TACOMA POWER
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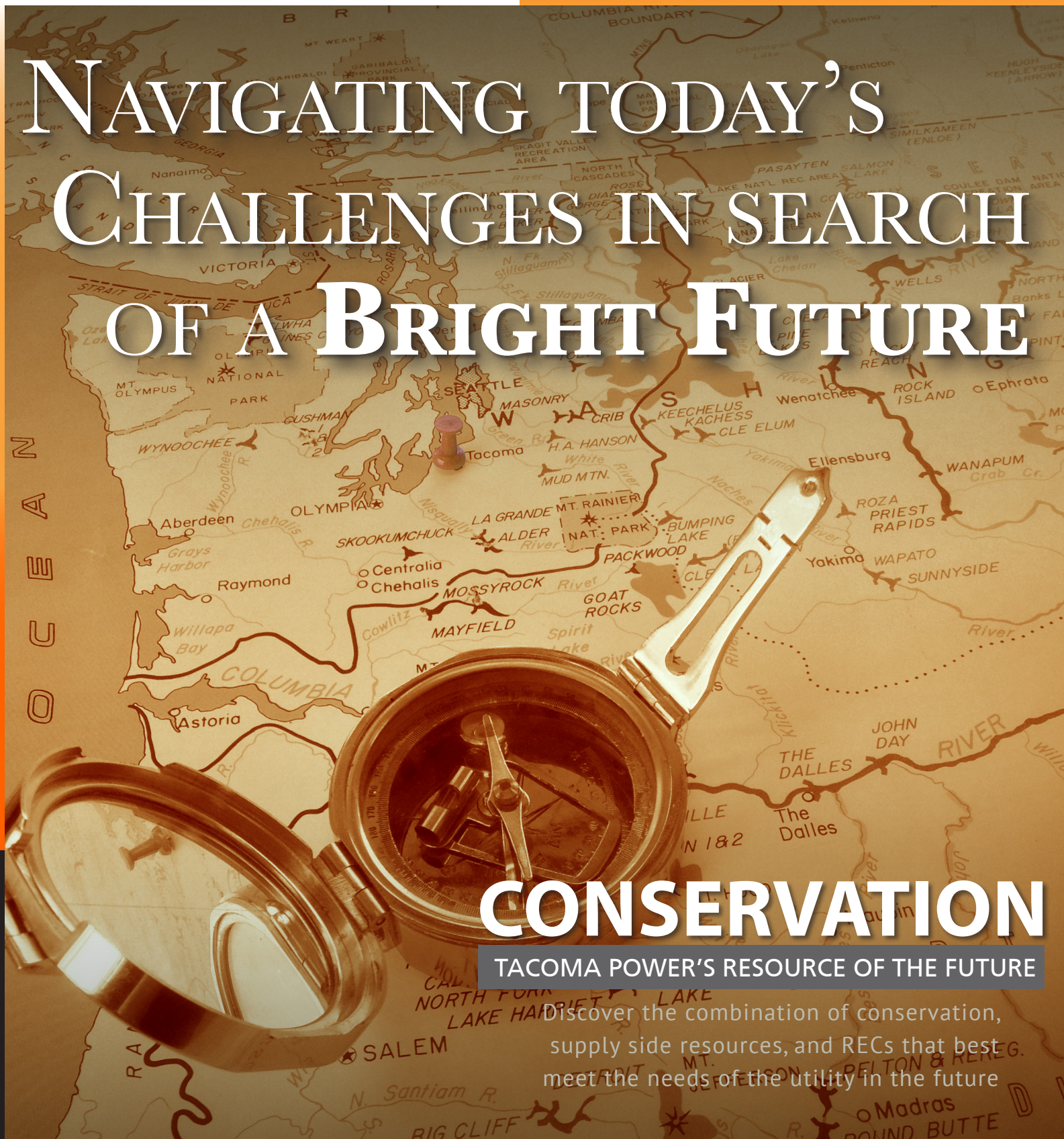
IRP

Tacoma Power's 2013 Integrated Resource Plan

Navigating today's Challenges in search of a Bright Future



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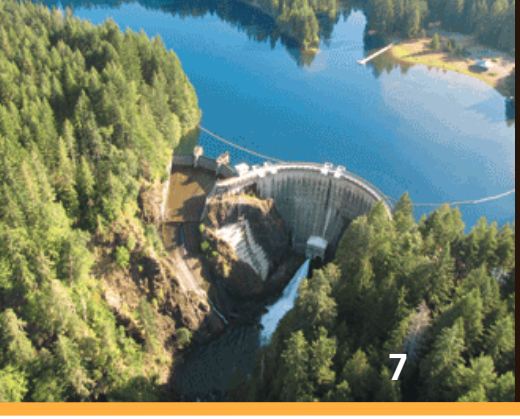

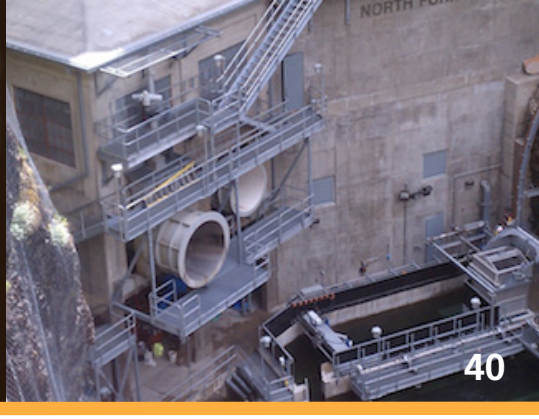

This publication of Tacoma Power's 2013 Integrated Resource Plan is intended to fulfill the requirements of Chapter 19.280 of the Revised Code of Washington.

The publication is the product of Tacoma Power's Power Management workgroup. For permission to reprint or reference portions of this document please contact Tacoma Power using one of the following methods:

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Executive Summary

The preparation of this Integrated Resource Plan (IRP) presented no shortage of challenging issues to address. The first of which was a shift in the timeline for preparing the IRP; in order to better align with Tacoma Power's conservation and renewable compliance timelines. Additionally, the region finds itself facing a unique combination of policy issues that Tacoma Power is either closely monitoring or participating in. Some of these issues are the developing Market Assessment and Coordination Committee (MC), fate of the Columbia River Treaty, effects of increasing renewable generation on the power grid, and developing Green House Gas initiatives. Each issue has the potential to significantly impact the utility in different ways and are further explored in the first section of this IRP.

This resource acquisition strategy provides Tacoma Power with the promise of a bright future for years to come

Regionally, demand continues its slow ascent out of the economic recession but for Tacoma Power, the utility is not forecasting to reach the demand levels experienced before 2001 until well into the 2020's. On the supply side, the region continues to develop new renewable resources ahead of need and currently has more generating capability than needed to meet load demand or the renewable portfolio standards. For Tacoma Power, the slow load growth, diligent operation and maintenance of existing facilities, and unprecedented success of our conservation program in recent years has pushed the planning horizon for this IRP to 2022 through 2028. This IRP analyzed and compared several different scenarios that could affect the utility between now and the end of the planning horizon, including special studies on the effects of the Columbia River Treaty and potential carbon pricing.

Upon conclusion of 2013 planning process, it is apparent that the conservation programs dedicated to the acquisition of approved conservation targets remain Tacoma Power's only additional near-term resource. The acquisition of the 15-year economic achievable potential of 59.5 aMW (8.1 aMW in the 2014/2015 biennium) will ensure Tacoma Power has sufficient surplus energy to meet forecast loads well into the 2020's. While there is no way to know for certain what the future holds, when the last 80 years of historical water conditions are used in combination with forecast loads (2022 through 2028), Tacoma Power is surplus in 96.5% of the historical periods. This leaves Tacoma Power with the purchase of additional Renewable Energy Credits (RECs) as the preferred strategy for complying with the 2016 through 2019 Renewable Portfolio Standard period.

New things are happening every day with potential to impact the utility but this resource acquisition strategy provides Tacoma Power with the promise of a bright future for years to come.

RESOLUTION NO. U-10671

A RESOLUTION relating to the approval and adoption of the Tacoma Power 2013 Integrated Resource Plan.

WHEREAS Washington State law (Chapter 19.280 RCW) requires the Department of Public Utilities, Light Division (d.b.a. "Tacoma Power"), to prepare and submit integrated resource plans ("2013 IRP") to the Washington State Department of Commerce by September 1st in even years. Tacoma Power has completed a full IRP for compliance with its 2014 submission, and

WHEREAS the 2013 IRP, on file with the Clerk of the Board, incorporates new estimates for retail customer demand, a review of the output of existing resources, and the amount of available and cost-effective resource supply options to meet forecast demand. An overview of the 2013 IRP was presented to the Board on October 23, 2013, and

WHEREAS RCW 19.280.050 requires the governing body of the electric utility to approve such plan after public notice and hearing, and

WHEREAS the Board conducted a public hearing on the plan on December 18, 2013, and

WHEREAS Tacoma Power requests approval and adoption of the 2013 IRP by the Board; Now, Therefore,

BE IT RESOLVED BY THE PUBLIC UTILITY BOARD OF THE CITY OF TACOMA:

Tacoma Power's 2013 Integrated Resource Plan is approved, and the appropriate officers of the City are directed to file such plan with the State of Washington in accordance with Chapter 19.280 RCW.

Approved as to form and legality:

William C. Fosbre
Chief Deputy City Attorney

Chair

Secretary

Charleen Jacobs
Clerk

Adopted 12-18-13

Introduction

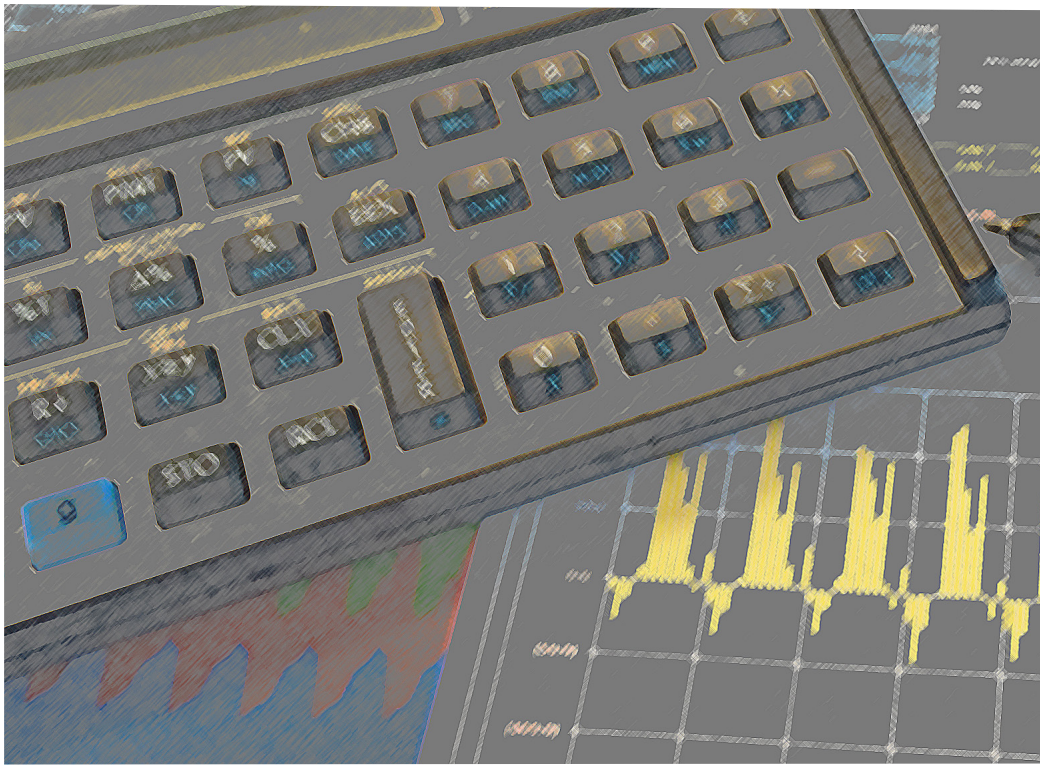
Developing an integrated resource plan (IRP) is a strategic planning process utilities use to help determine the best way to serve their customers. The goal of an IRP is to identify the portfolio of resources that can meet the customer needs at the lowest cost and risk. This is accomplished by using comparative and statistical analysis to evaluate the adequacy of power supply resources to meet our customers' energy needs in a variety of uncertain future conditions. Tacoma Power's previous IRP has demonstrated that Tacoma Power's portfolio of energy resources is sufficient to meet projected customer loads through 2022. This IRP's primary objective is to determine the combination of new resources to meet Tacoma Power customer's energy needs during the period of August 2022 through July 2028.

The IRP considers the operation and performance of the total resource portfolio under a variety of uncertain future conditions to determine the right timing and amount of additional resource supply needed to best serve our customers. The process of developing the IRP is designed to balance and mitigate the competing risks that: 1) Tacoma Power has adequate resources to meet our customer's needs; and 2) Tacoma Power minimizes our customer's costs by avoiding the premature acquisition of unnecessary resources. It would be short-sighted to acquire an additional resource "just in case" loads were to increase faster than expected. The effort needed to acquire a new resource is often a very expensive and lengthy process, requiring significant planning and preparation by itself.

The goal of an IRP is to identify the portfolio of resources that can meet the customer's needs at the lowest cost and risk.

Assessing the operation and performance of the resource portfolio is a complicated and difficult task. Some things are certain, like the expiration date of a power supply contract, but most things have varying levels of uncertainty. Three of the most significant components affecting Tacoma Power are what customer loads will be, how much water will be available behind the dams to generate electricity, and what wholesale electric prices will be. The IRP will indicate specific assumptions and demonstrate the analytical approach for comparing these and other uncertainties (e.g. the impacts of weather, market price of natural gas and other resource fuels, renewable portfolio standards, carbon taxes, emerging technologies, regulatory changes affecting the resource operations environment, etc.).

In addition to minimizing costs and risks, Tacoma Power has additional objectives to maintain and enhance system reliability and flexibility, where feasible. Tacoma Power also works to minimize adverse environmental and societal impacts and to expand the diversity of our supply portfolio. The IRP process continually asks "What if…" in building scenarios to discuss, analyze and compare alternatives. Each objective, risk and element of uncertainty is considered during the development of the IRP and culminates in the formulation of a 2-year recommended action plan for Tacoma Power.



History & Obligation of Preparing an IRP

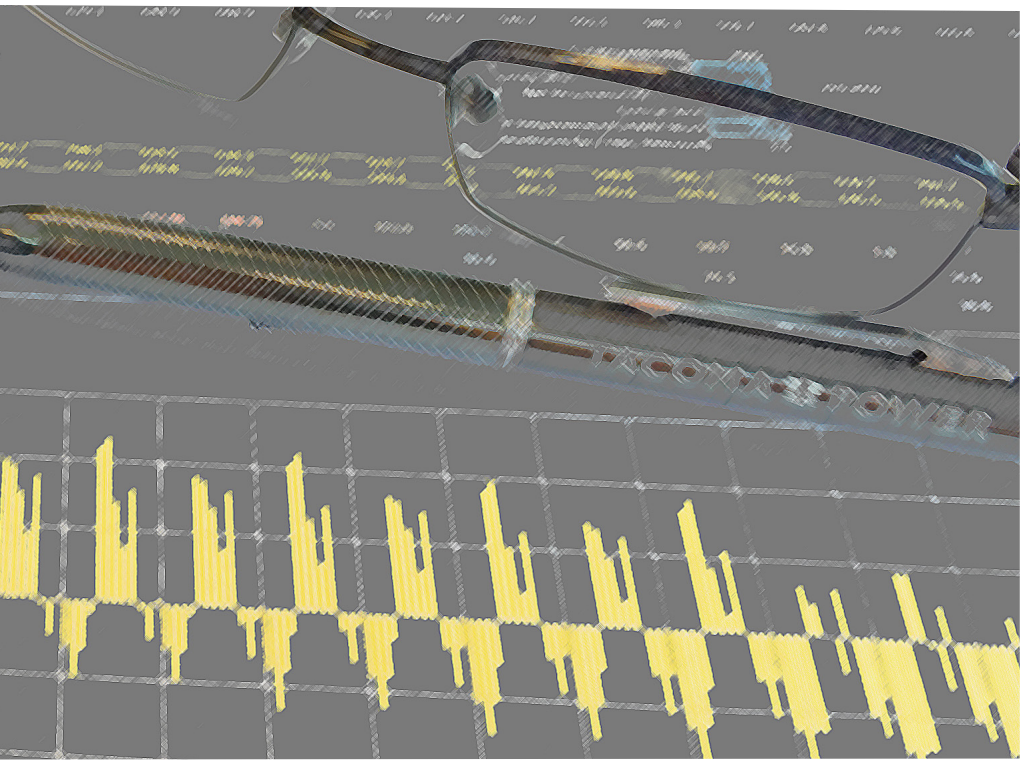
Tacoma Power has been preparing IRPs since 1990. Formerly, these plans were called "Least Cost Plans" but the general process and goal has remained constant. The process gets tailored in each subsequent edition of the IRP to study and analyze specific issues of concern. The most recent full IRP was published in 2010 and included a special assessment on the impacts of Climate Change and the growing population of Electric Vehicles. An update to the 2010 IRP was published in 2012, assessing the progress toward implementing the 2-year action plan and making further recommendations.

This Integrated Resource Plan fulfills the requirements of Chapter 19.280 of the Revised Code of Washington (RCW) and following approval by Tacoma Power's governing body, the Tacoma Public Utility Board, will be filed with the Washington State Department of Commerce. The Department of Commerce aggregates the information from Washington utilities to show electricity requirements and resource commitments for Washington as a whole. The objective of RCW 19.280 is to encourage utilities to perform the necessary resource planning to ensure they have secured sufficient power supplies to meet the needs of their customers.

Tacoma Power's 2013 Integrated Resource Plan

The development of the 2013 Integrated Resource Plan primarily follows a three step process. The first step is to assess the current environment and Tacoma Power's long-term needs. Demand projections are compared with the supply of owned resources and power supply contracts to define an expected load and resource balance. This identifies periods which may require supplemental resource supply to meet our customer's energy needs. The process, details, and results of this step are covered in the first section, titled Assessing the Current Situation.

The second step is to identify and evaluate potential new resources to fill any gaps identified for supplemental resource acquisition. Resource evaluation includes a comparison of direct capital and operational costs as well as relevant indirect costs, such as impacts to existing operational resource flexibility. This produces a subset of promising new resource types. Each of these are examined for the benefits, uncertainties and risks they pose in combination with Tacoma Power's existing portfolio.



The models used to perform these examinations calculate variable uncertain elements, such as different wholesale electricity and natural gas prices, different levels of water flowing into Tacoma Power's hydroelectric resources, and possible changes in customer demand, to identify the range of costs for each resource acquisition portfolio. This portfolio that minimizes the overall costs across the widest array of possible future scenarios is preferred. The process, details, and results of this step are covered in the second section, Resource Evaluation and Analysis,

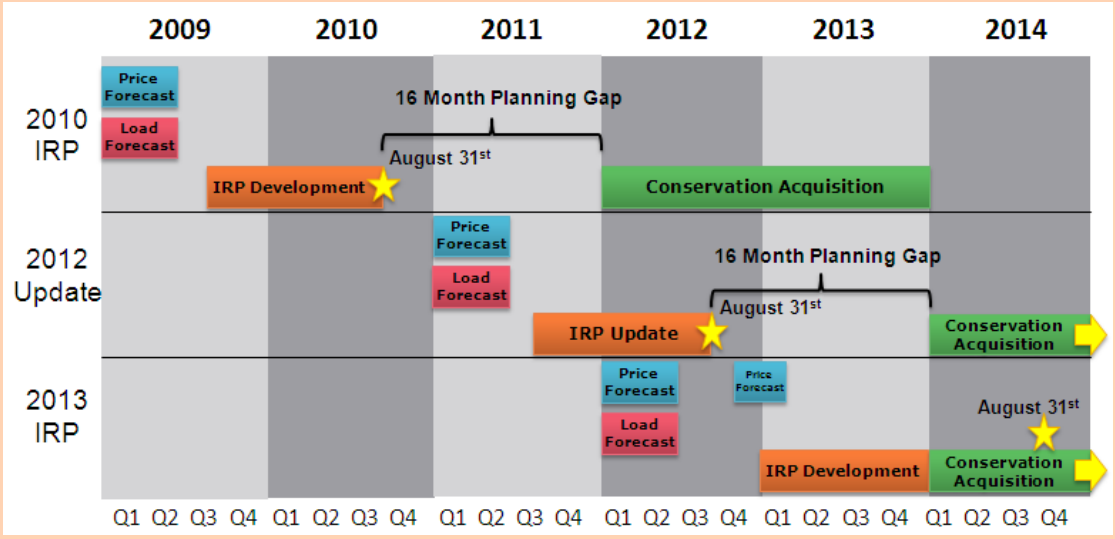
and Appendix 4: Analysis of Resource Scenarios.

The third and final step is to create an action plan based on the findings of the comparative and statistical analysis. This step also includes identifying areas for further study in subsequent IRP's. The details of this step are provided in the third section, The Implementation Plan. An attractive attribute of integrated resource planning is that it can be tailored to meet the specific needs of individual utilities. A decision facing Tacoma Power is how best to comply with Washington's Renewable Portfolio Standard, incorporated under the state's Energy Independence Act and codified in RCW 19.285. An update on Tacoma Power's compliance status and strategic plan for meeting the obligations in 2016 and 2020 are outlined in the fourth section, Renewable Compliance Update.

Stakeholder Process

Public participation is an important component for the success of the IRP. Tacoma Power has held three public meetings to share the IRP process and results while soliciting feedback. Special effort was made to contact key representatives from major commercial and industrial customers, local environmental and citizens interest groups, and local, state and federal agencies with an interest in Tacoma Power's IRP. The first meeting was held on March 18, 2013, followed by the second meeting on May 13, 2013. The final meeting was held on October 14, 2013, followed by a 15-day period to collect formal comments. The presentations shared during each of the three meetings are included in Appendix 7: Stakeholder Presentations.

