
CANDIDATE RESOURCE STRATEGIES

1 IN BRIEF

Tacoma Power has no immediate need for resources. Despite this fact, it is an important exercise to engage in a quantitative analysis to consider several commercially available resources in case that situation was to change. This document describes the candidate resource strategies evaluated for the Tacoma Power 2015 Integrated Resource Plan.

2 COST-EFFECTIVE CONSERVATION

Tacoma Power is required by Washington State law to set a target to acquire a pro-rata share of the ten year economically achievable, cost-effective conservation¹. The amount of conservation and schedule of acquisition is mandated through a separate specified process. For all of the following resource alternatives, it will be assumed that all targeted conservation will be acquired.

3 RESOURCE ADEQUACY AND RESOURCE NEED

Tacoma Power has identified three specific metrics to determine resource adequacy. Those metrics have indicated that aside from the cost-effective conservation programs mandated by state law, no additional resource is required for the period 2016-2035.

While immediate resource acquisition is not pressing, it is still important to go through the process of evaluating possible resource alternatives. It is possible that Tacoma Powers' resource need could suddenly change with the announcement of a large additional retail customer or if a generation asset was permanently disabled, it would be helpful to have some analysis to begin the discussion. Assuming that we would like to meet an approximate 50 MW need, we will focus on resources that are sized for this amount.

Resources are expensive, and depressed wholesale prices will not provide significant revenues for secondary energy sales, therefore investments in surplus generation are not likely to provide significant return. The resources considered in this section will focus on smaller scale, lower capacity, alternatives.

4 BLOCK/SLICE VERSUS SHAPED BLOCK ANALYSIS

Tacoma Power has until May 31, 2016 to decide if it would like to exercise an option to transition from the current BPA Block and Slice product to a Shaped Block product in 2019 for the remainder of the contract period (until September 30, 2028). There are multiple factors that influence the cost/benefit analysis of selecting a shaped block product including:

1. Benefit of reducing staff cost to support the Slice product (traders, analysts, IT, SIG consultant)
2. Benefit of software and hardware to support the Slice product
3. Cost/risk of less secondary revenues (possibly mitigated by cost of hedging instruments), includes reduced ability to arbitrage LLH for HLH
4. Benefit of increased transmission sales with less uncertain slice sales

¹ RCW reference

5. Benefit of greater secondary sales certainty
6. Benefit of reduced reserves required (3% generation)
7. Benefit of reduced slice penalties for violations
8. Benefit from reduced incidence of spill
9. Benefit from reduced rates for shaped block (based on BPA's realized secondary sales)
10. Cost/risk of lost flexibility (additional purchases to manage operational changes within real time)
11. Cost of lost efficiency from running Tacoma projects differently because of inflexibility of shaped block

A methodology has been proposed to value the BPA product selection. The candidate resource strategies under consideration will all be evaluated in the first round with the assumption that Tacoma Power will opt to remain a Block and Slice customer. In subsequent examinations, this assumption may be relaxed for the candidate resource portfolios that perform best.

5 RESOURCES CONSIDERED

Candidate Resource Portfolios have been separated into two categories; large resource strategies and small resource strategies. Large resource solutions will be evaluated based on the performance of the total resource portfolio. In a second round of resource evaluation, smaller resource strategies may be considered with larger resource strategies to determine which resources may be complimentary.

To assist with the comparison of portfolio performance, the existing Tacoma Power supply portfolio will be estimated for the study period without changes. This portfolio will be considered Portfolio Zero.

5.1 LARGE RESOURCE SOLUTIONS

1. Wind Farm (150 MW capacity) - Eastern Washington location. Integrated up to the hour using Tacoma Power's hydroelectric and BPA Slice flexibility and establishing a contract with the Balancing Area or nearby entity to provide within hour integration. Another possibility would be for Tacoma Power to set up the systems to allow for dynamic scheduling so that Tacoma Power could instantly adjust generation to follow the energy production. Transmission to Tacoma's system load or sale into the wholesale market using BPA PTP transmission. Assume renewable energy credits are generated. Assumed capacity factor of 32%.
2. Eastern WA Utility Solar (300 MW capacity) – Eastern Washington location. Integrated up to the hour using Tacoma Power's hydroelectric and BPA Slice flexibility and establishing a contract with the Balancing Area or nearby entity to provide within hour integration. Another possibility would be for Tacoma Power to set up the systems to allow for dynamic scheduling so that Tacoma Power could instantly adjust generation to follow the energy production. Transmission to Tacoma's system load or sale into the wholesale market using BPA PTP transmission. Assume renewable energy credits are generated. Assume a capacity factor of 17% (AC).
3. Tolling Agreement (50 MW) – While Tacoma Power can hardly justify the acquisition of a Combined Cycle Combustion Turbine given the need for resources, it may be possible to contract for a portion of an existing CCCT's capacity. For the purposes of this IRP, the contract could be either financial or physical. A virtual tolling agreement would allow Tacoma Power to financially transact with an owner of a physical resource to supply power as if it were owned by Tacoma Power. Costs would include fuel (Sumas) and

