2020 Electric Integrated Resource Plan

11. Preferred Resource Strategy

In April 2019, Avista announced a corporate goal to provide 100 percent “carbon neutral” energy by 2027 and by 2045 provide 100 percent clean energy, similar to the Washington requirements under the Clean Energy Transformation Act (CETA) for 2030 and 2045 respectively. Avista must maintain system reliability at affordable rates when achieving this goal. This will require renewable resources to remain cost competitive and for new technologies to emerge. This chapter outlines how Avista plans to meet its future resource needs including new CETA requirements and how we may achieve our own clean energy goals, while keeping costs within acceptable levels as determined by the Idaho and Washington utility commissions. Avista plans to acquire new resources by request for proposals (RFPs) and opportunistic resource acquisitions to deliver reliable power supply options to our customers at the lowest reasonable cost.

Section Highlights

- Avista will seek 300 MW of wind energy to be online in 2022, or later, from both the Northwest and Montana.
- A combination of Montana wind and storage resources meet the 2026 capacity deficits associated with the shutdown of Colstrip and the expiration of the Lancaster contract.
- Wind resources are preferred over solar due to the potential to generate during periods of time when solar resources are not contributing to the grid, and the desire to avoid resources whose timing is highly correlated with solar surplus across the Western Interconnection.
- Avista must plan to meet future capacity needs in a flexible manner depending on what resources materialize from RFPs.
- Energy efficiency will meet 71.4 percent of customer’s new energy requirements.
- Demand response programs will begin in 2025 ramping up to meet 100 MW of peak demand by 2035.

The IRP attempts to project the resource acquisition strategy using the best information available at the time and our understanding of the potential requirements of Washington State’s CETA. At the time of the drafting of this IRP, Washington had not released rules regarding how power will be accounted for when meeting the 100 percent clean goal and how the alternative compliance will work. Further, Avista did not include alternative compliance options to meet CETA goals. Avista expects the next IRP (2021) will address these rules when they are available. Avista’s Preferred Resource Strategy (PRS) describes the lowest reasonable cost portfolio of resources given Avista’s need for new capacity and clean energy resources, while taking into account social and economic factors prescribed by state policies of where Avista serves customers. This analysis also considers energy market risks, as alternative portfolios. The analysis tests sensitivities against the preferred portfolio to measure its cost changes to critical external factors like higher or lower than expected levels of load growth.

The resource strategy includes both supply side resources and load management options for customers including energy efficiency and demand response. The IRP measures resource options against each other to find the lowest cost portfolio of resources to meet resource deficits for winter and summer capacity, energy, and clean energy requirements. Avista also explored ways to integrate distribution and transmission resource needs to co-optimize all available options to serve its customers.

Resource Selection Process

Avista uses three models to evaluate resources for inclusion in the PRS. First is the Aurora model, discussed in Chapter 10, which Avista uses to develop the electric price forecast. The second model is Avista's Reliability Assessment Model (ARAM), to test the current resource portfolio's reliability metrics and each resource option's contribution to overall portfolio reliability. Chapter 6 and Chapter 9 discuss these topics. The third model, PRiSM (Preferred Resource Strategy Model), aids resource selection given the information determined from the market price forecast and each resource's reliability characteristics. PRiSM evaluates each resource option's costs (capital and operating), capabilities, and operating margins compared to each other to determine the lowest cost portfolio of resources to meet Avista resource needs (from Chapter 6). The model also considers risk as evaluated by 500 different potential market futures.

PRiSM

Avista staff developed the first version of PRiSM in 2002 to support resource decision making in the 2003 IRP. Ongoing enhancements improved the model since its initial development. PRiSM uses a mixed integer programming routine to support complex decision making with multiple objectives. These tools provide optimal values for variables, given system constraints. The model uses an add-in function to Excel from Lindo Systems named What's Best and the Gurobi solver. This software is the user interface to determine which model inputs are variables and allows for the creation of constraints on the system. For example, Avista must simultaneously meet its clean energy standard in Washington and its projected winter capacity shortfall.

The model solves using the net present value of resource costs given the following inputs:

1. Expected future deficiencies
    - Summer Planning Margin from ARAM
    - Winter Planning Margin from ARAM
    - Annual energy
    - Clean energy requirements
2. Costs to serve future retail loads as if served by the wholesale marketplace (from Aurora)
3. Existing resource and energy efficiency contributions
    - Operating margins

- Fixed operating costs

4. Supply-side resource, energy efficiency, and demand response options
   - Fixed operating costs
   - Return on capital
   - Interest expense
   - Taxes
   - Power Purchase Agreements
   - Peak Contribution from ARAM
   - Generation levels
   - Emission levels
5. Constraints
   - Must meet energy, capacity and clean energy shortfalls without market reliance
   - Resource quantities available to meet future deficits

The Preferred Resource Strategy

To meet future customer load, Avista uses a combined strategy of acquiring energy efficiency (reducing its customer's energy consumption), working with customers to use energy differently through demand response programs, upgrading our existing thermal and hydroelectric generation fleet, contracting for new renewable energy resources, and acquiring storage resources. Avista may take advantage of new opportunities, but will seek the lowest cost and environmentally sustainable energy resources for our customers. In addition, Avista may acquire resources other than those identified as preferred due to actual pricing, lack of availability, the reliability benefits not materializing, or the inability to meet state laws.

Avista's resource strategy relies on available information at the time of this analysis and is subject to change based on how Avista expects customers to use energy in the future, how projected resource costs change, and on how market price conditions influence the analysis and future acquisition. The strategy uses Avista's interpretation of the new Washington State CETA requirements. At the time of this IRP, rules are in development and Avista's portfolio may change depending upon the methodology the Washington Commission uses to account for clean resources and alternative compliance.

Resource selections use economics, environmental objectives, and maintaining customers reliably for decisions. Avista's first resource adequacy shortfall occurs in January 2026, when Avista assumes Colstrip will not be available for purposes of this IRP and is no longer available to serve Washington customers due to Washington state law excluding the plant from customer rates. Although, it would be beneficial for Colstrip to remain in operation through the 2025-2026 heating season for reliability unless new capacity is under Avista's control. Avista's analysis of Colstrip in this IRP (Chapter 12) indicates retiring the plant for Idaho customers in 2025 rather than 2035 is the economic choice[1]. Avista cannot unilaterally close Colstrip units 3 and 4 under the ownership agreement. Avista's energy needs increase later in 2026 when Avista's contract with

[1] Avista did not model any alternative shut down dates in this plan.

Lancaster[2] ends in October 2026. Filling these resource losses drives Avista's need for additional capacity. Avista may have needs for additional renewable energy to meet Washington State's CETA. New renewable resource acquisitions will likely begin as early as 2022 to help with the transition to a cleaner resource portfolio. Avista may also acquire resources or contracts to minimize customer's power costs.

Avista's resource plan is larger than in previous IRPs due to expected resource retirements and new renewable energy requirements driven by the assumption Avista does not use Idaho's share of the hydroelectric system to comply with CETA's clean goals (except for the 20 percent alternative compliance). Avista's interpretation of the law allows this energy to transfer between states with compensation to Idaho customers but awaits rulemaking before adjusting its resource plan.

The PRS divides the resource strategy between the first decade (2021-2030), second decade (2031-2040), and after 2040. Additional energy efficiency additions will occur over the 25-year plan. The next several sections of this chapter detail the expected resource acquisitions and summarize demand response and energy efficiency selections.

2021-2030 Supply Side Resource Selection

Avista will acquire new energy and capacity resources to meet clean energy goals and capacity deficits in the next several years. Table 11.1 shows a complete list of new generation selections. Avista's first selection is 200 MW of wind energy divided between Montana and the Northwest. Avista prioritized wind over other renewables due to its energy delivery profile combined with PPA price forecasts. Actual acquisition quantities and locations will be determined as part of RFPs and the transmission availability at the time of the acquisition.

Under the IRP resource assumptions, the PRS includes wind due to generation in higher-priced hours compared to solar and the potential for Montana wind projects to provide peak capacity toward meeting customers' winter peak load. In 2023, another 100 MW of wind will help meet future clean energy targets. In total, Avista estimates 122 aMW of clean energy procurement before 2023 to stay on track to meet the 80 percent CETA goal by 2030. Avista may release an RFP in the second quarter of 2020 to solicit projects to meet these goals. This RFP would be open to any clean resource with deliveries beginning in 2022. While the IRP identifies online dates between 2022 and 2023, other terms will receive consideration as long as the terms are in the best interests of Avista's customers and the resources meet the objectives of the CETA and Avista's clean energy goals.

