such as Open NY.
- **Cooperative structures:** The PSC and NYSERDA should evaluate the role of municipal/cooperative structures in Disadvantaged Communities in providing benefits to these host communities, examine laws regarding cooperatively owned enterprises, and establish consumer protections in this new market.
- **Host benefits:** NYSERDA should make host community benefits more robust and targeted (such as NYSERDA's Host Community Billing Program).

- **Local government:** NYSERDA, DEC, and DOS should empower local governments to take a leadership role in educating the community in clean energy.
- **Streamline incentives:** Based on available funding, NYSERDA should expand and streamline incentives for energy efficiency, including funding for customers based on utility payment history instead of credit scores. This should include enhanced coordination on the various State or federal bill payment assistance and energy efficiency programs.
- **Weatherization:** Based on available funding and consistent with recommendations in *Chapter 12. Buildings*, NYSERDA should invest in weatherization assistance and energy efficiency programs, and leverage funding from existing federal programs.
- **Broadband:** The State should enable host towns to speed up rural broadband expansion and leverage utility and clean energy investments to support broadband rollout.
- **Climate Resilience Hubs:** The State should consider support for incentivize local "climate resilience hubs," a central location that has solar and storage and becomes a location the community can gather during power outages.
- **DCAS:** The State should work with the New York City Department of Citywide Administrative Services to assist with building more renewable energy projects and in the implementation of other strategies including energy efficiency and building decarbonization.
- **Loan Loss program:** The State should leverage loan loss reserve programs as a tool to reduce the risk of lending to low-income households and to residents in Disadvantaged Communities, such as NYSERDA's Loan Loss Reserve Program.[237]
- **Subscriber benefits:** The PSC and NYSERDA should support benefits programs for LMI community subscribers, including the recent targets established in the NY-Sun initiative for 1,600 MW of the incremental 4,000 MW target to benefit Disadvantaged Communities and LMI subscribers, with an estimated $600 million in investments serving these communities.[238]

Commercial Rooftop & Parking Lot Solar

- **Rooftop / Parking lot solar:** The State should conduct further analysis to identify and implement effective ways to build economic or incentive structures to increase the development of

[237] NYSERDA. 2022. "Loan Loss Reserve Program." Albany. Accessed at https://www.nyserda.ny.gov/All-Programs/Loan-Loss-Reserve-Program#:~:text=The%20Loan%20Loss%20Reserve%20fund,the%20event%20of%20a%20default.

[238] New York State Department of Public Service. "Case 15-02703, In the Matter of the Value of Distributed Energy Resources, Order Expanding NY-Sun Program." Issued April 14, 2022.

commercial rooftop and parking lot solar installations paired with storage to take advantage of the available space, especially in urban areas.

E5. Promote Community Choice Aggregation

Community choice aggregation (CCA) programs allow local governments to make bulk power purchases on behalf of participating homes and businesses in their jurisdiction, making it easier for residents and employers to benefit from local clean energy projects, while also improving project economics and advancing the Climate Act requirements. Connecting homes, businesses, and community institutions with clean energy products and services through CCA programs, zero-emission microgrids, district systems, and community-scale campaigns encourages adoption of new, innovative technologies to generate value and savings for consumers in an equitable manner.

Most communities in New York that have implemented a CCA program procure 100% renewable energy as their default supply. When CCAs integrate opt-out community solar, participating homes and small businesses are enrolled in one or more community solar projects from which they receive credits on their electric bill. These credits directly reduce the charges on the bill. Customers who are enrolled in community solar typically receive guaranteed savings of 5% to 10%. Opt-out community solar allows CCAs to enroll hundreds, or even thousands, of people at once. This significantly reduces soft costs associated with solar and makes the economics of solar all the more attractive. This arrangement has potential to continue the downward trend in solar prices and incentives, while the total amount of solar dramatically increases. Many CCA programs are working to capture the economic benefits of clean energy more broadly. For example, some CCAs have developed opportunities around opt-out community solar, energy efficiency, heat pumps, electric vehicles (EVs), demand response, and energy storage.

The CJWG is generally supportive of encouraging local climate action, and more specifically sees CCAs as tools for transformative change in the way consumers connect to and purchase their energy. This strategy includes the CJWG recommendations to remove of barriers to entry, particularly for lower income households, and include safeguards for energy burdened households that may have been the target of previous predatory practices related to their energy bills and services.

Components of the Strategy

- **Support CCA and community distributed initiatives:** NYSERDA should continue to encourage development of CCA programs where communities choose 100% renewable energy as

the default supply and where participants are automatically enrolled in Community Solar. Prioritization of these efforts should be focused on Disadvantaged Communities.

