



2024

**INTEGRATED RESOURCE PLAN
PROGRESS REPORT**



Seattle City Light

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EXECUTIVE SUMMARY

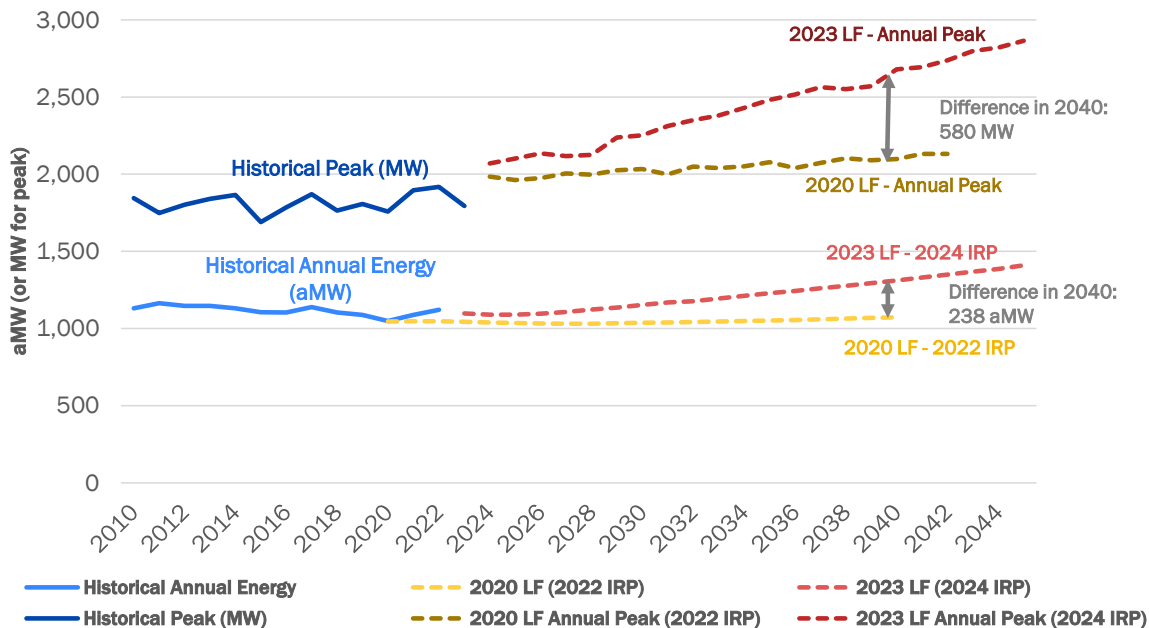
Seattle City Light (City Light) is a municipally owned utility serving the electric load of Seattle and surrounding areas. Since the last full Integrated Resource Plan was published in 2022 (“2022 IRP”), City Light has seen average as well as peak loads increasing in both winter and summer months, setting 30-year record high loads in December 2022 and again in January 2024. At the same time, City Light has faced extreme conditions that have limited generation from City Light’s owned hydroelectric projects and caused spikes in regional wholesale energy prices.

The 2024 Integrated Resource Plan (IRP) Progress Report (“2024 IRP Progress Report”) is an update to the 2022 IRP¹ that addresses changes in customers’ power needs, existing power supply, and assumptions on new energy

resource technologies and costs over the 22-year period 2024 through 2045. The analysis presented in this report indicates an increased need to acquire energy resources to serve growth in customers’ power needs.

The three load forecasts used in the most recent resource plan filings (2022 IRP, 2024 Demand Side Management Potential Assessment [DSMPA]², 2024 IRP Progress Report) show increasing load growth, reflecting the changes to City Light’s customer base from economic and population growth as well as technology electrification. Figure 1 shows the changes between the load forecast used in the 2022 IRP and the load forecast used in this 2024 IRP Progress Report with the difference of 238 aMW of energy needs and 580 MW of peak needs in 2040.

Figure 1. Load Forecast



¹2022IntegratedResourcePlan.pdf (seattle.gov)

²The 2024 DSMPA outlines the estimated magnitude, timing, and costs of potential resources in City Light’s service territory during the period of 2024-2045. The report identifies the cost-effective potential of energy efficiency, customer-sited solar photovoltaics, and demand response across the residential, commercial, and industrial sectors. <https://www.seattle.gov/documents/Departments/CityLight/DemandSideManagementPotentialAssessment.pdf>

These forecasts reflect the current landscape of the city, state, and federal policies that have collectively served to accelerate the adoption of electric technologies over their fossil fuel-based alternatives, including the City of Seattle Building Energy Performance Standards bill, state policies like the Zero-Emission Vehicle Standard, and the federal Inflation Reduction Act. Vehicle and building electrification adoption result in load peaks growing faster than the annual energy. Winter peaks continue to be the driver of the utility's need to acquire additional resources for load service.

Additions to City Light's portfolio of energy resources are necessary to serve growth in customers' power needs as a result of vehicle and building electrification for the study period of 2024 to 2045. Table 1 compares the type and volume of resource additions identified through the 2022 IRP and 2024 IRP Progress Report. The 2024 IRP Progress Report identifies 1,825 MW-nameplate additions of new resources in the first 10 years of the planning horizon (2024-2033) compared to 400 MW-nameplate additions for the first 10 years of the 2022 IRP's planning horizon (2022-2031).

Table 1: Comparison of Resource Additions in 2022 IRP v 2024 IRP Progress Report³

	2022 Full IRP			2024 IRP Progress Report		
New Resource Additions (Nameplate-MW, unless noted)	2022 – 2031	2032 – 2041	TOTAL	2024 – 2033	2034 – 2043	TOTAL
Battery	-	-	-	200	-	200
Solar	175	0	175	375	-	375
Solar + Battery	-	-	-	50	25	75
Wind	225	50	275	1,100	100	1,200
Enhanced Geothermal	-	-	-	100	300	400
Offshore Wind	-	-	-	-	100	100
Wholesale Resource Subtotal	400	50	450	1,825	525	2,350
Energy Efficiency (aMW)	85	31	116	80	49	129
Customer Solar Programs (aMW)	4	4	8	12	21	33
Time of Use Program (MW)	-	-	-	7	8	15
Demand Response (MW)	79	43	122	19	17	36
Total	568	128	696	1,943	620	2,563

³ This table includes data through 2043 to keep the year intervals (10-year periods) consistent with the 2022 IRP. Other results in this report include data through 2045.

THE FINDINGS ABOVE CULMINATE IN FOUR KEY TAKE-AWAYS:

1. City Light has experienced **increasing levels of load growth** across the three prior resource plans (2022 IRP, 2024 DSMPA, 2024 IRP Progress Report), showing the changes happening to its customer base from economic and population growth and transportation and building electrification.
2. While the increased load has **increased City Light's resource adequacy needs** in all evaluated months, transportation and building electrification has had an outsized impact on **projected winter peaks**.
3. Meeting future electricity needs requires **adding wind, solar, batteries, and enhanced geothermal** to City Light's portfolio.
4. City Light will continue to evaluate **carbon free, firm resource options** that can reliably respond to changes in demand including additional hydropower, enhanced geothermal, small modular reactors, hydrogen, fusion, and other emerging technologies.



INTRODUCTION

IRP LEGAL REQUIREMENTS

Washington law (RCW 19.280) requires all electric utilities with more than 25,000 customers to develop comprehensive resource plans that identify strategies to meet their customers' electricity needs in the short and long term.

Seattle City Light is required to file an IRP, which is either a progress report due every two years or an updated IRP due every four years. Progress reports reflect changing conditions and provide updates on the progress of IRPs, whereas IRPs are comprehensive resource plans that explain the mix of generation and demand-side resources the utility plans to use to meet its customers' electricity needs over the period covered in the plan. City Light produced its last full IRP in 2022 and will produce the next one in 2026.

City Light has provided its customers with reliable, affordable, and environmentally responsive clean energy since 1910. As the utility plans for the future, it must account for growing power supply demands from its customers, while prioritizing emissions reductions. This will ensure an equitable clean energy transition for all customers served.

With shared environmental values, City Light and the residents of Seattle continue to promote balancing power supply demands with environmentally friendly power supply resources required to meet those needs. City Light is a consistent voice for generating electricity with renewable or non-emitting resources and for promoting energy efficiency with its customers. It strives to limit negative impacts on the environment and reduce the need for costly new power generation. Since 2005, City Light has operated as Greenhouse Gas (GHG) neutral—the first electric utility in the nation to achieve that distinction.

City Light's 2022 IRP outlined how the utility will meet anticipated customer needs under changing market dynamics, evolving policies, and future uncertainties over the period of 2022 to 2042. These considerations ranged from the evaluation of energy efficiency potential and new resource opportunities to ensure reliability, environmental stewardship, and compliance with Washington state-mandated clean and renewable resource requirements. Long-term energy resource planning requires a constant review of conditions that affect power supply needs, costs, and risks. As such, City Light drafted this 2024 IRP Progress Report to provide an update on topics covered in the 2022 IRP, covering the period of 2024 to 2045.⁴

⁴ In some instances, the presentation of results within the report summarizes for reporting intervals consistent with the 2022 IRP and regulatory filing templates. However, the study period is 2024 to 2045 and there are conclusions drawn from the full study period.