Timing of the 2013 IRP



Tacoma Power published an update to our 2010 IRP in 2012 and this 2013 IRP is being published sooner than required by RCW 19.280. This is to better align with Tacoma Power's internal budgeting and business processes. Tacoma Power is required to publish a full IRP a minimum of every four years subsequent to September 1, 2008. At a minimum, a progress report or update must be completed two years following the completion of a full IRP. The next full IRP is not required to be completed until September 1, 2014, however, the timing of when budget approvals must be finalized for Tacoma Power's conservation acquisition process and the preparation of significant inputs used for analysis do not align well with previous IRP development schedules.

One of the resources that the IRP evaluates for the quantities and timing of acquisition is energy conservation . Tacoma Power uses the IRP planning process to set the biennial conservation acquisition target mandated by RCW 19.285. The figure above illustrates the IRP development process in connection with the conservation acquisition cycle since 2009. When the 2010 IRP was published there was a resulting 16 month gap between the completion of the IRP and the time that Tacoma Power proceeded with acquiring the recommended levels of conservation. Shifting the timing for developing the IRP in 2013 will allow Tacoma Power to finalize a recommendation on the quantity of conservation to acquire much closer to the period when the actual conservation programs will be put in place for acquisition.

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Assessing the Current Situation

Tacoma Power is in an enviable position. The utility has a portfolio of low cost resources that provide the ability to supply customer's needs under most conditions throughout the year. This significantly limits the risk and exposure of paying unpredictable prices in the wholesale power market to acquire supplemental energy. In addition, Tacoma Power's retail rates remain low relative to other utilities in the region and customers consistently report they are satisfied with utility services.

Washington State's electric power industry is facing a myriad of uncertainties and challenges. The wholesale market price for electricity continues to be volatile and unpredictable. Changing laws, regulations, and responsibilities continue to constrain the operational flexibility of the resource portfolio and limit utility choices for acquiring new resources. Transmission constraints pose operational challenges and add construction time, complexity, and cost to resource acquisition choices. Despite these challenges, Tacoma Power remains committed to continuing to provide reliable and low cost power to its customers.

This section provides a series of short narratives that are intended to provide the context for this IRP. The following sections will provide an overview of Tacoma Power's existing portfolio and describe recent events, regulatory, policy and operational challenges in which the utility operates.

Overview of Tacoma Power

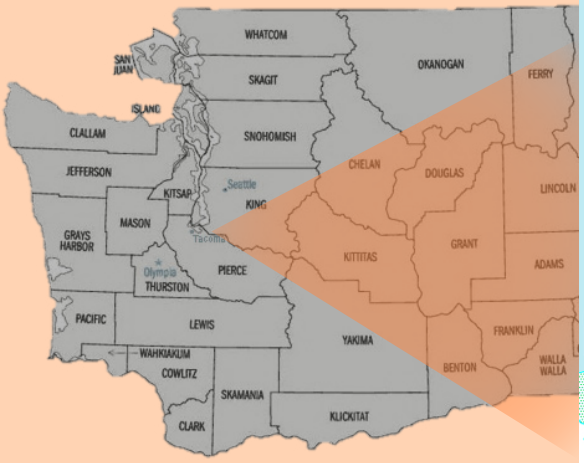
Tacoma Power is one of the oldest municipally owned utilities in the country. Incorporated in 1884 as Tacoma Light & Water Company, the City of Tacoma purchased the company in 1893. Today the utility is still a publicly owned division of Tacoma Public Utilities and serves over 169,000 customers across 180 square miles. In 2012 Tacoma Power supplied approximately 580 aMW to its customers and the average residential cost is currently $0.07/kWh. Nearly all of this electricity comes from hydroelectric power plants. Over half of which is provided through long-term contracts with the Bonneville Power Administration (BPA), and the remainder is provided by utility owned power plants and other long-term contracts.

With a high year-to-year variability in the amount of rainfall and snowpack that flows into the reservoirs used in generating electricity, Tacoma Power assumes critical water–the lowest historical river flows from the last 80 years, when planning to serve loads. As a result, the utility will on average generate more electricity than is needed to meet customer demand. Surplus electricity is sold into the wholesale power market and the revenue helps Tacoma Power

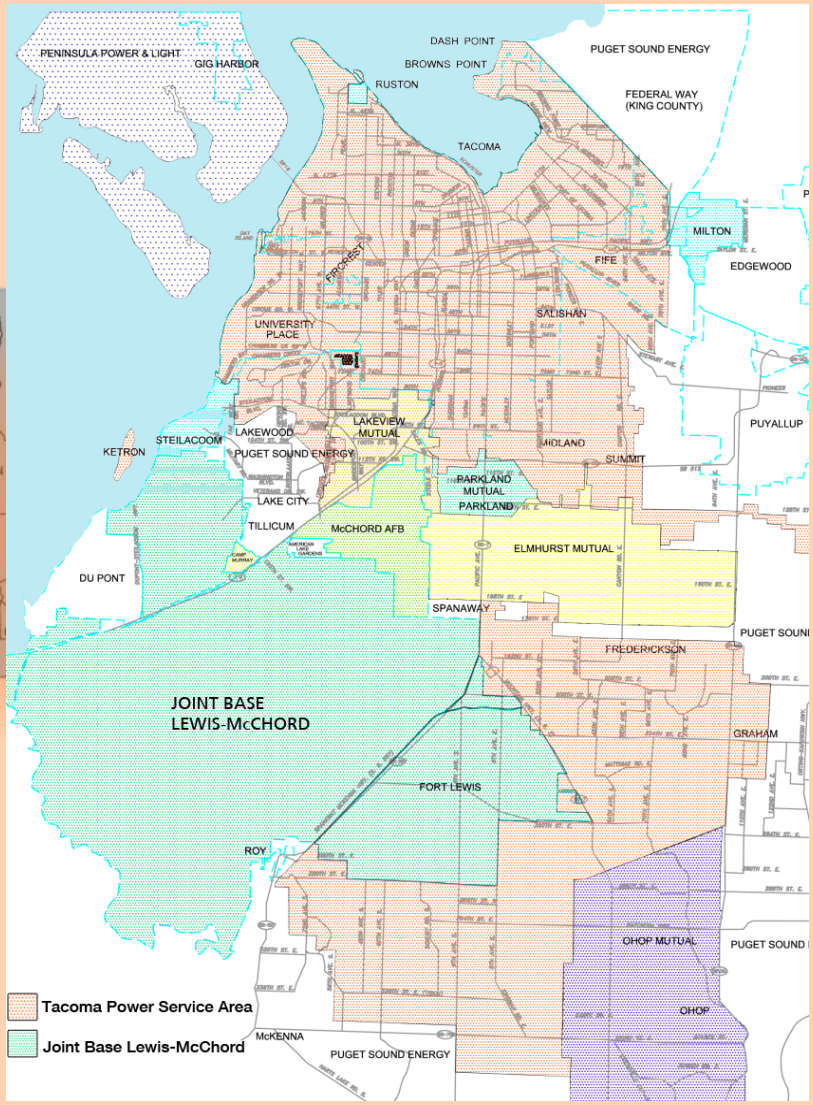
keep customer rates as low as possible. Most of the generating resources used to serve customers are located outside of the utility's service area. A combination of owned and contracted for transmission resources are used to bring the electricity from the power plants to Tacoma Power's service area.

City of Tacoma

Tacoma is Washington State's third largest city with a population of just under 200,000. Tacoma is located on the Puget Sound's Commencement Bay which is approximately 30 miles southwest of Seattle.



Tacoma was incorporated in 1884 and became known as the "City of Destiny" when it was designated as the terminus of the Northern Pacific Railroad. Today the city is a diverse, progressive, and international city serving as the center of business activity for the South Sound region and a gateway to the Pacific Rim.



Significant Policy Issues

Policy issues can arise from a multitude of locations, new federal laws or rulemaking, statutory or local legislative changes, or operational changes as a result of working through challenges facing the region. Tacoma Power has staff dedicated to working on policy issues that arise in each of these areas and often devotes one or more subject matter experts to each issue in order to advocate and protect the interests of Tacoma Power's customers. A couple of major issues facing the region in the current planning period are the Market Assessment and Coordination Committee (MC) effort, the future of the Columbia River Treaty, the looming effects of California's integration of solar resources, and Green House Gas legislation.

Tacoma Power At A Glance

Service Area: 180 square Miles
Customers Served: 169,112
(54.7% in city limits and 45.3% outside)
2012 Retail Load: 580 aMW
Average Residential Cost: $0.07/kWh

The Market Assessment and Coordination Committee (MC) was established in 2012. Over the last few years Balancing Authorities in the Northwest

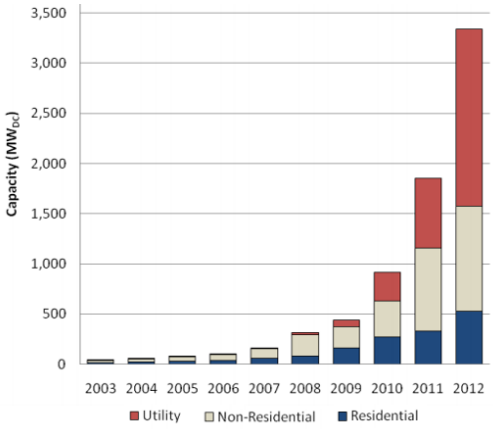
have identified several challenges to operating the regional power system in a reliable and cost-effective manner as significant quantities of variable energy resources such as wind and solar are brought onto the electric grid. In order to better evaluate these issues and potential solutions, 22 utility organizations began collaborating through various workgroups within the Northwest Power Pool (NWPP). One potential solution could be the implementation of a centralized Energy Imbalance Market (EIM). While other regions in the US have successfully established centralized markets as a means of helping respond to rapid changes in loads and resources, this type of market has never been implemented in a region so heavily dominated by hydro resources and without a centralized transmission operator. The MC effort is currently evaluating the efficacy, appropriateness, costs, benefits, and potential structure of an EIM for the Northwest. There is no definitive completion date for this workgroup but they are continuing to address concerns, evaluate possibilities, and make recommendations on next steps for implementation. Tacoma Power is an active participant in the MC effort.

Another significant issue facing Tacoma Power over the next decade is the fate of the Columbia River Treaty. The treaty was established in 1964 between the United States and Canada as a means of coordinating the development and operation of dams on the Columbia River for power and flood control benefits. Coordinated operations could change as soon as September of 2024 unless the two nations agree on a new arrangement. Flood control operations at both the U.S. and Canadian storage projects could change significantly, with uncertain effects on the region's hydropower output. Tacoma Power's largest energy supply resource is a Power Purchase Agreement with BPA, whose resources are predominately located on the Columbia River. A much smaller amount of power comes from agreements with Grant County Public Utility District and the Grand Coulee Project Hydroelectric Authority (GCPHA), which would also be affected. Further details and a potential outcome of this issue have been incorporated into the scenario analysis detailed in Appendix 5: Comprehensive Review of Resource Alternatives.

A third issue that has emerged in the last year is the forecast addition of significant solar resources in the State of California. The Northwest and California are interconnected through AC and DC transmission lines, called interties, with the potential ability to transfer over 7,000 megawatts per hour. The two regions use these interties to share power resources and help keep costs down. California's peak loads often occur in the summer, meaning there is usually surplus generation capacity available during the winter when loads are highest in the Northwest.

In 2011, the California legislature passed a law requiring utilities to serve 25 percent of their retail customers' load with qualified renewable resources by 2016. The requirement increases to 33 percent by 2020 and the law established policies limiting the use of renewable generation from outside California to meet the requirements. As costs for photovoltaic generation have been falling rapidly over the last few years, many new solar installations have been used for helping meet these needs.

The International Renewable Energy Council reports that, through 2012, California had 35 percent of the nation's total solar supply with more than 2,500 MW's of grid connected photovoltaic generation.[1] Currently, 48 percent of all utility sector installations are either in California or supply electricity for the California power market. If current trends for solar installations continue, the addition of this resource has significant potential to affect the availability and timing of surplus generation in California. This may impact the availability of generation, the market prices for power, and change the dynamics of exporting renewable resources out of the Northwest. It is too early to predict the full range of challenges, but the issue is one that Tacoma Power is actively monitoring and has included in the analysis of this IRP.



Annual US Installed Grid-Connected Photovoltaic Capacity by Sector

One final policy issue of concern is the potential adoption of a Green House Gas initiative. The likelihood for new legislation that implements a form of carbon

1 IREC's Solar Market and Installation Trends Report 2013 (http://www.irecusa.org)

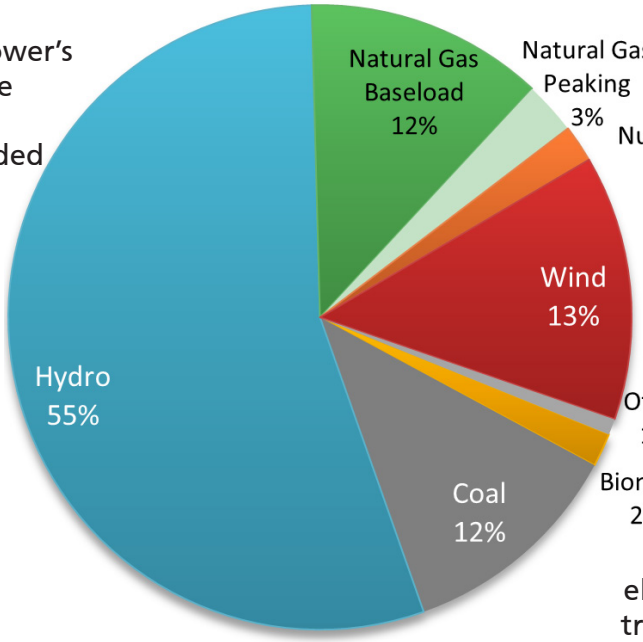
pricing is increasing as individual states continue to consider the potential impacts and benefits of doing so. On the West Coast, Washington and Oregon's Governors, as well as citizen groups, are mobilizing around the issue. Recent economic analysis suggests potential for new economic and jobs growth around tax shifts that tax carbon and reduce other taxes. In addition, recent polling indicates a majority of voters would support a tax shift model similar to the Environmental Tax Reform programs in the European Union or British Columbia.

For Tacoma Power, the impacts of carbon pricing depend on where the program originates. If adopted within WECC, but not in Washington, a carbon tax would likely create downward pressure on the price of electricity in local power markets. This would be the result of power being stranded outside the northwest market. If adopted in Washington, it would likely increase the value of electricity traded in the wholesale market. Tacoma Power's previous analysis indicates that a fully implemented $30 per tonne tax on CO2e in Washington would raise the price of wholesale electricity an average of $17 per MWh. When Tacoma Power is surplus this higher price would result in additional revenues that the utility could use to offset retail prices.

Regional Electricity System

The region's predominant generating resource continues to be hydroelectric power plants. However, the portfolio is persistently gaining diversity as new generating capabilities become more cost effective and the emphasis on acquiring renewable resources remains at the forefront of resource planning. The generating capacity of the regional electricity system is currently 62,301 MW and 55 percent of that capacity comes from hydroelectric power plants[2]. In an average operating year, these hydroelectric resources will produce 16,279 aMW of electricity whereas Tacoma Power's owned resources will generate approximately 320 aMW. The regional electric system recorded a weather adjusted average load of 20,219 aMW in 2011[3] and by comparison, Tacoma Power's 680 aMW of annual load and the generating capabilities are only a small part of the regional electricity system.

A significant component of the regional electricity system is the Federal Columbia River Power System (FCRPS), consisting of 31 federally owned hydro projects on the Columbia and Snake Rivers. Owned and maintained by the US Army Corps of Engineers (COE) and the Bureau of Reclamation (USBR), the Bonneville Power Administration (BPA) markets and distributes the power generated from these federal dams and the Columbia Generating Station, a 1,030 aMW nuclear plant. BPA also owns and operates about 75 percent of the Northwest's transmission system. Tacoma Power purchases over half of the annual energy used to serve their customers from BPA and many of the resources BPA manages are used for balancing the increasing supply of renewable energy in the Northwest.



Northwest Installed Nameplate Capacity (62,301 MW)

Every day the region's generation and loads converge as Balancing Authorities manage the real-time balance of loads and resources. Each moment generator owners and operators, load serving entities, power marketers, and others are cooperating in regional wholesale electricity markets for the trading of surplus and deficit generation capabilities. These transactions usually

2 Northwest Power & Conservation Council Resources Located in Power Act Region or contracted to PNW loads; WECC, In-service, under construction, standby or idle.

3 Northwest Power & Conservation Council's Sixth Plan Mid-term Assessment (p. 7)

occur at regional trading hubs, of which the closest to Tacoma Power is the Mid-Columbia trading hub. On average, the prices in the last few years have been relatively modest but the volatility associated with these electricity prices remains unpredictable and can change dramatically with little notice. In 2012, average annual prices at Mid-C were less than $17.00/MWh[4], but in several hours throughout the year prices rose to over $40.00/MWh. In July of 2013 hourly prices rose above $125/MWh. Managing loads and resources in this unpredictable market environment continues to be a challenge for all of the region's load service providers.

Transmission Assessment

Transmission plays a key role in any IRP but it is often overshadowed by a focus on supply and demand-side resources. Transmission is not only necessary and important for ensuring the successful acquisition of resources, but also has cost and availability components that must be considered in the resource acquisition process. Tacoma Power focuses on both owned and contracted-for transmission resources by participating in national and regional policy issues that affect how we operate and maintain our transmission infrastructure. The majority of Tacoma Power's contracted transmission resources are with BPA for delivering the output of existing Power Supply Agreements and providing access to the wholesale electricity market. Additionally, our local transmission and distribution infrastructure is operated and maintained by one of Tacoma Power's largest business units, the Transmission and Distribution (T&D) section.

Tacoma Power's electrical network is integrated into the western electric transmission system of North America. This system covers the majority of eleven western states, two Canadian provinces, and a northern portion of Baja California, Mexico. Within the Northwest, BPA owns and operates approximately 75 percent of the high voltage transmission facilities. In addition to using its own network, Tacoma Power also utilizes the transmission services provided by BPA and other regional transmission providers to transmit, deliver, and exchange power in the regional wholesale power market.

Regional Transmission Planning

Regionally, Tacoma Power is a charter member of ColumbiaGrid, a non-profit membership corporation formed in March of 2006, whose primary function is to support and facilitate multi-system single-utility regional transmission planning. It accomplishes this through a coordinated, open, non-discriminatory, and transparent planning process, intended to facilitate transmission expansion in the region. The northwest region includes three investor-owned utilities PacifiCorp, Avista and Puget Sound Energy, as well as a number of other transmission owners.

One of the most significant issues affecting the regional transmission system is FERC's Order 1000. Finalized in 2011, the order required jurisdictional transmission-owning utilities (i.e., investor-owned utilities) to (1) engage in regional and interregional transmission planning, and (2) develop cost allocation methods to allocate the costs of new transmission projects among beneficiaries of the proposed transmission line.[5] In a recent order on ColumbiaGrid's Order 1000 compliance filing, FERC clarified questions on cost allocation. The decision requires regional planning parties to agree to binding, rather than advisory, cost allocation. This requirement is a challenge for non-jurisdictional utilities and thus threatens the sustainability of the regional transmission planning process in the ColumbiaGrid region. Participants from key transmission owning utilities in the region continue to try and work together to determine the best path forward and Tacoma Power remains an active participant in these regional discussions.

Balancing Authority

The electric power system is organized into Balancing Authorities in order to maintain system reliably. Tacoma Power is one of 19 balancing authorities in the Northwest Power Pool Area. Each balancing authority must continuously balance loads and resources, maintain interconnection frequency at the required levels, monitor and manage transmission power flow, maintain system voltages within required limits, and deal with generation or transmission outages.

4 Price Information compiled from Dow Jones Newswires Mid-Columbia Historical Price Indexes
5 Order 1000 is currently on appeal in the District of Columbia U.S. Court of Appeals

Federal Regulation

The Federal Energy Regulatory Commission (FERC) has significant regulatory authority over the nation's interconnected transmission system and wholesale energy markets. FERC has issued several recent orders related to regional and interregional transmission planning and cost allocation, as well as the integration of intermittent generation (such as wind and solar). Tacoma Power continually monitors and participates in policy discussions related to FERC's orders by individually advocating for the interests of our customers and cooperatively joining with trade organizations where appropriate.

Reliability Standards

The Energy Policy Act of 2005 substantially revised how electric reliability is governed in the United States. Prior to 2005, utilities such as Tacoma Power voluntarily complied with reliability standards, policies and procedures established by the North American Electric Reliability Corporation (NERC) and Western Electricity Coordination Council (WECC). Following the Energy Policy Act in 2005 compliance with reliability standards became mandatory. Currently NERC monitors and audits utilities to ensure and enforce compliance with the latest standards. To verify compliance with these standards, Tacoma Power conducts a self-administered audit every year and WECC performs on-site audits every three years. Tacoma Power was last audited by WECC in early 2013 and is in compliance with all applicable NERC and WECC standards.

Local Transmission Planning and Operation

Tacoma Power owns and operates 416 circuit miles of 230kV and 110kV transmission. Primarily located in Pierce County, the majority of these lines and substations form a contiguous network that interconnects Tacoma Power's customers with Tacoma Power's generation resources and BPA transmission facilities. Tacoma Power uses this system to provide distribution services to its retail customers and to provide wholesale transmission services under an Open Access Transmission Tariff (OATT). The terms, provisions, and rates of the OATT were updated and revised in 2012.