- **Expand CCA eligibility:** The PSC should enable county governments to authorize and form CCA programs with local opt-out in addition to the cities, towns, and villages that are currently eligible to participate.
- **Enable zero-emission microgrids and district systems:** Over the next 10 years, NYSERDA should work with utilities and campuses to enable the development of zero-emission microgrids (municipal, schools, and private) and district clean energy systems. Microgrids can serve as a community asset by enhancing resiliency and local system reliability, reducing grid congestion, and increasing electric system efficiency.
- **Ensure strong consumer protections:** PSC should continue refining its CCA policies to ensure proper safeguards are in place to protect consumers and should consider the most efficient way to deliver maximum benefits from renewable energy, particularly to LMI households.

Enhance the Grid

While transformation of the power sector is critical to achieving the State's goals and requirements, it also presents the opportunity to make enhancements to the electric grid. Enhancements can improve the efficiency, delivery, and reliability of electricity, facilitate the integration of renewable energy, and prioritize clean resources consistent with the Climate Act.

E6. Deploy Existing Storage Technologies

A portfolio of energy storage technologies will be needed as intermittent renewable energy generation penetration increases. Existing and newer, long-duration storage will be needed to maintain reliability as the State approaches 2040; however, these technologies will need to be deployed well before 2040 to reach the State's goals and requirements.[239]

In 2018, the PSC issued a landmark energy storage order based on the Energy Storage Roadmap. The order established a 3,000 MW energy storage goal by 2030 and included deployment mechanisms to achieve the target. However, the goal was established based on a 50% renewable target for 2030. The new Climate Act targets will require significantly higher levels of energy storage as exemplified in the recent

[239] NYSERDA. 2020. "Pathways to Deep Decarbonization in New York State."

Power Grid Study,[240] which identified a need for more than 15 gigawatts (GW) of energy storage. The order also included $350 million in bridge incentives to accelerate the energy storage market, including solar-plus-storage projects with NY-Sun and another $53 million in RGGI funds. As of December 2022, these funds have been almost fully allocated. Though the order was a significant step forward for the energy storage market in New York, deployment needs are most certainly greater than initially envisioned and these existing programs will be insufficient to meet the expanding need. NYSERDA and DPS are currently in the process of updating the State's Energy Storage Roadmap to update and revise the storage deployment goal to achieve 6,000 MW of energy storage by 2030 in recognition of the substantially higher requirements identified in the Power Grid Study.

The CJWG was generally supportive of this strategy and suggested prioritization of energy storage to protect Disadvantaged Communities where the resilience need is greatest including at both the local distribution and transmission levels, which is contained in the components below.

Components of the Strategy

- **Provide increased funding for energy storage deployment:** The PSC should consider methods to create a market for retail and wholesale storage, such as establishing Clean Dispatch Credits or expanding the CES to better integrate storage or to initiate a new docket that sets new binding targets and creates a dedicated funding mechanism that is similar to the CES for storage as soon as practicable and no later than the end of 2023. Funding should be prioritized to projects that benefit frontline communities where the resilience needs are often the greatest.
- **Incorporate energy storage into energy delivery and transmission planning:** Further refined modeling of the future electrical grid is needed to evaluate the potential system reliability needs that are anticipated for that future grid. The modeling should identify the need for storage resources with longer durations that may develop with technology innovation to show the true breakdown of potential storage versus fully dispatchable generation needs and that includes modeling for better demand-side management of electricity such as thermal energy storage, electric vehicle-to-grid technology, etc.

[240] New York State Department of Public Service and NYSERDA. 2021. "New York Power Grid Study." Albany. Accessed at https://www.nyserda.ny.gov/About/Publications/New-York-Power-Grid-Study.

- **Work with the NYISO:** The State should continue to work with NYISO on market enhancements that facilitate the resource transition, support investment, minimize costs to consumers, and meet reliability.

E7. Invest in Transmission and Distribution Infrastructure Upgrades

As New York State moves forward in meeting the Climate Act requirements, there will be a need for significant investments in New York's electricity transmission and distribution system to allow for the utilization of new renewable and energy storage resources and to meet growing electric load due to electrification. The scope and nature of these investments are expected to vary depending upon the location and type of energy storage and zero-emission generation resources that are added to the system. The REDCs should participate in utility and NYISO planning processes to identify sites in Disadvantaged Communities and legacy/rust belt cities that present economic development opportunities for consideration in these infrastructure investments, with particular emphasis on fulfilling supply chain needs to meet the Climate Act emissions reductions requirements. The PSC should continue to evaluate through its utility planning processes any changes to utility rates, tariff structures, or other rules to achieve the objectives of the Climate Act, including in support of economic development. The high-voltage transmission system, or bulk electric system, is operated by the NYISO, whereas the lower voltage, local transmission and distribution systems are owned by electric utilities.

