

McCULLOUGH RESEARCH

ROBERT F. McCULLOUGH, JR.
PRINCIPAL

Date: March 19, 2019
To: Rick Aramburu
From: Robert McCullough
Subject: Needs and Costs of Energize Eastside

Since 2009 the transmission project known variously as the “North King County Capacity Increase” (2009), “Sammamish-Lakeside-Talbot Sensitivity” (2010), “Eastside Transmission Project” (2014-2017), “Lakeside 115 KV Transmission Project” (2014), “Lakeside Project” (2013), “Lakeside Substation Project” (2012), and since 2013, “Energize Eastside” has spent \$54,634,345 on planning and public relations.^{1,2} In spite of the multiplicity of names and corresponding studies, actual details remain sketchy. Specifically, data on the need for the project and its costs are difficult to find.

More recently, in August 2017, the configuration of this long-awaited project was entirely changed.³ The new project, the “Talbot Hill/Lakeside Transmission Line”, is now proposing to replace the “Energize Eastside” proposal with a less ambitious plan that will only construct 4.8 miles of the original 8.8 miles originally considered. In February of this year PSE stated:

“PSE has not completed an application for the transmission line segment running from the proposed Richards Creek substation north and cannot accurately estimate the timing of the timing of this submittal until additional work permitting the Project’s south half is complete.”⁴

¹ 2017 Puget Sound Energy FERC Form 1, page 216.

² \$54,634,345 is the figure as of December 31, 2017. A more reasonable forecast to year end 2018 would be \$61,668,850.

³ “Progress on Energize Eastside continues with PSE submitting its first permit application to the City of Bellevue. PSE plans to build and energize the new Richards Creek substation in Bellevue and upgrade the existing transmission lines in south Bellevue, Newcastle and Renton by the summer of 2018.

Permit applications for the rest of the southern portion of the project in Newcastle and Renton will be submitted this fall. After that, PSE anticipates submitting permit applications for the northern portion in Bellevue and Redmond in late 2017 – early 2018.”

<https://energizeeastside.com/news>, September 18, 2017.

⁴ Declaration, Daniel Kock, PSE, February 11, 2019.

Needs and Costs of Energize Eastside

March 19, 2019

Page 2

For newcomers to electric transmission planning, this seems like a minor adjustment. If a building is too tall for local zoning standards, a developer can simply agree to build a building half as tall without refileing the various plans and applications. This is a reasonable solution in almost all land use cases.

Electric transmission is entirely different. Planning studies in electric transmission planning must be undertaken on a system level. This is due to the physics of electricity transmission. While the line itself can be easily plotted on a map, the actual flows often diverge significantly from our geographic intuitions. This reflects two factors: First, the flows of electricity are not contract paths, but the results of flows across the entire grid. A specific line may well have implications on neighboring lines – or even lines at some distance. Electrons are notoriously uninterested in contracts since they follow the path of least resistance. Second, contingencies on the system are very different when the line's proposed path changes. The new Talbot Hill/Lakeside Transmission Line will be less vulnerable to contingencies from the north – specifically since it will no longer connect to the north.

In practice this means that the vintage studies performed in 2012, 2013, and 2015 are no longer pertinent to the project under discussion and would not be regarded as appropriate in normal planning discussions.^{5,6,7,8}

Since electrons do not follow maps, the coincidence that part of the new Talbot Hill/Lakeside Transmission Line coincides with the previously proposed project is not relevant since electrons may trace entirely different paths under the newly proposed configurations. This is exacerbated by the fact that all evidence available in state and federal filings of Puget Sound Energy clearly indicates that the assumed peak loads have not materialized – and overall electric peak loads on their system are declining.

To fulfill the requirements of the Bellevue Municipal Code (Section 20.20.255.E.3), Puget Sound Energy must establish the need for any electrical facility it proposes to build in the city:

The applicant shall demonstrate that an operational need exists that requires the location or expansion at the proposed site;

And the Newcastle Municipal Code Section 18.44.052.A.3) addresses the question of need in a similar fashion:

⁵ City of Bellevue Electrical Reliability Study Phase 2 Report, Exponent, February 2012.

⁶ Eastside Needs Assessment Report, Quanta Technology, October 2013.

⁷ Supplemental Eastside Needs Assessment Report, Quanta Technology, April 2015.