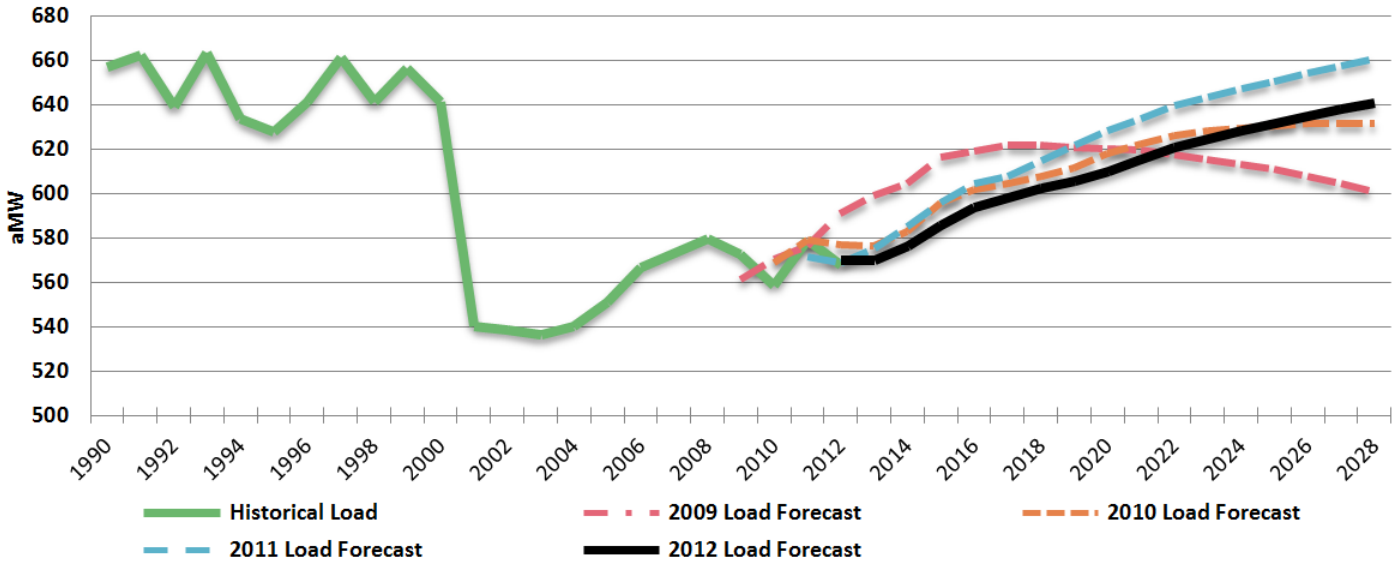
Tacoma Power's T&D business unit actively plans, constructs, operates and maintains this transmission network. They regularly prepare a 15-Year Facility Horizon Plan to implement capacity additions, reliability projects, renewal and replacement projects, and technology enhancements. Since the last IRP, Tacoma Power has completed a number of upgrades to its transmission system, including the completion and energization of three new substations, the replacement of two 230/115kV transformers, and the upgrade of a 230 kV transmission line. The next 15-year horizon plan is scheduled for completion in 2017 and some major projects currently underway or being evaluated are:

- The Mountain Substation is scheduled to be energized in November 2013
- The Southwest Substation 230 kV bus will be upgraded to a ring bus configuration in 2014
- A Cowlitz Substation 230 kV bus upgrade in 2016
- Reconfiguration for 115 kV buses at major substations starting in 2015
- Pearl – Cushman 115 kV line rebuild
- North Bay Crossing Tower Rehabilitation Project
- Henderson Bay Crossing Tower Rehabilitation Project

Tacoma Power Demand Overview

From 2010-2011, regional electricity demand increased by 651 aMW.[6] However, regional loads remain below the levels they were before the 2008 recession. On a weather-adjusted basis, total regional loads (excluding direct service industries) reached a high of 20,477 average megawatts in 2008, and then fell to 20,152 average megawatts in 2010. In 2011, regional weather-adjusted loads recovered to 20,219 average megawatts. If recent trends continue, the Northwest Power & Conservation Council (NWPCC) is expecting regional loads to return to pre-recession levels around 2014.

6 Northwest Power & Conservation Council's Sixth Power Plan Mid-term Assessment (p. 7)



Tacoma Power's Historical Actual Load and Load Forecasts

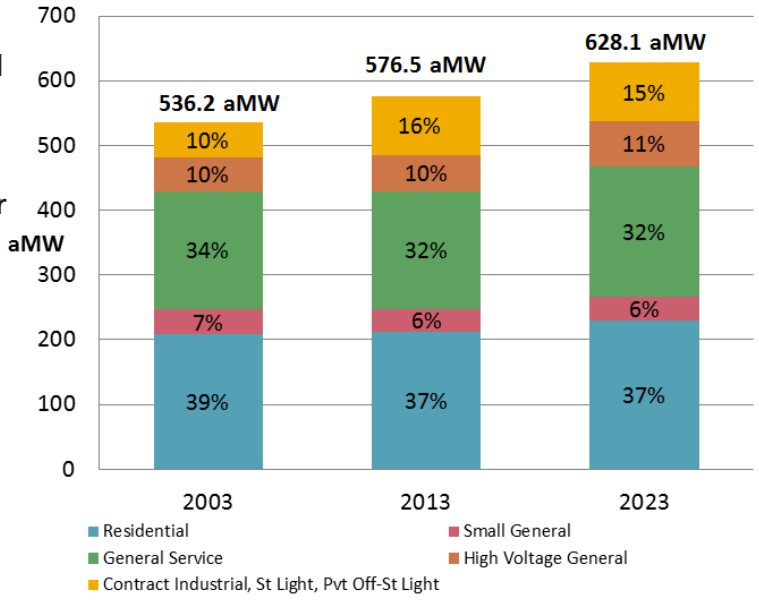
Local loads in the Puget Sound region appear to be rising more quickly. Many local economists are forecasting a bright economic future for the Puget Sound region. Geographic location and an educated workforce are just two of several reasons some economists predict the Puget Sound region will continue to outpace national trends for economic gains.[7] It is always difficult to determine how fast loads will grow but as the local economy flourishes, there is an expectation that Tacoma Power's loads will grow too.

Tacoma Power prepares an annual load forecast that is used in many areas of the utility's planning and budgeting efforts. The final Load Forecast is a combination of econometric modeling, trending analysis, and direct estimates from discussion and inquiry with Tacoma Power's diverse customer base. Many individuals carefully review the forecast before a final version is approved and the most recent load forecast at the start of this IRP process was the 2012 Load Forecast. More detail about the content and process of creating the Load Forecast can be found in Appendix 3: 2012 Load Forecast.

Tacoma Power has several different classes of customers and each class has a unique load forecasting methodology attributed to it. The different customer classes Tacoma Power currently has are; Contract Industrial Service (CP), High Voltage General Service (HVG), General Service, Small General Service, Lighting Services, and Residential. Each of the customer classes sum up to the combined load forecast. The chart to the right shows 10-year intervals of Tacoma Power's historical and forecast customer mix by class.

The annual average rate of system load growth is forecast at 1.1 percent for the 20-year load forecast. The chart above shows a historical comparison of the actual loads with the current load forecast as well as previous load forecasts.

Another important aspect of retail load is how it varies within the year. The figure on the following page shows Tacoma Power's projected firm average loads and peak energy loads from the 2012 Load Forecast. This illustration demonstrates that average wintertime loads are about one-third higher



Historical and Forecast Changes in Customer Mix

7 Seattle Business Magazine, January 2013, 2013 Economic Outlook http://www.seattlebusinessmag.com/article/2013-economic-outlook?page=0,4

than summertime loads. It also demonstrates how the peak load in December and January is nearly fifty percent higher than the average loads in those months.

Tacoma Power's qualitative analysis of the 2012 Load Forecast identified several potential upside and downside risks to the load forecast. The load forecast is one of the areas where there is the most risk because a new single large industrial customer can change the whole Load Resource Balance. Some of the potential upward and downward risks identified are:

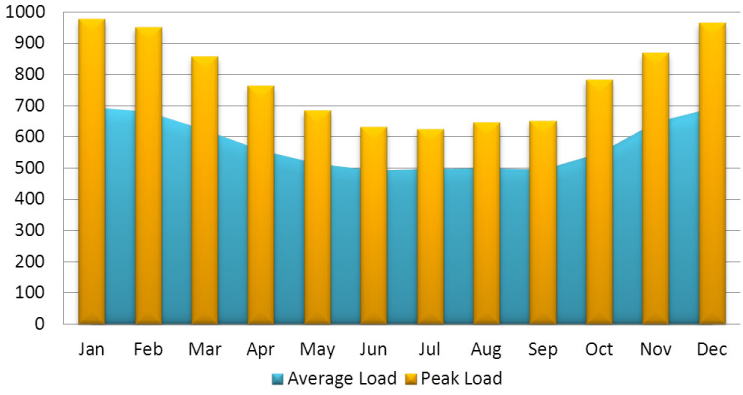
Upward Load Risks

- Economic signs of recovery while industrial and manufacturing costs seemingly remain low
- The Port of Tacoma continues to develop available land and places a New Large Single Load in the Port area
- Tacoma Power's Low rates in comparison to other regions remain well below the average
- The University of Washington Tacoma campus has expanded for several years and continues to do so, thus continues to help revive the downtown Tacoma economy
- Electric Vehicle Penetration increases
- Potential Air Quality regulations could force wood stove heating to gas or electric services

Downward Load Risks

- Near term retail rate increases lower short-term load growth
- Continual focus on acquiring Conservation within Tacoma Power Service Area keeps load growth at moderate rates
- A sustainably low cost of transportation fuel limits the penetration of electric vehicles

Currently Tacoma Power has more potential risk should the long-term load forecast be too low. The combination of near-term surplus resource supply and fewer downward pressures on load indicate a need for additional sensitivity analyses on the load forecast. The results of these analyses are detailed in the second section, Resource Evaluation and Analysis.



Monthly Peak and Average Loads

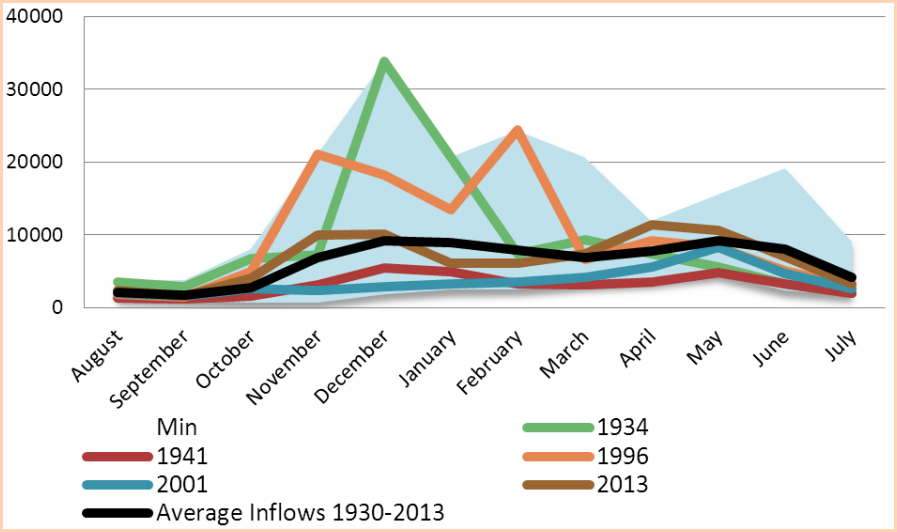
Tacoma Power Resource Overview

Tacoma Power uses a combination of owned resources and power supply contracts to meet customer loads. Tacoma Power's largest single resource is the long-term Slice/Block Power Sales Agreement with BPA. This contract supplies the power for more than half of Tacoma Power's retail load and will not expire until 2028. In addition, Tacoma Power operates five hydroelectric generation projects in Washington: Cowlitz, Cushman, Hood Street, Nisqually, and Wynoochee. Two other long-term power supply contracts for the Priest Rapids projects and the Grand Coulee Project Hydroelectric Authority (GCPHA) projects provide firm power to serve Tacoma Power's retail loads. Additional details

Tacoma Power's Cushman No. 2 Dam

Critical Water

Every year the timing and amount of water available for generation is different and Tacoma Power uses the historical record of inflows since 1930 to establish a critical water planning standard. Critical Water is equivalent to the lowest annual streamflows since the 1930 water-year and Average Water is the average of the historical annual streamflows since that water-year. Tacoma Power plans to Critical Water to reduce the likelihood of not being able to meet customer loads. This picture illustrates the potential variability that the utility can experience at one of it's many resources. The shaded blue area represents the range of potential output from the historical record and the individual lines represent the average monthly water from that year.



Variability of Cowlitz Basin Inflows (CFS)

about these resources can be seen in the table below and a more detailed overview of these resources is provided in Appendix 1: Tacoma Power's Resource Portfolio.

A number of factors influence the actual output of Tacoma Power's resources throughout the year. The largest single influencing factor is the amount of water flowing into projects from local snowpack and rainfall. Other factors such as the reservoir levels for recreation and specific flow requirements for fish habitat must also be managed. Customer loads are continually fluctuating up and down and there are requirements to

Project	Facility	Nameplate Capacity (MW)	2012 Energy Production (MWh / aMW)		Portion of Total	Critical Energy Production (MWh / aMW)[2]
Owned Projects						
Cowlitz	Mayfield	162	904,605	103.3	11.2 %	407,474 / 46.5
	Mossyrock	300	1,418,377	161.9	17.6 %	618,723 / 70.6
Nisqually	Alder	50	274,568	31.3	3.4 %	133,869 / 15.3
	La Grande	64	424,584	48.5	5.3 %	215,753 / 24.6
Cushman	Number 1	43.2	108,798	12.4	1.4 %	69,947 / 8.0
	Number 2	81	152,951	17.5	1.9 %	66,717 / 7.6
Wynoochee	Wynoochee	12.8	38,148	4.4	0.5 %	31,505 / 3.6
Hood Street	Hood Street	0	4,029	0.5	0.1 %	3,106 / 0.4
	Subtotals	713	3,326,060	379.7	41.3 %	1,547,094 / 176.6
Contract and Market Purchases						
[3] BPA		-	4,167,447	475.7	51.8 %	3,516,168 / 401.4
[4] GCPHA		-	255,564	29.2	3.2 %	241,219 / 27.5
Priest Rapids		-	37,355	4.3	0.5 %	17,198 / 2.0
Market Purchases		-	262,626	30.0	3.3 %	- -
	Subtotals	-	4,722,992	509.2	58.7 %	3,774,585 / 430.9
Total Portfolio Resources		713	8,049,052	888.9	100 %	5,321,679 / 607.5

1 Production figures are from Tacoma Power's May 2013 Official Statement associated with refunding certain revenue bonds
2 Critical inflows are the lowest recorded annual inflows for Tacoma Power's system and are based on the operating year of August 1940 through July 1941
3 Slice Capacity is 356 MW assuming 2.97 % of Federal System capacity at 12,000 MW
4 Grand Coulee Project Hydroelectric Authority

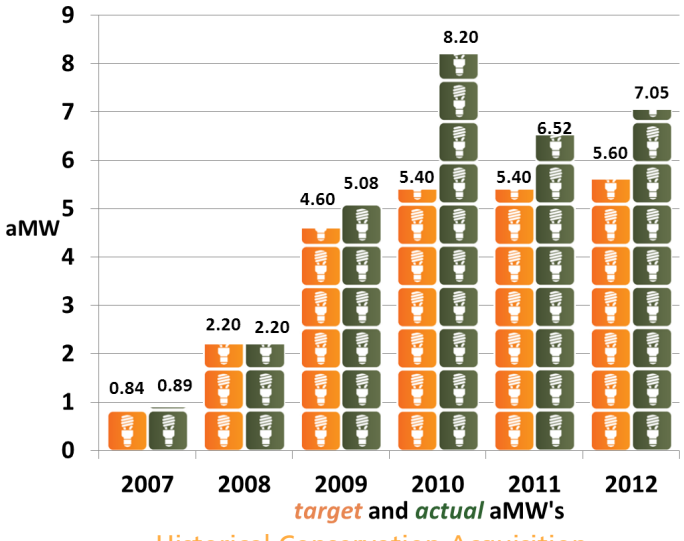
reserve a specific portion of generation capability on a moment by moment basis to meet this variation in load. Matching the resource output with immediate loads, while managing future uncertainty of streamflows and meeting all requirements and obligations makes operating the hydro projects a complex 24 hours a day, seven days a week operation.

The figure on the previous page (Critical Water) details the variability of Cowlitz River Basin inflows, which contribute to Tacoma Power's Mayfield and Mossyrock projects, and illustrates how streamflows into a project can vary from year to year. The historical range is indicated in the shaded area behind the actual inflows from specified operating years. The Cowlitz, Cushman, Nisqually, and Wynoochee projects are continually monitored and adjusted to maintain flood control levels, meet license requirements, and produce an appropriate level of generation for Tacoma Power's customers. Some projects, such as Hood Street and the GCPHA projects, are not adjusted on a regular basis, they produce energy based on how much water is currently flowing through the project.

The BPA Slice/Block Agreement provides approximately half of its power through a fixed monthly block amount of energy and the other half is based on a slice of the actual generation from several of BPA's large generating resources. The Slice portion operates much like another hydro project with limited flexibility and specified operating requirements that must be met throughout the year.

Conservation

The federal enactment of the Pacific Northwest Electric Power Planning and Conservation Act in 1980 established conservation as a priority resource in the Northwest. Since that time, the Northwest Power Planning and Conservation Council (NWPCC) has been assisting in the coordination of conservation and resource development plans. These plans help guide the region on meeting forecast electricity loads into the future and identify quantities of potential conservation for the region. The most recent plan, the Sixth Power Plan, was updated in March 2013 and the NWPCC is in the process of developing the Seventh Power Plan.



Historical Conservation Acquisition

Conservation has been an integral component in Tacoma Power's resource strategy for several years. From 1990 to 2012, the utility spent approximately $101.2 million on conservation. Because of these expenditures, Tacoma Power's overall load in 2012 is an estimated 35 aMW lower than it would otherwise be. In the last three years, Tacoma Power has acquired over 132 percent of our energy efficiency targets. We have received regional recognition for our success and much of it is attributed to the hard work and dedication of our staff and their commitment to our customers. The chart on the left illustrates past conservation targets and the actual acquisition since 2007.

Since 2008, the IRP has recommended conservation acquisition as the only near-term resource to add to the utility's portfolio. We have sought to aggressively acquire all cost-effective conservation for multiple reasons:

- It is often less expensive to reduce customer load growth through conservation than to construct and operate new generation resources or upgrade distribution systems. Conservation can delay the need for these expenditures;

- Several types of conservation are only cost-effective if acquired at specific times. For example, retrofitting a building with new insulation is more costly than initially designing and constructing buildings to be energy efficient. Failure to

achieve these types of conservation is known as lost opportunities;

- Conservation has multiple environmental benefits, from reducing air pollution to allowing a more natural operation of hydroelectric facilities;

- Conservation can provide direct benefits to our customers. For example, programs to weatherize homes of low-income customers can improve health and quality of life for their occupants; and

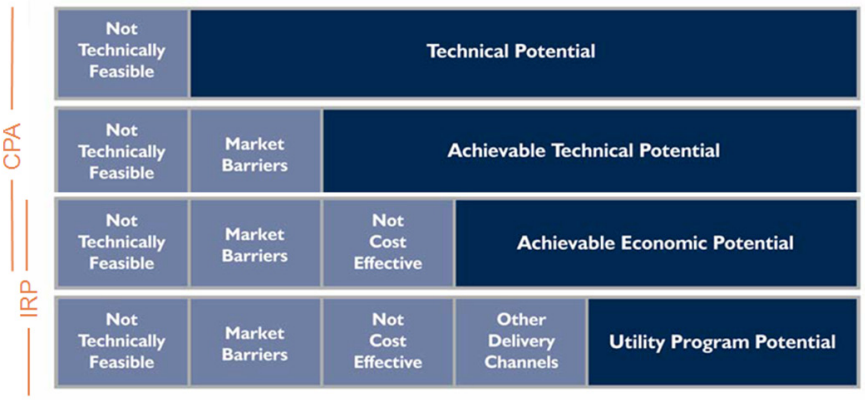
- Conservation provides local economic benefits. The trades-people and companies installing conservation measures at homes and businesses contribute to the local economy.

The utility is required under statute to assess the ten-year potential for acquiring cost-effective conservation and set a specified two-year conservation acquisition goal. Utilities that fail to achieve these goals have to pay a penalty that starts at $50/MWh and escalates with inflation.

Establishing the Conservation Target

The IRP is used to evaluate alternatives and determine how much energy conservation should be acquired each year. However, the minimum conservation to be acquired is determined by calculating a pro-rata share of the Conservation Potential Assessment's (CPA) 10-year economic achievable conservation potential. Tacoma Power contracts with an independent third party, The Cadmus Group, to develop the CPA. The IRP can determine an amount of conservation larger than the pro-rata share for the two year period, and project needed conservation acquisitions throughout the IRP planning period. Keeping this process as part of the IRP allows Tacoma Power to evaluate and compare the effects of decisions that impact loads and resources while ensuring the action plan recommends options for a minimal cost and risk future.

The assessment incorporates the most up to date information about each available conservation measure as well as unique information about Tacoma Power's customers and service area. Previous quantities of acquired conservation through 2012 are incorporated into the analysis and Cadmus takes a multi-step approach to deliver a list of measures called the Achievable Economic Potential.



Types of Conservation Potential

Step 1 – Technical Potential: Cadmus delivers a complete range of technically feasible and not technically feasible alternatives. Not technically feasible alternatives are conservation measures that are not applicable to our service territory. An example is crop irrigation measures since Tacoma Power does not have any crop irrigation.

Step 2 – Achievable Technical Potential: A portion of technical potential will never be installed due to market barriers. An example of this might be, not every customer in Tacoma Power's service area is going to make their home more efficient by having the home insulated even if the utility paid for the measures. The NWPCC provides achievable factors that are applied to each conservation measure.

Step 3 - Achievable Economic Potential: The achievable economic potential is determined by applying a cost-effectiveness screen, based on Tacoma Power's forecast avoided cost (see Appendix 2: Price Forecast). Only measures with a benefit-to-cost ratio greater than one, based on the Total Resource Cost Test, constitute achievable economic potential.