The 2024 IRP Progress Report was created as part of good utility practice and developed with guidance from the Mayor of Seattle, Seattle City Council, and Washington state law, including the Energy Independence Act (I-937) and the Clean Energy Transformation Act (CETA).

The 2024 IRP Progress Report updates the following from the 2022 IRP:

- Load forecast and resource adequacy needs.
- Demand-side resource options (incorporating the results of the 2024 DSMPA).
- Supply-side resource options and prices.

CURRENT RESOURCE PORTFOLIO

City Light has cultivated its existing resource portfolio to be among the cleanest and lowest cost in the nation. This portfolio includes many past investments in energy efficiency, City Light–owned hydropower resources, existing hydropower and renewable contracts from regional partners, and wholesale market purchases. Energy efficiency programs have helped to reduce City Light customers’ energy use, and the 2022 IRP, 2024 DSMPA and 2024 IRP Progress Report plan for the continued utilization of energy efficiency, customer solar, and demand response programs as resources to meet customer power needs. The locations of City Light’s resources are shown in Figure 2.



City Light’s generation mix remained roughly the same as in the 2022 IRP, with the majority coming from hydropower and a relatively even split between owned and contracted generation. Additionally, City Light has continued its participation in the wholesale power market and regional planning committees, including the Western Energy Imbalance Market (since 2020) and the Western Power Pool.

Figure 2. City Light’s Generation and Contracted Resources

ENERGY RESOURCES

- **Owned Hydro**
- **Treaty Rights From British Columbia**
- **Long-Term Hydro Contracts**
(CBH is the Columbia Basin Hydropower)
- **Other Long-Term Contracts**



City Light’s power resources are typically 90% hydropower and approximately 50% of that is supplied by four hydroelectric projects owned and operated by the utility. Most of the remaining hydropower is purchased from the Bonneville Power Administration (BPA), a nonprofit federal power marketing agency. Beyond generating hydropower, City Light has the responsibility to operate its hydroelectric projects for flood control, fish management, and reservoir recreation. Additionally, in coordination with City Light, Seattle Public Utilities operates two projects for municipal water supply. City Light’s power mix for 2022 is shown in Figure 3.

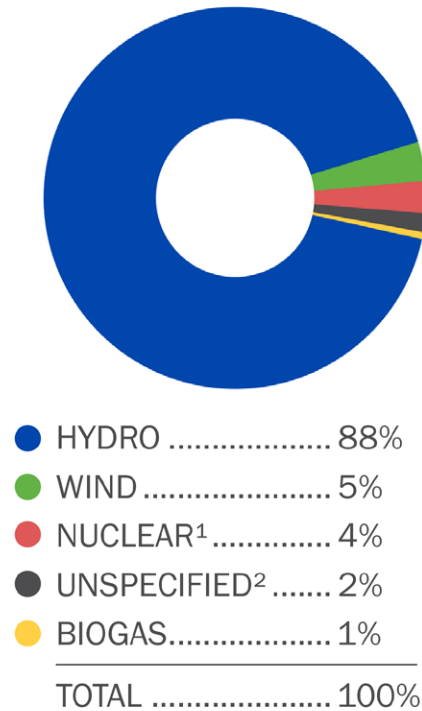
The following sections summarize the City Light–owned generation and power purchasing contracts. For full details on these items, please see the 2022 IRP. Table 2 lists each resource, its generation in 2023, and for contracted resources, when the contract is set to expire.

City Light–Owned Generation

City Light owns several generation resources, all of which are hydropower:

- The **Boundary Dam**, located on the Pend Oreille River in northeastern Washington, is City Light’s largest resource. The dam has a peaking capability slightly above 1,000 MW and an average annual generation of approximately 418 aMW. Under an agreement between City Light and the Pend Oreille County Public Utility District No. 1 (PUD), City Light provides a portion of the output of the Boundary Dam to Pend Oreille PUD through the end of the current license.
- The **Skagit Project** includes the Ross, Diablo, and Gorge Dams in the North Cascades. This triple-cascaded project is located on the Skagit River in Whatcom, Skagit, and Snohomish Counties. These dams have a combined one-hour peak capability of about 700 MW at full pool with generous storage capacity, but they have significant operational constraints for fish management. Their average annual generation is approximately 274 aMW.
- **South Fork Tolt Reservoir and Dam** is located 16 miles upstream from the City of Carnation on the South Fork Tolt River in King County. This project is jointly operated with Seattle Public Utilities to provide drinking water to the metropolitan Seattle area. The project has a one-hour peaking capability of less than 17 MW and average annual generation is approximately 6 aMW.
- **Cedar Falls Dam** is located in King County. This was City Light’s first hydroelectric plant and the nation’s first municipally owned hydroelectric plant. This project is jointly operated with Seattle Public Utilities to provide drinking water to metropolitan Seattle area. The project has a capacity of 30 MW and average annual generation is approximately 8 aMW.

Figure 3. City Light’s 2022 Power Mix



¹ This fuel represents a portion of the power purchased from BPA.

² City Light does not have coal or natural gas resources in its power supply portfolio. It does make market purchases to balance or match its loads and resources. These purchases, along with market purchases made by BPA, may incidentally include coal or natural gas resources, which are assigned to the utility. Any emissions associated with unspecified market purchases are offset through our GHG neutrality policy.

City Light Power Purchase Contracts

City Light also has numerous power purchase contracts with different entities:

- **The BPA contract** allows City Light to receive power from 31 hydroelectric projects and several thermal and renewable projects in the Pacific Northwest. The energy is delivered over BPA's transmission grid.
- **The High Ross Agreement** is an 80-year treaty with the Canadian Province of British Columbia. City Light ended plans to raise the height of Ross Dam in exchange for power purchases from British Columbia Hydro (acting through its subsidiary Powerex).
- **The Seven Mile Encroachment** contract associated with the High Ross Treaty allowed BC Hydro to raise the Seven Mile Reservoir, which reduced the output at Boundary Dam due to encroachment on the tailrace. Under this agreement, BC Hydro returns or pays for the energy that would otherwise have been generated at Boundary Dam if Seven Mile Reservoir had not been raised.
- **The Lucky Peak Project** is a hydropower project located near Boise, Idaho, where City Light has power purchase contract rights to Lucky Peak output (approximately 34 aMW annually) until 2038. City Light occasionally enters into energy exchange agreements to exchange the weather-driven output of the project for firm energy. For the period studied in this 2024 IRP Progress Report it was assumed that output of the Lucky Peak Project is used to serve load directly without exchanges.
- **The Priest Rapids Project** consists of two dams; Priest Rapids Dam and Wanapum Dam. City Light purchases power from this project under two agreements with Grant PUD, which owns and operates the project.
- **The Columbia Basin Hydropower contracts** comprise power from three hydroelectric projects. The projects are owned by three irrigation districts, so electric generation is mainly in the summer months. Two contracts that were previously part of this group have expired (Eltopia Branch Canal and RD Smith).
- **The Columbia Ridge Landfill Gas Project** is a 20-year power purchase agreement with Waste Management Renewable Energy, LLC to purchase approximately 12 aMW each year from its landfill.
- **The King County West Point Treatment Plan Project** is a 20-year power purchase agreement that began in February 2010 with King County to purchase the output from a methane gas-producing digester at the wastewater treatment plant in Discovery Park.





Table 2. City Light's 2023 Energy Resources⁵

Resource	2023 Energy Produced (MWh)	% of Grand Total	Year Contract Expires
Owned Generation			
Boundary	2,851,570	29.5	-
Gorge	726,576	7.5	-
Diablo	551,388	5.7	-
Ross	413,109	4.3	-
Cedar Falls	25,809	0.3	-
South Fork Tolt	30,432	0.3	-
Total Owned	4,598,884	47.66	-
Contracts			
BPA Block	4,039,150	41.8	2028
Priest Rapids	19,221	0.2	2052
Columbia Basin Hydro	249,373	2.6	2025–2027
High Ross	303,454	3.1	2066
Seven Mile	9,258	0.1	2066
Lucky Peak	332,046	3.4	2038
Columbia Ridge	78,333	0.8	2028/2033
King County WW	7,215	0.1	2033
Condon Wind	33,991	0.4	2028
Total Contracts	5,072,041	52.5	-
Grand Total	9,670,925	100.0	-

⁵ In April 2024, City Light recently executed two solar power purchase agreements for 47 MW and 40 MW. These projects are expected to start operations March 2025 and December 2025 respectively. These projects are not included in the current resource portfolio analysis since the contracts were not executed at the time the analysis was completed.

Figure 4 presents the balance between City Light's load and resources using a month-hour graphic for the 2025 study period and Figure 5 shows the balance for the 2035 study period. For Figure 4 and Figure 5, the month-hour graphics show stacked area plots for the major components of City Light's power supply: owned generation, the existing BPA contract, and other contracts. The **green** area shows the expected power supply from a BPA contract during the simulated year, the **orange** area plot shows the expected power supply from other contracts and the **blue** shows median generation for owned generation for each month-hour of the simulated year. The **black** line is the median load expected for the month-hour depicted. The difference between load and generation is met with short-term purchases and sales in the wholesale power market (further discussion of City Light Wholesale Power Market Participation is below).