The most potent of the GHGs identified in the Climate Act is sulfur hexafluoride (SF_6), which is 17,500 times more potent than CO_2 based on a 20-year global warming potential (GWP), and persists in the atmosphere for thousands of years. SF_6 is most commonly used as an insulator in electricity transmission and distribution equipment and its use continues to grow. New York utilities were historically one of the largest emitters of SF_6 but are now among the leaders nationwide in reducing leakage rates through voluntary reduction programs. These significant future investments in new transmission infrastructure should include a plan for fully phasing-out reliance on SF_6, including measures for existing equipment, to minimize leaks as the State transitions to environmentally friendly and cost-effective alternatives.

The Public Policy Transmission Planning Process is the primary mechanism that ensures the bulk transmission grid can enable New York State's climate policies, which includes transmission upgrades that connect and transport renewable generation and energy storage resources to load centers. The PSC has issued multiple orders to initiate a statewide transmission planning process, which the utilities now refer to as the Coordinated Grid Planning Process, and is a requirement of the Accelerated Renewable Energy Growth and Community Benefit Act. The Coordinated Grid Planning Process will identify Phase

One transmission upgrades, which are local transmission projects that would address existing reliability needs but also have Climate Act benefits such as increased hosting capacity for renewable generation. Phase Two projects include local transmission upgrades that are needed to address Climate Act goals and requirements and would not otherwise be identified in the routine capital planning process of the utility. Finally, the utilities will need to coordinate with the NYISO to identify the most efficient mix of local and bulk transmission upgrades needed to meet the long-term Climate Act goals and requirements. In addition, the State approved contracts in April 2022 under a competitive procurement through Tier 4 of the CES to deliver renewable energy into New York City, which is particularly dependent on polluting fossil fuel-fired generation.

The CJWG is supportive of this strategy, seeing it as key to building out renewable energy resources. It suggests the inclusion of additional actions, including proactively identifying key transmission and distribution upgrades, improvements, and new line construction needed to deliver renewable energy across the State and maximize the retirement of fossil fuel-fired resources. As recommended by the CJWG, this Scoping Plan recommends that state agencies and utilities approach interconnection through a justice-oriented lens where community-led and community-supported clean energy projects are facilitated and recognize that high interconnection costs for projects in Disadvantaged Communities are a barrier that needs to be addressed.

Components of Strategy

- **Transmission and distribution expansion:** The State should expand electricity transmission and distribution systems to support energy delivery and, building on the Power Grid Study, continue research, development, and demonstration (RD&D) and rapid deployment of advanced grid technology to:
  - Alleviate transmission system bottlenecks to allow for better deliverability of renewable energy throughout the State
  - Unbottle constrained resources to allow more hydro and/or wind imports and the ability to reduce system congestion
  - Optimize the utilization of existing transmission capacity and right of ways
  - Increase circuit load factor through dynamic ratings
  - Encourage utilities to accelerate cost-effective investments in their local systems that will facilitate renewable energy development and support electrification of other sectors, such as buildings and transportation, but also increase safety and resiliency

    - Evaluate opportunities for energy storage to function and be compensated as a transmission and distribution system asset
    - Encourage agencies with roles in the Article VII siting process to prioritize transmission projects that are identified in the Coordinated Grid Planning Process or that provide Climate Act benefits

- **Strategic investment:** NYPA, LIPA, and utility companies should continue with strategic long-term transmission and distribution investments for expedited projects needed in the short-term (within approximately five years). Utilities should continue investments for local transmission and distribution investments within a utility's footprint, and public policy needs should be declared in the current NYISO Public Policy Transmission Planning Process through Federal Energy Regulatory Commission (FERC) Order 1000.
- **SF_6 emissions:** DEC should adopt regulations to reduce SF_6 emissions and establish a timeline for phasing out new SF_6 equipment. New York should also collaborate with other U.S. Climate Alliance states to align policies across the country to drive a market shift toward SF_6 alternative technologies nationwide. This will help New York's power grid remain one of the cleanest, lowest emission grids in the country.
- **Hosting capacity:** The State should focus on increasing hosting capacity with a holistic/top-down approach in order to accelerate adoption, while also being mindful of the tradeoffs between siting resources in high-cost areas and investments in transmission and distribution infrastructure to reach the most equitable cost option, support the integration of large-scale renewables and DERs, meet forecasted electricity demand growth with widespread electrification, and support economic development efforts.
- **Renewable Energy Zones:** The State should create a database to identify Renewable Energy Zones and track renewable energy development and availability capacity in these zones. The database should inform recommendations for a process to establish Renewable Energy Zones where construction and interconnection of large-scale renewable generation is cost-effective, determine quantity of renewable energy targeted within each zone, and develop a plan for each Renewable Energy Zone to build sufficient transmission to ensure energy delivery within and out of the zone.
- **Upgrades for offshore wind:** The State should conduct further planning and pursue system upgrades on Long Island and in New York City to facilitate 9,000 MW of offshore wind.
- **Multi-port infrastructure:** The State should promote multi-port infrastructure investment to support and facilitate the growth of the offshore wind industry in New York. Future offshore

wind solicitations should continue to include a multi-port strategy and a requirement for offshore wind generators to partner with any of the prequalified New York ports to stage, construct, manufacture key components, or coordinate operations and maintenance activities.