natural gas storage costs and may include abatement for carbon emissions or other environmental effects. Assume that delivery of power comes from somewhere in BPA balancing area. Uses BPA PTP transmission to bring to Tacoma Power's load or wholesale market. Heat rate of 6,700 Btu/kwh.

4. GCPHA Renewal (50 aMW) – Eastern Washington location. Run of river projects on irrigation canals follows a profile shape that extends from March to October with the bulk of the generation occurring during the runoff and agricultural seasons of May through August. This resource is considered to be non-dispatchable. No renewable energy credits are expected to be included in the purchase. Transmission to Tacoma's system load or sale into the wholesale market using BPA PTP transmission. Does not contribute to calculations of available reserves.
5. Hydropower PPA (50 aMW) – Eastern Washington location. Run of river project located on the Columbia River or one of its' tributaries. A non-dispatchable project that has no pondage or ramping capabilities. No Renewable Energy Credits are assumed to be included in the purchase. Transmission to Tacoma's system load or sale into the wholesale market using BPA PTP transmission. Does not contribute to calculations of available reserves. Streamflows for the project are based on flows at the Mid-C projects and correlated to the 58 historical water simulations.
6. Reciprocating Engine (10 MW) – Tacoma Power service territory location. Natural gas fuel. Heat rate of 8,400 Btu/kwh. Includes abatement for carbon emissions include CO2 taxes.

5.2 SMALL RESOURCE SOLUTIONS

7. Tacoma Power Utility Solar (10 MW capacity) – Distributed within Tacoma Power's service territory. Tacoma Power purchases solar panels and locates them at customer locations around the service territory. Tacoma Power retains the ownership of the solar panel installations and owns the power and Renewable Energy Credits from each installation. The customer continues to pay a retail rate for power. Tacoma Power saves transmission charges and line losses that other generation would incur and may realize distribution efficiency benefits. Customers benefit from having slightly increased reliability and possibly slightly reduced rates (spread over all service customers) from realized transmission and distribution benefits and by knowing power is being generated locally. Assuming that commercial and industrial customers are targeted, there would be 1000 participants each with on average 10 kw systems. The rate of acquisition would be estimated at 100 installations (1 MW) per year. Assume a capacity factor of 15.5% (AC).
8. Barrier Dam (2.5 MW capacity) – The Barrier Dam is part of Tacoma Power's Cowlitz Salmon Hatchery and is situated on the Cowlitz River below Mayfield Dam. The purpose of the Dam is to prevent fish from bypassing the fish collection facility and swimming into the pond below Mayfield Dam. The dam was built in 1968 and is showing signs of significant deterioration. Part of the reconstruction of the dam could be to retrofit it to include generating units. This project would be considered a run of river project with no pondage of its' own. This IRP analysis assumes that the dam could be fit with five units of 0.5 MW each for a total additional capacity of 2.5 MW. Renewable energy credits might be possible. Transmission to Tacoma's system load would be capable on existing transmission. Would this project need a new substation? Would this project require a limited re-opening of the Cowlitz project FERC license?

9. Biodigester (2 MW) – Located in Tacoma, a biodigester converts food and animal waste into methane gas which is burned to generate power. Non-energy benefits include renewable energy credits, Greenhouse Gas reduction, avoidance of tipping and hauling fees for separated food waste. Assume City of Tacoma does not charge the utility for food waste.

10. Demand Response (25 MW) – Large industrial or commercial customers contractually agree to shave or drop retail load on instruction or by intervention by Tacoma Power. Tacoma Power will compensate customers through a rate reduction equivalent to \$1/kw/month. Benefit to Tacoma Power is the ability to count demand response equal to spinning reserve.

11. Additional Conservation (9.7 aMW in 2035) – expanding conservation acquisition programs above those required based on avoided cost to comply with I-937. Justification for this acquisition is to avoid future resource need.