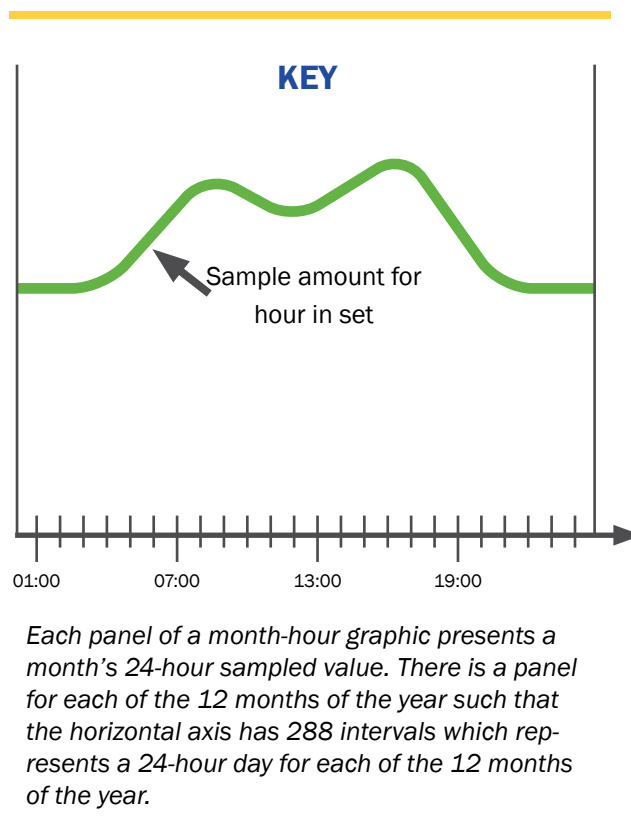


Figure 4. 2025 Simulated Load & Resource Balance (Current Resource Portfolio)

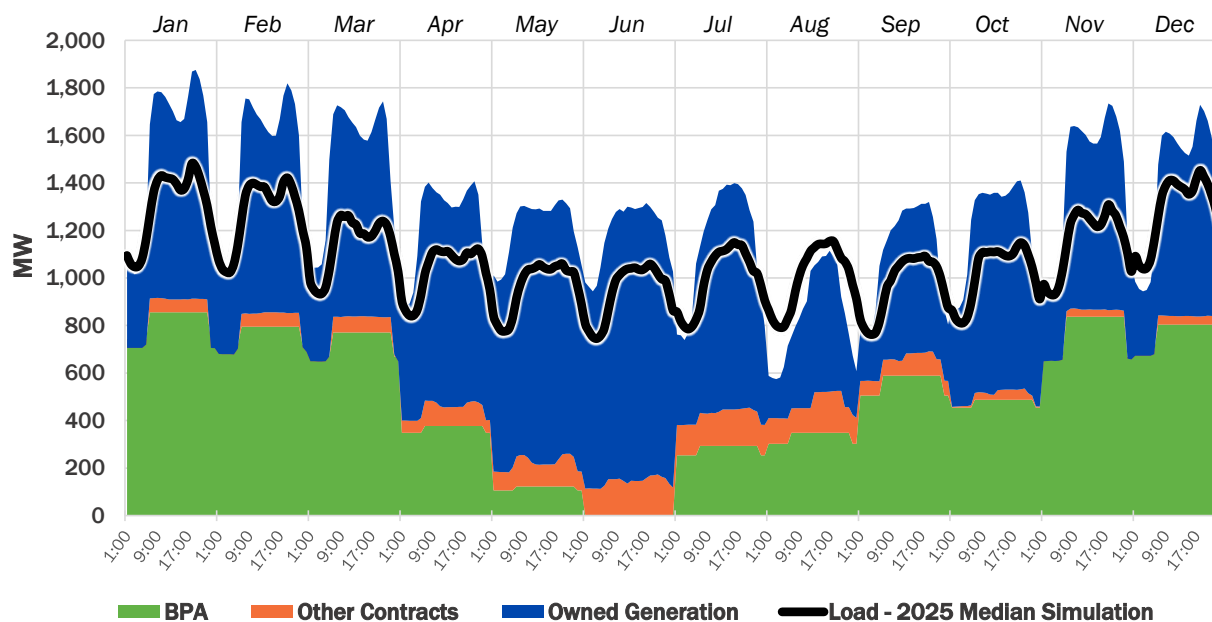
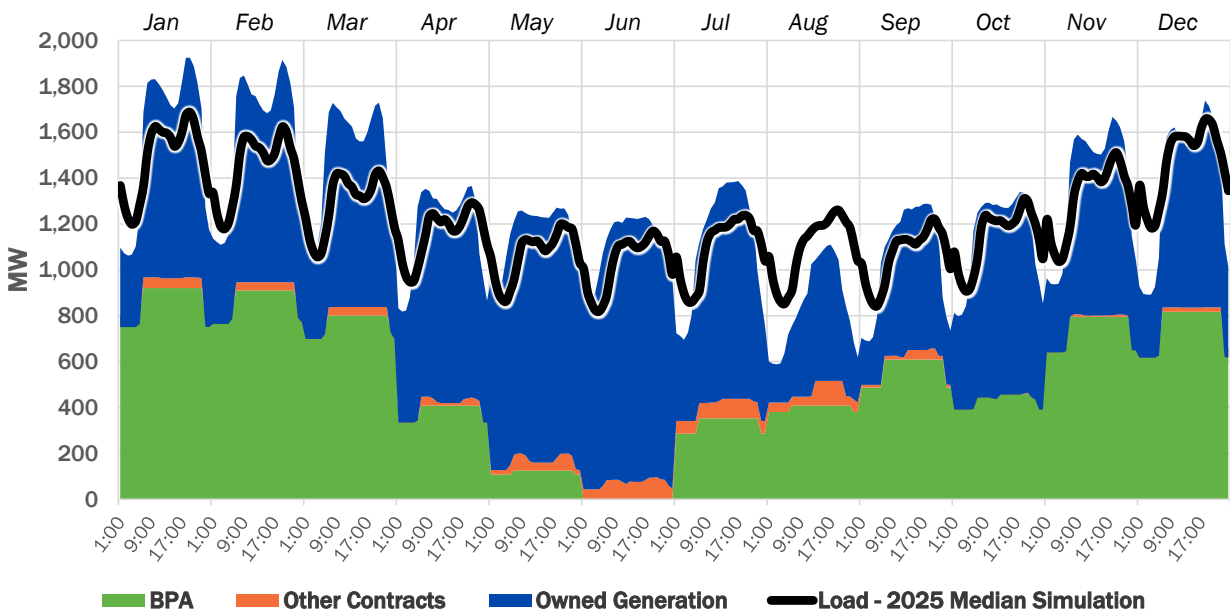


Figure 5. 2035 Simulated Load & Resource Balance (Current Resource Portfolio)



Demand Side Resource Programs

The demand side resources portfolio and conservation targets from the 2024 DSMPA were used as inputs for the 2024 IRP Progress Report. Table 3 shows City Light’s achievable economic potential conservation targets by sector from the 2024 DSMPA.

Table 3. Achievable Economic Potential Conservation Targets (aMW)

Sector	2-Year (2024–2025)	4-Year (2024–2027)	10-Year (2024–2033)	22-Year (2024–2045)
Residential	4	8	22	50
Commercial	12	23	49	72
Industrial	2	4	8	10
Total	18	35	79	132

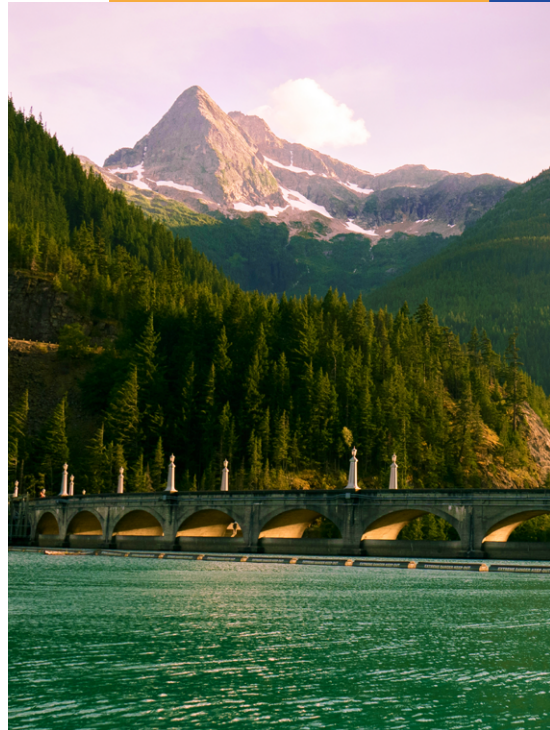
Table 4 summarizes demand side resources from the 2024 DSMPA used in the 2024 IRP Progress Report by program category and for the resource plan reporting intervals.