- **Education:** The State should continue engagement, outreach, education, and support for local municipalities, communities, and residents to improve acceptance of energy delivery projects.

E8. Improve Reliability Planning and Markets

Generation resources combined with the transmission and distribution systems, control centers, and wholesale markets provide a continuously operating, reliable system to service New York's electric needs. All of these elements will need to make the transition and come together effectively to provide continuity of a reliable power system, while implementing the goals and requirements of the Climate Act. A flexible grid also necessitates an interconnected digital system passing data back and forth, which increases cybersecurity vulnerabilities and risks. These vulnerabilities and risks must be identified and mitigated.

During the grid transition, several reliability challenges must be successfully managed; these challenges include the variety of resource and resource attributes and the anticipation of changing load needs and patterns. Continual study of needs through the NYISO's Comprehensive System Planning Process and expansion of the transmission system to relieve constrained generation pockets will be needed to help increase electric grid reliability during the transition.

With a supply mix increasingly composed of intermittent generation resources, the grid will face unprecedented challenges to remain resilient to weather events regardless of the location of supply resources. The current system is heavily dependent on existing fossil fueled resources to maintain reliability. To ensure reliability and that generation is available when needed, fossil fuel plants have dual fuel capability utilizing oil as a backup fuel during periods of high gas and electric demand. To replace these units, dispatchable and zero-emission resources will be needed to balance the system and must be significant in capacity, be able to come online quickly, and be flexible enough to meet rapid, steep ramping needs.

The importance of developing large amounts of dispatchable generation is echoed in the Power Grid Study, Pathways Study, and NYISO Grid in Transition and Climate Change Study. Energy storage is one such resource that can provide benefits on the supply side at the generation level by providing dispatchable, flexible capacity, which results in lower generation costs and increased system reliability.

Energy storage can also provide benefits on the demand side at the customer level by providing flexibility and resiliency benefits for consumers through demand response and backup power supply. In addition, markets that incentivize resources with the desired attributes, provide optimal reliable grid management, and are sufficiently flexible to allow for technology innovation will help achieve the Climate Act requirements, while ensuring benefits for, and reduced impacts on, Disadvantaged Communities. This requires several forward-looking market designs that send the correct price signal at the appropriate time. Effective markets can help to actively facilitate the clean energy transition while supporting reliability and removing barriers to clean energy deployment.

The CJWG generally supports the call for continued efforts to ensure reliability and improve resiliency to extreme weather events and climate change but suggests that the NYISO and its processes should be more transparent and information better disseminated with local energy advocates. It also suggests that there is a need to address extreme heat vulnerabilities beyond overcapacity to the grid, such as water demand for cooling of power plant systems, the declining efficiency and reduced output from combustion turbines and combined-cycle plants during high temperatures, and the expansion of metal in power lines as a result of extreme heat that results in sagging power lines and an increased risk of tree strike-related fires. Furthermore, the CJWG posits that investments in storm hardening infrastructure must be first implemented in historically overburdened Black and brown communities, since these communities have less access to cooling for summer storms, heating for winter storms, transportation, or savings.

Components of the Strategy

Planning and Analysis of Needs

- **Continual evaluation:** The State should conduct established biennial evaluations to assess the state of bulk power system reliability in consultation with the federally designated electric bulk system operator (NYISO) and the New York State Reliability Council. These evaluations should ascertain if any program adjustments are needed to ensure continued safe and adequate electric service. They should be informed by the review of the State's power system performance in conformance with established operations requirements and by relevant studies including the NYISO's Reliability Needs Assessment and the NYISO 2021-2040 System & Resource Outlook.
- **Assessing climate change impacts:** Power system studies and planning should consider analyses to integrate climate change impacts as needed for reliability and resiliency. Studies should reflect that risks and reliability challenges will change over time due to the impacts of climate change and the changes to the power system.

Resiliency

- **Infrastructure investment:** The State should continue efforts to ensure reliability and resiliency of the electric grid to be able to withstand the effects of extreme weather events, which will be exacerbated by climate change. This work should include continued infrastructure investment such as storm hardening, elevating equipment and substations, and moving lines underground. In addition, design criteria must change over time and must reflect the impacts of climate change as needed. Given the impacts of storms on communities, investment in community outreach to provide effective communication, and support from the time of storm preparation through restoration must be made.