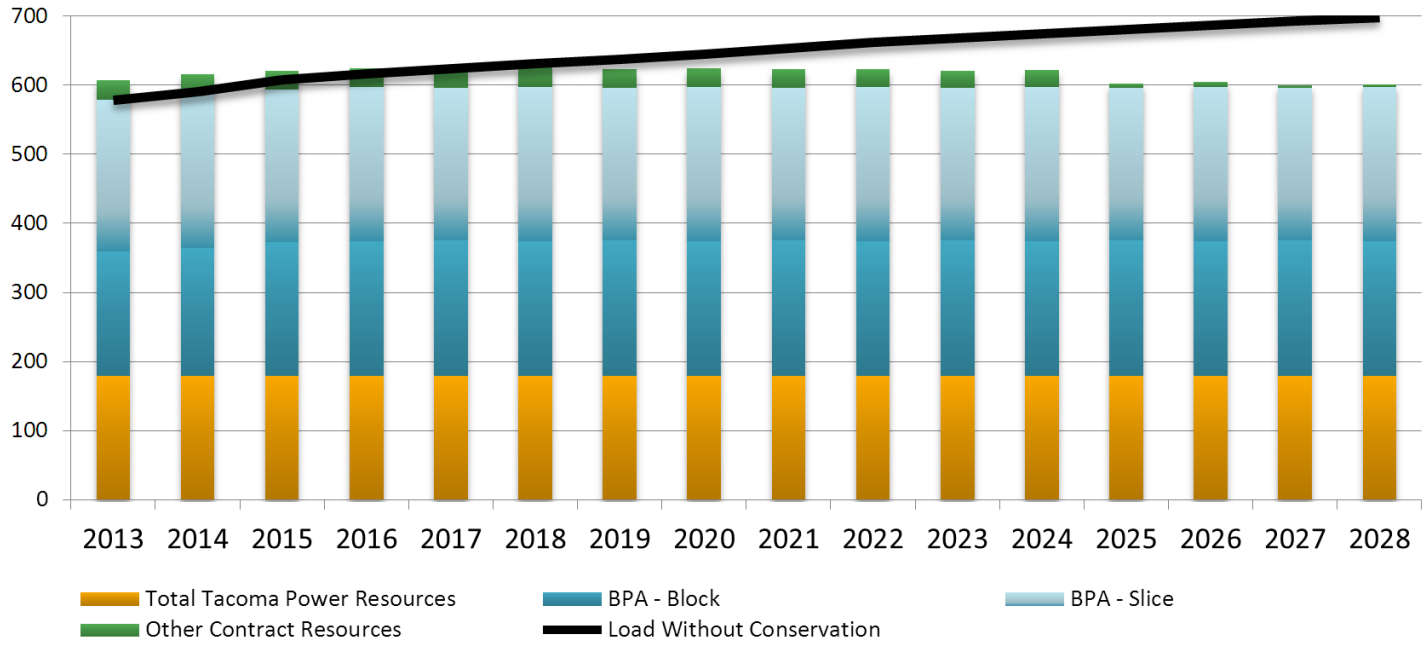
Step 4 – Utility Program Potential: A portion of the achievable economic potential will actually be best delivered through channels other than utility programs, such as market transformation efforts, codes and standards, and other non-programmatic opportunities.

The CPA presents technical, achievable technical, and achievable economic potential measures. The range of programs to meet the achievable economic potential are then evaluated by Tacoma

Power's Conservation Resource Management group and a list of programs the utility can implement to acquire the potential is developed. Some conservation measures are acquired through other organizations and this affects the potential amount of conservation Tacoma Power can achieve. The list of conservation programs is combined with the load resource balance analysis to produce the optimal quantity and types of conservation the utility should pursue.

The resulting Utility Program Potential becomes our conservation acquisition goal. More detailed information about the development and results of the CPA is included in Appendix 4: Conservation Potential Assessment. More detailed information on how the latest CPA impacts Tacoma Power's Load Resource Balance and the resulting Utility Program Potential for this IRP is summarized in Resource Evaluation Section.

Annual Load Resource Balance

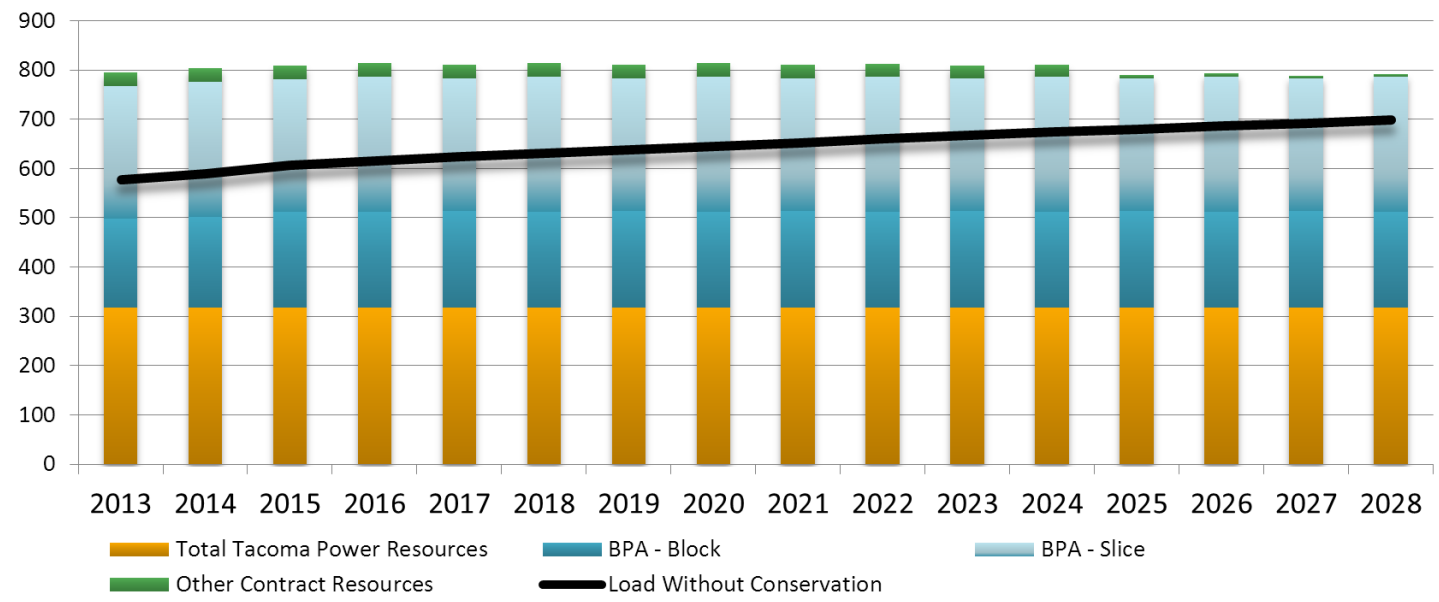


Critical Water Annual Load Resource Balance without Conservation

The central component in developing the IRP is the Load Resource Balance (LRB). Collectively incorporating information about our loads and resources, the LRB identifies the timing and magnitude for potential future resource deficits. With this information, Tacoma Power can begin to plan for acquiring the types of resources and quantity that will best meet the needs of our customers. The figure below represents Tacoma Power's LRB before acquiring conservation.

The yellow bars indicate the critical water capabilities of Tacoma Power's resources and blue bars indicate the critical water Slice and block capabilities of Tacoma Power's BPA Slice/Block Power Purchase Agreement. The green bars represent the remaining contract resources and the black line represents the load forecast before conservation. It is apparent that a slight resource deficit begins to appear in 2017. However, it is important to remember that this is our generation capability under the most critical water flows and the chart on the following page illustrates the LRB under average water conditions.

Under average water conditions Tacoma Power is surplus throughout the entire planning horizon. The critical and average water conditions are based on records of historical river flows since 1929. A majority of the increase is from Tacoma Power's owned resources, approximately 138 aMW over the entire period, but the Slice portion of the BPA Slice/Block contract also increases by approximately 60 aMW. While using critical



Average Water Annual Load Resource Balance without Conservation

water planning appears conservative and leads to surplus generation in many years, Tacoma Power has to be able to provide power to our customers in the most critical of water years just the same as a year that is not critical. Our goal is to strike the appropriate balance between the amount of risk we face from being too deficit in low/critical water years and the risk of selling power at very low prices from resources that are not needed in average/high flow water years. We employ a number of mechanisms to mitigate that risk and it all starts with these views of the LRB.

However, these charts only portray an annual snapshot and it is just as important to consider a quarterly view of the LRB. The next section will take a closer look at LRB on a quarterly basis and show the effects of adding demand-side and supply-side resources to the portfolio.

Get money to improve your rental property

Lower costs, increase retention and enhance building appeal with energy-saving improvements

MONEY AVAILABLE FOR:

- Window and sliding glass doors
- Attic, floor and wall insulation
- Heating and cooling systems
- Lighting
- Showerheads

WHY MAKE ENERGY-SAVING IMPROVEMENTS

- Save money on electric bills
- Enhance building appeal
- Retain tenants longer
- Rebates and financing save money up front

HOW TO START

- Schedule an on-site assessment
- Energy experts will identify cost-effective improvements

Tacoma Power reserves the right to withdraw, modify, or terminate its programs, requirements and rebates at any time without notice and doesn't endorse any particular contractor or product.

"These changes add value to the building and make our customers happier. We fully endorse the program."

Brian Reeder | Reeder Management, Inc.

We partnered with Reeder Management, Inc. to make energy-saving upgrades to Canyon Ridge Apartments.

UPGRADES

- 144 efficient double pane windows for 36 units
- 20,800 square feet of attic and floor insulation

RESULTS

- Project cost: $59,494
- Rebate: $22,440
- Estimate savings per unit: $143/yr.

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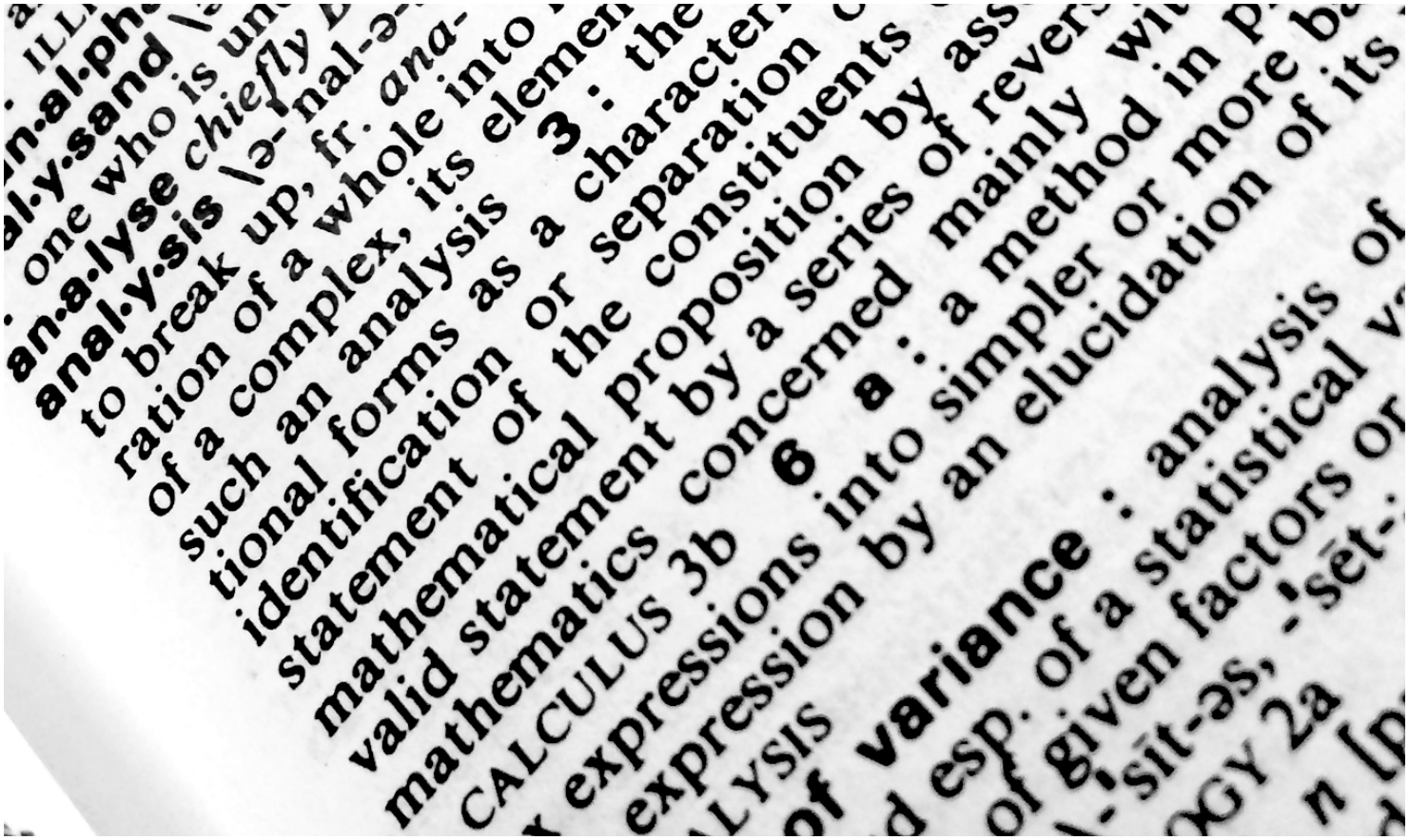


Resource Evaluation & Analysis

The Resource Evaluation and Analysis section is the most significant and complex component in the preparation of the IRP. With the aid of computer models, a multi-step analysis is performed using the information discussed in the previous section as well as forecasts for loads, electricity prices, and available resource alternatives. The analysis is targeted on the largest elements of uncertainty affecting Tacoma Power: water conditions, market prices, and the quantity load that will need to be served. In this IRP, we have focused our planning period on the years between 2022 and 2028 because, after acquiring conservation, the resource portfolio under critical water begins to equal the load forecast on an annual basis around that time. This section focuses on our approach for analyzing these uncertainties and demonstrates how the resource portfolio will be able to meet the needs of Tacoma Power's customers.

Potential New Supply Resources

As indicated by the Load Resource Balance (LRB) in the previous section, Tacoma Power is not in immediate need of new supply-side resources. However, through the development of the IRP it is important to review a full range of resource options for serving our customers. The information gathered in this review helps inform resource modeling efforts and helps to prepare for unexpected changes to loads. The addition of a new industrial customer could quickly change Tacoma Power's LRB. Having a current review of available resource alternatives enhances the utility's ability to quickly respond to potential resource deficit situations. This section will first provide an overview of screening criteria used in evalu-

ating resource alternatives and then provide a brief comparison of the resources chosen for further analysis as an addition to our resource portfolio. This portion of the IRP is a requirement under RCW 19.285 and a more comprehensive review of alternative potential resource technologies can be viewed in Appendix 5: Comprehensive Review of Resource Alternatives.

Screening Criteria

There are three principal types of resources available: baseload resources, intermediate resources, and peaking resources. Each resource type contributes to the needs of the utility and operation of the existing resource portfolio in a different way. It is important to consider the resource type in conjunction with the screening criteria listed below for determining which resources are likely to provide the most additional benefits for Tacoma Power.

Statutory Mandates - Utility requirements under the Energy Independence Act and the current operating environment narrow the focus of resource options. For example, the utility is required to ensure a percentage of generation comes from eligible renewable resources and resources that fit this criteria provide additional benefit for the utility.

Compatibility with Existing Portfolio and Resource Needs – Tacoma Power's existing portfolio is primarily hydro based and as a result of rain, snowfall, and runoff trends, the portfolio is more surplus or deficit in certain periods than others. In addition, Tacoma Power loads peak in the winter and additional generation that is at its minimum when this occurs is less valuable to the utility.

Cost – A primary utility goal is to maintain the low retail rates we are currently able to provide for our customers. In order to do this we must make resource acquisition choices that complement our operating strategies and have minimal ongoing operating and maintenance costs.

Resource Flexibility – Customer loads continually move up and down within the hour and it is Tacoma Power's responsibility to ensure that the resource portfolio can match that movement. There is additional benefit for resources that Tacoma Power has the ability to dispatch up or down as needed.

Principal Resource Types

Baseload resources run continuously except during repair or maintenance. They typically have low variable operation and maintenance costs as compared to other resources. Baseload sources usually have limited ability to change output with variations in demand. Hydroelectric facilities provide the majority of Tacoma's baseload resource.

Intermediate resources are used in conjunction with baseload resources to meet all but the highest demands for electricity. Intermediate plants typically cost more to operate and are less efficient than baseload plants. An example of an intermediate resource would be a combined-cycle, natural gas fired combustion turbine.

Peaking plants are the third type of resource. They are used to provide power during peak load periods. Peaking plants often trade efficiency for fast response to changes in load. The most common peaking plant is a simple-cycle gas turbine generator.

Environmental Impact – Tacoma Power continually seeks to preserve and enhance our environment. Tacoma Power's preference is toward resources that minimize the release of greenhouse gas emissions and reduce the utility's overall carbon footprint.

Reliability – It is our goal to maintain or increase reliability to our customers. Resources that degrade the reliability of Tacoma Power's system are not viewed favorably.

Control/Ownership/Location – Relying on unstructured contracts in the wholesale power market adds increasing levels of risk for the utility and direct ownership or a tightly structured power supply agreement are preferred. In addition, resources significantly removed from Tacoma Power's service area increase costs, complexity, and uncertainties in the delivery of that power. It is our preference to have resources located as close in proximity to our customers as possible.

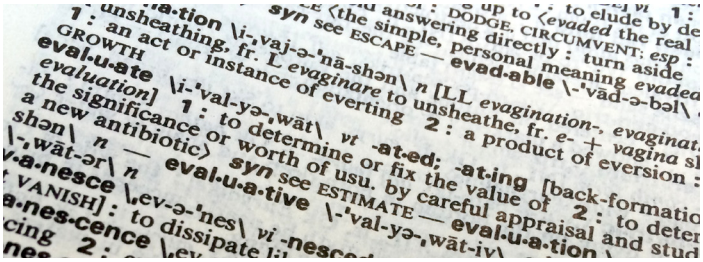
Portfolio Diversity – The utility prefers for the start and end of supply contracts or licenses to occur in periods that are different from the existing portfolio of resources. This reduces the burden of having to manage significant workload from dealing with multiple expirations at the same time. Additionally, the shape of generation from Tacoma Power's resources does not directly match with loads throughout the year. Tacoma Power would not favorably consider a resource that has a high level of correlation with our existing resource portfolio.

Screening Results

After considering a spectrum of resource supply alternatives the following resources were selected for further analysis (in alphabetical order):

Biomass – Biomass resources are perhaps the second best approach for meeting the utility's renewable compliance requirement. The term biomass encompasses a wide variety of resource alternatives and each project has its own attributes, costs and concerns. Some biomass resources have the capability to be dispatched up or down, creating the opportunity to complement existing hydro variability. However, biomass resources are often considered a baseload resource and there are several not too costly and nearby alternatives for the potential acquisition of a biomass generating resource. A principle challenge with biomass is securing a stable and consistent fuel source. Through the passage of the screening results and the nature of this resource, Tacoma Power has modeled the Power Supply Portfolio adding a 12 MW biomass resource with sensitivities as high as 24 MW.

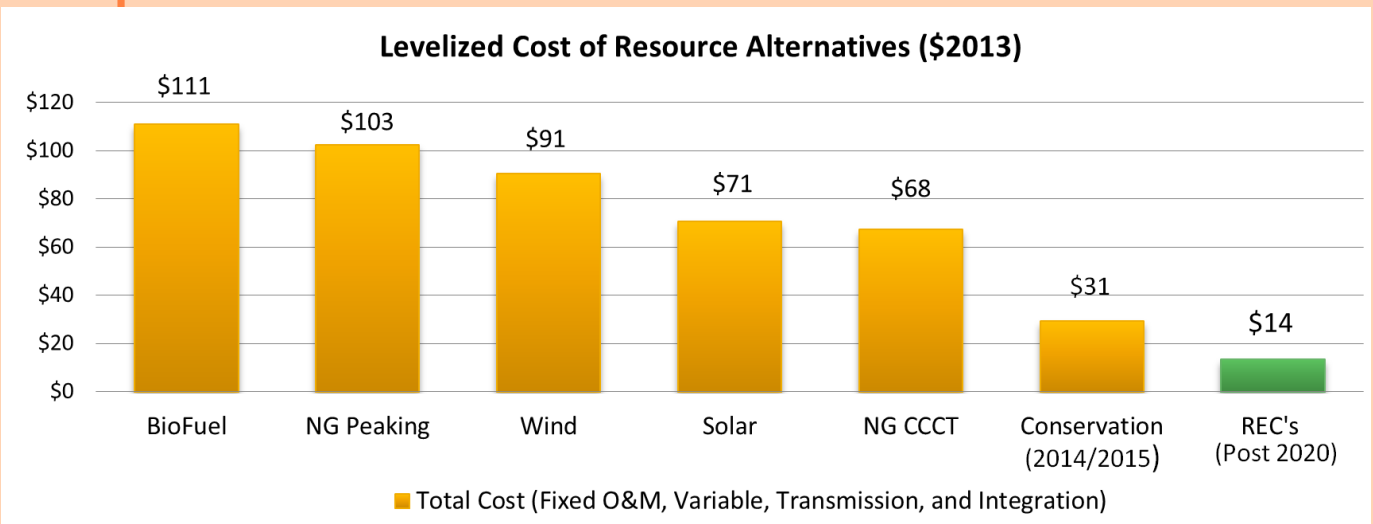
Combustion Turbines – Natural Gas fueled Combustion Turbines, continue to remain a viable alternative resource. Simple Cycle Combustion Turbines (SCCT) are a peaking resource that offer a very high degree of operational flexibility. SCCT's can be turned off completely when



not needed and can run at full power within a few minutes. With natural gas prices expected to remain relatively low for the next several years and opportunities for locating a facility in close proximity to the service area it is important to further analyze the portfolio with the addition of this resource type. Tacoma Power has modeled the Power Supply Portfolio adding a 30 MW SCCT resource.