[2] Rathdrum Power, LLC, Combined Cycle Combustion Turbine.

Table 11.1: 2020 Preferred Resource Strategy (2021-2030)

Resource	Time Period	ISO Conditions (MW)	Equivalent Winter Peak Capacity (MW)	Energy Capability (aMW)
On-system wind	2022	100	5	37
Montana wind	2022	100	40	48
On-system wind	2023	100	5	37
Kettle Falls modernization	2024	12	12	10
Rathdrum CT upgrade	2026	24	24	22
Long duration pumped hydro storage	2026	175	175	n/a
Post Falls modernization	2026	8	3.7	4.5
Montana wind	2027	200	80	96
Total		**719**	**344.7**	**254.5**

Avista, like the other Washington utilities with an ownership share in Colstrip Units 3 and 4, is required to cease recovering the cost of coal-fired generation in Washington rates after 2025. While the fate of the plant will depend on a decision made by all owners of the facility, each of whom have their own economic circumstances, this IRP indicates Avista's most economic decision would be to close the plant at the end of 2025 as opposed to 2035[3]. To replace the lost Colstrip capacity along with the expiring Lancaster PPA, Avista seeks to add a combination of 175 MW of long duration pumped hydro and 200 MW of Montana wind. Absent a resource addition that is dependable on cold winter days, the ability to serve our customers is at great risk. Avista must acquire replacement generation with operational characteristics that enable the Company to serve our customers when they need it the most.

Avista is monitoring the potential for regional pumped hydro storage from several proposed projects with varying sizes and durations. Avista has an interest in pursuing one of these projects if the capacity and duration of the storage facility may help meet customers' winter peak load and if it exceeds the timing needs and pricing characteristics of alternative resources. Avista's analysis shows long duration storage assets may allow it to replace the need for natural gas-fired peaking generation identified in the previous IRP. Given the potential for storage, Avista considers it as part of its PRS and will actively pursue storage as long as it meets the needs of our customers in a reliable and cost effective manner. At any time, if Avista believes pumped storage is not feasible or cost effective, Avista may pursue other alternatives including a natural gas-fired peaker. To help with this decision making process, Avista may to issue a capacity RFP in 2021 to identify and compare all potential alternatives.

[3] From a regional reliability point of view, the plant would likely be better to close after the heating season ends in 2026. Avista expects this concern to be part of any closure decisions and should be a factor in policy decision making. Further, Avista did not model alternative closure dates in this IRP.

The 200 MW Montana wind resource would serve customers by adding potentially low cost clean energy as a contribution to meeting peak winter loads. This selection anticipates the utilization of the existing transmission currently used by Colstrip and would require this transmission capacity to be available. Any decision will likely result from an RFP in 2022 or 2023 to identify potential projects in either Montana or other locations with similar cost and operational attributes.

Existing Generation Project Upgrades

Avista is investigating the possibility of increasing the capacity of Kettle Falls by up to 12 MW by 2024. The Kettle Falls Generating Station is reaching the point where a repowering effort may be justified in lieu of replacing equipment in-kind. Similar to Kettle Falls, Avista will evaluate options to increase capacity at its Rathdrum CT site. Avista will work with the manufacturer and other vendors to identify potential methods to increase the capability of the plant. For planning purposes, this IRP estimates 24 MW of additional capacity, but that number could vary depending on the full evaluation of alternatives.

The Post Falls hydroelectric facility will also undergo modernization, leading to capacity improvements. At this point, the generating facilities are nearing the end of operating life, and Avista will need to decide to modernize by either replacing the generators and turbines with in-kind equipment or with equipment that increases the capacity of the facility. The IRP calculates an incremental capacity improvement as part of the overall modernization effort because it will increase the project's capability and increase clean energy production while utilizing the same renewable resource.

2031-2040 Supply Side Resource Selection

The second decade of the IRP's resource selection strategy is a continued effort to replace existing resource capacity, meet future load growth, and maintain resource adequacy. The complete list of resource additions for this decade is in Table 11.2. The first addition is a plan to replace the loss of our long-term regional hydro contracts with new contracts. Avista anticipates the potential for 75 MW of existing hydroelectric capacity to replace its expiring contracts. Existing hydroelectric generation will likely be competitive given 2031 is in the midst of the 80 percent requirement of CETA. Although capacity should be available, it will be a competitive process to acquire the generation.

The next resource selection is an upgrade or addition to the Long Lake Hydroelectric Development. This IRP identifies a need for this additional capacity to assist in meeting winter peak load and adding clean energy. Redevelopment of this project will require a long lead-time. The first step in this redevelopment is to certify the project as complying with the requirements of CETA. The need for this determination is due to language in CETA section 4 prohibiting new diversions, new impoundments, new bypass reaches, or expansion of existing reservoirs for qualifying resources. Avista believes an additional project at Long Lake meets the intent of the law, but would need a declaratory order before proceeding on the long permitting and construction process.

Table 11.1: 2020 Preferred Resource Strategy (2031-2040)

Resource	Time Period	ISO Conditions (MW)	Equivalent Winter Peak Capacity (MW)	Energy Capability (aMW)
Regional hydro PPA	2031	75	75	34
Long Lake upgrade/modernization	2035	68	68	23
Liquid air energy storage (LAES)	2036	25	15	n/a
Liquid air energy storage (LAES)	2038	25	15	n/a
Liquid air energy storage (LAES)	2040	25	15	n/a
Total		**218**	**188**	**57**

Assuming the Long Lake project is determined to qualify for CETA; Avista will need to determine the best method to increase the capability at the project. Avista has identified two alternatives requiring further study. The first alternative is a second powerhouse. Avista has studied this alternative since the 1970s. The second alternative is to create a new powerhouse with enough generating capability to retire the generating equipment in the existing powerhouse. The advantage of this alternative is the existing generation equipment is at the point it will require additional investment; this alternative could forgo the need to make such an investment. Both alternatives would install a new penstock at the location of the replacement for the saddle dam on the south end of the development. When the preferred alternative is decided, Avista will proceed with the CETA qualification review and the permitting process if warranted.

After 2035, Avista will require additional capacity to meet growing peak loads and the likely retirement of the Northeast CT. This IRP anticipates storage resources will be the economic choice in this period. At this time, using projected cost declines and required duration requirements for resource adequacy, Liquid Air Energy Storage (LAES) technology is the most likely option. Given the advancements in storage, the next 15 years of innovation may identify a lower cost option to meet customer needs. The requirements identify additional LAES in 2036, 2038, 2040, and 2041. It is likely the construction would be at one site with expansion capability as loads grow. Avista also recognizes the closure of the Northeast CT for driving the resource need and an earlier or later retirement of this resource will change the construction timetable for storage.

2041-2045 Supply Side Resource Selection

Avista typically does not forecast resource additions beyond 20 years. Given the CETA requirement to be 100 percent non-emitting by 2045, Avista concluded that modeling resources 25 years in the future had merit. The final five years of the plan, while relatively uncertain, identifies the need to replace existing renewable PPAs, with the addition of both renewable and storage technologies. Table 11.3 outlines these additions required to meet both energy and capacity requirements of Avista's customers.