Table 4. Achievable Economic Potential of Demand-Side Resources

2024 IRP Progress Report				
New Resource Additions	2024-2028	2029-2033	2034-2043	TOTAL
Energy Efficiency (aMW)	43	37	49	129
Customer Solar Programs (aMW)	5	7	21	33
Time of Use Program (MW)	2	5	8	15
Demand Response (MW)	16	3	17	36
Total	66	52	95	213

City Light Wholesale Power Market Participation

City Light balances its energy portfolio to meet demand reliably and cost-effectively; a key component of that effort involves purchasing and selling power in the wholesale market. City Light engages in both bi-lateral transactions in the wholesale market as well as participates in the Western Energy Imbalance Market (WEIM) operated by the California Independent System Operator (CAISO). Participation in the wholesale market allows City Light to make purchases that supplement its existing resources and sell excess power to offset fixed costs, which is critical to City Light as approximately 90% of its current portfolio is hydroelectric. Hydroelectric output varies due to changing water conditions (e.g., season and year) and operating restrictions. Under average water conditions, City Light has surplus energy throughout most of the year that it can sell in the wholesale market. When hydropower is limited (typically December and mid-July to mid-September), City Light can purchase resources through the market to compensate for any deficit.



City Light's Participation in Regional Planning and Coordination

Coordinated regional planning of resources and transmission is important for building and maintaining a reliable grid. While there is not an overarching Regional Transmission Operator or Independent System Operator that covers comprehensive planning or management of reliability, resource adequacy, transmission, and ancillary services across multiple Western states, there are forums and programs where stakeholders come together to collectively address and plan for these items.

The Western Power Pool is a key contributor to this effort, coordinating regional reliability programs, including a Reserve Sharing Program, Western Frequency Response Sharing Group and the Western Resource Adequacy Program (WRAP). This work is particularly important to ensure that utilities are prepared to meet the evolving needs of their customers with a changing mix of resources as the region advances efforts to reduce carbon emissions associated with electricity generation and integrate additional renewables.

The WRAP tariff was approved by the Federal Energy Regulatory Commission in December 2022 and the first non-binding phase of the WRAP began in the 2022–2023 winter season. City Light plans to continue its status as a non-binding program participant until the program requires all participants to become binding, expected in 2028. City Light will be integrating the WRAP-assigned planning reserve margin into future capacity-based modeling and planning to ensure compliance and benefit eligibility as a participant in the WRAP.



TRANSMISSION

The majority of City Light's resources are delivered on BPA's transmission system. As the largest regional Transmission Provider, BPA has a comprehensive transmission planning process to ensure that it meets its customers' needs. As a participant in these planning processes, City Light plans to make the formal requests that RCW 19.280.030(1)(f) (ii) requires. City Light tracks and maintains its involvement with the planning processes to make sure that its transmission needs will continue to be met as the new resources become available.



LOAD FORECAST

The first step in assessing the need for additional resources is forecasting City Light's future electricity demand and establishing a target for the desired level of resource adequacy. To determine future electricity demand, City Light assesses how much total energy customers will likely consume over a period of time (load), the maximum amount they will likely consume instantaneously (peak demand), and how rapidly they are likely to change their instantaneous needs (flexibility or ramp).

The corporate load forecast completed in late 2023 represents the utility's best estimate for how its retail load will change over time. Consistent with many other utilities' load forecasts, City Light's load forecast is higher than previous versions primarily due to updated assumptions for the electrification of the building and transportation sectors. These assumptions reflect the current landscape of city, state, and federal policies that have collectively served to accelerate the adoption of electric technologies over their fossil fuel-based alternatives. The load forecast also factors in additional elements, including projected growth in population over the next two decades and the impacts of a changing and more volatile climate in our region.

Load Forecast Modeling Methodology



City Light has employed an end-use load forecasting approach since 2018, which includes load impacts from customers' adoption of technologies, such as customer-driven equipment efficiency trends, transportation electrification, customer solar, and building electrification (e.g., space and water heating, cooling). The forecast uses hourly load shapes and a probabilistic modeling framework to forecast future peak loads based on historical weather patterns, adjusted for gradually warming temperatures.

Load Forecast Results

As in the 2022 IRP, growth trends in electricity demand for the service area are expected to continue during the study period. Figure 6 shows a comparison of the most current system load forecast (2023, used in this 2024 IRP Progress Report) to the previous two forecasts, the 2022 load forecast (used in the 2024 DSMPA) and the 2020 load forecast (used in the 2022 IRP). Figure 7 compares the annual energy and peak load forecasts against the 2022 load forecast (the input for the 2024 DSMPA).

Figure 6. Annual 2023 Retail Load Forecast and Its Comparison with Previous Forecasts

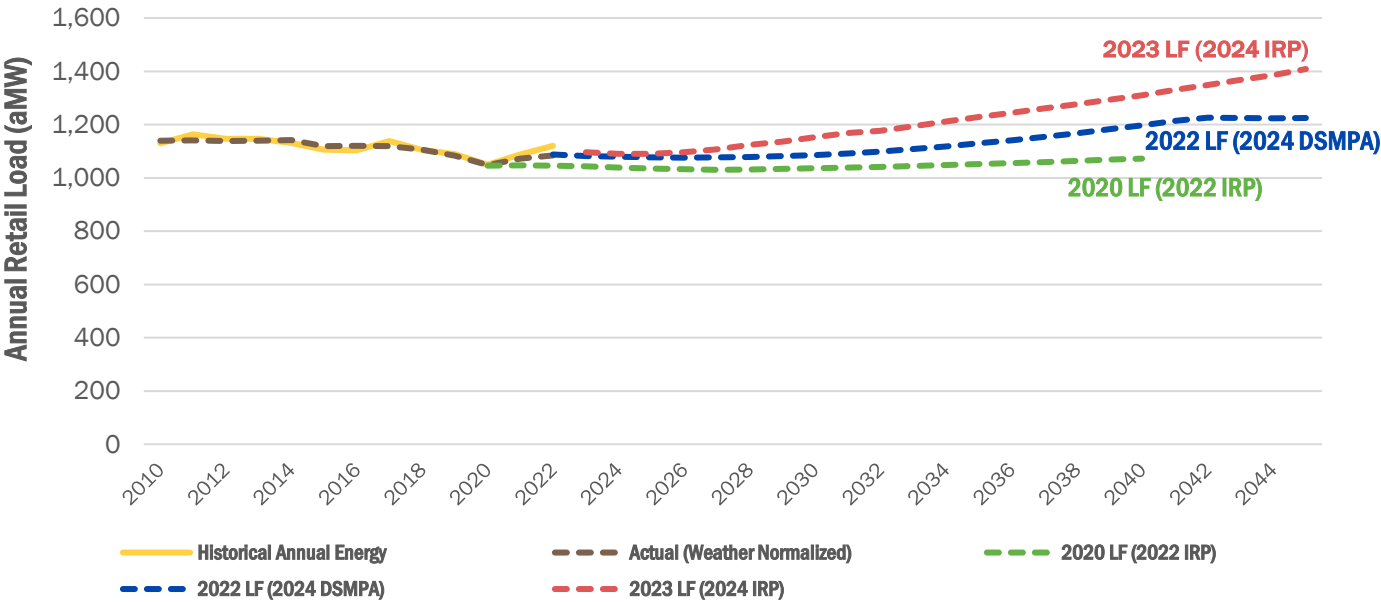
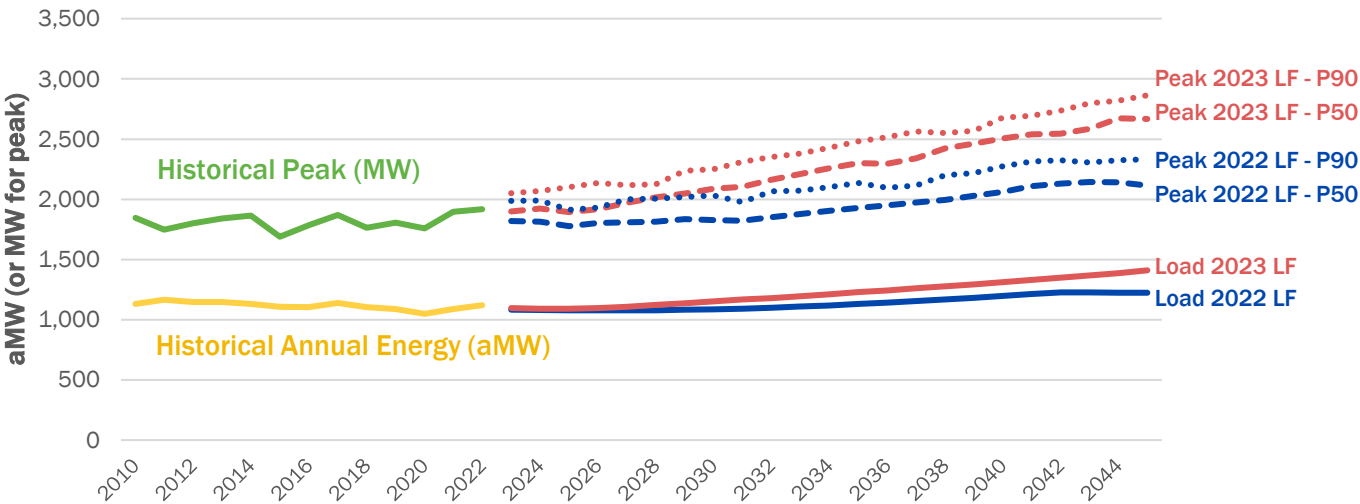


Figure 7. Annual 2023 Retail Load Peak Forecast and Its Comparison with Prior Forecast (MW)



Load Forecast Factors

Relative to previous IRPs, the load forecast used for this study period shows load growth at a faster pace due to EV and heat pump penetration, regulatory changes, building codes, and customer behaviors. Accounting for these dynamics using an end-use load forecast results in load peaks growing faster than the annual average energy.