Pumped Storage – There are several pumped storage permits open within the region as well as potential to install a pumped storage facility at one of Tacoma Power's existing hydro projects. This resource is often considered a peaking resource with the dual potential of increasing loads during periods of high run-off, when loads are generally more moderate, as well as providing valuable energy during peak periods. Pumped Storage resources can be a significant help with balancing loads and integrating other resource types. Tacoma Power has modeled a 50 MW pumped storage resource in addition to the existing portfolio.

Comparison of Resource Alternatives



Levelized Cost of Resource Alternatives with RECs

This chart illustrates the economic comparison of the specified resource alternatives as well as conservation. Detailed results of the analysis from including these resources in Tacoma Power's power supply portfolio are included in Appendix 5: Comprehensive Review of Resource Alternatives.

Renewable Energy Credits – Renewable Energy Credits (RECs) remain the cheapest way to comply with statutory renewable energy requirements. There is minimal risk in acquiring RECs and they do not have the operating challenges and oversight required with physical generating assets. Acquiring RECs in place of physical assets is considered a temporary strategy until Tacoma Power determines a need for additional generating capabilities. More detail about Tacoma Power's strategy can be found in the fourth section, Renewable Compliance Update.

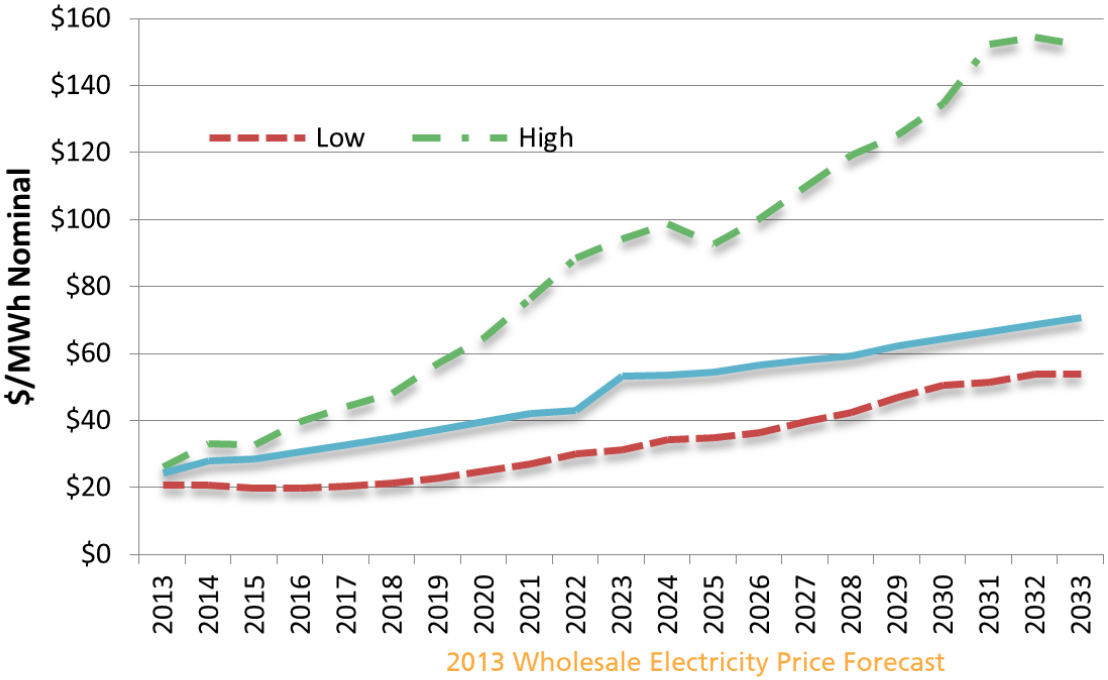
Solar/Photovoltaic – Solar resource technology continues to evolve at an increasingly quick rate. In areas, such as California or Arizona, where there is a large amount of sunshine year round, Power Supply Contracts for Utility Scale Solar installations are becoming less expensive than wind generation. As technology continues to evolve and potential for solar plant installations continue to rise in the eastern part of Washington State, it is important to further analyze this resource within the resource portfolio. Tacoma Power has modeled the addition of a 25 MW solar plant.

Wind – Wind resources have been constructed in our region faster than any other kind of resource in the last ten years. They remain cost competitive with other resource alternatives but present challenges when integrating them into a resource portfolio. Tacoma Power has modeled the addition of a 25 MW wind plant.

Price Forecast

The projection of future wholesale electricity and natural gas prices is a significant factor in determining the strategy for acquiring additional resources. Specifically, Tacoma Power uses the forecast of wholesale electricity prices at the Mid-Columbia[8] hub (Price Forecast) when evaluating alternative resource options, determining the cost effective conservation measures, budgeting, and long-term planning of Tacoma Power's resource portfolio. The base Price Forecast is derived by Wood Mackenzie and Tacoma Power's analysts review the significant drivers behind the base forecast. After adding variability to the base forecast with our own econometric models a high and low Price Forecast is produced to accompany the base forecast. The following chart illustrates our Low, Base, and High Price Forecasts for the planning period.

The wholesale electricity market is a dynamic and continually changing entity with many factors influencing prices. Tacoma Power updates the long-term Price Forecast twice a year and the most recently available forecast was used in this IRP. As a final step in the development of the Price Forecast, Tacoma Power creates an Avoided Cost Risk Adder as a means of accounting for additional risk that would otherwise not be accounted for that may emerge prior to the years when a new resource may be added to Tacoma Power's portfolio. More detail about how this forecast is developed is located in Appendix 2: Price Forecast.



2013 Wholesale Electricity Price Forecast

8 The Mid-Columbia (Mid-C) is the common hub for commercial trading of energy in the northwest.

Power Supply Modeling

Even though Tacoma Power's annual Load Resource Balance (LRB) indicates that the utility will have surplus electricity for some time to come, the utility continues to assess future resource needs and compare resource technologies that complement Tacoma Power's Resource Portfolio. This assessment allows Tacoma Power to address two important questions:

- What future resource portfolio is "best" for the utility? Specifically, what combination of new resources (type, amount, and timing), if any, minimizes expected utility costs over a range of potential futures and maintains the reliability of the portfolio?

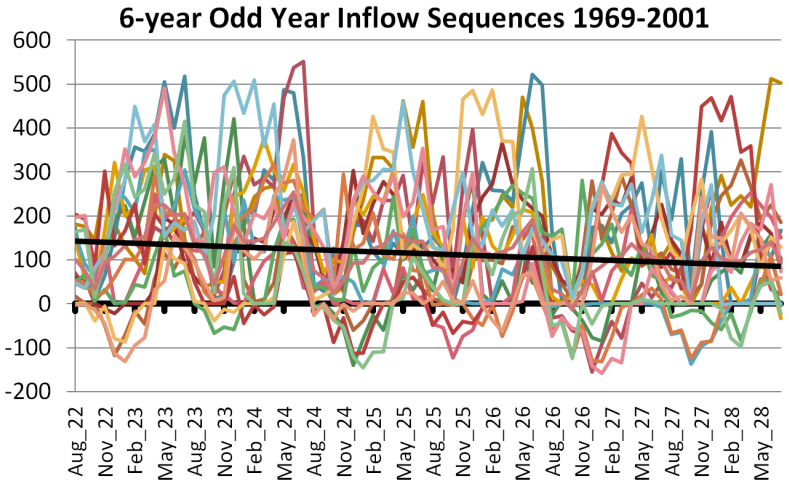
- Should Tacoma Power acquire eligible renewable generation,[9] or renewable energy credits (RECs) to comply with the renewable requirements of the Energy Independence Act?

Tacoma Power's best approach for addressing these questions and dealing with varying levels of uncertainty in items such as the load forecast, wholesale electricity prices, and inflows into Tacoma Power's reservoirs, is to simulate Tacoma Power's hydroelectric operations in a range of potential future scenarios. A computer model is used for this simulation and is based on both historical data as well as currently available knowledge about specific operational constraints at Tacoma Power's facilities. In this simulation of Tacoma Power's existing resources a monthly LRB is produced illustrating which historical months would result in Tacoma being surplus or deficit. The power resource portfolio can then be altered with additional load or resource combinations for comparison.

Comparing the monthly LRB's from the different resource portfolio combinations, Tacoma Power is able to determine an estimated portfolio cost for each scenario. Other factors, such as environmental attributes, regulatory risks, integration requirements, transmission, and fuel costs are also considered in the portfolio evaluation. The objective of this modeling is to identify the resource portfolio, both existing and new (if any), that is most likely to minimize costs and reduce risk for Tacoma Power during the planning period. The rest of this section lays out the framework and preparation for comparison of the potential future scenarios and summarizes specific scenarios for comparison. Additional results from scenario analysis are provided in Appendix 6: Comprehensive Overview of Scenario Alternatives.

Preparing the Vista Model

Tacoma Power's modeling of Hydro Operations in the IRP is through a proprietary computer model called Vista LT (Vista) by Hatch Ltd. The model is an optimizing engine that determines when it is best to use available resources to generate electricity and when it is best to store water in Tacoma Power's project reservoirs for future utilization. The resulting output displays Tacoma Power's LRB given the availability of the historical water conditions from the water years 1930 to 2008. The model performs this optimization based on the unique and specific operating characteristics of Tacoma Power's hydro resources. Tacoma Power has configured the Vista model to optimize the purchases and sales for a six year sequence of historical water conditions.



Sample Output of Vista Model: 17 odd Operating Years between 1969 and 2001

9 Eligible renewable generation includes: Incremental electricity produced as a result of efficiency improvements completed after March 31, 1999, to hydroelectric generation projects; wind; solar energy; geothermal energy; wave, ocean, or tidal power; and generation powered by biodiesel, biomass, or by gas from sewage treatment facilities or landfills.

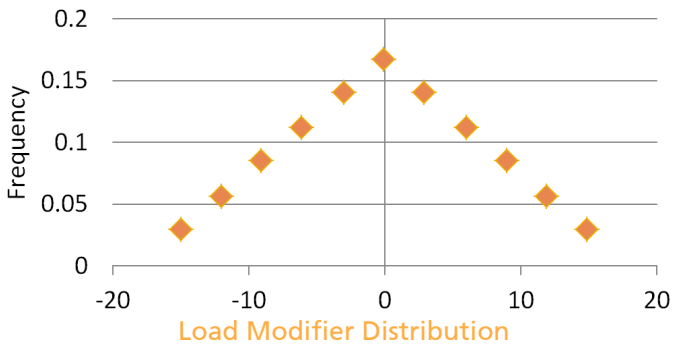
These water condition sequences are applied to a load and price forecast for the planning horizon, 2022[10] through 2028[11]. In general, the price forecast is modified to account for water conditions – electricity prices tend to be higher in dry water years and lower in wet water years. Each load and resource profile simulation results in 72 unique generation shapes aligned with the corresponding year's water conditions.

The figure on the previous page shows a sample of what the Vista model output looks like with an average trend line of the surplus/deficit of the utility. In this scenario, by 2028 there is an overall decrease in the annual surplus of available generation to just under 100 aMW. This analysis would demonstrate that Tacoma Power is on average in a surplus load-resource balance position. However, as evidenced by the lines that go below 0, in certain periods Tacoma Power would be short of power if those specific water conditions were to reoccur. More detail on the quantity and frequency of these deficits is explained below in the summarized scenarios results.

Post Processing and Sensitivity

After reviewing the resultant monthly LRB of the scenario, the next step is to incorporate the variability of load and power prices into the analysis. The process Tacoma Power has used to incorporate this variability is accomplished through the use of a sensitivity analysis model, Crystal Ball. Crystal Ball is a stochastic risk modeling tool that uses the Vista output to further evaluate changes to the portfolio across a variety of possible future load and water year price scenarios. The load and water year data varies independently from one another. Load variability has been configured to follow a distribution in the range of losing 15 aMW to gaining 15 aMW (see figure below for the illustration of the distribution). The model selects the starting water year at random and then looks up both the generation and the multiplier for Mid-C wholesale electricity prices at that water year. This step in the analysis provides a more complete picture of the risks Tacoma Power faces going forward with regard to its load resource balance.

There are a variety of approaches Tacoma Power could take to reduce its risk of having insufficient resources to serve load. The Crystal Ball model is configured with distributions for demand side and supply side resources to assess these approaches. The number of aMW of each resource type is represented as a load reduction shape or supply side generation shape. For example, energy efficiency savings from the Conservation Potential Assessment will be used to adjust the annual load shape based on what type of measures are implemented and how they affect the shape of the load. Supply side resource shapes are generated using available information as described in more detail in the Scenarios for Analysis. In the model, resource costs are represented through a dollar/aMW to acquire them and as a function of the annual generation shape. The value of saved or acquired energy from specific resources is based on the shape of estimated sales and purchases and hourly prices.



The Crystal Ball model generates 1000 forecasts for the number of hours of additional energy purchases and the aMW's purchased under the different portfolio combinations. The sets of resource acquisitions and their net present values are used to select energy efficiency and supply side measures for subsequent Vista runs. Resource selection is based on comparing costs and eliminating resource sets that produce the same number of hours with additional energy purchases under various load assumptions and across variable water year scenarios.

Vista is configured with the same demand side and supply side resource options for inclusion in the portfolio. Using the resource suggestions from Crystal Ball, the resource and load profile in Vista is reconfigured to generate a new set of

10 Previous IRP's have determined this is around the time that Tacoma Power's surplus/deficit position is near 0.
11 Tacoma Power's Power Supply Agreement with BPA expires in 2028 and there have been no discussions to date about what will happen after that period.

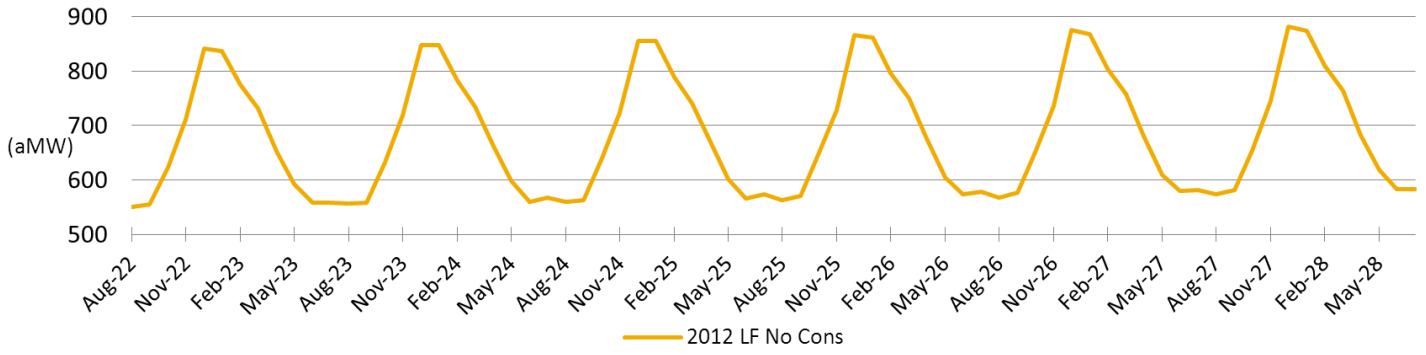
generation shapes. Rerunning the new load and resource profiles in Vista allows Tacoma Power to optimize the resource combination across all the owned resources in Tacoma Power's portfolio. This is an iterative process where the Vista model revises the shape of Tacoma Power's hydro generation and provides a basis for subsequent Crystal Ball analysis, and the Crystal Ball analysis provides revised inputs to the Vista model.

Through the iteration of model runs, the number of hours of additional purchases are narrowed down to a set of portfolio options which best align with Tacoma Power's future needs. These options are used to inform decisions about the timing, quantity, and type of supply side and demand side resources Tacoma Power should acquire. Those options are formulated into the action plan for Tacoma Power in the final pages of the IRP.

Modeling the Base Case

Tacoma Power's Base Case, or starting place for the analysis, begins with the assumption that no conservation is acquired between now and 2022. Loads are forecast to grow at approximately 1.1 percent over the next 20 years (See Appendix 3 on the 2012 Load Forecast). The resources used in the base case portfolio are those resources currently included in Tacoma Power's resource portfolio and any known future events (such as contract expirations[12] or license requirements) which limit the operation of the resources (See Appendix 1 on Tacoma Power Resource Portfolio). The base case before conservation is important because it defines the foundation for the timing and quantity of resources that should be added to the portfolio.

Load Forecast: 2012 Monthly Load Forecast



Load Forecast before new Conservation

Results: From August 2022 to July 2028 Tacoma Power's loads grow by approximately 30.3 aMW and the resource portfolio loses approximately 27.1 aMW through the conclusion of the GCPHA Power Sales Agreements. The GCPHA Contracts begin expiring in 2022 and the last of the five, Main Canal, ends on January 1, 2027. Over the entire period of the planning horizon Tacoma Power is **118.4 aMW** surplus and has surplus energy available in 89 percent of the historical monthly water conditions from 1930 to 2008.

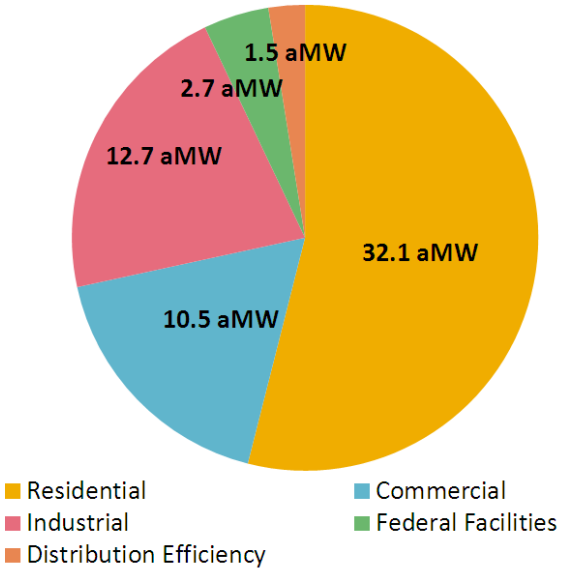
The results of the analysis illustrate the monthly number of MW's deficit and the percent of months that are surplus under the historical monthly water conditions from 1930 to 2008. In August, under the 2022-2023 operating year, Tacoma Power was only deficit a total of 18 MW's under all of the historical water years from 1930 to 2008. On a percentage basis in August, Tacoma Power is surplus in 96 percent of all the historical water conditions. Single months with a moderate deficit are generally not considered a major area of concern. When several months of deficit periods occur in a row, especially coincident with the period when loads are greatest, is when further analysis is needed or when there is potential for acquiring an additional resource. Additional information is available for each of the scenarios in Appendix 6: Comprehensive Overview of Scenario Alternatives.

12 **Expected Changes**: Loss of GCPHA resources (RD Smith: 6.1 MW – 9/1/2022, EBC: 2.2 MW – 5/1/2023, PEC: 2.3 MW – 3/1/2025, Summer Falls: 96 MW – 1/1/2025, Main Canal: 26 MW – 1/1/2027)

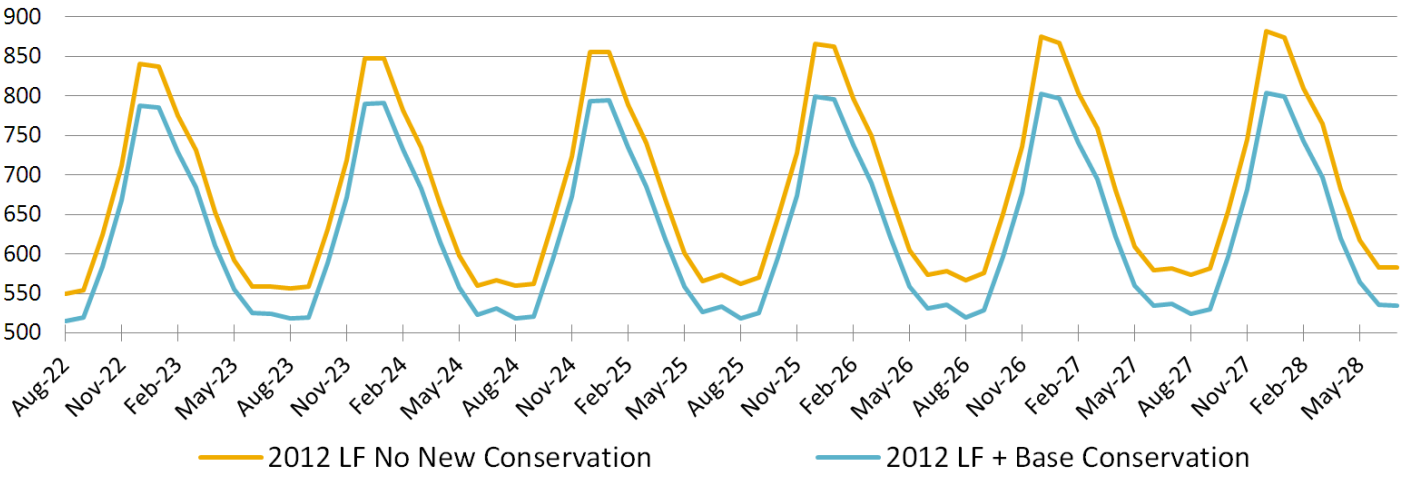
Adding Conservation

This scenario adds achievable economic potential conservation from the Conservation Potential Assessment (see Appendix 4: Conservation Potential Assessment) to the base case. This is the amount of conservation required to meet Tacoma Power's statutory obligations. Because this amount of conservation is required, this scenario becomes the base case upon which all other resource alternatives are modeled. The same resource portfolio is used as the previous scenario but the hourly load forecast is altered to reflect the impact of acquired conservation between now and the planning horizon.