Table 11.2: 2020 Preferred Resource Strategy (2041-2045)

Resource	Time Period	ISO Conditions (MW)	Equivalent Winter Peak Capacity (MW)	Energy Capability (aMW)
Liquid air energy storage	2041	25	15	n/a
NW wind	2042	100	5	37
4 hour storage (lithium-ion)	2042	25	3.75	n/a
NW wind	2043	100	5	37
4 hour storage (lithium-ion)	2043	100	15	n/a
Solar	2043	5	0.1	1.3
Solar w/ storage (50 MW x 4 hours)	2044	50	8.5	12
4 hour storage (lithium-ion)	2044	75	11.25	n/a
NW wind	2045	100	5	37
4 hour storage (lithium-ion)	2045	100	15	n/a
Total		**680**	**83.6**	**124.3**

Demand Response Selection

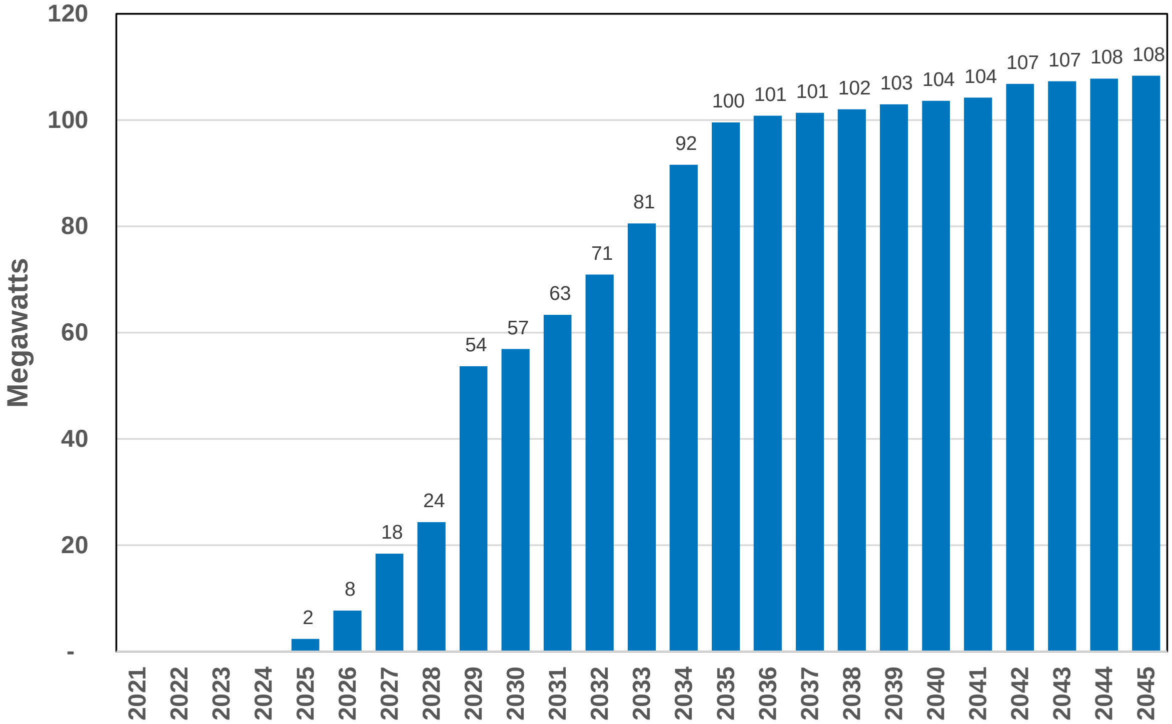
Demand Response (DR) will be an important part of Avista's strategy to satisfy customer's peak load requirements as generating resources leave the portfolio. Currently, Avista does not offer any load management programs, although it tested programs in the last few years. To understand the potential for new programs, Avista contracted with Applied Energy Group (AEG) to estimate the amount of DR available within the Idaho and Washington service territories. This process identified 17 potential programs to reduce 187 MW of winter peak load. Some programs offer reduction in both winter and summer, while others in only one season. Avista's forecasted needs are for winter peak reduction and several of the programs are cost effective. The first DR program selected in the PRS begins in 2025 and is likely to ramp into full capability by 2029. Table 11.4 shows each of the programs selected as part of the PRS and Figure 11.1 illustrates when DR enters the system and how the penetration of DR programs increases.

DR programs to meet reliability targets will depend on the length of time the program can reduce loads. For this IRP, Avista assumes a 60 percent peak credit. This is similar to the amount of an equivalent capacity DR program compared to an equal size natural gas-fired CT alternative. Due to the limited duration of the DR program, it only achieves 60 percent of the reliability benefits of a natural gas-fired CT. As Avista begins these DR programs, experience and program design will determine the ultimate capacity contribution to reliability. Further, the rate programs (time-of-use rates and variable peak pricing) are not dispatchable and any actual benefit will come from observation of the programs over time. DR programs may begin earlier than this IRP forecast as the 2021 Capacity RFP may highlight programs with cost effective potential prior to 2026. Certain programs may have a long lead-time to recruit enough participants in order to have sufficient DR capacity available.

Table 11.3: PRS Demand Response Programs

Resource	Start Year	Maximum Load Reduction (MW)
Variable peak pricing	2025	29.7
DLC smart thermostats	2029	18.9
Large C&I curtailment	2029	25.0
Time-of-use rates (opt in)	2032	8.3
Third party contracts	2032	23.1
Real-time pricing	2037	1.1
Ancillary services	2042	2.2
Total		**108.3**

Figure 11.1: Demand Response



Energy Efficiency Selection

The final resource as part of the PRS is energy efficiency. This IRP studied over 6,000 energy efficiency programs to reduce demand and offset the need for new generation. Avista models each of the programs individually to make sure to include each program's capacity and energy benefits in the analysis. This method allows for an accurate accounting of peak savings for energy efficiency that would not be included with programs modeled as buckets or compared to a levelized price of energy. In the midst of the IRP, Washington passed legislation effectively changing certain programs to codes and standards. This legislation reduces 2045 loads by six average megawatts from the more stringent codes and standards and is included in the energy efficiency selection.

As described in Chapter 3, the long-term energy and peak demand forecast already includes the benefits of energy efficiency. This requires adjustments to the load forecast to exclude the projected additions to energy efficiency so that potential specific programs selection can occur. This adjustment uses an iterative process in the PRiSM model. The process starts by adding back in the load represented by the prior 2017 IRP energy efficiency amounts to the load forecast. PRiSM then solves to add both supply-side and demand-side resources. The amount of selected energy efficiency changes as the amount of new energy efficiency added to the load forecast. Then the process repeats until the amount of energy efficiency selected and the amount of energy efficiency added to the load forecast is similar. Table 11.5 shows these amounts added to the load forecast and the ultimate amount of energy efficiency included in the PRS. The 187 aMW of savings amount includes transmission and distribution losses along with the six aMW from recent legislation for codes and standards. Avista expects total energy growth of 262 aMW between 2021 and 2045 with energy efficiency meeting 187 aMW. Energy efficiency is the primary resource to meet increases in customer's energy needs. Energy efficiency meets 71 percent of new load growth compared to 53 percent in the 2017 IRP.

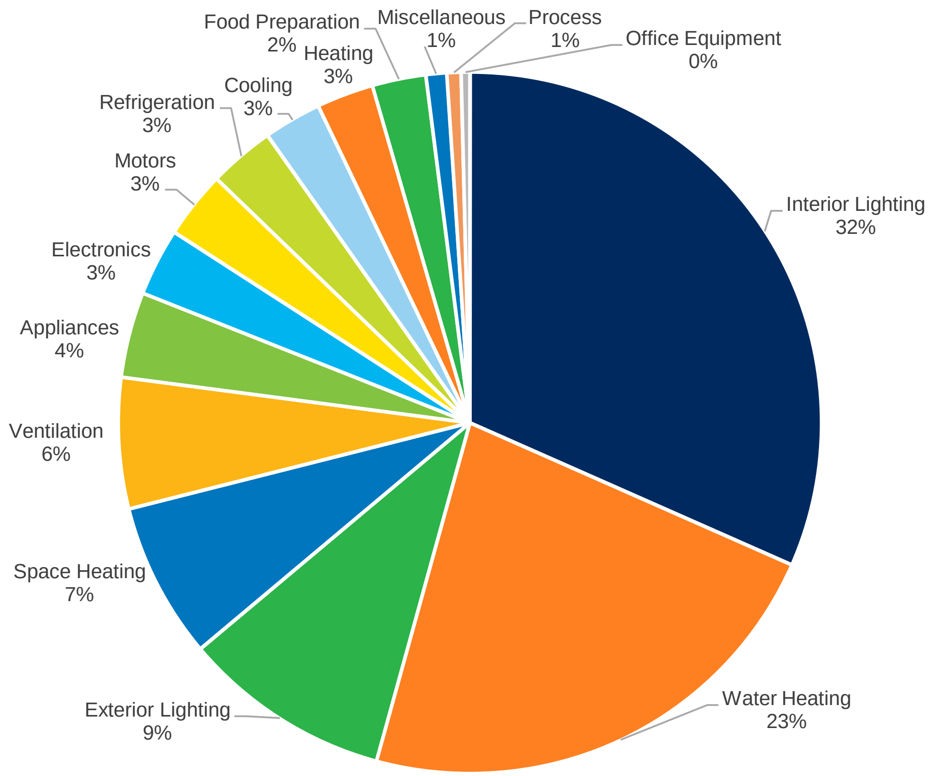
Table 11.4: Energy Efficiency Selected by PRiSM vs. Added to the Load Forecast

Year	EE Added to the Load Forecast	Selected EE from PRiSM
2021	6.1	6.0
2025	33.1	33.0
2030	72.0	72.1
2035	112.4	113.1
2040	149.4	150.9
2045	184.8	187.1

Over the course of the IRP planning horizon, 36 percent of new energy efficiency will come from Idaho customers and 64 percent from Washington customers. A majority of the savings will be from commercial customers (49 percent), followed by 41 percent from residential customers. The remaining savings will be from industrial customers. The greatest source of energy efficiency will come from lighting, and space and water heating. Figure 11.2 shows the program's share of the total savings to achieve the full 187.1 aMW of savings. The energy efficiency programs not only lower annual energy demand, they also reduce winter and summer peak demand. The selected programs lower winter peak load growth by 120 percent of its annual energy and summer peak loads by 133 percent of its annual average energy savings.