Figure 8 and Figure 9 show the impact of transportation electrification (TE), air conditioning (AC), and building electrification (BE) for sample days in 2045 to illustrate changing dynamics during the study period. Cooling and low solar output due to clouds contribute to the summer peak on the July sample day shown in Figure 8, whereas space and water heating drives the winter peak for the December sample day shown in Figure 9. The box around hour 18 in Figure 8 and around hour 9 in Figure 9 depicts the peak hours.

Figure 8. Sample Summer Day Load Forecasts in Year 2045 (MW)

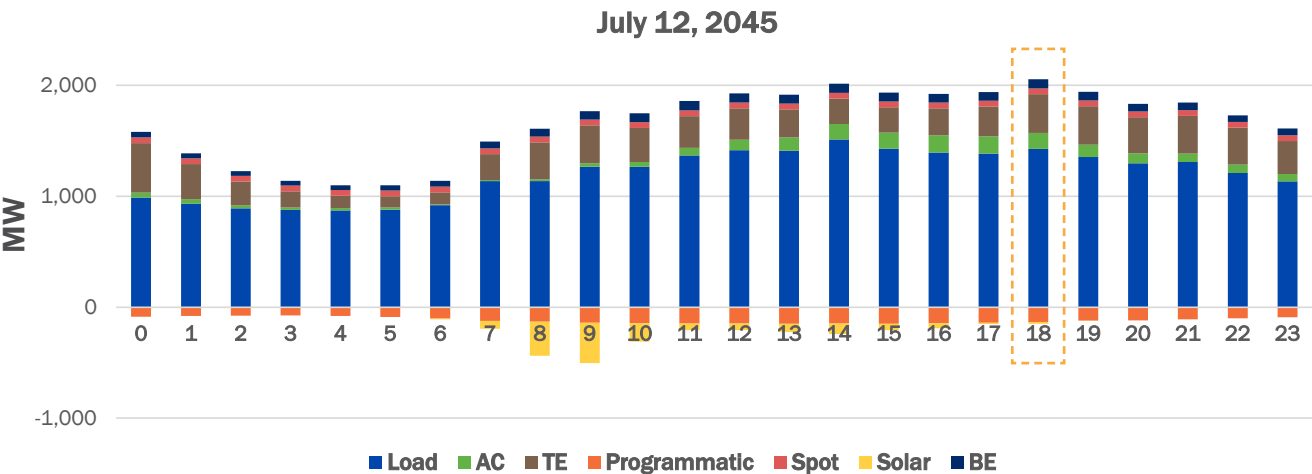
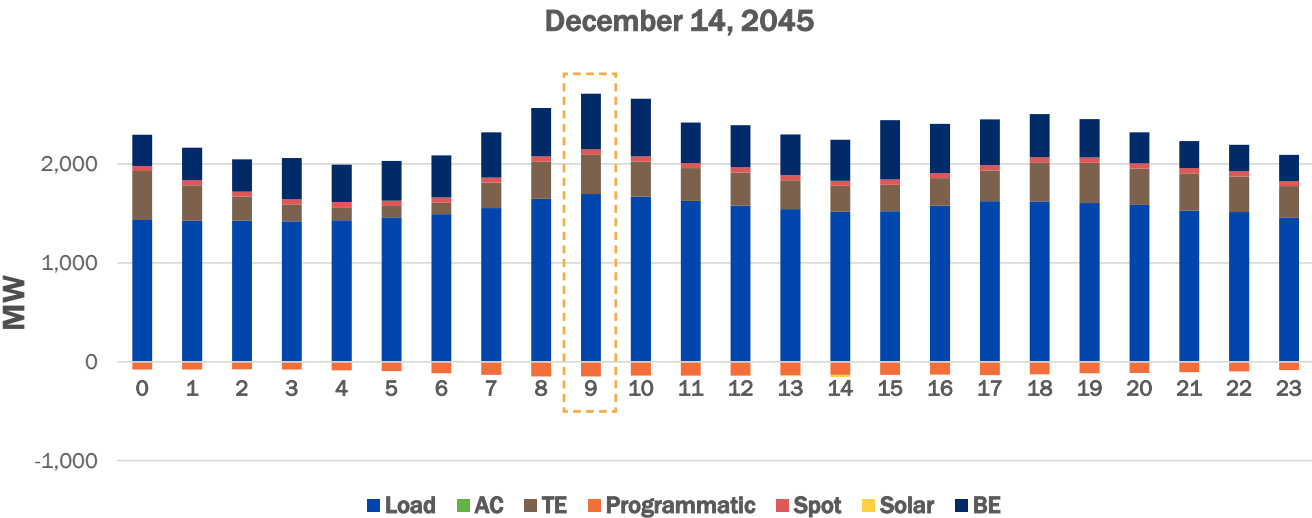


Figure 9. Sample Winter Day Load Forecasts in Year 2045 (MW)

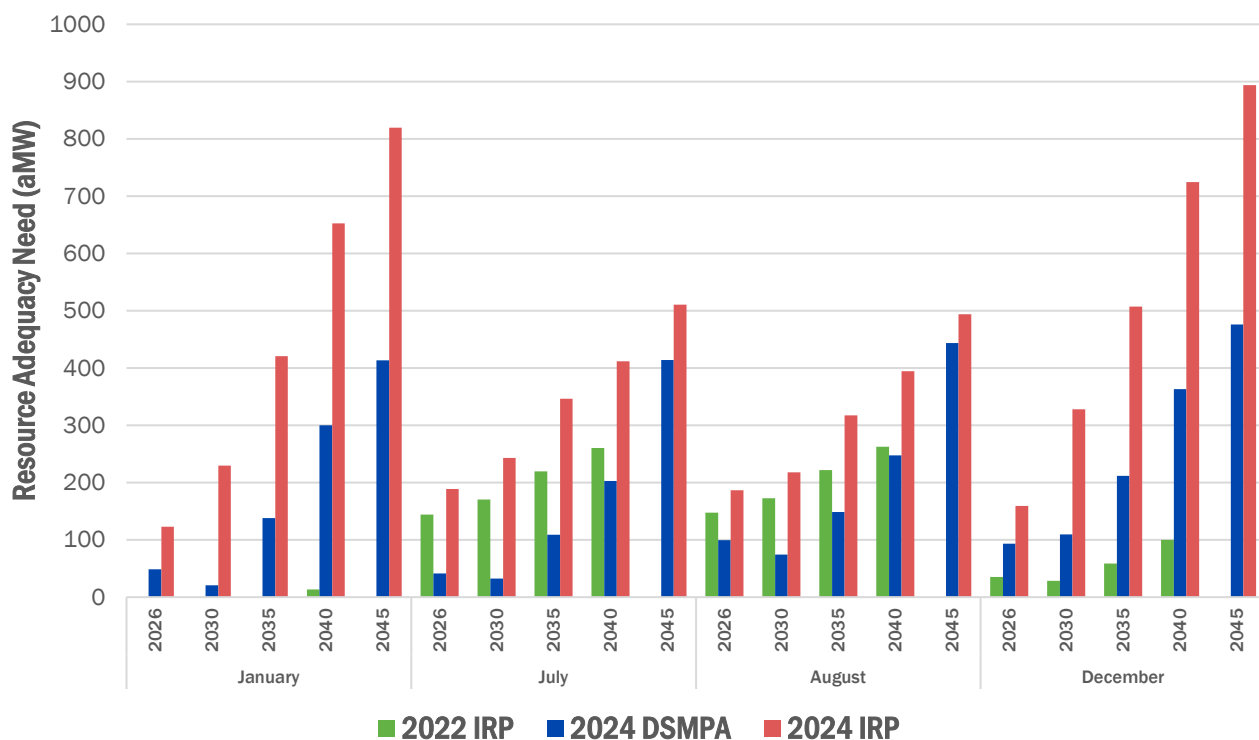


RESOURCE ADEQUACY

Through the resource planning process, City Light identifies future energy needs for the next 22 years based on the ability of its existing supply to meet future forecasted demand. To identify these energy needs, City Light performs a resource adequacy assessment and forecasts how much eligible renewable generation will be needed to comply with regulations. Ensuring adequate resources to meet customer power needs is an urgent and immediate challenge, which, if not addressed, could result in circumstances when there are not enough resources to serve customers. Figure 10 details the resource adequacy needs from the 2022 IRP, 2024 DSMPA and the 2024 IRP Progress Report.



Figure 10. Resource Adequacy Needs From the 2022 IRP, 2024 DSMPA and 2024 IRP Progress Report





City Light’s resource adequacy needs have increased, particularly in winter months, with the adoption of the latest corporate load forecast. Resource adequacy needs are calculated using an internally developed Monte Carlo hourly simulation optimization model that flexes hydro capability over five consecutive days, the Hydro Risk and Reliability Analyzer (HydRRA). HydRRA is the same resource adequacy model used in the 2022 IRP and the 2024 DSMPA.