Load Forecast: 2012 Load Forecast with Base Achievable Economic Potential Conservation



Conservation by Sector



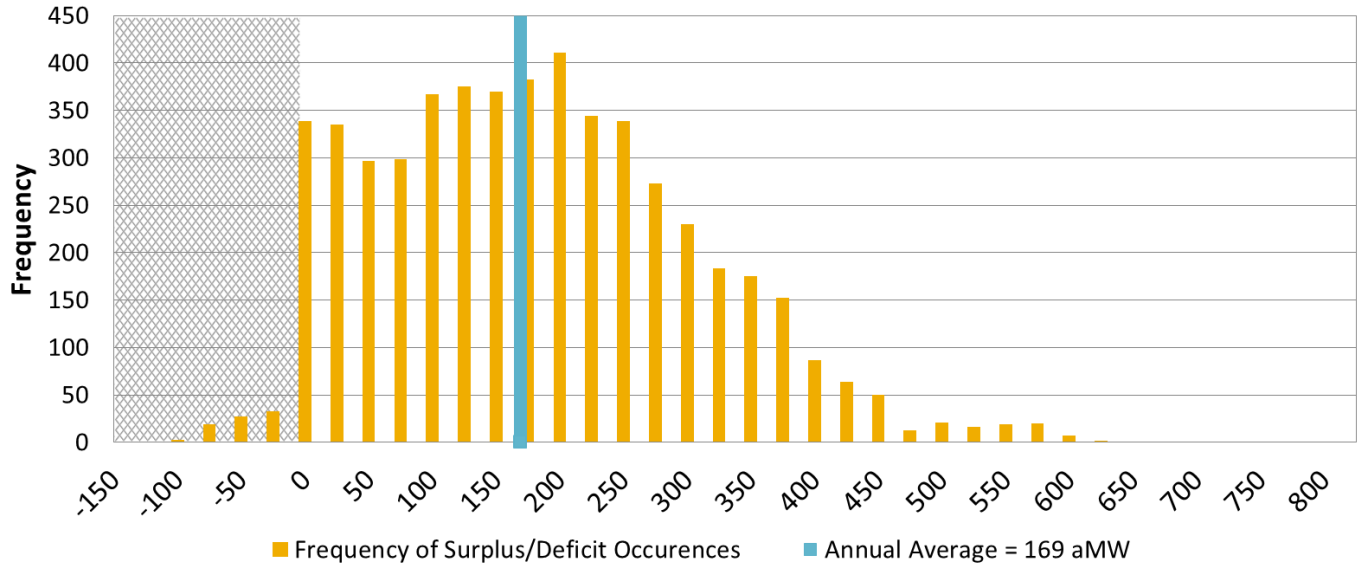
Effect of Conservation on Load Forecast

The 15 year Base Achievable Economic Potential Conservation (Base Conservation) from the 2013 CPA represents **59.5 aMW** of conservation. This is the minimum amount of conservation Tacoma Power will acquire and meet its required statutory responsibilities. The acquisition by sector is represented in the chart above and is derived using the Base Price Forecast plus Risk Adder.

Incremental Cost of Conservation: Between now and 2028 Tacoma Power will acquire 59.5 aMW of conservation. This results in a cost of approximately $32 million dollars for the conservation target in the 2014/15 biennium. The 2013 nominal cost of this acquired conservation is **$31.12/MWh**.

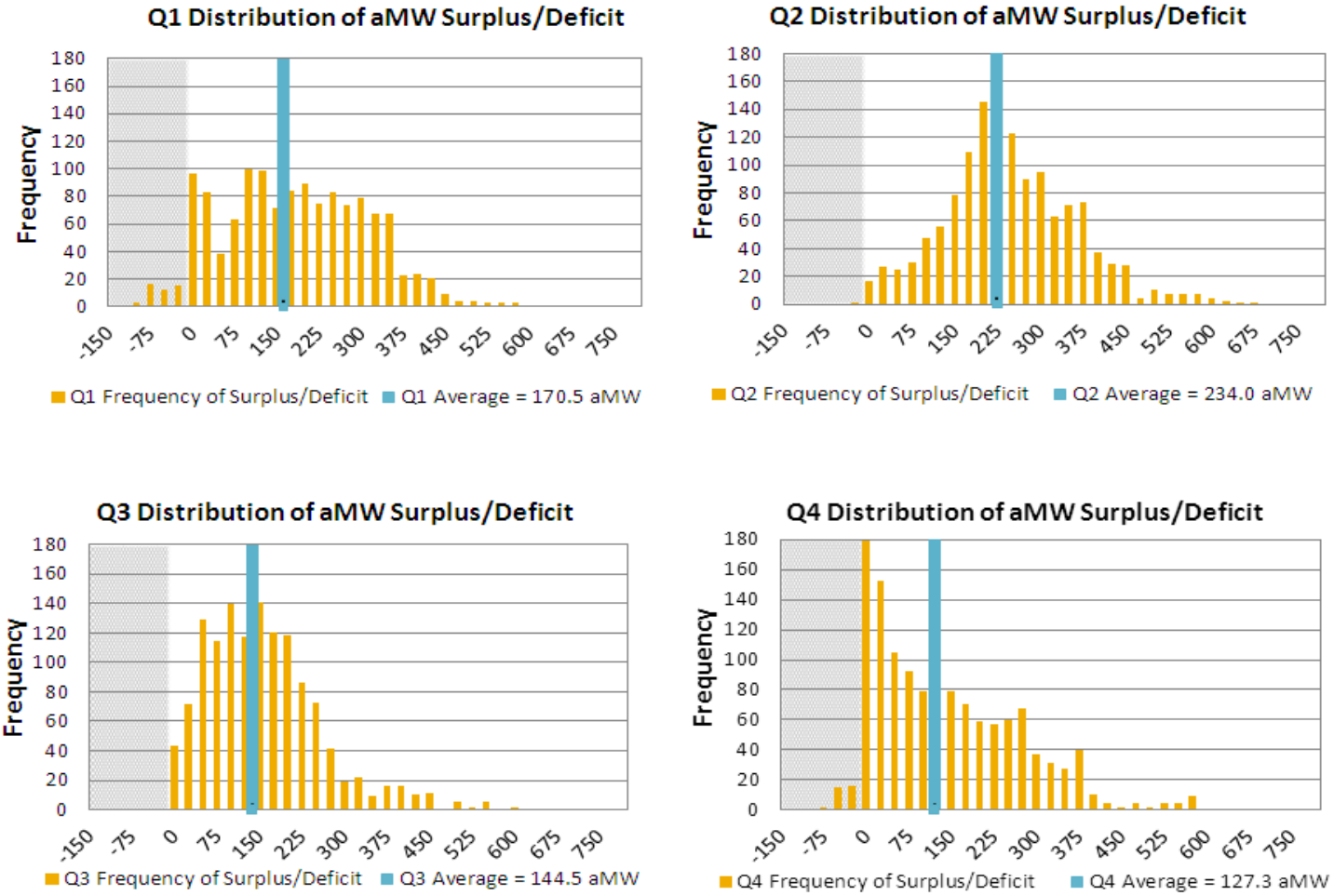
Impact on the Portfolio: Adding the required conservation to Tacoma Power's portfolio results in a **168.8 aMW** surplus between the period of August 2022 and July 2028. The following charts on the next page display a distribution of the frequency and size in which the surplus or deficit month occurs. Subsequent illustrations detail the percent of months surplus over this period, as well as the number of monthly occurrences and average quantity of MW's deficit the portfolio is.

Tacoma Power is mostly concerned with the shaded area, those periods of time when the resource portfolio must be subsidized with additional generation, and the periods of significant surplus on the far right portion of the chart. Looking at the surplus and deficit position on a quarterly basis (see quarterly distribution charts on the next page) illustrates that the deficit concern is mostly apparent in the first and fourth quarters.



Distribution of Annual aMW Surplus/Deficit

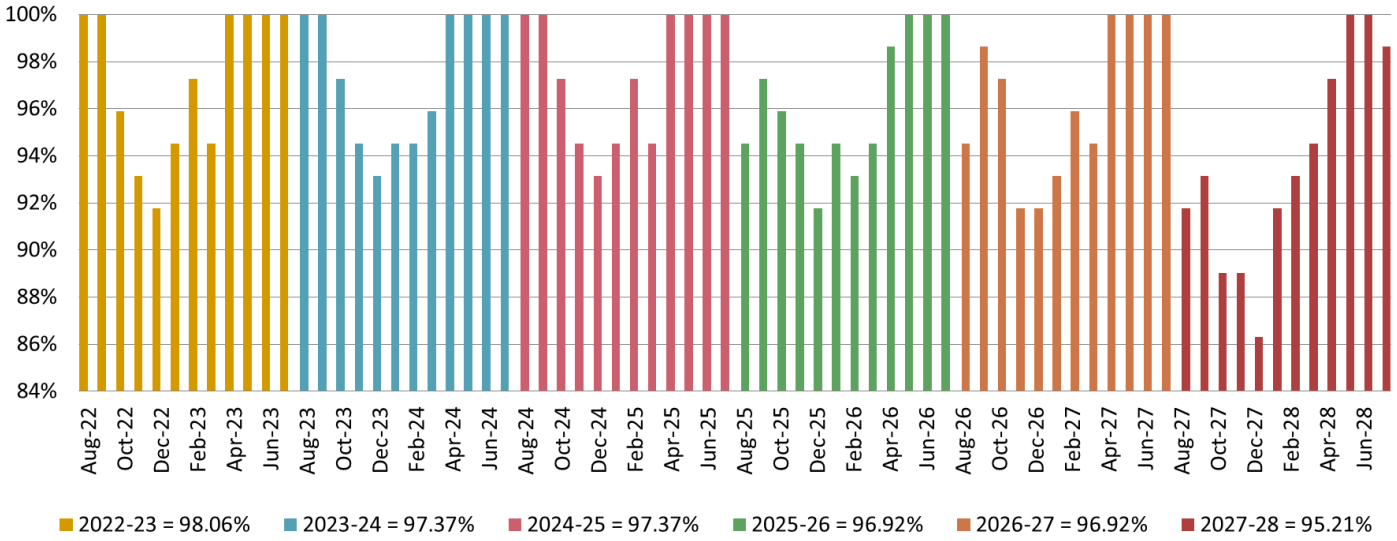
Conversely, the surplus concerns are most apparent in the second and third quarters. Tacoma Power utilizes the Mid-Columbia wholesale electricity market for selling surplus generation and purchasing additional power. Market electricity prices are typically lowest during the second and third quarters and highest during the first and fourth quarters. Analyzing how a resource affects Tacoma Power's portfolio in these periods is the primary focus in the Alternative Resource Portfolio simulations (see next segment).



Quarterly Distributions of aMW Surplus/Deficit

The frequency of occurrences and quantity of MW's when Tacoma Power's portfolio is in a deficit position typically helps define supplemental needs for the portfolio. Based on the historical monthly water conditions, the following chart displays the percentage of months in each six-year sequence when the portfolio is Surplus. The following chart illustrates that on average, the portfolio is surplus in **96.5 percent** of the historical periods.

The following chart is a summary of the base case analysis and demonstrates both the average quantity of the deficit and the number of deficit occurrences. This is based on the historical water years between 1930 and 2008 when a deficit occurs and takes into account the load assumptions for the simulated period between August 2022 and July 2028. While Tacoma Power is surplus in 96.5 percent of the historical water-months, when a deficit occurs the annual average deficit for the month grows from 11 aMW in the 2022/23 operating year to 26 aMW in the 2027/28 operating year. The maximum deficit during this same period grows from 38 MW to 87 MW.



Percent of Months Surplus under Historical Water Years

Peaking Demand Analysis

In addition to having enough sustained energy to meet load, it is critical that Tacoma Power also have enough generating capacity to meet its short-term peak load. Prudent utility practice requires planning to meet these capacity obligations based upon the greatest risk potential. For a hydro utility this would be during a year when reservoir inflows are critically low.

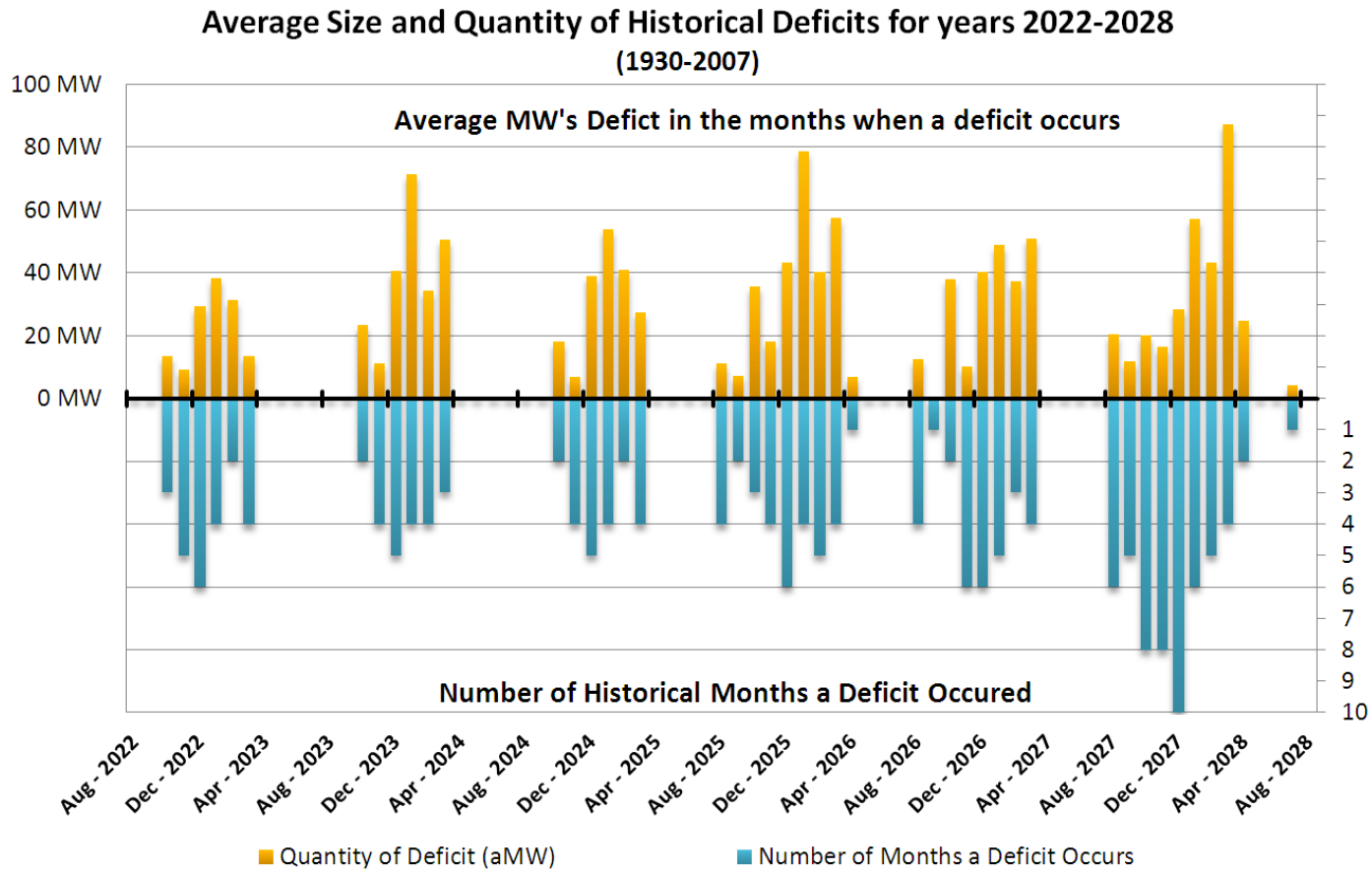
Tacoma Power's highest annual demand is during the winter months and typically corresponds with the year's coldest temperatures. These loads can be almost twice as high as the average load for the year. Tacoma Power's analysis of the ability to meet peak demand in this IRP is based upon the 2017 load forecast. The forecast has been compared with a range of scenarios under different operating conditions for the periods when reservoir inflows were critically low. Under these conditions, Tacoma Power has sufficient capacity to meet its load obligations.

Alternative Resource Portfolio Simulations

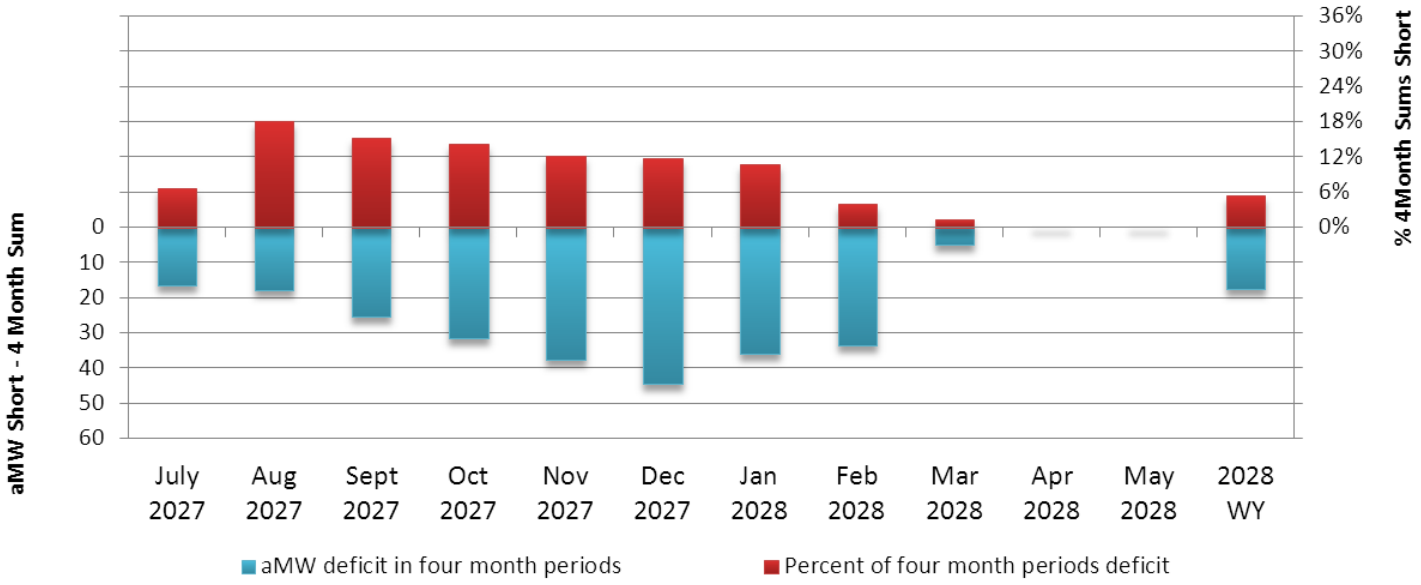
Under the base case Tacoma Power is surplus in 96.5 percent of the historical periods. On an annual basis, this translates into an approximate probability that 3.5 percent of the time Tacoma Power will have to acquire additional resource capabilities or rely on wholesale market purchases. Relying on purchased power can be risky and there is historical precedence and potential for the market price to exceed several thousand dollars per megawatt-hour, as experienced in December of 2000. However, Tacoma Power has an Energy Risk Management Program that mitigates this risk by optimizing the time and quantity of MW's sold and purchased in the wholesale power market.

The figure below illustrates the number of historical months deficit, as well as the fact that the total number of megawatts deficit are growing from the start of the period to the end of the period. Additionally, if Tacoma Power only acquires the conservation analyzed in the base case, there will not be enough renewable energy in the portfolio to meet the requirements of Washington's Renewable Portfolio Standard. Tacoma Power will have to purchase renewable energy credits (RECs) to supplement the current combination of power purchases and owned generation. This section considers the costs and impacts of acquiring new physical generating assets that passed the resource selection criteria.

The figure on the next page summarizes the output from the Crystal Ball analysis, focused only on the 2027/2028 water year. This is the period of focus because it is when Tacoma Power is most deficit and the effect of adding different resources can best be illustrated. Summing four months of the analysis period, the red (top) bar illustrates the average percent short in those months. The corresponding blue (bottom) bar illustrates the quantity of aMW short in the same time period. This net effect of each resource scenario can be compared to this chart for differences. Additional details on the analysis summarized in this section can be found in Appendix 6: Comprehensive Overview of Scenario Alternatives.