The amount of energy efficiency determined through this process will lead to program creation in both Washington and Idaho. The IRP informs the energy efficiency team to determine cost effective solutions and pursue new programs that may arise between IRP analyses.

Figure 11.2: Energy Efficiency Savings Programs



Reliability Analysis

For the first time, this IRP includes a reliability analysis of the PRS. The increasing amount of intermittent generation and storage included in the resource plan necessitated the need for a reliability analysis. Prior plans used only planning margin criteria along with reliable resource options to validate reliability. This plan uses a Loss of Load Probability Analysis (LOLP) to validate its reliability for the year 2030. This analysis uses the ARAM model. The model simulates 1,000 potential scenarios with different loads, wind estimates, hydro conditions, and forced outage rates for each hour. This analysis also includes existing resources expected to remain online in 2030 along with resource selections from this plan.

The objective of this plan is to have a LOLP of near 5 percent. This means up to 5 percent of the 1,000 simulations do not meet entire load requirements for the year. This methodology is similar to the concept of one resource adequacy issue in 20 years. The analysis compares this portfolio to alternative portfolios of existing resources with enough added combustion turbines to have a 5 percent LOLP. This allows for a comparison of reliability metrics compared to traditional resources and no resource additions. Table 11.6 shows this comparison. This analysis also assumes the ability to purchase short-term market power. Such market power purchases are limited to 250 MW in high-load periods, meaning temperatures below four degrees or above 84 degrees (daily average).

Table 11.5: 2030 Reliability Metrics

Year	Preferred Resource Strategy	350 MW Natural Gas CT	No Resource Additions
LOLP	5.3%	5.2%	54.3%
LOLH	2.02 hours	1.79 hours	50.8 hours
LOLE	0.18	0.14	3.71
EUE	330 MWh	264 MWh	10,092 MWh
Total Events	196	156	4,047

Without any new resources, we would have a greater than 50 percent probability of not being able to serve all loads in 2030. Both the PRS and 350 MW natural gas-fired alternatives have nearly 5 percent probability of an event meeting the criteria for resource adequacy. LOLP is the Northwest industry standard measurement of reliability, but other measurements may be necessary to validate resource needs for the system, especially as additional intermittent resources and storage enter the resource mix. The LOLP is really a measure of the frequency of a bad year. Other metrics are frequency of an event (LOLE)[4], duration of an event (LOLH)[5], and quantity of an event (EUE)[6]. It is possible Avista will consider utilizing some of these metrics in the future to measure reliability. Avista and other utilities are exploring regional resource adequacy targets and accountability. If the region can agree on the development of a regional resource adequacy program including the adoption of common reliability metrics and the ability to share reserves, Avista could require fewer total capacity resources in the near term or rely less on market purchases during extreme weather events.

Cost and Rate Projections

Avista typically only estimates costs related to existing and new resources as part of its IRP analysis. Under CETA in Washington, Avista must estimate total electric revenue requirements to determine if the cost of compliance exceeds CETA's 2 percent cost threshold over each of its four-year compliance periods beginning in 2030-2034. Estimating non-power supply related cost is outside the scope of the IRP, so for this calculation existing non-modelled costs inflate at 2 percent per year. This is the level of inflation used throughout the modeling process.

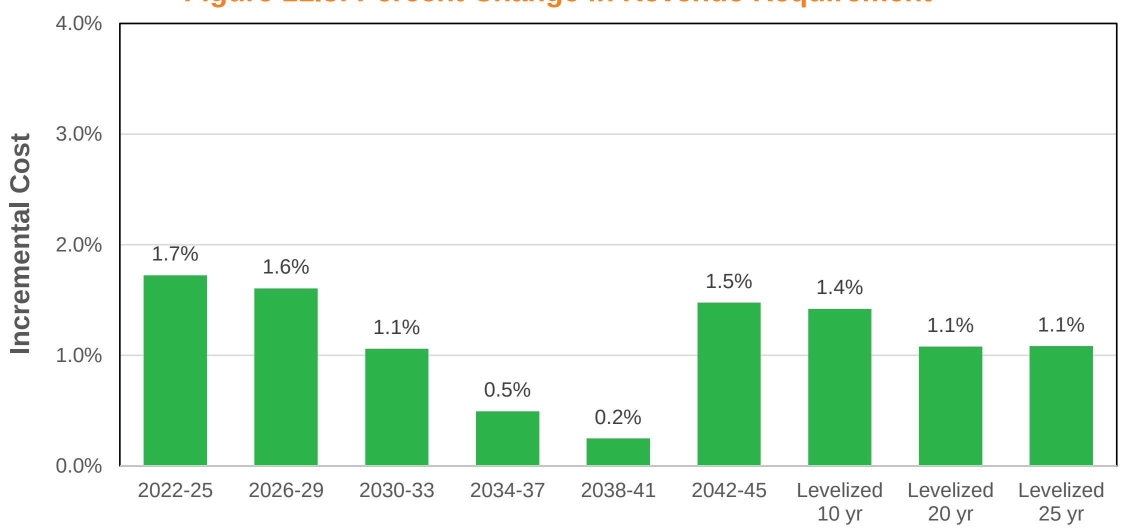
With CETA, it is important to understand the change in utility cost due to the policy. Specifically the provision to limit cost associated with its implementation, such as the 2 percent cost cap for meeting the 100 percent clean energy. This policy estimates rate increases in four-year increments. Figure 11.3 shows the estimates for cost increases for

[4] LOLE (Loss of Load Expectation) is defined by the total number of days within the 1,000 draws with unserved load dived by the number of draws (1,000).
[5] LOLH (Loss of Load Hours) is the average duration of the event measured by the number of hours of the outages.
[6] EUE (Expected Unserved Energy) is the average MWh of each event.

Avista's PRS in these increments. Over the 25-year period, costs are 1.4 percent higher for the system to comply with CETA as compared to a portfolio without CETA requirements. Avista found earlier investments in resources minimize the outer year cost increases. As 2045 approaches, meeting 100 percent of Washington energy needs will be difficult without new storage technology and the cost is likely to exceed the 2 percent cost cap. Avista did not model the 2045 portfolio to serve 100 percent of energy or allow the model to reach the 2 percent cost cap. Avista requires additional clarification and guidance from Washington Commission rulemaking to model the cost cap correctly.