The resource adequacy need is quantified as the energy needed to meet the City Light reliability metric of 0.2 Monthly Loss of Load Event (MoLOLEv) for each of the months of December, January, July, and August over 900 different simulations of supply and demand. The simulations reflect 30 different water supply years (1990 to 2019) affecting generation and 30 different weather years (1993 to 2022) affecting demand for electricity. The MoLOLEv metric has been City Light’s long-term planning resource adequacy metric since 2018, and it is equivalent to an average of two deficit events in 10 years for each month.

As illustrated in Figure 11, much of the future resource adequacy needs are driven by winter demand peaks. The MoLOLEv resource adequacy metric is sensitive to multi-hour (or even multiday) winter demand peaks.

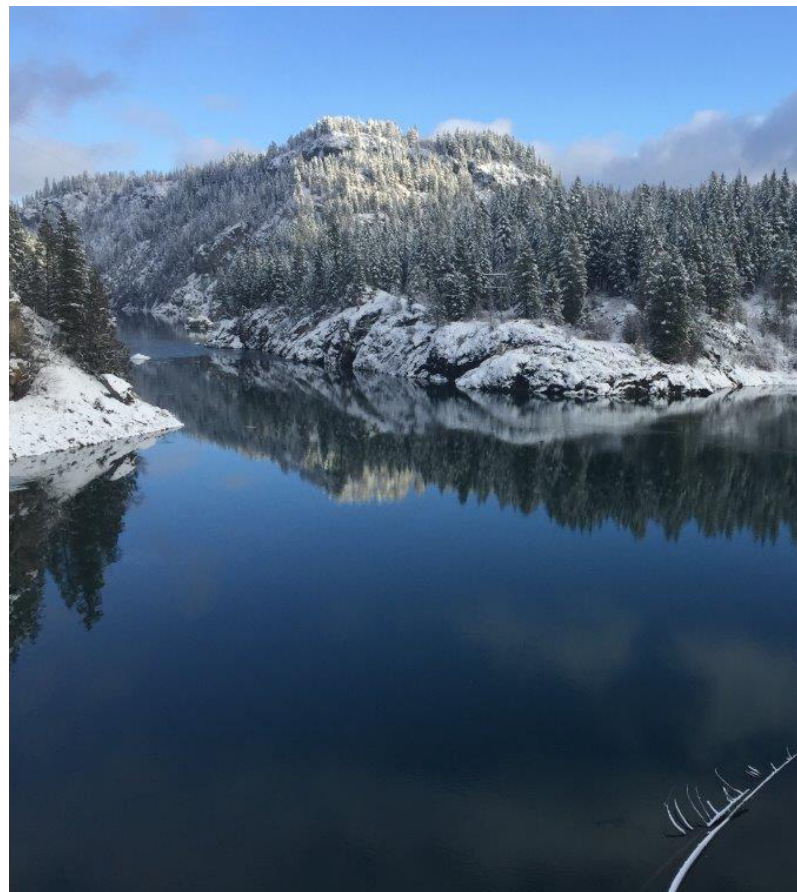


Figure 11. Comparison of Monthly P90 Peaks of 2022 IRP and 2024 IRP Load Forecasts





REGULATORY ENVIRONMENT

City Light's approach to the regulatory environment has remained relatively consistent since the 2022 IRP. The following sections summarize updates or changes to the treatment of compliance obligations in the resource plan. For more detailed summaries of the regulations, please see the 2022 IRP report.

I-937 Energy Independence Act

The Washington State Energy Independence Act, also known as I-937, requires electric utilities serving at least 25,000 retail customers to use minimum amounts of eligible renewable energy and fund cost-effective energy conservation. To comply with I-937 requirements, City Light used the Act's no load growth compliance option from 2019 through 2023. However, as a result of increased load due to continued growth in transportation and building electrification in City Light's service territory, it will likely use the Act's 15% target option starting in 2024. City Light updates the load forecast annually, and supply resource and regulatory planning will follow the load forecast and other applicable information.

Clean Energy Transformation Act (CETA)

In accordance with the CETA, City Light prepared two plans: Clean Energy Implementation Plan (CEIP) and Clean Energy Action Plan (CEAP). City Light submitted its first CEIP to the Washington Department of Commerce under CETA in 2022. The 2022 IRP outlined City Light's 10-year CEAP that allows City Light to meet its goals around reliability, affordability, and environmental responsiveness, while also complying with regulatory requirements and ensuring service equity. There have been no changes to this plan since the 2022 IRP.

CETA additionally requires utilities to consider the Social Cost of GHGs (SCGHG)^{6,7} when developing integrated resource plans and clean energy action plans. City Light's Seattle Area Resource Additions Advisor (SARAA) capacity expansion model evaluates whether, on a monthly basis, it is more cost effective to fulfill energy shortfalls with new supply- or demand-side energy additions, or to purchase electricity from the market. In this evaluation, market purchases are assumed to be unspecified and therefore have a SCGHG penalty added to the price. City Light updated the inputs to this model for the 2024 IRP Progress Report but did not change the SCGHG values.

Climate Commitment Act (CCA) and Clean Fuel Standard (CFS)

Washington's CCA and CFS, which were passed in 2021 and 2022 respectively, were not featured in the 2022 IRP. Impacts of the policies were incorporated into the 2023 corporate load forecast, which contributed to increased building and transportation electrification. No specific updates were made to the resource planning models used in the 2024 IRP Progress Report (HydRRA and SARAA) to address the CCA or CFS.

⁶ <https://www.utc.wa.gov/regulated-industries/utilities/energy/conservation-and-renewable-energy-overview/clean-energy-transformation-act/social-cost-carbon>

⁷ Revised Code of Washington related to IRPs that governs SCGHG methodology is 3a under 19.280.030

RESOURCE ADDITIONS

Meeting the electric needs during the study period requires the addition of new resources during the planning horizon. City Light used its SARAA capacity expansion model to select a resource portfolio that minimizes total portfolio costs while ensuring that City Light's portfolio requirements are met. SARAA is the same mixed-integer linear program used for modeling capacity expansion that was used in the 2022 IRP and the 2024 DSMPA. Table 5 summarizes the resource additions by category and reporting intervals consistent with the 2022 IRP and regulatory filing templates.⁸



Table 5. Resource Additions selected using SARAA by Category

2024 IRP Progress Report				
New Resource Additions (Nameplate-MW)	2024 - 2028	2029 - 2033	2034 - 2043	TOTAL
Battery	200	-	-	200
Solar	375	-	-	375
Solar + Battery	50	-	25	75
Wind	750	350	100	1,200
Enhanced Geothermal	-	100	300	400
Offshore Wind	-	-	100	100
Wholesale Resource Total	1,375	450	525	2,350

Supply-Side Resource Options

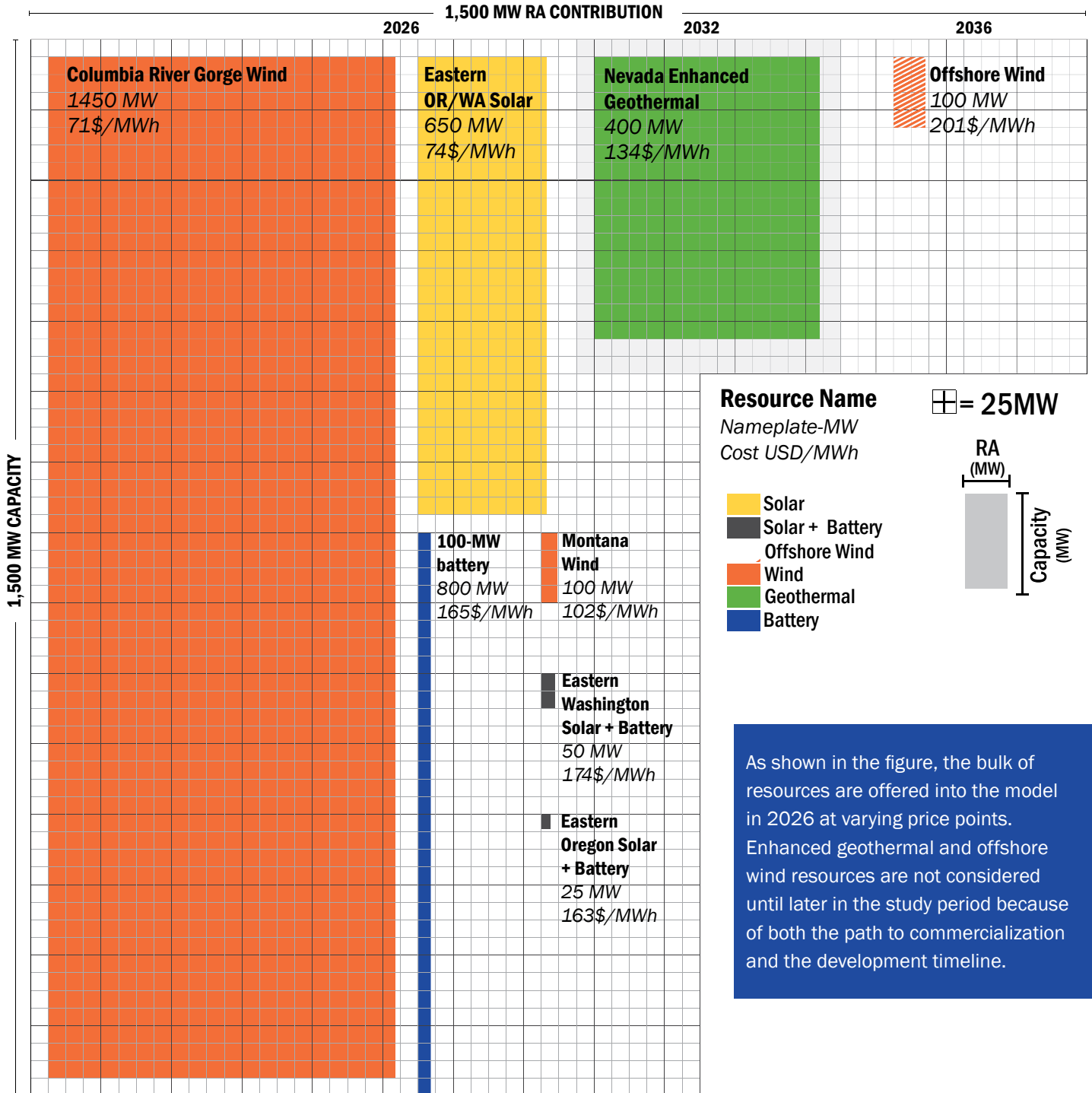
As part of the 2024 IRP, City Light considered several supply-side resources to supplement its planned demand-side resources identified in the 2024 DSMPA to meet its portfolio requirements over the 22-year IRP time horizon: 2024 through 2045.