Improving Grid Reliability through Markets

- **Market flexibility:** The State should work with the NYISO to update the market products, requirements, and technology standards needed to maintain reliability over time so that all resources can participate in the market, based on their attributes, to provide the products and services needed for reliability. Undue costs, including creating barriers to renewables, should not be imposed that would impair meeting the Climate Act requirements. Reliability needs and risks will change over time, and the markets should reflect these changes as well.
- **Market participation:** The State should work with the NYISO to expand wholesale market eligibility participation rules for new policy resources. The NYISO implemented the Co-Located Storage Resource Market Design, the first phase of a Hybrid Storage Model, where hybrid resources are allowed to participate as two separate resources located at the same site in December 2021. The NYISO is in the process of developing the next phase of the Hybrid Storage Model, which would allow for a more versatile "Aggregated" market design in to be completed in 2022. The NYISO should also make changes consistent with FERC Order 2222 requirements.
- **Wholesale market improvements:** The State should work with the NYISO to continue assessing opportunities to improve accuracy and granularity of wholesale market energy price signals, including shortage pricing, congestion relief, and peak/off-peak pricing. This should include the evaluation of the inclusion and valuation of ancillary market services in the context of integrating increasing quantities of renewable resources and other products.
- **Support flexible resources:** The State should work with the NYISO to adapt current ancillary service market designs and look to add products that are needed to incent flexibility as needed to efficiently integrate renewables. The NYISO supports markets for energy, ancillary services, and capacity. The fundamental relationship among these markets will likely need to evolve. For

example, more revenue will likely shift to ancillary service markets over time as system needs are reevaluated in the context of integrating increasing quantities of renewable resources. This should include proactive development of new products needed; however, these new products should be structured properly to reflect only current system needs so as to not cause unnecessary costs. A balancing act is needed between developing the products and services of the future while not implementing changes before they are needed.

- **Resource adequacy:** The State and the NYISO should examine all resource adequacy options and continue to improve resource adequacy contribution compensation, including the consideration of alternative market structures of procuring resource adequacy. In May 2022, the State and the NYISO were successful in advocating to FERC to ensure that buyer-side mitigation will not be applied to Climate Act resources and for alternatives that maximize access to the capacity market for public policy resources.[241] The State and the NYISO should investigate how best to include all resources in the capacity markets, with the goal of reflecting dynamic smart loads in resource adequacy. The State and the NYISO should continue to evaluate the capacity market value of all resource types so that resources are paid for capacity consistent with the value they provide to the grid as well as allow fair access to the capacity market for energy limited resources and accurately reflect the value of such resources especially as the need for grid flexibility grows over time.
- **Value environmental attributes:** The State should determine the most effective approach to incorporate environmental values in market pricing and/or in policy and investment benefit-cost analysis. There should also be consideration of improvements to current State programs to incentivize Climate Act resources through mechanisms such as Renewable Energy Certificates, Offshore Wind Renewable Energy Certificates, and storage solicitations. The State should consider changes and/or augmentation to the RGGI program to more fully reflect the cost and impact of emissions as represented in New York policy and consider if other changes are necessary in pricing in the wholesale markets to help achieve the Climate Act mandates, including a more rapid increase in renewable and storage build out and a transition of the fossil fleet. This assessment should consider the need for, and impact of such changes given the potential economywide program, as discussed in *Chapter 17. Economywide Strategies*. Finally,

[241] Buyer-side mitigation is a mechanism used in the capacity market that is intended to prevent bidders from artificially suppressing capacity prices. However, in practice, this can unintentionally favor fossil generators over clean resources. FERC Order is available here: https://elibrary.ferc.gov/eLibrary/filelist?accession_number=20220510-3099.

the State should consider a Clean Dispatch Credit for zero-emission, fully dispatchable assets that dispatch during peak load times.

- **Earnings adjustment mechanisms:** The PSC should initiate a generic proceeding for earnings adjustment mechanisms to review and evaluate how the existing mechanisms are working, lay the groundwork and create consistency across the utilities where it makes sense to do so, and consider additional earnings adjustment mechanisms related to the decarbonization and social equity goals of the Climate Act. This review should be done on a periodic basis, and earnings adjustment mechanisms should be adjusted as necessary to encourage the needed outcomes.

Support of Distributed Energy Resources and Demand-Side Opportunities

- **Demand-side opportunities:** The State should expand demand-side opportunities and opportunities for flexible resources. It is anticipated that demand response resources will play a more critical reliability role in the future as the grid becomes more electrified and the load shape shifts. Demand response can also supply some amount of needed system flexibility without emitting carbon which is consistent with the 100x40 Climate Act requirement. There should be a holistic evaluation of both wholesale and retail demand response programs to identify gaps and opportunities for new programs or program changes to meet the needs of a changing grid. As the grid evolves with State policy, it will become more important that incentives are adequate for the participation of flexible resources in the real-time energy market. An efficient real-time market can create opportunities for resources to compete and meet rapidly changing system needs. The NYISO is evaluating prospective changes to the energy market in the context of its Grid in Transition efforts.
- **Market access for Distributed Energy Resources:** The State should improve access for DERs and continue improvements to cost causation retail rate price signals through:
  - Continued promotion and improvement of the Value Stack compensation mechanism in the Value of Distributed Energy Resources proceeding
  - Continued innovation in demand-side management and DER programs, with a focus on expanding utility customer enrollment and performance
  - Continued promotion and improvement of Standby and Buy-back service rates
  - Increased deployment and efficient use of DER
  - Continued design and implementation of Distributed System Platforms and markets for DER products and services