⁸ Independent Technical Analysis of Energize Eastside, Utility System Efficiencies, April 28, 2015.

Needs and Costs of Energize Eastside

March 19, 2019

Page 3

- a. Describe how the proposed utility facility regional location is a consequence of needs or demands from customers located within the city or service area; and
- b. Describe why the operational needs of the facility require locating the utility facility regional at the proposed site.

It is a truism of investor owned utility planning that as the sums increase in the construction work in progress accounts, defense of the project becomes financially more and more important. In this case, requests for updated data has been rejected more and more forcefully as time progresses. The most recent requests for relevant load data have been refused on the ground that the summary data might expose individual consumer data.⁹

When the project commenced in 2010, Puget Sound Energy forecasted overall peak loads for 2017 as 5,843 MW.¹⁰ The actual winter peak load in 2017 was 4,206 MW.¹¹ If, as there is every reason to believe, the lack of load growth over the past decade (and the most recent forecast indicating a lack of load growth for the next decade) makes the need for a major infrastructure project on the eastside both speculative and premature.¹²

Need for the project has changed considerably over the past eight years. Initially, a significant focus was on the need to deliver the Canadian Entitlement. This shows up in the documentation available at ColumbiaGrid, a planning body that represents a variety of pacific Northwest utilities – including Puget Sound Energy.

The focus on the Canadian Entitlement is a bit odd given that British Columbia, the recipient of the Canadian Entitlement under an agreement dating from 1964, had rejected depending on U.S. supplies in legislation enacted in 2005.^{13,14,15}

As British Columbia Hydro testified a year ago at the British Columbia Utilities Commission:

Canadian Entitlement to the Down Stream Benefits under the Columbia River Treaty: The Canadian Entitlement has been eliminated as an alternative resource both due to the legislated self-sufficiency requirement but al-

⁹ Marshall, George. *Re: CEH Requests dated June 9,2018 and July 8,2018* September 19, 2018.

¹⁰ 2009 IRP Addendum, page 8.

¹¹ 2017 Puget Sound Energy FERC Form 1, page

¹² 2019 IRPAG Meeting #2, PSE, August 28, 2018, page 24.

¹³ McCullough, Robert. *Comments on Commission Alternative Resource Portfolios BCUC Site C Inquiry* testimony F35-21, October 18, 2017, page 4.

¹⁴ U.S. Benefits from the Columbia River Treaty – Past, Present and Future: A Province of British Columbia

Perspective BC Ministry of Energy and Mines, June 25, 2013. Page 8.

¹⁵ Canadian Entitlement, U.S. Entity, April 2013, page 2.

Needs and Costs of Energize Eastside

March 19, 2019

Page 4

so given current negotiations between Canada and the US, the current energy reliance and limited firm transmission availability through the I5 corridor to BC.¹⁶

External market reliance (including Canadian Entitlement)**	-	-	Reliability concerns and uncertain long term availability. Also legislatively barred through section 6(2) of the <i>Clean Energy Act</i> – the legal requirement to be self-sufficient requires “solely from electricity generating facilities within the province”	17
---	---	---	--	----

BC Hydro has not explicitly relied upon the Canadian Entitlement (CE) to the Down Stream Benefits (DSBs) under the Columbia River Treaty (CRT) in developing the portfolios used in this application (except for a short term bridging or contingency resource). BC Hydro does not believe the CE to be an appropriate resource to rely upon in its portfolio development for the following reasons:

1. The Clean Energy Act requires that BC Hydro be self-sufficient for energy and capacity by being able to supply mid-level load forecasts planning to average water from heritage hydro contracted with or own;¹⁸

Given British Columbia’s 2005 Clean Energy Act and the ongoing renegotiation of the Columbian Entitlement, the need for this transmission line to carry energy and capacity north has been quietly dropped. Even more importantly, the plan to build the transmission line in stages would make wheeling to Canada over the line impossible.¹⁹

This conclusion was underscored by the response to concerns over the use of the line to wheel the Canadian Entitlement:

As described in the Phase I Draft EIS, transmission of electrical power outside of PSE’s service territory is not an objective of the project.²⁰

The Canadian Entitlement is one of a number of issues currently under negotiation between the United States and British Columbia Hydro. The economics of BC Hydro’s

¹⁶ BC Hydro Submission to the British Columbia Utilities Commission Inquiry into the Site C Clean Energy Project, August 30, 2017, page 60.