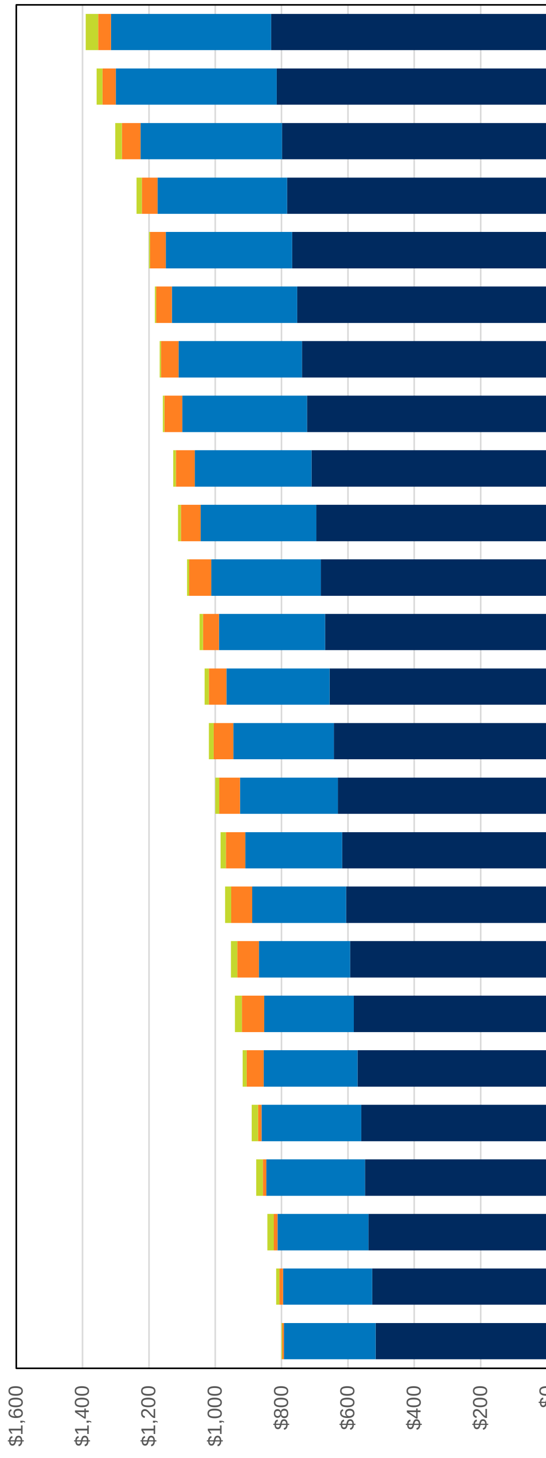
Figure 11.4 shows the forecast of annual power cost and average annual customer rates. The figure separates costs into four categories. The first is non-power related costs, estimated at $517 million[7] or 65 percent of the total customer rate in 2021. These costs include Fixed O&M related to Avista owned hydroelectric and biomass resources, distribution, transmission, and administrative and general expenses. The remaining costs are power supply related, including existing thermal generation, market transactions, contracts, new generation, new transmission for new resources, and energy efficiency. These cost categories are 1) the cost of existing generation and market transactions, 2) the cost to add capacity to serve the highest load hours, and 3) the added cost to comply with the CETA law in Washington. These added costs calculation compares the PRS to alternative portfolios. The present value of future revenue requirement for the 25 years is $11.8 billion. The existing resource cost and market transactions will contribute $3.7 billion to these estimates, while new capacity resource additions add $485 million, and the CETA requirements add $163 million. These costs lead to increases in customer rates of approximately 2 percent per year. Although power supply cost growth escalation is higher than 2 percent, the effect on overall rates is low given the relatively small contribution of power supply expense to the overall customer rate.

Figure 11.3: Percent Change in Revenue Requirement



[7] This estimate does not forecast what Avista's actual rates will be in 2021 and is an estimate for IRP analysis. This work does not include the level of scrutiny required for rate setting.

Figure 11.4: Utility Revenue Requirement



	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Clean Energy	2	10	19	20	20	12	21	20	19	16	12	15	13
Capacity	5	11	11	11	10	51	67	64	63	59	63	60	53
Existing and Energy Only	276	268	275	297	301	283	271	275	283	291	295	303	311
Non- Power Related	517	527	538	548	559	571	582	594	606	618	630	643	656
Total Revenue Requirement	801	816	843	877	890	917	941	953	970	984	1,000	1,019	1,032
Rate Cents/kWh	8.7	8.8	9.1	9.4	9.5	9.8	10.0	10.1	10.3	10.4	10.5	10.7	10.8

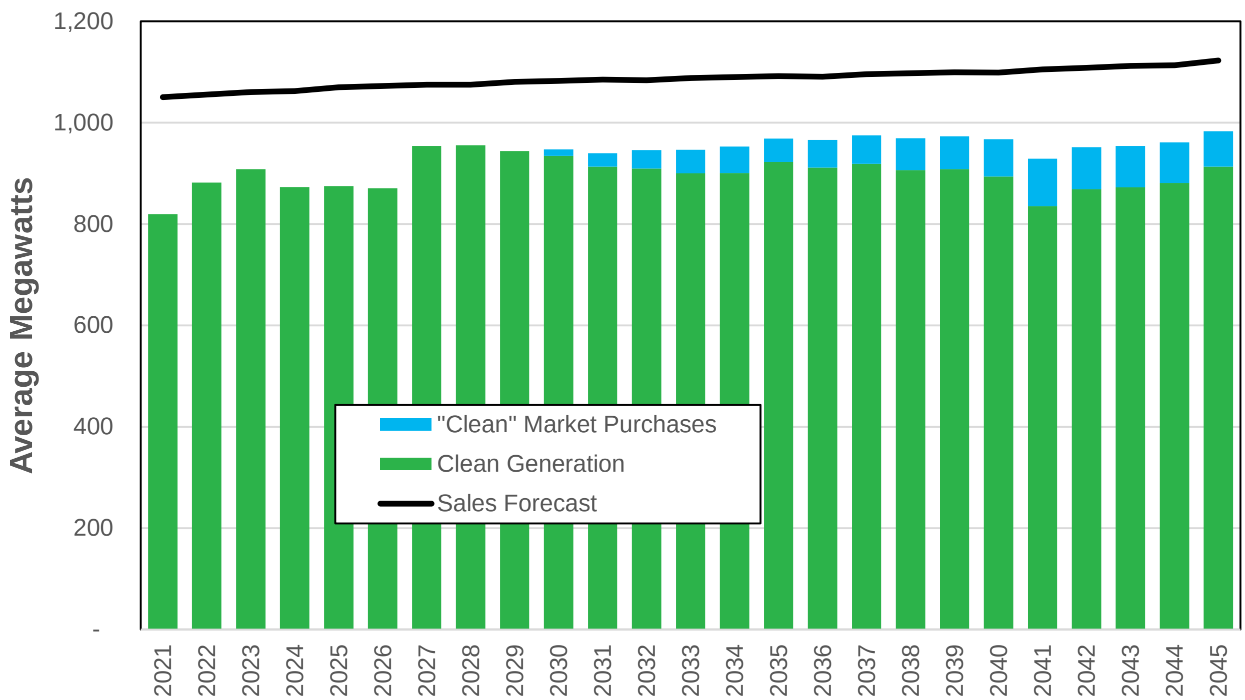
	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
Clean Energy	10	7	9	8	5	4	3	3	16	20	18	38
Capacity	48	66	59	57	54	53	47	47	48	56	40	38
Existing and Energy Only	320	330	349	352	376	372	378	381	390	426	485	483
Non- Power Related	669	682	696	710	724	738	753	768	783	799	815	831
Total Revenue Requirement	1,047	1,085	1,113	1,127	1,158	1,167	1,182	1,200	1,238	1,302	1,357	1,390
Rate Cents/kWh	11.0	11.3	11.6	11.7	12.0	12.1	12.2	12.4	12.8	13.4	13.9	14.1

Environmental Analysis

Avista has a company-wide goal to serve all its customers with clean energy, specifically 100 percent of retail sales by net clean energy or emission offsets by 2027, and 100 percent of delivered energy by 2045. Avista is committed to this goal, and must balance this goal with state policies, affordability and reliability. Affordability is key to Avista's customers, most of whom have lower than state median household incomes. In addition, Avista customers live in areas subject to extreme winter and summer temperatures. CETA's cost cap provision reflects the need to balance the environmental and economic attributes of energy.

Avista's PRS meets 89 percent of the 2027 corporate goal, meaning nearly 90 percent of energy delivered on average will be from clean resources including hydroelectric, biomass, wind, and solar. Figure 11.15 shows the annual amounts. This estimate includes (shown in blue) the clean energy associated with market purchases. A future with more renewables and storage will require significant market interaction and regional cooperation to deal with the oversupply of intermittent generation and resource adequacy. As described in Chapter 10, the regional market will become cleaner as state laws require higher amounts of clean energy, coal plants close, and natural gas prices stay low. Avista estimates a portion of market transactions will be from clean resources. This estimate from the net amount of energy Avista purchases or sells each year and then applies the regional annual market emissions factor. With this factor, we can determine a split between clean and thermal generation purchases.

Figure 11.5: Annual Clean Energy



The PRS increases the amount of clean energy Avista serves to its customers and reduces its greenhouse gas emissions. Avista can estimate the amount of emissions associated with its owned generation based upon dispatch, but the amount of emissions from some market purchases are difficult to estimate because the generation sources cannot be determined, especially in power modelling. To estimate market purchase emissions, Avista uses the annual average regional emissions rate. For example, when Avista sells energy, the sales reduce Avista's emissions using the associated market rate or increase Avista's emissions by market rates for purchases. The market used for this analysis includes generation-related emissions from Washington, Idaho, Montana, Oregon, Utah, and Wyoming[8]. Chapter 10 covers these emission rates in further detail. For 2021, the greenhouse gas emissions rate is 672 pounds per MWh and by 2030, the rate falls to 426 pounds per MWh. These emissions are in the total net emissions calculation in Figure 11.6 in the dotted black line. These emissions also include purchased power associated for storage resources. The orange bars represent the expected emissions from current resources, while the yellow portion is from new resources. The solid line shows the actual emissions from Avista plans in 2018 as a comparison.