- **Availability of information:** The State should enhance and augment the availability of public information to assist developers in making informed project development decisions.
- **Proactive advocacy:** Based on available resources, the State should fund expansion of the existing office and team within DPS that systematically focuses on proactive advocacy at NYISO and FERC to provide DPS with the necessary resources to ensure that wholesale markets and planning processes align with Climate Act requirements and support environmental justice concerns while also maintaining reliability. The expanded DPS office should focus on improved coordination with other essential State agencies including NYSERDA and DEC. The DPS office should also monitor the developments of FERC's recently created Office of Public Participation and work with both that office and its Environmental Justice senior advisor to assist and support increased participation by low-income New Yorkers at FERC.

E9. Advance Demand Side Solutions

Responsive demand presents an opportunity to optimize for the lowest system cost and most expeditious deployment of both clean supply and demand solutions by reducing the need for electricity, especially during peak hours. Peak demand hours occur when electrical power is provided for a sustained period at a rate significantly higher than the average supply level. Evaluating energy consumption on building load duration curves is a way to evaluate how consistently a building is using the energy it consumes and to provide a method to determine if there is an opportunity to implement peak demand saving strategies and reduce inefficient energy usage. As such, responsive demand should be analyzed and appropriately modeled as part of future generation and energy supply to allow for consideration of those modeled impacts on costs and timelines of power generation by decade and incorporation into system planning.

Reducing demand and creating demand flexibility can significantly reduce scope and costs of infrastructure buildout and will yield GHG reductions, criteria pollutant reductions, and health benefits in the near term by reducing reliance on high-polluting peaker facilities. Continuing to focus efforts on reducing the peak demand now will ensure that as we build out a clean electric grid, we do not build extra capacity of renewable generation assets to meet a higher peak demand and run the risk of those assets being underutilized. Energy efficiency improvements and load management can also help businesses reduce costs to all electric customers and help avoid dual-fueled peaking units from switching to oil during gas demand peaks.

Components of the Strategy

Planning and Analysis

- **Cost study:** DPS and NYSERDA, in consultation with utilities, should complete a study on avoiding or reducing grid upgrade costs through the use of demand response and geothermal, including district thermal systems, with a focus on LMI individuals and Disadvantaged Communities.
- **Data availability:** DPS, NYSERDA, and the NYISO should identify and make available key pieces of data needed for markets to facilitate the clean energy transition in real-time marginal, average emissions and/or zonal resource/fuel mix data, as needed from the NYISO and as defined by New York City and pertinent State agencies to facilitate cost-effective implementation of the Climate Act, Local Law 97, and to improve value of DER and demand response programs.[242]

Development of Standards and Tests

- **Appliance standards:** New York's Advanced Building Codes, Appliance and Equipment Efficiency Standards Act of 2022 enables NYSERDA, with DOS, to establish and enforce efficiency standards for appliances and equipment that are sold, leased, or installed in New York in order to promote energy reduction, water conservation, GHG reduction, and/or increased demand flexibility. NYSERDA should prioritize State and federal appliance standards and adopt State equipment standards (or advocate for the federal government to adopt standards) that require a universal, standardized communication protocol in electric and heat pump water heaters, space heating heat pumps, EVs, and in-home batteries.
- **Program participation:** The PSC and DPS should develop standards to enable "opt-out" programs rather than "opt-in." Demand flexibility programs that are designed as opt-out instead of opt-in should include standards to ensure customers will see savings on their bills.
- **Benefit-cost analyses:** The PSC should reopen the generic benefit-cost analysis proceeding to update costs and benefits, including Climate Act compliance costs (carbon and other environmental impacts), important non-energy benefits (such as localized health impacts and equity), and inclusion (or lack thereof) of customer cost contributions in order to accurately assess the true value of energy efficiency and demand response while complying with the Climate Act. This analysis should also consider the scenarios modeled in the integration analysis and

[242] A number of assumptions including for imports and exports from other regional transmission organizations and independent system operators must be determined.

discussed in *Chapter 12. Buildings* that describe the building improvements needed for widespread building efficiency and electrification and areas where backup sources of heat may be needed.

- **Equity of rules:** The PSC and DPS should ensure that energy storage does not face double rules and unfair charges. The State should consolidate its permitting rules for energy storage so they can be evaluated in one process. Utility commissions should reexamine their tariffs on energy storage resources and ensure they are applied fairly. In March 2022, the PSC issued an order adopting new Standby Service and Buyback Service rates that included the adoption of a limited exemption from Buyback rates for standalone energy storage systems. This order will help to further develop and grow the energy storage market in New York that will be necessary to enable the State's clean energy goals.[243] The PSC also issued an order directing the utilities to file revised Buyback and Standby Service Tariffs,[244] and those tariffs have been filed by the utilities.