The plan specifically studied utility-scale onshore wind and solar resources in eastern Washington and eastern Oregon, offshore wind off the northwest Oregon coast, and enhanced geothermal locations in the West. Figure 12 shows the resource inputs added to SARAA model where each rectangle represents a specific resource with the attributes listed in the following box.

⁸ The study period for the resource plan extended through 2045 and Figure 12 shows resource additions in 2044 and 2045 that are not included in this presentation of resource additions but contribute to conclusions of the 2024 IRP Progress Report.

- The height of each rectangle is the total capacity of the resource.
- The width of the rectangle represents the resource's contribution to City Light's resource adequacy needs (i.e., a square means that 100% of the resource contributes to resource adequacy needs⁹).
- The position of the rectangle on the horizontal axis represents the year the resource was first offered into the market.
- The cost of energy delivered to City Light in nominal dollars per MWh for the year the resource was first able to be selected along with the resource name is presented for each rectangle.

Figure 12. Resource Options Added to the SARAA Model



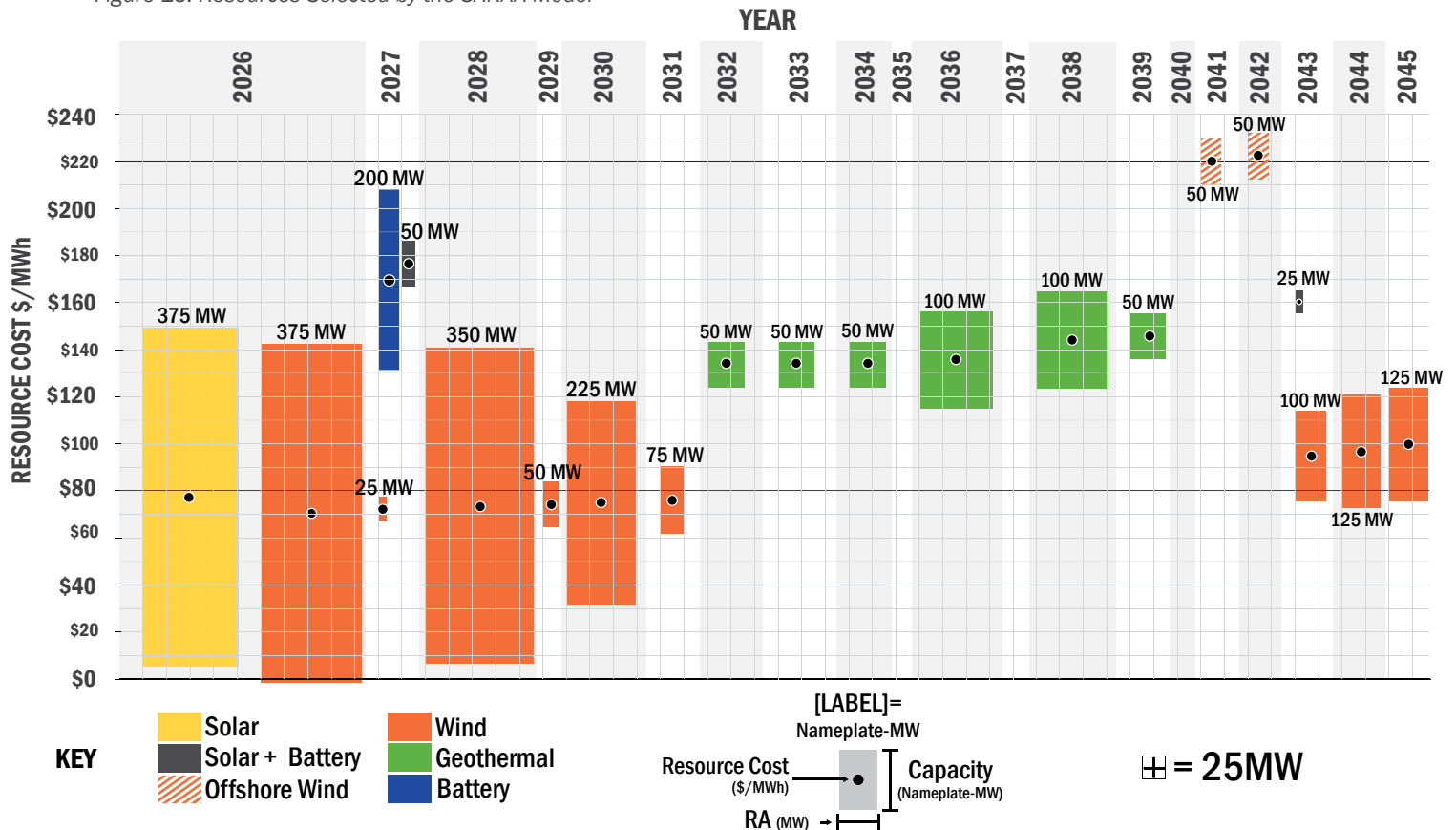
⁹Resource contribution to City Light's adequacy needs is calculated using HydRRA based on its additive value to MoLOLEv metrics. The amount of capacity that can be contributed to adequacy is generally less than 100% of nameplate capacity of the resource.

Selected Supply-Side Resources

Figure 13 shows the resources selected by the capacity expansion model from what was offered. This graphic has the same attributes as Figure 12, but each resource is split across the years selected by the model and the capacity and resource adequacy values represent what was selected (versus what was offered).

- The height of each rectangle is the total capacity of the resource.
- The width of the rectangle represents the resource's contribution to City Light's resource adequacy needs (i.e., a square means that 100% of the resource contributes to resource adequacy needs).
- The position of the rectangle on the horizontal axis represents the year the resource was selected by the capacity expansion model.
- The dot at the centroid of each rectangle aligns with the resource cost delivered to City Light for the year selected in nominal \$/MWh on the vertical axis.

Figure 13. Resources Selected by the SARAA Model



PUBLIC INVOLVEMENT

City Light convened an external advisory panel to provide feedback on the development of its IRPs. The panel is comprised of individuals representing customers, environmental organizations, regional energy-related governmental organizations, and academics. Since the 2022 IRP was finalized, City Light has conducted seven meetings, as shown in Figure 14, with the external IRP advisory panel that covered topics including energy conservation, climate change, load forecasts, resource adequacy, IRP modeling assumptions, and many other energy-related issues. Advisory panel feedback helped to shape the IRP process, findings, and recommendations.

Member	Organization
Steve Gelb	Emerald Cities Collaborative
Paul Munz	Former Bonneville Power Administration
Jeremy Park	University of Washington
Yuri Rodrigues	Seattle Pacific University
Mike Ruby	Envirometrics, Inc.
Amy Wheelless	WA Department of Commerce
Elizabeth Osborne	WA Department of Commerce
Austin Scharff	WA Department of Commerce
John Ollis	NW Power & Conservation Council
Charlee Thompson	Northwest Energy Coalition
Dr. Angela Griffin	Byrd Barr

Figure 14. Timeline of External IRP Advisory Panel Meetings



February 6, 2023

Introductions, 2022
IRP Review, 2024
DSMPA Plan, Lastest
City Light Forecast

March 27, 2023

Introduction to
DSMPA

June 20, 2023

DSMPA Progress

September 25, 2023

2023 DSMPA Results

November 13, 2023

2024 IRP Kickoff
and Workplan

February 26, 2024

2024 IRP Load
Forecast & Resource
Adequacy

May 6, 2024

2024 IRP Portfolios

FINAL THOUGHTS

The 2024 IRP Progress Report findings build on the results and trends from the full 2022 IRP and show the actions City Light is taking to plan for future power supply needs of our customers. City Light observed the following key changes compared to the 2022 IRP:

- City Light has experienced an increase in the load forecast, with the change from previous versions primarily due to updated assumptions for electrification of the building and transportation sectors.
- In turn, City Light's resource adequacy needs have increased, not only due to the increased load but also the increased winter peaks and heightened uncertainty associated with electrification.
- City Light expects increased resource acquisition needs over the planning period to meet the increases in electric service for its customers.