The 2030 emissions will be 79 percent lower than the 2018 levels and 85 percent lower by 2045. The major emissions reductions come from the removal of Colstrip and Lancaster from the system along with reductions in natural gas-fired dispatch. Another point of interest is the regional change in emissions from electrification of the transportation system. Avista's current load forecast used in the PRS includes 100,000 vehicles converting from petroleum. This conversion reduces regional economy-wide emissions and transfers vehicle charging onto the electric system, resulting in lower emission rates. To illustrate this impact, the solid black line in Figure 11.6 shows the reduction in vehicle emissions, which is greater than the total emission from Avista's power supply by 2045.

Another measure of emissions is emissions intensity. This is the net emissions from Figure 11.6 divided by retail sales. For 2021, this is 461 pounds per MWh. By 2040, this amount will decline to approximately 100 pounds per MWh. This data is in Figure 11.7. As a comparison, Avista's current emissions intensity as reported by the Washington State Department of Commerce for Washington retail sales is 565 pounds per MWh.

[8] Avista believes this footprint is beyond where Avista can acquire power from, but is consistent with methodologies currently used in Washington State fuel mix reporting. This may also change with rulemaking underway.

Figure 11.6: Greenhouse Gas Emissions

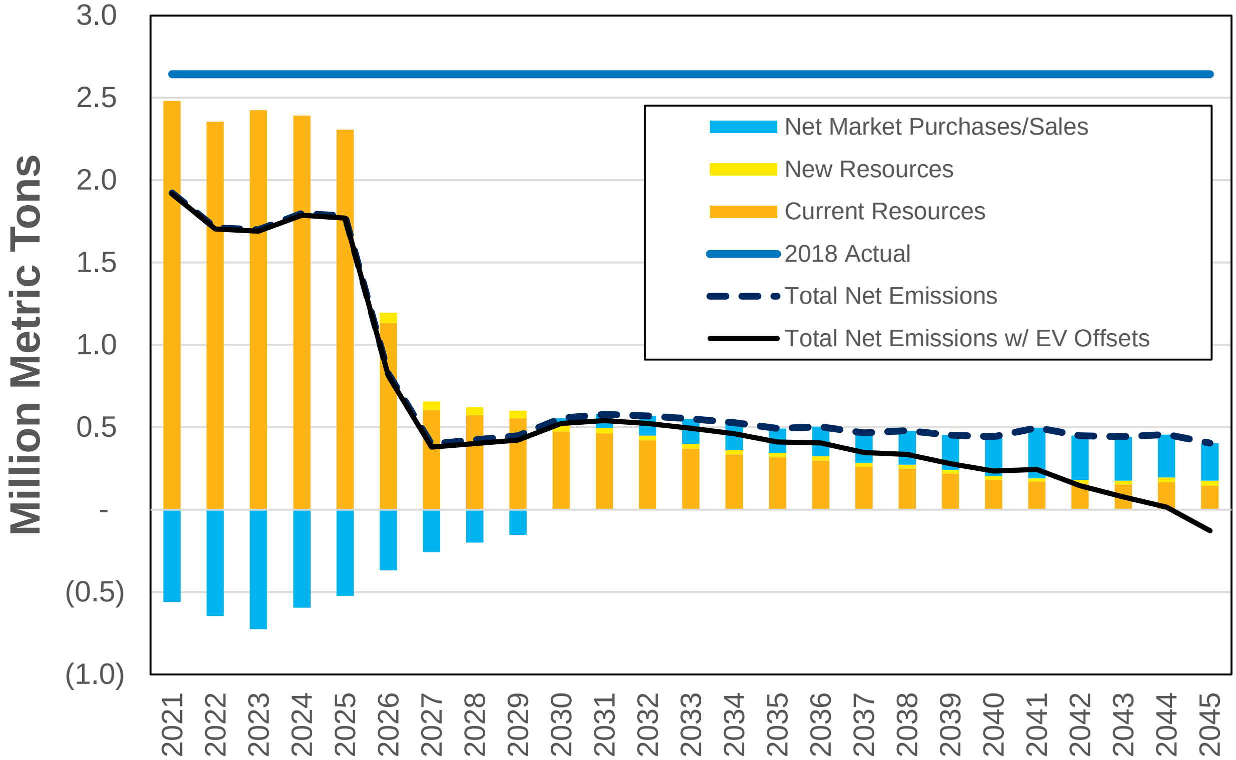
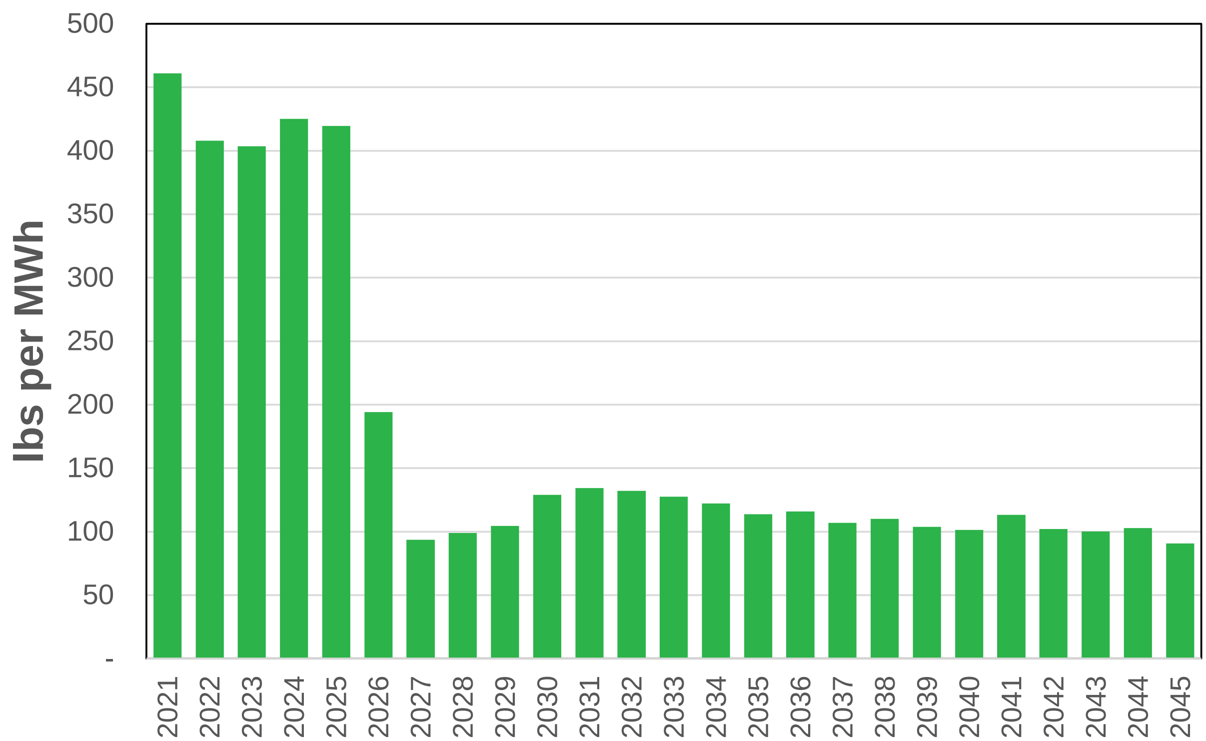
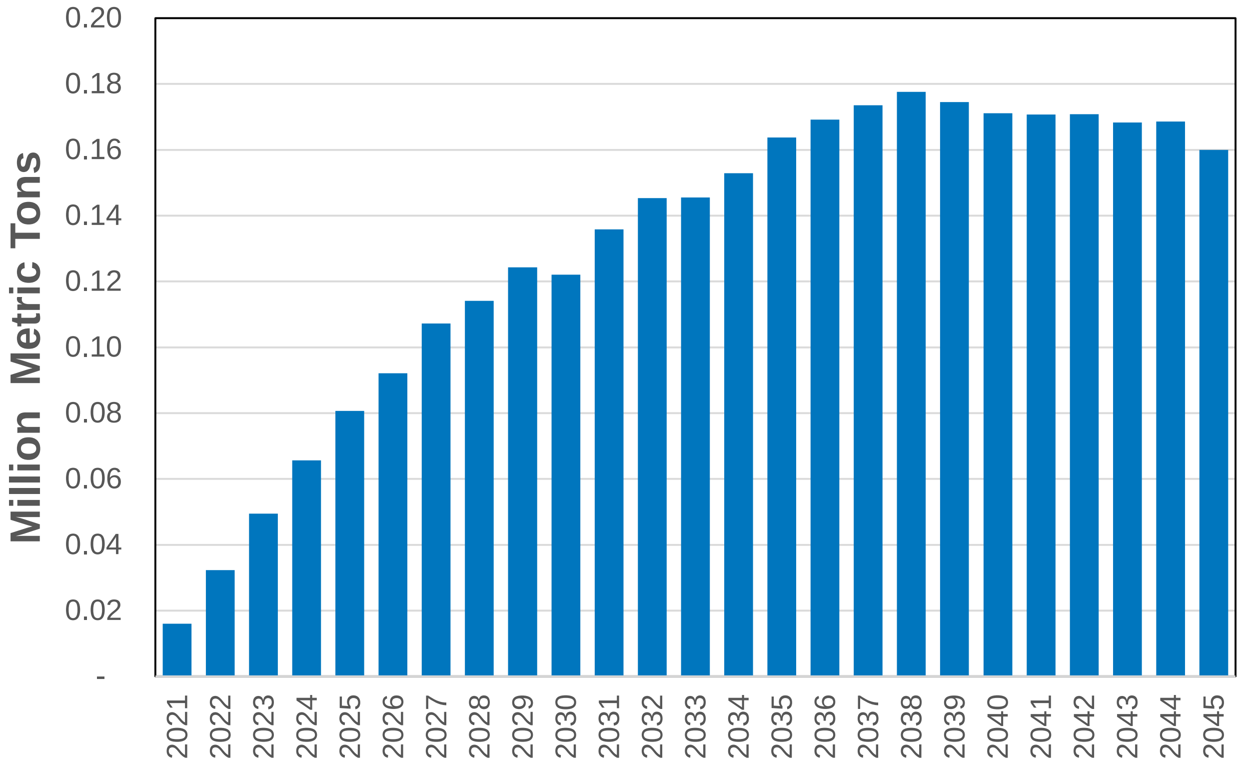