Prioritize Under-Resourced Communities

- **Engagement:** Utilities should engage the community and partner with community-based organizations to learn about communities and identify needs and shared objectives.
- **Funding:** New funding should be directed toward low-income and Disadvantaged Communities and existing funds should be made more accessible.
- **Metrics:** In planning for a sustainable future, New York should work with communities to ensure appropriate metrics to track program success and partner with local governments to establish appropriate consumer protections.

Invest in New Technology

To achieve the 70x30 requirement, the focus should be on energy delivery, energy efficiency, and aggressive deployment of existing renewable energy and energy storage technologies. However, the 100x40 requirement presents significant challenges that cannot currently be met by the deployment of these existing technologies. Current studies identify that, even after full deployment of available clean energy technologies, there is a remaining need for 15 GW to 45 GW of zero-emission, dispatchable electricity generation capacity in 2040 to meet demand and maintain reliability, although that gap may

[243] Case 15-E-0751, *Order Establishing an Allocated Cost of Service Methodology for Standby and Buyback Service Rates and Energy Storage Contract Demand Charge Exemptions* (March 16, 2022).

[244] Case 15-E-0751, *Order Directing Standby and Buyback Service Tariff Filings* (March 16, 2022).

change over time depending on forecasted demand.[245,246] This calls for a focus on identifying and developing solutions for dispatchable technologies that can be called on as needed to balance supply and demand. In addition, these studies show a forecasted need of 111 GW to 124 GW in total generation capacity in 2040 as compared with the current electric system capacity of 37 GW in 2022. This equates to a three-fold increase in generating capacity between now and 2040.

E10. Explore Technology Solutions

Whether the answer is new long-duration storage technology or other new zero-emission, dispatchable technologies that may emerge due to RD&D efforts over the next two decades, the costs are likely to be high and aggressive action and smart planning will be necessary to make these fundamental shifts in our energy systems in the next two decades. While these actions will be costly, the health, societal, and economic benefits of the transition to clean zero-emitting technologies will be significant and the cost of inaction or insufficient action will far outweigh the costs of action. The utilization of technology solutions must be consistent with the requirements of Section 7(2) and 7(3) of the Climate Act in agency decision-making.

Moving forward, one technology focus is long duration energy storage. Achieving the Climate Act's high renewable energy, zero-emission electricity system will require substantial amounts of energy storage operating over various time scales – spanning from minutes to hours, days, weeks, and even longer – to maintain grid flexibility, reliability, and resiliency. When it comes to alternative fuels, while some have potential to serve as flexible and dispatchable resources, many are unproven at commercial scale. Of particular interest is to ensure historically overburdened communities do not see an increase in co-pollutants or reduction in air quality as a result of these alternative fuels. Therefore, further analysis, technical development, and research is needed in order to determine the feasibility and climate and health impacts of alternative fuels to ensure they provide net benefits.

Nuclear power generation is a complex technology with potential impacts on host communities as well as questions relating to the impacts of nuclear waste on health and the environment. Yet at the same time, nuclear generation provides a significant amount of baseload resources and is zero-emission, providing a

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[245] NYSERDA. 2021. "New York Power Grid Study." Albany. Accessed at https://www.nyserda.ny.gov/About/Publications/New-York-Power-Grid-Study.

[246] New York Independent System Operator. 2022. "2021-2040 System & Resource Outlook (The Outlook)." Albany. Accessed at https://www.nyiso.com/documents/20142/32663964/2021-2040_System_Resource_Outlook_Report_DRAFT_v15_ESPWG_Clean.pdf/99fb4cbf-ed93-f32e-9acf-ecb6a0cf4841.

complement to the increasing amount of variable generation renewables being added to the grid. Analysis should occur prior to the end of the Zero Emissions Credit program in 2029 to determine whether subsidizing any of the State's remaining nuclear reactors will be necessary for meeting the 100x40 requirement and/or whether more cost-effective and environmentally friendly alternatives are available. The analysis should consider the ability of nuclear to contribute to baseload and to meet reliability requirements, as well as cost, health, safety, community impact, and environmental concerns of nuclear power generation.

The CJWG supports the near-term focus on achievement of 70x30 via deployment of currently available solutions. However, it expresses strong concern about the promotion of some emerging technologies, including green hydrogen, RNG, biofuels, biomass, and waste-to-energy, which it contends can add more GHGs to the environment rather than less and can also lead to more localized pollution concentrated in environmental justice communities. The CJWG highlights the need for further research and consideration of life cycle GHG accounting and potential air quality and health impacts of these technologies prior to supporting demonstration projects. The CJWG also recommends a life cycle analysis of the environmental, health, safety, emissions, and environmental justice impacts of nuclear fuel be conducted and the State proactively plan for the scheduled shutdown of the four reactors upstate.