¹⁷ Ibid., Appendix L, page 4.

¹⁸ Ibid., Appendix L, page 49.

¹⁹ As noted earlier, the remote possibility that changes in British Columbia law and integrated resource plans might change to include imports from the U.S. would not be relevant to a line that terminates half-way.

²⁰ Final EIS Appendix J Phase 1 Comments & Responses, March 2018, Page JI-10.

Needs and Costs of Energize Eastside

March 19, 2019

Page 5

new 1,100 MW “mega-dam” at Site C depends on exports to the United States making the prospects of new imports from the U.S. even more remote.

In recent years, the eastside transmission project has relied on forecasts showing that rapid growth will create the required need for the project. The Final EIS comments favorably on the dated studies that use these forecasts:

PSE's Eastside Needs Assessment Report prepared by PSE, the Supplemental Eastside Needs Assessment Report prepared by Quanta Technology and PSE, and the Independent Technical Analysis prepared by Utility System Efficiencies, Inc. for the City of Bellevue confirms the project need. Stantec reviewed the analyses and found them to be in accord with standard industry practice for electrical system planning.²¹

The EIS response has missed the point. Even if the studies are well prepared, their relevance is severely limited when the assumptions used in them have become obsolete. PSE's original needs assessment utilized forecasts from 2012.²²

Rapid changes in the electric industry have rendered older load forecasts obsolete. The following chart shows PSE's official load forecasts against actuals for the past decade:

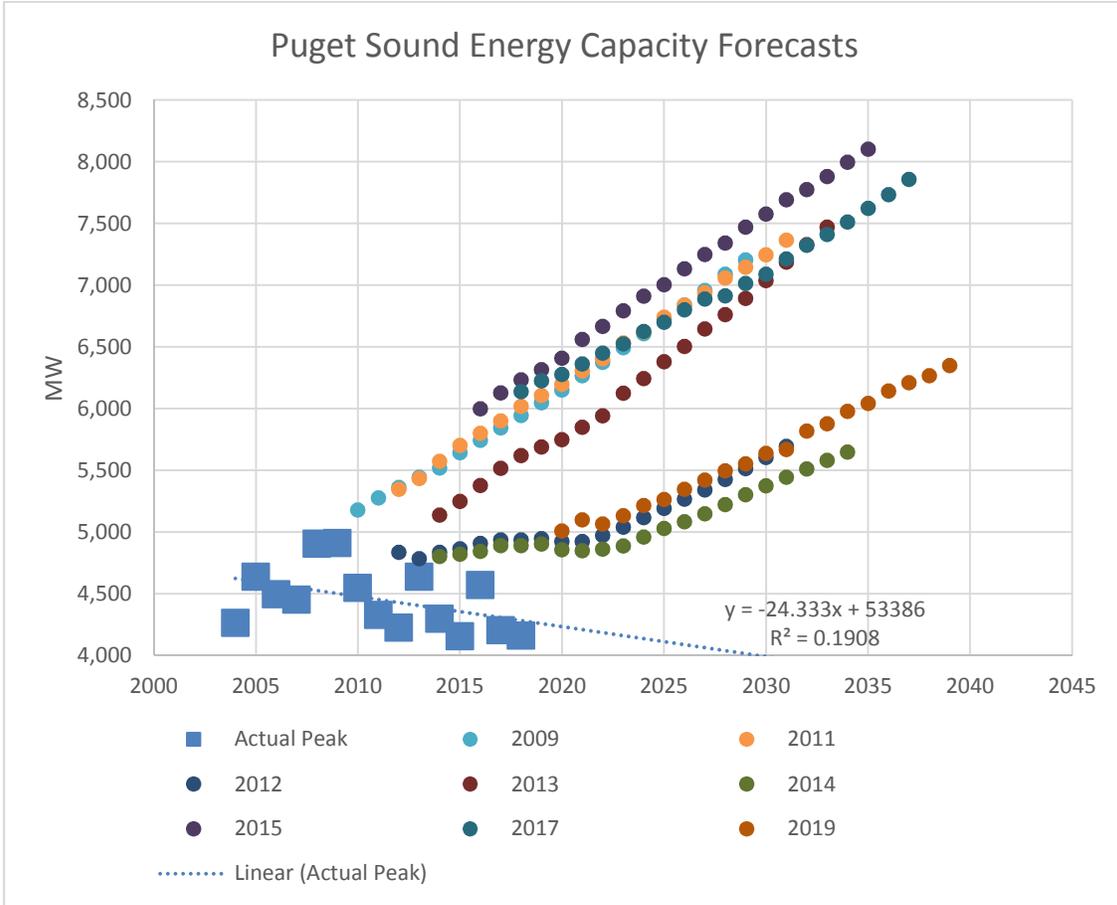
²¹ Ibid., page J1-16.