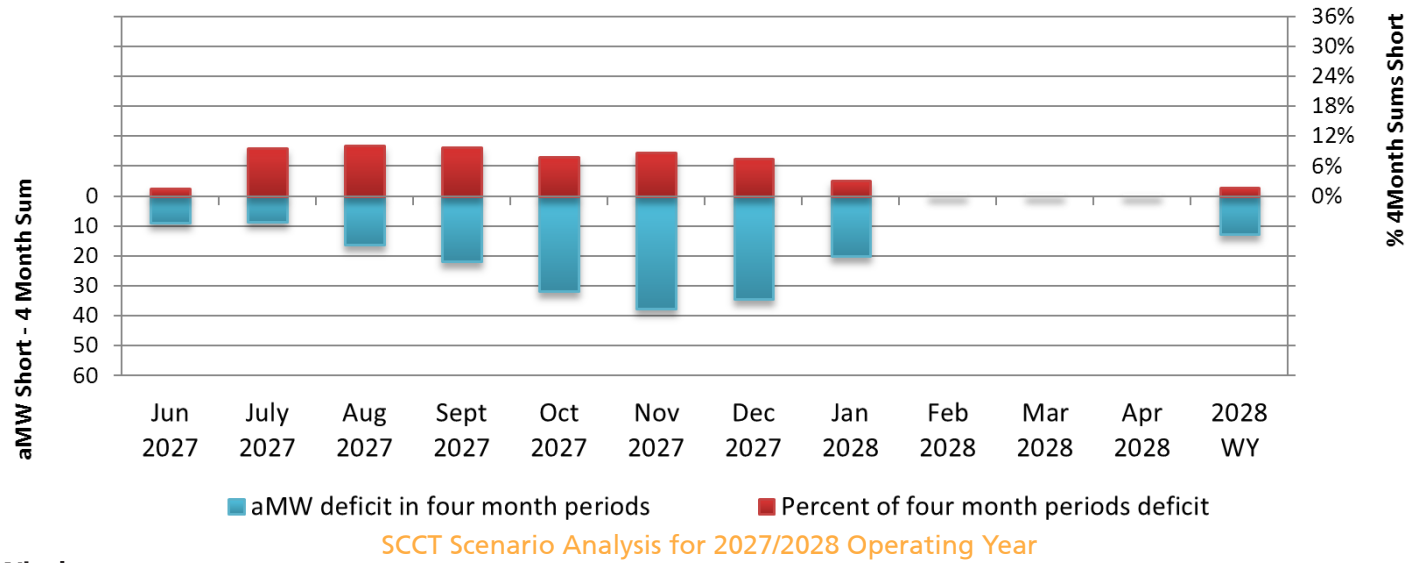
Size and Quantity of Historical Deficits



Base Case Analysis for 2027/2028 Operating Year

Combustion Turbines

Tacoma Power modeled a 30 aMW single cycle turbine (SCT). The results of the analysis indicate a reduction in the frequency of load resource balance deficits in years of combined low water year conditions and 12 to 15 aMW of additional load. However, in most years of the analysis the additional resource only increases the number of hours that Tacoma Power has available surplus in a low priced power market. Even during periods when the LRB is negative, the levelized cost of the SCT is almost invariably above the expected wholesale price at the Mid-Columbia market. A Combined Cycle Combustion Turbine (CCCT) is slow to cycle on and off and the size of the plant would increase the baseload generation of Tacoma Power's generation portfolio. This slightly reduces the number of deficit periods but mostly just results in Tacoma Power having that much more surplus generation in the surplus periods.



SCCT Scenario Analysis for 2027/2028 Operating Year

Wind

The modeled wind scenario was based on a single site with a 25 MW nameplate value and approximately 28 percent capacity factor. Tacoma Power shaped owned hydro resources around the hypotheti-

cal wind plant in VISTA. In Crystal Ball the wind shape reduced the frequency of a deficit LRB portfolio but not very effectively. During the periods when the LRB is most deficit, there is usually a very small contribution from the wind resource. Often when the region experiences the coldest ambient temperatures, there is very little wind blowing for the production of wind generation. Additionally, the levelized cost of wind is high in comparison to the average wholesale electricity prices currently forecast.

Biomass

The biomass scenario was based on using several small biomass plants that totaled 12 MW of capacity. In total these plants produce approximately 9.7 aMW. The resource was modeled as a dispatchable resource and mostly produced generation during the daytime in both the VISTA and Crystal Ball models. Despite the small size, because it is dispatchable, the resource reduces the frequency of a deficit LRB by approximately 2 percent. However, BioFuel is an expensive resource and in most scenarios the cost of the resource exceeds the value of the excess energy that would likely be sold back into the Mid-Columbia wholesale energy market.

Solar

Recently solar resources have become much more cost competitive. Tacoma Power modeled a solar scenario based on a 25 MW solar facility with a generation profile coincident with a recently evaluated term sheet. The term sheet was provided by an independent third party for a new solar facility in the northwest. The modeled generation profile was effective in reducing the deficit LRB periods for the scenario where there was a new high load. However, the effective reduction was mostly only in the summertime when the solar generation was at its peak. In the wintertime the generation profile does not complement Tacoma Power's load profile very effectively. Lastly, there are integration challenges associated with the resource and with abundant new solar resources in the WECC region, there is an expectation that more integration issues will emerge before the 2020's.

Pumped Storage

Tacoma modeled a pumped storage scenario with 50 MW of capacity. Pumped Storage facilities use more energy to push water up-hill than they do to produce power when the water is released. The scenario did not effectively reduce the frequency of deficit LRB periods. Nor did it help much with the magnitude of high new load periods in low water year scenarios. However, the resource has the potential to produce a financial buffer by displacing deficit LRB periods into a lower priced time frame. The resource generates revenue savings in very low and very high water years when price volatility can be high. Because of the way the resource operates it can also be used to increase load during periods when Tacoma Power's hydro generators are running at high levels of output and loads are at low levels. This usually occurs during the spring runoff period when ambient temperatures are mild and there is low load during the Light Load Hours. It is recommended that we acquire more refined cost data for the modeled plant in this scenario. Currently Tacoma Power has used the most recent EIA estimates. The EIA estimates show a wide range of levelized costs, from $58 per MWh to $149 per MWh. With a resource cost at the lower end of these estimates there is potential for a pumped storage facility provide sufficient benefits for the utility. It is recommended in the action plan for Tacoma Power to complete a more in-depth analysis on this type of resource in the near future.

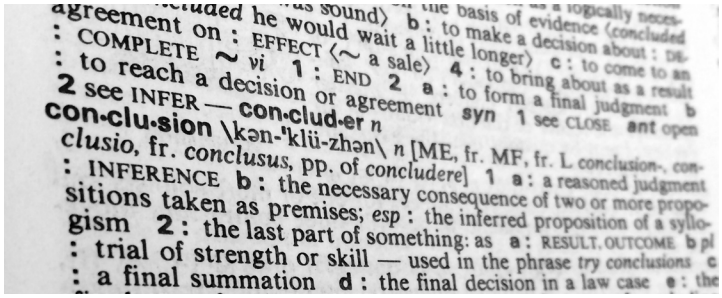
Increasing Loads

Increasing loads, above what is included in the load forecast, is the greatest risk for Tacoma Power. The number of months when the LRB is deficit increases and a combination of higher loads in periods of low water during November through February can have negative impacts on Tacoma Power's portfolio. This is especially true in low water years as these can be periods with high electricity prices and thus, pose the greatest risk to the utility. An increase in load by 12 to 15 aMW is generally manageable but the addition of 20 to 35 aMW of load can be more difficult to integrate with the existing portfolio. If Tacoma Power were to receive a new load of this magnitude the resource scenario analysis should be redone based on the actual resulting shape of Tacoma Power's load profile including the new load.

Modeling Conclusions

Tacoma Power's best resource strategy at this time is to delay the acquisition of additional physical generating resources. Under current forecasts, Tacoma Power's LRB exhibits an adequate level of resource capabilities to meet our customer's needs. Following this strategy leaves Tacoma Power short on the quantity of renewable generation needed to meet Washington's Renewable Portfolio Standard. As such, Tacoma Power's approach will be to acquire renewable energy credits as a compliance strategy. Additional details about Tacoma Power's renewable compliance strategy are included in the fourth section, Renewable Compliance Update.

Tacoma Power's greatest risk potential is that a new large load would initiate a request for power services from Tacoma Power. The size, timing, variability, and location are all important determining factors affecting the operations of Tacoma Power's resource portfolio and how we ultimately are able to provide electrical services to the load. It is not advised to acquire an additional resource to mitigate this risk however, Tacoma Power's current policies and contracts have been developed to help protect the existing customer base from these risks. Tacoma Power's Customer Service


agreement on : EFFECT 〈～ a sale〉 4 : to bring about as a result
: COMPLETE ～ vi 1 : END 2 a : to form a final judgment b
: to reach a decision or agreement syn 1 see CLOSE ant open
2 see INFER — con·clud·er n
con·clu·sion \kən-'klü-zhən\ n [ME, fr. MF, fr. L conclusion-, conclusio, fr. conclusus, pp. of concludere] 1 a : a reasoned judgment
: INFERENCE b : the necessary consequence of two or more propositions taken as premises; esp : the inferred proposition of a syllogism 2 : the last part of something: as a : RESULT, OUTCOME b pl
: trial of strength or skill — used in the phrase try conclusions c
: a final summation d : the final decision in a law case e : the

Policy includes provisions to allow for negotiation of the rates for a new load greater than 8 aMW and the BPA Slice/Block Power Sales Agreement includes specific provisions for new loads greater than 10 aMW.

With a limited risk exposure in critical water years and the lack of renewable resources to meet RPS requirements it is important for Tacoma Power to closely monitor the availability of renewable assets. Tacoma Power will need to closely observe the potential for new or existing renewable resources in the region. If a situation arises where Tacoma Power could acquire a new biomass, solar, or wind resource for relatively low additional cost to the utility, a detailed study should be performed on the specific resource and costs of integration before making a further decision not to acquire it.

Special Studies

In previous Integrated Resource Plans, Tacoma Power has included special assessments on specific issues. Often these issues have the potential to adversely impact the way Tacoma Power operates the resource portfolio or the ability serve our customers. In this IRP, Tacoma Power has elected to update its Carbon Scenario from the 2010 IRP and assess the impacts of the Columbia River Treaty.

Carbon Update

The possibility of carbon pricing creates uncertainty for every IRP. The 2010 IRP included a preliminary quantitative assessment of the impacts of climate change on Tacoma Power's loads and resources. This is one of the many factors influencing the magnitude and the timing of the potentially impending federal or state carbon legislation. The following qualitative assessment provides an overview and outlook for carbon legislation that may impact Tacoma Power.

Federal

In the near-term implementation of carbon pricing at the federal level is unlikely unless there is a substantial change in the congressional delegation in 2014. However, in long-term there is higher likelihood that some kind of carbon pricing will be adopted or a regulation will be implemented that makes the cost of carbon higher than it is now.

California

The effect of carbon pricing in California is already incorporated in Tacoma Power's existing price forecast. Currently California grants 90 percent of its Greenhouse Gas Allowances and is auctioning the remainder at slightly above the minimum price of $10. In the previous auction, 100 percent of the allowances that were available sold. The price for 2013 emissions ranged from $10.09 to $14.00 and if prices remain at this level, it would imply participants have an additional

willingness to pay approximately $5/MWh more for electricity which does not create CO2e or is covered by an allowance.

	V2013$	V2015$	V2016$	V2013q	V2015q	V2016q
8/16/2013	$12.22		$11.10	13,865,422		9,560,000
5/16/2013	$14.00		$10.71	14,522,048		7,515,000
2/18/2013	$13.62		$10.71	12,924,822		4,440,000
11/14/2012	$10.09	$10.00		23,126,110	39,450,000	

California Auction Results by Vintage

Washington

Governor Insley is currently exploring options for pricing carbon and reports on this effort are expected to be available in September 2013. There is possibility for a legislative consideration of one or more of the proposals in 2014.

Tacoma Power's previous work, using a model called Aurora, indicates that a $30 per tonne tax on CO2e in Washington could result in raising the price of electricity an average of $17 per MWh. Coal and Natural Gas generation would likely be reduced more often. Tacoma Power estimates that some portion of coal generation could be reduced as much as 6 percent of the time and some portion of natural gas generation would be affected 40 percent to 60 percent of the time, depending on the water year.

Carbon Pricing and the Fossil Fuel Market

The market itself provides more uncertainty than any likely carbon price. Carbon pricing is being considered against a backdrop of rapidly increasing fossil fuel supplies and the net effect of a carbon pricing mechanism would depend on how the increase in fossil fuels is handled. Given the expected addition of natural gas and liquids production in North America, an approximate price of $92/tonne CO2e would be required by 2020 to keep the price of gasoline and other fuels where they are today. Federal action would likely need to be implemented to achieve a level of carbon pricing this high. Therefore, carbon pricing is not likely to move the price of electricity much above the marginal cost of natural gas generation plus the carbon price.

There is also great uncertainty as to the effect that the new natural gas supplies will have. Increased US supply of fuel for consumption in Washington presupposes that these new supplies will not be exported to Asia and the rest of the developing world. However, by early 2013 new liquids production had displaced 45 percent of the 2007 imports of crude. By the 2020's we may expect to be exporting fuel rather than simply displacing imports. In this case, world prices would drive US market production and likely have an impact on US prices.

Summary

As of last year, neither a cap-and-trade program nor carbon tax adoption within the US was likely. However, that appears to be changing. Economic analysis has shown economic and job growth potential for the tax shifts that tax carbon and reduce other taxes. These studies have been completed in Massachusetts and Oregon. Economic studies in Washington under the Climate Legislative and Executive Workgroup as well as in Oregon for a carbon tax are ongoing. Other states such as Vermont, New Mexico, and Colorado are also considering similar studies. Polling has shown in many areas that 55 percent to 60 percent of voters would support a tax shift program modeled on the Environmental Tax Reform programs of the EU or British Columbia's program. 57 percent to 60 percent have stated they would support a Cap-and-Trade program. One concern that has risen through polling is how the money will be used. Near-term tax cuts that improve the economy are most popular and as the economy recovers, similar uses for funding may appear.

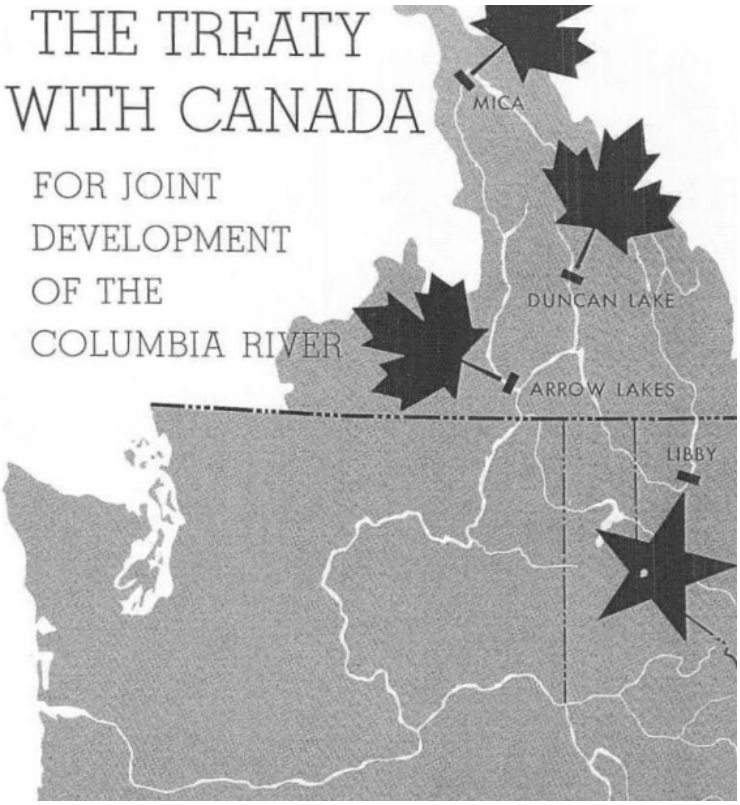
For Tacoma Power, the impact of carbon pricing depends on where it occurs. If adopted within WECC, but not in Washington, a carbon tax will create downward pressure on the price of wholesale power because of power being stranded outside the affected market. However, if adopted within Washington, it would create a higher income potential for Tacoma Power's surplus sales

in the wholesale market. The expected price per MWh impact would be about half of the adopted price of carbon. Tacoma Power continues to closely monitor and analyze new developments with regard to carbon pricing.

Columbia River Treaty

The Columbia River Treaty was established in 1964 between the United States and Canada as a means of coordinating the development and operation of dams on the Columbia River basin for power and flood control benefits. The United States shares the downstream benefits with Canada, as determined through the contents of the treaty, in exchange for Canada managing the water flows from further upstream. The treaty will remain in effect until September of 2024 and there is a ten-year unilateral notice provision required to emancipate the parties from the terms and conditions of the treaty. A regional workgroup in the United States is expected to make a recommendation based upon the interests of stakeholders in the United States late in 2013 or early 2014.

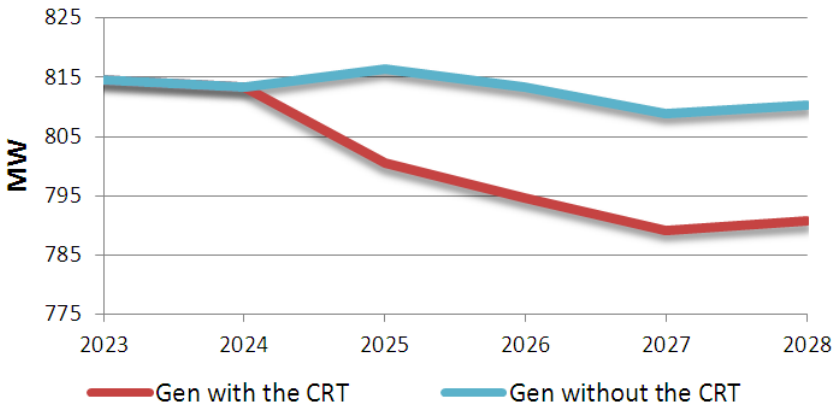
Tacoma Power is impacted by the treaty through two Power Purchase agreements, the Priest Rapids Agreement with Grant County PUD and the Bonneville Power Administration Agreement. The power purchased under these agreements originates from projects on the Columbia River. We currently estimate that if the treaty were to be terminated in September of 2024 that we would no longer need to return approximately 20 aMW of energy to Canada and approximately 57 MW of peaking capacity. Some of this energy will likely be lost due to additional amounts of spill in Spring runoff periods



Cover of Columbia River Treaty Handbook[13]

if upstream flows on the Columbia River are not coordinated between Canada and the United States. However, it is expected that the region would work together during these surplus periods to produce as much energy as possible.

Portfolio Resource Changes: The figure to the left illustrates an estimated impact to Tacoma Power's generation sources if the Treaty were to end. Tacoma Power's Bonneville Power Administration Slice Contract is adjusted to receive approximately 19.5 aMW of additional power and the Priest Rapids Contract is adjusted to received 0.5 aMW of additional power.



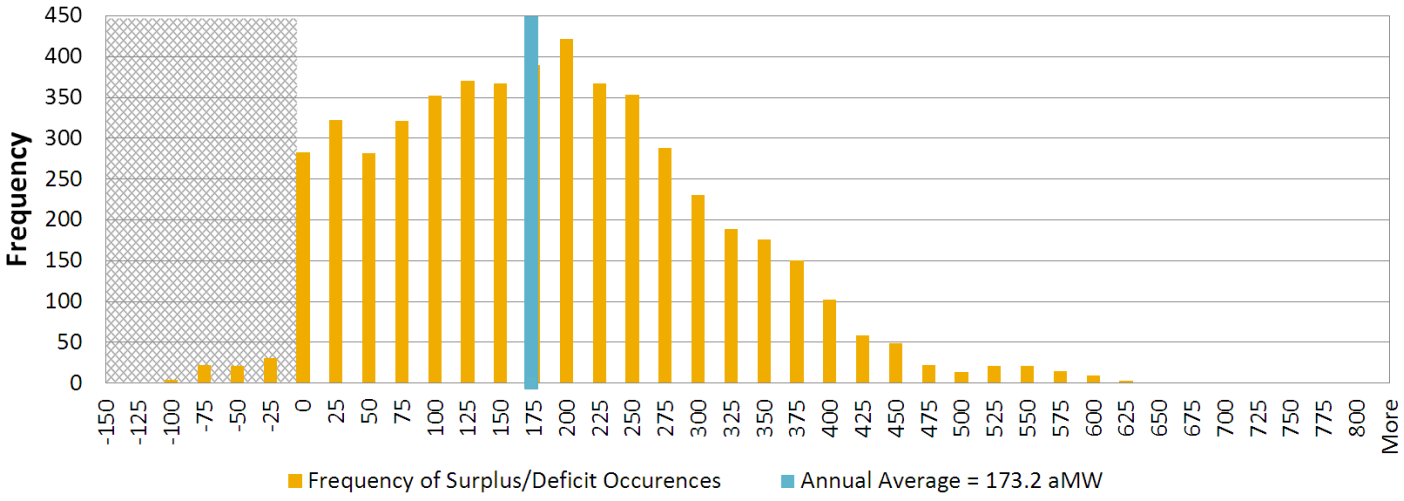
Estimated Impacts of the Columbia River Treaty on Tacoma Power's Generation

Incremental Cost of Resource Additions: None, since the changes are a result of managing the flow of water on the Columbia River. Tacoma Power receives power based on the timing and amount generated at dams along the Columbia River and our payments under these Agreements are structured as a take or pay arrangement. We do not pay based on the actual number of MWh's generated; we pay a fixed amount regardless the quantity of power received each year.