Figure 11.7: Total Net Greenhouse Gas Emissions Intensity



Avista's energy efficiency programs also reduce regional emissions and therefore an estimate of the emissions avoided by energy efficiency needs to be calculated. There are many methods to estimate the "avoided emissions" associated with energy efficiency, but Avista chose to use the annual average market rate of emissions per MWh for this calculation. The reason for this choice is the change in load requires a market response of generation rather than just the individual utility; therefore, with less load, the utility and the region will have lower emissions. Avista believes this method properly estimates the change in emissions. For this analysis, each MWh of energy efficiency reduces regional emissions by the market rate (Chapter 10- Figure 10.14). This reduction feeds into the optimization of resources and the Washington State requirement to use the social cost of carbon benefits of energy efficiency. The estimated savings are not included in Figure 11.6 above because of their inclusion in the net emissions to serve net load. The calculation helps to understand the benefit of the emission reduction from energy efficiency. Figure 11.8 shows the annual avoided greenhouse gas emissions from energy efficiency. Over the 25-year forecast, Avista's energy efficiency programs reduce regional emissions by 3.25 million metric tons between 2021 and 2045.

Figure 11.8: Energy Efficiency GHG Emissions Savings

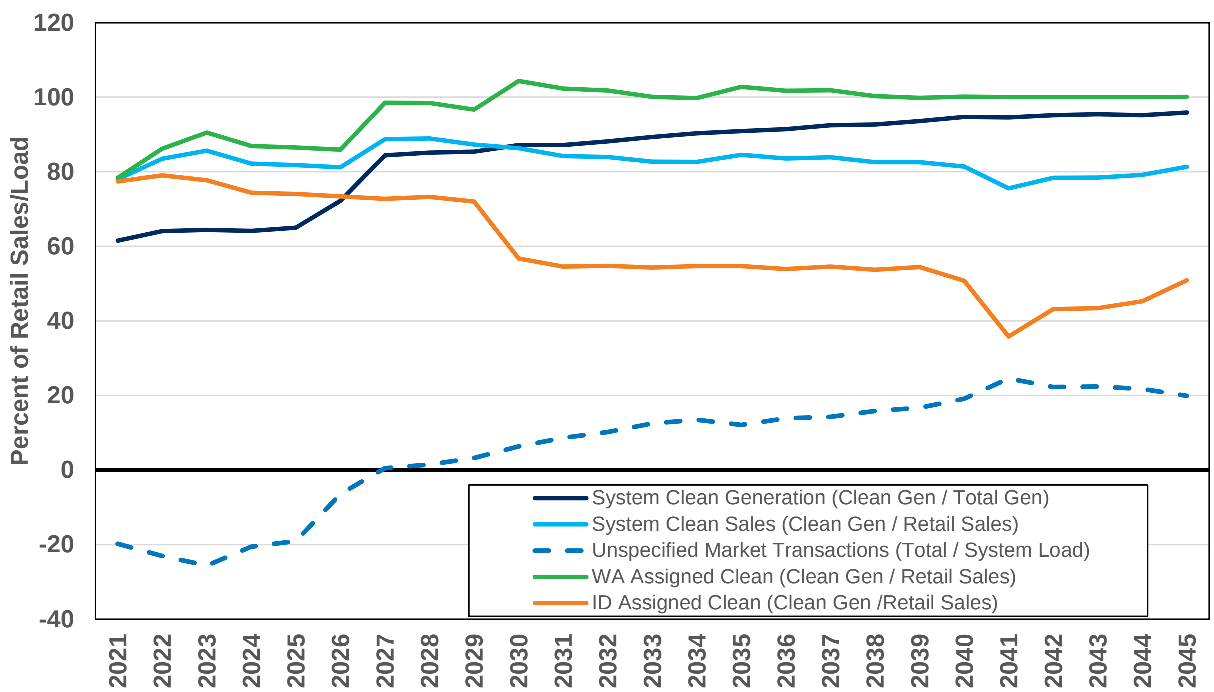


For resource optimization, this analysis includes the upstream emissions content from the natural gas supply chain. Upstream emissions come from the drilling, processing, and transportation of the natural gas to end use customers. Avista sources its natural gas for power entirely from the Canadian system. As described in Chapter 9, the upstream emissions factor for our natural gas purchases is 0.784 percent including the associated multipliers for methane release. These emissions are included in the optimization of resource choices, but are not included in the estimate shown in Figure 11.7. Avista estimates these emissions to be 10,000 metric tons in 2020 and 1,160 metric tons by 2045. Lower natural gas usage is the driver from lower upstream emissions.

Another metric to view Avista's clean energy resource mix is to account for transfers of clean energy between states (see Figure 11.9). The figure shows several different clean energy measures to illustrate how energy serves customers in each state and as a system. The dark blue line is "System Clean Generation (Clean Gen / Total Gen)" it estimates the amount of clean generation as compared to Avista's controlled generation, this metric shows Avista's system clean generation mix.

The light blue line "System Clean Sales (Clean Gen / Retail Sales)" shows the amount of clean generation as compared to annual system retail sales. Any remaining power to serve customers is from market transactions or from other generation. The dotted blue line estimates the amount of net market transactions and is labeled "Unspecified Market Transactions (Total / System Load)." Clean energy assigned to Washington for CETA compliance is the green line "WA Assigned Clean (Clean Gen / Retail Sales)" and the remaining clean energy for Idaho is the orange line "ID Assigned Clean (Clean Gen / Retail Sales)." Lastly, this chart does not forecast any REC sales to non-Avista customers.

Figure 11.9: Clean Energy Mix Forecast



Avoided Cost

As part of the IRP process, Avista calculates the avoided or incremental cost to serve customers by comparing the PRS cost to alternative portfolios. There are two important avoided cost calculations: the first is for new generation resources and the second is for energy efficiency.