Table 6. Selected Resource Additions by Category

2024 IRP Progress Report			
New Resource Additions (Nameplate-MW, unless noted)	2024 – 2033	2034 – 2043	TOTAL
Battery	200	-	200
Solar	375	-	375
Solar + Battery	50	25	75
Wind	1,100	100	1,200
Enhanced Geothermal	100	300	400
Offshore Wind	-	100	100
Wholesale Resource Total	1,825	525	2,350
Energy Efficiency (aMW)	80	49	129
Customer Solar Programs (aMW)	12	21	33
Time of Use Program (MW)	7	8	15
Demand Response (MW)	19	17	36
Total	1,943	620	2,563

Future Work

As the electric system evolves to enable the energy transition, the tools, processes, inputs, and assumptions in integrated resource planning must evolve with it. City Light has identified several areas of future work to improve analysis in the 2026 Integrated Resource Plan.

TRANSMISSION

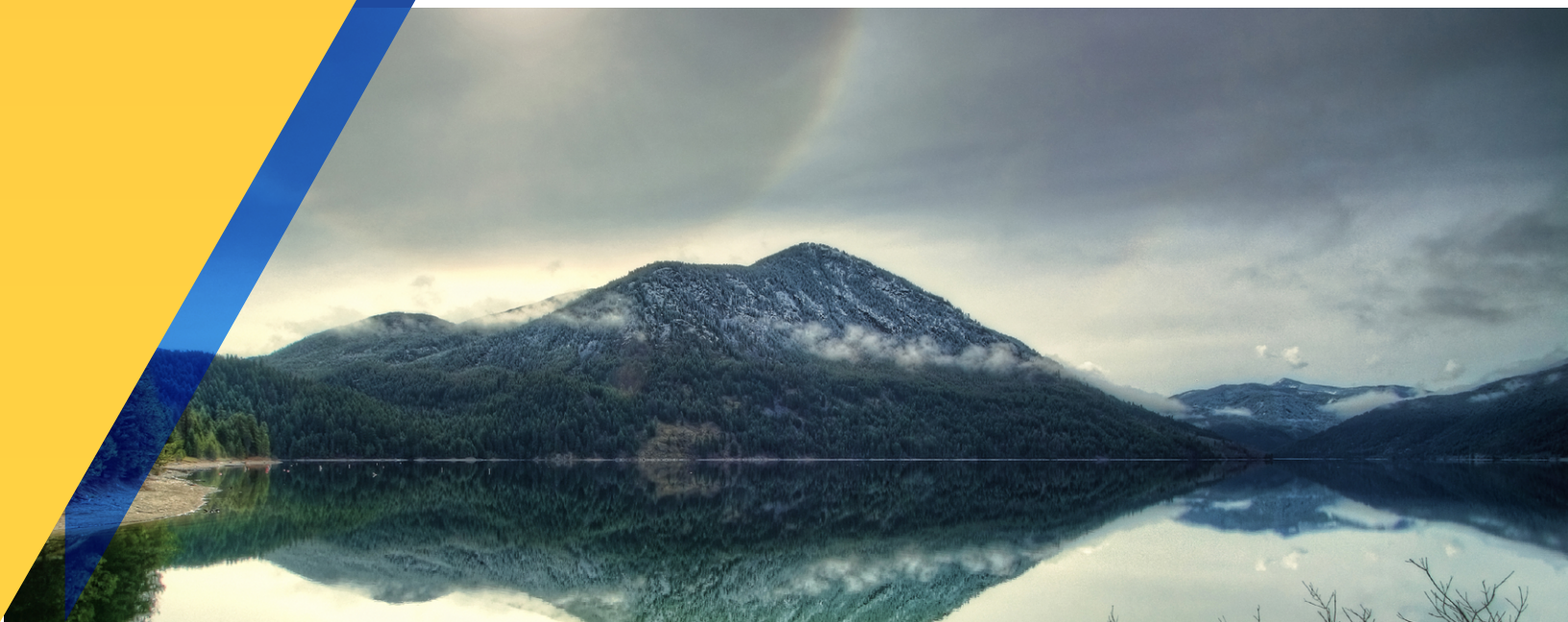
Consistent with conclusions in both City Light's 2022 IRP and 2024 DSMMPA, improvements in the transmission system will be critical to meet clean energy targets and electrification goals established by city and state legislation. Model improvements are necessary to incorporate constraints on the bulk electric system that impact delivery of new supply resources to City Light's customers as well as the value of distributed energy resources or storage resources for optimizing utilization of existing transmission service.

ADEQUACY PLANNING

City Light is working to include additional resource adequacy metric(s) in its adequacy planning as well as improved modeling to credit the inter-day and inter-seasonal value of storage resources.

CLEAN-FIRM RESOURCES

City Light will continue to evaluate carbon free, firm resource options that can reliably respond to changes in demand including additional hydropower, enhanced geothermal, small modular reactors, hydrogen, fusion, and other emerging technologies.





Seattle City Light

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seattle.gov/city-light



The 2024 INTEGRATED RESOURCE PLAN

Progress Report for Seattle City Light

Appendix: Washington State Department of Commerce Cover Sheet

The Washington State Department of Commerce requires the submission of a standardized cover sheet with either a full Integrated Resource Plan or the Progress Report. The cover sheet summarizes the utility's resource stack in the most recently completed year, called the "Base Year", and for milestones five and ten years in the future. Appendix Figure 1 shows the cover sheet filed with the Washington Department of Commerce for the 2024 IRP Progress Report.

Appendix Figure 1: Cover Sheet for Washington Department of Commerce filing - Seattle City Light 2024 IRP Progress Report

Integrated Resource Plan Cover Sheet

Legend

Enter your information into these shaded fields

Utility Information

Report Year

2024

Utility

Seattle City Light

Prepared by

Resource Planning & Analysis

Email

rpa@seattle.gov

Date of Board/Commission Approval

8/13/2024

Notes: Explain resource choices other than conservation/use of renewable energy credits

Line 27: Hydro resources comprise Skagit total generation, Boundary generation, specified imports from Box Canyon encroachment on Boundary, exports from Boundary encroachment on 7 Mile, Priest Rapids Project contract, Columbia Basin Hydro contract, specified energy from the High Ross agreement, and Lucky Peak generation. Line 39: City Light's long-term

Washington State Utility Integrated Resource Plan Year 2024									
Estimate Interval	Base Year			5-year Forecast			10-year Forecast		
Estimate Period	2023			2028			2033		
Season	Winter	Summer	Annual	Winter	Summer	Annual	Winter	Summer	Annual
Units	MW	MW	aMW	MW	MW	aMW	MW	MW	aMW
Loads	1,836.00	1,323.00	1,079.00	2,253.00	1,838.00	1,172.00	2,451.00	2,117.00	1,288.00
Exports	8.00	8.00	2.00	8.00	8.00	2.00	8.00	8.00	2.00
Resources:									
Energy Conservation Measures				49.00	49.00	49.00	92.00	92.00	92.00
BTM Solar				0.00	11.00	5.00	0.00	29.00	12.00
Demand Response				17.00	17.00	17.00	26.00	26.00	26.00
BPA Tier 1 or Base	836.00	544.00	461.00	922.00	612.00	496.00	976.00	536.00	491.00
BPA Tier 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cogeneration	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hydro	1,453.00	1,964.00	702.00	1,336.00	1,667.00	754.00	1,336.00	1,667.00	754.00
Wind	46.00	49.00	10.00	750.00	750.00	239.00	1,100.00	1,100.00	358.00
Utility-scale Solar	0.00	0.00	0.00	425.00	425.00	119.00	425.00	425.00	199.00
FTM Distributed Solar	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Biomass	12.80	12.80	12.00	12.80	12.80	12.00	12.80	12.80	12.00
Biogas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Landfill Gas	2.00	2.00	1.00	2.00	2.00	1.00	2.00	2.00	1.00
Geothermal	0.00	0.00	0.00	0.00	0.00	0.00	100.00	100.00	100.00
Nuclear	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Distributed Renewables	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Thermal Natural Gas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Thermal Coal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Market Purchases	350.00	350.00	-1.00	200.00	200.00	0.00	200.00	200.00	0.00
Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Imports	10.00	6.00	2.00	10.00	6.00	3.00	10.00	6.00	3.00
Undecided	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Resources	2709.80	2927.80	1187.00	3723.80	3751.80	1695.00	4279.80	4195.80	2048.00
Load Resource Balance	865.80	1596.80	106.00	1462.80	1905.80	521.00	1820.80	2070.80	758.00