Load Forecast: 2012 Load Forecast with Conservation

13 Cover of original handbook developed by BPA

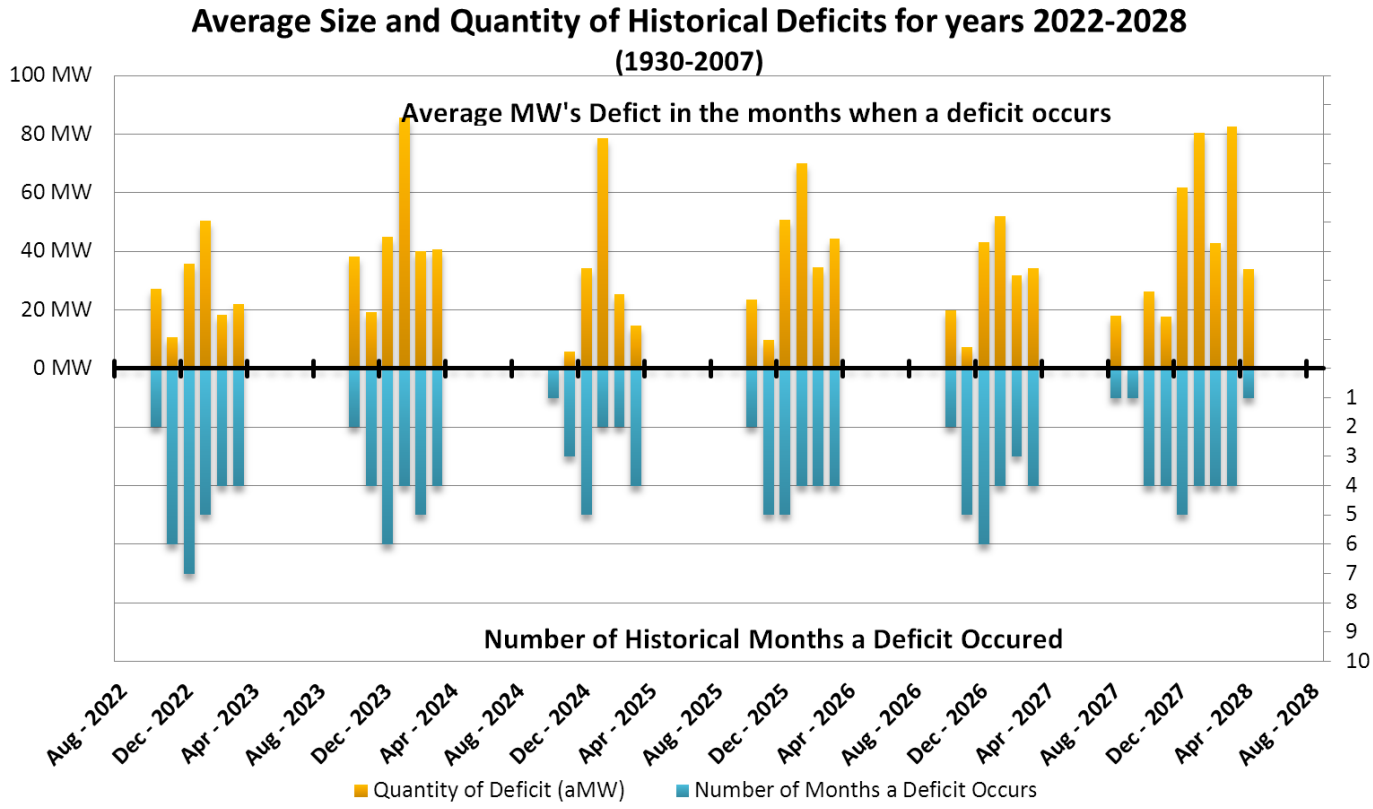
Results: Tacoma Power is surplus in 97.2 percent of the historical periods and between the 2022 to 2028 time period, the utility is surplus by 173.2 aMW. The first figure below shows the distribution of surplus and deficit periods between 2022 and 2028.



Columbia River Treaty Distribution of Annual aMW Surplus/Deficit

The next figure below the change in the deficit over the 2022 to 2028 time period. In this period, Tacoma Power's average megawatt deficit grows from 13.6 aMW to 30.4 aMW, the resulting deficit in 2028 is slightly less than the base case analysis. The maximum deficit grows from 50.4 aMW to 82.6 aMW.

If the region proceeds to terminate the Columbia River Treaty, Tacoma Power does not currently estimate the impacts to be significant in comparison to the relative size of the total resource portfolio. The timing of inflows related to the Slice portion of the BPA Slice/Block Power Sales Agreement will be altered and result in the largest impact. Conversely, Tacoma Power would anticipate saving several million dollars a year that currently fund the treaty.



Columbia River Treaty Size and Quantity of Historical Deficits for Tacoma Power in 2022-2028

The Implementation Plan

An important component in the development of the Integrated Resource Plan is to identify near-term actions recommended for implementing the findings of the plan itself. Tacoma Power sees this "implementation plan" as the culmination of what the utility learned from the effort to develop the IRP. The 2013 IRP implementation plan has two parts. The first part describes actions the utility intends to begin, and in many cases complete, before publishing the next IRP. The second part covers areas identified for further study that may, or may not affect or be addressed in future plans.

Actions resulting from this IRP

The following items are the recommended actions as a result of the development of this IRP:

1. Acquire approximately 8.1 aMW of conservation over the 2014-2015 biennium. Increase the 2014-2015 conservation budget to approximately $32 million.
2. Continue working on the renewable resource compliance strategy for the 2016-2019 compliance period as well as developing a strategy for beyond 2020.
3. Enhance utility modeling and assessment capabilities to better account for risk and uncertainties. If possible, acquire or develop updated long-term planning portfolio model.
4. Continue to monitor developing impacts of increasing solar generation capabilities in WECC and model impacts to Tacoma Power.
5. Continue to monitor developing climate legislation and model impacts to Tacoma Power.
6. Complete further evaluation and analysis for costs and benefits of acquiring a pumped storage facility.

Conservation

Tacoma Power is required, per the Energy Independence Act (EIA), to implement all cost effective conservation. The 2013 Conservation Potential Assessment quantified Tacoma Power's fifteen-year cost-effective achievable conservation potential as 59.5 aMW. This results in an annual conservation goal of approximately 4.05 aMW in 2014 and 2015 with an expected cost of $32 million dollars in the biennium.

After a two-year ramp up period in Tacoma Power's first EIA compliance biennium (2010-2011), the utility exceeded its target of 8.58 aMW's with over 15 aMW's of conservation resources. The 2012-2013 biennium will see the utility overshoot its target again but by a smaller margin. This over-achievement has been

due in part because of pent up demand for new conservation measures as well as the availability of cheap lighting resources. In the upcoming 2014-2015 biennium, these advantages will have largely disappeared and programs will be promoting smaller, more difficult, and slightly more expensive measures. Overall, commercial-industrial conservation targets will be diminished but in a measure distribution that is very similar to today. In the residential sector, Tacoma Power will shift its emphasis from lighting to long-lived, weather-sensitive measures, such as an augmented weatherization program and a more aggressive ductless heat pump program.

Renewable Energy Credit Acquisition

Tacoma Power is also required, per the Energy Independence Act, to acquire approximately 455,000 MWh's of renewable energy or renewable energy credits beginning in 2016. The IRP confirms that the best approach for meeting the 2016-2019 target is to supplement Tacoma Power's current eligible renewable resources and REC contracts with the addition of more RECs. Tacoma Power has already started the process to acquire the necessary contracts to procure another 265,000 MWh's of RECs for the 2016-2019 time period. The utility is presently negotiating long-term purchase agreements that are expected to result in final agreements in the near future.

Tacoma Power is currently forecasting long-term REC prices to be above the current market price for RECs, but the utility is still in the process of developing its strategy for beyond 2020. Tacoma Power acknowledges the possibility of needing to acquire additional generation capabilities between now and then. If the current Load Resource Balance situation changes in the next few years Tacoma Power would likely acquire additional renewable generation to mitigate the deficit position. The comparison of costs for renewable generating resources and the costs associated with acquiring additional REC contracts for beyond 2020 will be an important component in the development of the next IRP. Tacoma Power will continually monitor the market for opportunities to acquire new generating resources and will need to perform more in-depth analysis on how specific project attributes align with the resource portfolio before making a definitive decision on potential acquisition.

Actions for Next IRP

The electricity industry faces many issues that could fundamentally change the way Tacoma Power operates. Below are a few issues Tacoma Power is planning to monitor in the interim and during the development of the next plan.

Developing Solar

As discussed in the Significant Policy Issues of the first section, Assessing the Current Situation, the developing solar capabilities in the Desert-Southwest region have the potential to impact electricity markets in the Northwest. These market impacts are just starting to be explored but in the meantime, generation continues to come online at a rapid pace to meet the Renewable Portfolio Targets of states like California. Additionally, solar/photovoltaic technology is developing at an astounding rate amidst plummeting manufacturing and production costs. There is certain to be numerous impacts as a result of these changes and it is important for Tacoma Power to persist in monitoring changing market conditions while modeling the effect on resource portfolio operations.

Developing Climate Legislation

There are a number of ongoing efforts to address climate change at the federal, regional and statutory level. Tacoma Power has been actively engaged in monitoring and participating in developing legislation to advocate for the interests of Tacoma Power customers. Discussed further in the Carbon Update segment of the second section, Resource Evaluation and Analysis, the impacts of impending legislation vary depending on where it is implemented. Tacoma Power will need to continue to actively participate in these activities and ensure adequate preparation for impacts to the operation of the utility's resource portfolio.

Pumped Storage

The final recommendation for Tacoma Power before the conclusion of the next IRP is to perform a more in-depth economic and operational analysis of adding a pumped storage facility to Tacoma Power's resource portfolio. Several preliminary permits for new pumped storage projects in the Northwest have been granted by FERC. Additionally, Tacoma Power has the potential to modify an existing hydro facility to develop this type of resource. The abundance of potential pumped storage facilities combined with a growing regional need for capacity resources to integrate the variable output of renewable generation makes the timing for this in-depth analysis optimal.

BPA Product Decision

Tacoma Power's Slice/Block Power Sales Agreement contains a provision that allows for Tacoma Power to change the type of power product it receives under the Agreement. Tacoma Power has the option to change to a full Block product. Notice must be provided to BPA by May 31, 2016, and assessing the impacts and/or benefits of requesting a change should be an area of focus in the next IRP.

Utility Modeling Capabilities

After the assessment goals of this IRP were identified, Tacoma Power determined the best approach for accomplishing those goals. Utility staff identified available modeling capabilities to assess the Load Resource Balance and a procedure to post process those results for including the variability of loads and electricity prices. However, the sequence of events used is complex and the iteration of so many different steps makes it difficult to ensure the consistency and accuracy of data being used in the models. The staff time dedicated to ensuring the accuracy and consistency of the data would better be used to develop and analyze additional scenarios with the potential to affect the utility. To accomplish this, Tacoma Power will need to acquire new modeling capabilities. The ideal model would integrate the same real time load, weather and operational data used by the utility's near-term and day-ahead traders and employ a stochastic approach for analyzing scenarios. Tacoma Power will need to address this goal upon the conclusion of the 2013 IRP so that new modeling capabilities can be setup and tested prior to start of the next IRP.

Renewable Compliance Update

This section provides an overview of Tacoma Power's compliance with Washington States Renewable Portfolio Standard (RPS). In 2006, Washington State citizens passed Initiative Number 937 (I-937) by public vote. The initiative was codified as the Energy Independence Act in RCW 19.285 and regulations were enacted to implement the act in 2008 by the Department of Commerce. These regulations can be found at WAC 194-37[14].

The Energy Independence Act requires utilities with more than 25,000 customers to demonstrate that a specific percentage of their generation originate

Cushman Northfork Powerhouse

14 The Legislature has amended the law six times since it was adopted by voters, and some provisions in the rules no longer match the statute. Other changes may be warranted by changes in industry practices or the experience of affected utilities and stakeholders in implementation and compliance. On August 28, 2013, the Department of Commerce issued a notice that it is considering amending the Energy Independence Act rules in Chapter 194-37 WAC to reflect the statutory changes and clarify or correct provisions that no longer reflect current industry practices or have proven unclear in implementation.

from an eligible renewable resource or the utility must purchase that same quantity of megawatt-hours (MWh's) in renewable energy credits (RECs). The number of MWh's is a percentage of the total energy provided to retail customers and begins at three percent between 2012 and 2015. The quantity escalates to nine percent between 2016 and 2019 and again to fifteen percent after that period. Utilities must demonstrate they have acquired sufficient eligible renewable resources or renewable energy credits (RECs) to meet the renewable mandate on the first day of each compliance year.

REC Supply Balance

Tacoma Power's renewable target in the 2012 compliance year was **143,341 MWh's**. Tacoma Power met the target through a combination of incremental hydro projects and REC contracts. This combination of resources provided over 150,000 MWh's of eligible renewable energy. The chart below illustrates Tacoma Power's compliance in the current period as well as the forecasted need for future compliance periods.

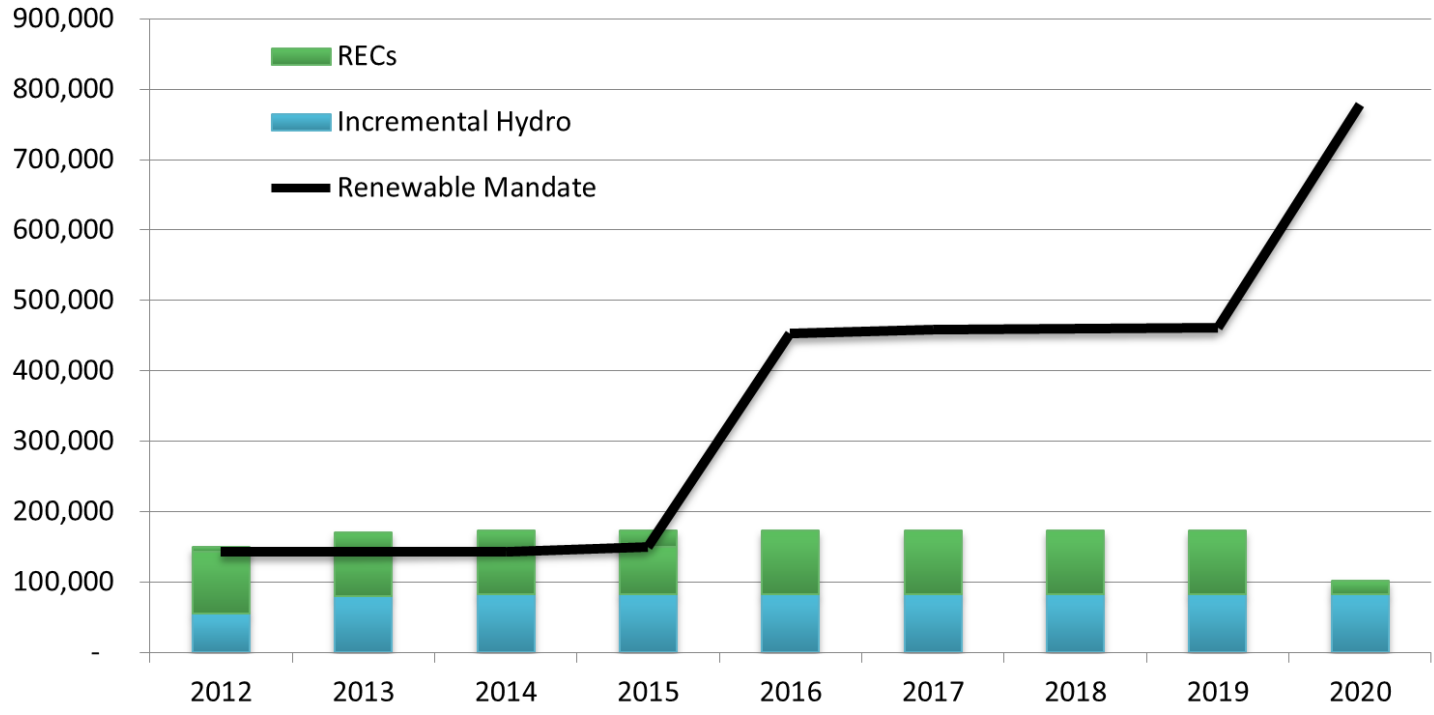
Renewable Energy Credits

Renewable energy credits, or REC's, are the environmental attributes of electricity generated by an eligible renewable resource as defined in 19.285.030 RCW.

Eligible Renewable Resources

Eligible Renewable Resources are resources that can be applied towards the renewable mandates of the Energy Independence Act, as defined in 19.285 RCW. Examples of eligible renewable resources include wind, biomass, biodiesel, geothermal, solar, certain hydro resources (tidal, wave, ocean, or incremental hydro), and certain gas resources (landfills and sewage treatment facilities). Traditional hydro generation, while defined in state law as a renewable resource (19.29A.010 &19.285.030 RCW), is not part of the list of resources utilities can use to comply with the Energy Independence Act's renewable mandates.

Tacoma Power has REC contracts with two separate providers. One of these contracts provides REC's directly associated with the output of wind farms located in Idaho and extends through 2019. The other quantity of RECs comes from Tacoma Power's Slice/Block Power Purchase Agreement with the Bonneville Power Administration (BPA). Per the terms of this Agreement, Tacoma Power is entitled to a portion of the RECs associated with BPA's wind farms.



Tacoma Power's Renewable Compliance Status

Tacoma Power has contributions from five separate Incremental Hydro resources. The majority of these renewable contributions come from Tacoma Power's Mossyrock generator rebuild. The rebuild was completed in 2010 and provides 41,041 additional MWh's in electrical energy. Tacoma Power also receives an apprenticeship labor credit for the rebuild which brings the total renewable credit in 2012 to 49,249 MWh's.

Tacoma Power has two power production efficiency improvements at the Cushman hydroelectric project. In 2013, Tacoma Power began operating a third powerhouse at the Cushman hydroelectric project. When fully operational the expected annual generation from the Northfork Powerhouse will be approximately 23,242 MWh's per year. The second Cushman project improvement was a butterfly valve refurbishment as a part of the regular maintenance that occurred in 2009 and 2010. The effective incremental energy produced in 2012 was 1,678 MWh's.

In 2003 Tacoma Power completed construction of a new generating unit at the LaGrande dam, called LaGrande Unit 6. The generator produced an average of 3,432 MWh's per year between 2008 and 2010. Finally, Grant County PUD completed the installation of a new juvenile fish bypass system at the Wanapum Development in 2008. Tacoma Power has a Power Purchase Agreement with Grant County PUD for a portion of the output from the Wanapum Development and the renewable contribution from this improvement in 2012 was 2,362 MWh. Tacoma Power had a total of 150,183 MWh's of eligible renewable energy in 2012.

Current REC Market and Compliance Strategy

Tacoma Power has sufficient eligible renewables to meet its requirement from 2012 through 2015. In 2016, the renewable requirement escalates to nine percent and Tacoma Power will need to acquire additional eligible renewables to meet this requirement. Based on the current load forecast, Tacoma Power will need to acquire approximately 265,000 MWh's of eligible renewables.

One option is to acquire additional RECs to meet this requirement. Currently REC prices for the 2016 through 2019 time period are less than $10 per MWh. The other option is to acquire eligible renewable generating resources. However, as demonstrated by the resource analysis in the second section, Resource Evaluation and Analysis, once Tacoma Power acquires the quantity of cost effective conservation specified in the analysis, Tacoma Power is an average of169 MW's surplus. Therefore, not only would the addition of another physical resource make Tacoma Power more surplus but it would have a negative impact on the cost of the total resource portfolio.

The current minimum levelized cost estimates for adding a new physical resource is approximately $70 per MWh. Assuming Tacoma Power acquired a resource for this amount and deducted $10 per MWh for the value of the renewable attributes of the project, the net cost of the resource would be approximately $60 per MWh. Tacoma Power's current wholesale price forecast for the 2016 through 2019 compliance period averages less than $40 per MWh. Assuming energy sales at an average market price of $40 per MWh would result in a loss of $20 per MWh for every MWh sold back into the wholesale electricity market. Given the average quantity of surplus generation in Tacoma Power's portfolio, a majority of the MWh's produced by a new renewable resource would need to be sold and thus the preferred strategy for the next compliance period is to acquire REC contracts to meet the renewable requirement.

As a result of the analysis in this IRP, Tacoma Power has started negotiations with REC suppliers to acquire a significant portion of the estimated renewable requirement for the 2016 through 2019 compliance period. The strategy for this compliance period is to execute contracts with REC suppliers to fill the majority of the projected requirement. As the utility approaches 2016 and has more accurate load information for determining the compliance requirement, we will acquire sufficient contracts to fill the remaining need. Between now and the next IRP, Tacoma Power intends to develop a more comprehensive strategy for complying with the post 2020 compliance period. It is expected that there will be further updates on Tacoma Power's progress in this area in future IRP's.

Commonly Used Terms

Adverse Water - is the amount of streamflow associated with the 75th percentile year – three out of every four years have higher flows, while one out of four years has a lower flow.

Average Water – is the amount of streamflow associated with the 50th percentile year – one out of every two years have higher flows.

Critical Water - as the amount of electricity that the utility would generate if the combined annual streamflow into Tacoma Power and BPA projects equaled the lowest amount on record. This streamflow occurred from August 1940 to July 1941.

Operating Year - An operating year begins in August and ends the following July. This period coincides with our region's hydrological cycle, beginning and ending when storage reservoirs are nearly full and river flows are at their lowest. The cycle dictates how hydrologic projects are operated, hence the term operating year.

Water Year – A water year begins in October and ends the following September.

WoodMac – Wood Mackenzie is a third party that provides the Natural Gas and Wholesale Electric Price forecast for Tacoma Power.

Common Acronyms

aMW	Average megawatt
BPA	Bonneville Power Administration
CCCT	Combined-Cycle Combustion Turbines
CFS	Cubic Feet per Second
CO2	Carbon Dioxide
CO2e	Carbon Dioxide Equivalent
CPA	Conservation Potential Assessment
EPRI	Electric Power Research Institute
FERC	Federal Energy Regulatory Commission
GCPHA	Grand Coulee Project Hydroelectric Authority
GHG	Greenhouse Gas
GW, GWh	Gigawatt, gigawatt-hour
IRP	Integrated Resource Plan
LRB	Load Resource Balance
kW, kWh	Kilowatt, kilowatt-hour
Mid-C	Mid-Columbia Trading Hub
MW, MWh	Megawatt, Megawatt-hour
NERC	North American Electric Reliability Corporation
NG	Natural Gas
NREL	North American Renewable Energy Laboratory
NWPCC	Northwest Power & Conservation Council
RCW	Revised Code of Washington
REC	Renewable Energy Credit
RPS	Renewable Portfolio Standard
SCCT	Simple Cycle Combustion Turbines
WAC	Washington Administrative Code
WECC	Western Electricity Coordinating Council

Appendices

The appendices provide additional detail about specific sections of this Integrated Resource Plan and are available for download from Tacoma Power's website: http://bit.ly/tpwr2013irp.

APPENDIX 1: Tacoma Power's Resource Portfolio

APPENDIX 2: Price Forecast

APPENDIX 3: 2012 Load Forecast

APPENDIX 4: Conservation Potential Assessment

APPENDIX 5: Comprehensive Review of Resource Alternatives

APPENDIX 6: Comprehensive Overview of Scenario Alternatives

APPENDIX 7: Stakeholder Process and Presentations

Questions & Comments

On behalf of Tacoma Power, we would like to thank you for taking the time to review our 2013 Integrated Resource Plan. The utility puts a lot of time and effort into preparing a comprehensive and complete plan that minimizes risks and maximizes the value of the services we provide to our customers. If you have any questions or comments about the content provided within this document, please do not hesitate to contact us through one of the following methods:

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