New Resource Avoided Cost

The 2020 IRP's avoided costs are in Table 11.6. However, avoided costs will change as Avista's loads and resources change, as well as with changes in the wholesale power marketplace. Avoided Costs use the best available estimate at the time of the analysis with the data available. Any precise or specific project characteristics will likely change the value of a resource. The prices shown in the table represent energy and capacity values for different periods and product types, including renewable energy projects. For example, a new generation project with equal deliveries over the year in all hours has an energy value equal to the flat energy price shown in Table 11.6. The table also includes traditional on-peak and off-peak pricing as a comparison to the flat price. In addition to the energy prices, this theoretical resource would also receive the capacity value as it produces power at the time of system peak. This system peak contributing value begins in 2026 for resources that can dependably meet winter peak requirements.

Capacity value is the resulting marginal cost of capacity each year. Specifically, the calculation compares a higher cost of a portfolio with new capacity against a lower cost portfolio with no new resources for each year. Avista uses these annual cash flow differences to create an annualized cost of capacity beginning the first year the utility is short with an annual price adjustment of 2 percent per year. This calculation removes the variability in annual payments but is the same present value cost. The next step divides the cost by the amount of added capacity in terms of winter peak. This value is the cost of capacity per MW, or cost per kW-year. The capacity payment applies to the capacity contribution of the resource at the time of the winter peak hour.

To obtain a full capacity payment, the resource must generate 100 percent of its capacity rating at the time of system peak. For example, solar receives a 2 percent credit based on ELCC analysis and would receive 2 percent of the capacity payment as compared to its operational capacity. For wind resources, their location determines the capacity credit they receive. Northwest wind contributes 5 percent of its operational capacity to winter peaks, while Montana wind contributes 40 percent. No matter the resource, Avista will need to conduct an ELCC analysis for any specific project it evaluates to determine its peak credit. Another item to consider for intermittent resources is the cost to integrate the variability onto the system. Any potential resource seeking Avoided Cost pricing shall reduce its compensation by these integration costs.

The clean energy premium calculation is similar to the capacity credit, but in this instance, it estimates the cost to comply with CETA by comparing the PRS to a portfolio without complying with CETA. Chapter 12 discusses these portfolios. Avista uses these annual cash flow differences to create an annualized cost of capacity beginning with the first year of clean energy acquisition with an annual price adjustment of 2 percent per year. Then the new annual cost divided by the incremental megawatt hours of generation. This value shows the amount of extra cost per MWh to meet CETA[9]. This benefit includes the cost associated with changing to cleaner capacity resources but also adding clean energy resources.

A scenario is also included to highlight the Clean Premium for projects if federal tax credits continue (see Table 11.7). In this scenario, the incremental cost of clean energy is lower due to the cost shift from utility customers to tax payers. The clean premium estimate for specific future projects will depend on the amount of clean energy and clean capacity the asset produces.

Avista believes the best method for estimating avoided costs of new clean energy resources is through the RFP process. An RFP process provides real cost information with specific energy resources. These pricing results are the real avoided costs if Avista were to acquire additional clean energy resources. For capacity resources, an RFP is also the best method for determining these costs. Although certain cases, specifically acquiring hydroelectric existing resources may not be available in an RFP process, and Avista must use judgement and market intelligence when acquiring these resources to ensure they are at competitive prices.

Energy Efficiency Avoided Cost

The energy efficiency avoided cost is useful for the energy efficiency evaluation and acquisition team to conduct financial analysis of potential programs in between IRP analyses. The process to estimate avoided cost calculates the marginal cost of energy and capacity of the resources selected in the PRS. The calculation process is similar to the generation resources above, but differs in the case of energy efficiency. In this scenario, the model disables the option to use energy efficiency as a resource. This method results in the total benefit energy efficiency brings to the system.

Unlike generation resources, the energy efficiency avoided costs include additional premium components. First is the 10 percent NPCC preference adder. Second is the consideration of transmission and distribution losses. Third is savings of constructing less transmission and distribution facilities. The social cost of carbon is also included for project evaluation in Washington. For this example, the social cost of carbon applies to the projected greenhouse gas savings from the market transactions as described above. For avoided cost purposes, this consideration is included in the clean energy premium. In summary, energy efficiency avoided cost is the first value of the saved energy. The second is the savings in capacity resources as defined by the difference between a portfolio meeting only capacity requirements and no capacity obligations. Third, is the incremental cost to meet the clean energy requirements of CETA. This includes the value

[9] Avista is modeling the CETA premium as an energy payment for Avoided Cost. Analysis shows the CETA premium actually changes some capacity decisions and theoretically, some of the clean energy premium should be associated with capacity for clean energy resources. This also assume Idaho's share of the hydroelectric system does not contribute to Washington's 100 percent goals, with the exception of alternative compliance limited to 20 percent in 2030.

of less clean energy resources required by energy efficiency effect of lowering load and the reduction in greenhouse emissions. Figure 11.9 shows each of these cost estimates below.

Table 11.6: New Resource Avoided Costs

Year	Energy Flat (MWh)	Energy On-Peak (MWh)	Energy Off-Peak (MWh)	Clean Premium (MWh)	Capacity ($/kW-Yr)
2021	19.67	22.64	15.71	0.00	0.0
2022	19.98	22.75	16.28	11.75	0.0
2023	20.44	23.05	16.98	11.99	0.0
2024	21.61	24.09	18.28	12.23	0.0
2025	22.76	25.19	19.50	12.47	0.0
2026	24.27	26.40	21.43	12.72	107.7
2027	23.57	25.27	21.30	12.97	109.9
2028	25.02	26.26	23.35	13.23	112.1
2029	25.92	26.80	24.73	13.50	114.3
2030	26.72	27.08	26.25	13.77	116.6
2031	29.46	29.66	29.21	14.04	118.9
2032	29.78	29.95	29.54	14.32	121.3
2033	31.22	30.74	31.89	14.61	123.7
2034	32.83	31.94	34.06	14.90	126.2
2035	33.66	32.64	35.05	15.20	128.7
2036	35.82	34.82	37.16	15.51	131.3
2037	36.12	34.58	38.19	15.82	133.9
2038	38.81	37.40	40.76	16.13	136.6
2039	38.60	37.13	40.57	16.45	139.3
2040	38.52	36.80	40.84	16.78	142.1
2041	39.09	37.74	40.92	17.12	145.0
2042	38.98	37.99	40.31	17.46	147.9
2043	40.24	39.51	41.21	17.81	150.8
2044	46.10	45.29	47.15	18.17	153.9
2045	43.94	43.11	45.05	18.53	156.9
15 yr Levelized	24.58	26.11	22.55	11.81	64.8
20 yr Levelized	26.44	27.55	24.98	12.43	75.1
25 yr Levelized	27.86	28.77	26.66	12.93	82.2

Table 11.7: New Resource Avoided Costs With Renewable Tax Credits

Year	Energy Flat (MWh)	Energy On-Peak (MWh)	Energy Off-Peak (MWh)	Clean Premium (w/ Tax Incentive) (MWh)	Capacity ($/kW-Yr)
2021	19.67	22.64	15.71	0.00	0.0
2022	19.98	22.75	16.28	3.44	0.0
2023	20.44	23.05	16.98	3.50	0.0
2024	21.61	24.09	18.28	3.57	0.0
2025	22.76	25.19	19.50	3.65	0.0
2026	24.27	26.40	21.43	3.72	107.7
2027	23.57	25.27	21.30	3.79	109.9
2028	25.02	26.26	23.35	3.87	112.1
2029	25.92	26.80	24.73	3.95	114.3
2030	26.72	27.08	26.25	4.03	116.6
2031	29.46	29.66	29.21	4.11	118.9
2032	29.78	29.95	29.54	4.19	121.3
2033	31.22	30.74	31.89	4.27	123.7
2034	32.83	31.94	34.06	4.36	126.2
2035	33.66	32.64	35.05	4.44	128.7
2036	35.82	34.82	37.16	4.53	131.3
2037	36.12	34.58	38.19	4.62	133.9
2038	38.81	37.40	40.76	4.72	136.6
2039	38.60	37.13	40.57	4.81	139.3
2040	38.52	36.80	40.84	4.91	142.1
2041	39.09	37.74	40.92	5.01	145.0
2042	38.98	37.99	40.31	5.11	147.9
2043	40.24	39.51	41.21	5.21	150.8
2044	46.10	45.29	47.15	5.31	153.9
2045	43.94	43.11	45.05	5.42	156.9
15 yr Levelized	24.58	26.11	22.55	3.45	64.8
20 yr Levelized	26.44	27.55	24.98	3.63	75.1
25 yr Levelized	27.86	28.77	26.66	3.78	82.2

Figure 11.10: Avoided Cost of Energy Efficiency