Components of the Strategy

Solutions for Dispatchable Technologies

- **Determine technologies and define zero-emission:** The PSC, in coordination with NYSERDA, DEC, and other agencies should identify, explore, evaluate, and support the development of dispatchable technologies and solutions as they emerge in support of the Climate Act's requirements for a zero-emission electricity system by 2040 and for consistency with Section 7(2) and 7(3) of the Climate Act. This should include a comprehensive analysis of the life cycle of GHG emissions, benefits (health, environmental, and economic), safety considerations, and costs of these technologies.
- **Modeling:** NYSERDA should conduct detailed, holistic, modeling within a zero-emission world. Modeling should include holistic integration of load, generation, and energy delivery and be flexible in the solutions chosen. While modeling is being completed, the State should move forward with known needs.
- **Support innovation and demonstration projects:** NYSERDA should act as a hub for technological innovation and convene stakeholders and conduct strategic research on new

renewable and storage project technologies. NYSERDA should work with a consortium including but not limited to the NYISO, utilities, developers, and solution providers to bring technologies to large-scale deployment faster and more cost-effectively. This includes support for utility-scale demonstration projects for new technologies, including storage and transmission and distribution.

- **Federal resources:** The State should advocate for and leverage federal and National Laboratory resources focused on identifying and commercializing advancements in transmission and zero-emission dispatchable long-duration storage solutions.
- **Market enhancements:** The State should continue market enhancements, such as adjusting capacity market valuation, market rules, and market incentives that better align the markets with the Climate Act to encourage the innovation that will support achievement of the 100x40 requirement. Market solutions for these dispatchable technologies, such as long-duration storage, are important to support investment, minimize the cost to consumers, and support reliability.
- **Long-duration energy storage:** NYSERDA should focus programs and funding on research and demonstration projects for the development of large-scale and longer-duration storage. The State should develop and expand a Storage Center of Excellence so that new technologies can be matured and deployed on the grid for large-scale testing as well as attract and engage relevant parties in collaborative efforts to address the challenges unique to long-duration storage.

Alternative Fuels

- **Prioritization:** During planning, the State should prioritize zero-emission resources (such as storage, energy efficiency, and renewable energy) where feasible when considering the need to meet demand for end uses, technology limitations, GHG emission impacts, and costs. Green hydrogen and RNG should be targeted to strategic uses or when needed for safety, reliability, resilience or affordability and should demonstrate air quality, health and life cycle GHG benefits including avoiding localized pollution in Disadvantaged Communities before implementation.
- **Analysis of impact:** Further analysis, technical development, and research is needed in order to determine the feasibility, climate impact, and health impacts of alternative fuels prior to infrastructure investment. Technological innovation, development, and scaled deployment is needed in order to prove the effectiveness and economics of the technologies. Specifically, RD&D strategies should include:
  - Rigorous energy, GHG, and environmental sustainability guidelines and metrics for RNG and green hydrogen. Priority utilization should be provided for feedstocks with the lowest GHG emissions, with strong preference given to zero- or negative-emission sources

- Analysis of the potential air quality and health impacts of producing and using these fuels and best practices or end uses to minimize these impacts, including research into mitigating localized impacts in Disadvantaged Communities
- Evaluation of the safety of green hydrogen storage and pipeline operation
- Research on emissions controls that reduce/eliminate emissions (e.g., NO_X from hydrogen combustion) and research on emissions (leaks) of hydrogen and associated climate impacts
- The potential for negative or positive impacts on other economic sectors, such as waste management or agriculture

Nuclear Generation

- **Evaluate the future role of nuclear generation:** The State should evaluate the role of existing nuclear reactors within the 100x40 requirements as part of policy actions needed prior to the cessation of the State's Zero Emissions Credit program in 2029, and also include the time needed for potential federal and State relicensing of these facilities and the time to determine refueling options for the different reactors.[247] In addition, the State should consider the potential contribution of advanced nuclear technologies in achieving 100% zero-emission electricity by 2040. Advanced nuclear reactors may provide a way to develop and deploy new nuclear resources faster, at lower cost, with improved safety mechanisms and with lower residual nuclear waste,[248] but this potential has not been demonstrated and must be carefully and rigorously evaluated. Within this evaluation, the State should analyze the expense, health, safety, security, opportunity costs, community impact and environmental impacts of nuclear power generation, including but not limited to, fuel mining and production, nuclear waste disposal and site remediation.
- **Public input:** If public policy mechanisms are proposed for the continuation of nuclear power generation, effective mechanisms for input and comments by stakeholders and the public should be implemented to include but not be limited to representation from customers, environmental interests, environmental justice communities, labor, local communities, and indigenous communities.

[247] U.S. Nuclear Regulatory Commission. 2022. "Reactor License Renewal Process." Accessed at https://www.nrc.gov/reactors/operating/licensing/renewal/process.html.

[248] 42 U.S. Code § 16271