²² Eastside Needs Assessment Report, October 2013, page 7.

Needs and Costs of Energize Eastside

March 19, 2019

Page 6



23

These charts are referred to as “porcupine charts” since the older forecasts stand out like a porcupine’s quills. The blue boxes represent actual peak data. This is the “body” of the porcupine. Puget Sound Energy’s actual peaks are declining over time. The dotted line that decreases over time shows a simple statistical model of Puget’s decline in peak loads.

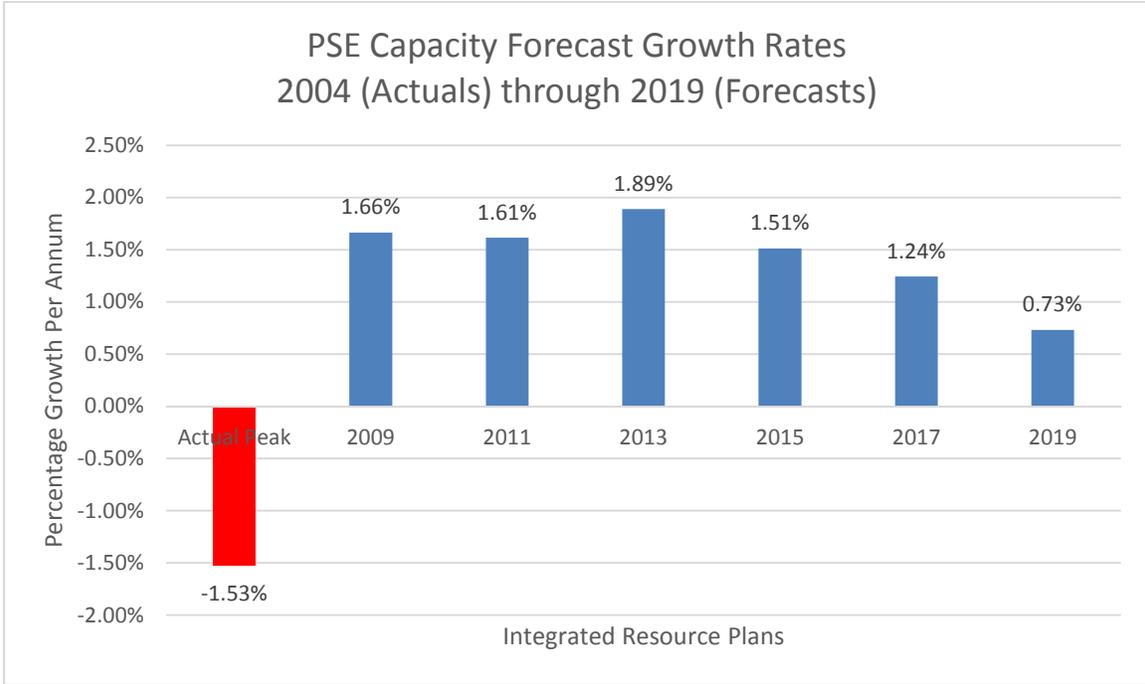
As can be seen clearly from “quills” of the porcupine, PSE’s peak load forecasts have fallen sharply over the transmission project’s ten-year life. When the project was first originated, PSE expected its capacity loads to be 39% higher than the actual peak experienced in the winter of 2017/2018. Not only have the assumed growth rates for capacity been unrealistically high, but the actual trend in actual peaks has been negative:

²³ Sources for this chart are the PSE IRPs for 2009 through the preliminary materials for 2019. Actual peaks are from the PSE FERC Form 1s and from the 2018 Form 3-Qs. The fourth quarter of 2018 has been interpolated from EIA-930 reports.

Needs and Costs of Energize Eastside

March 19, 2019

Page 7

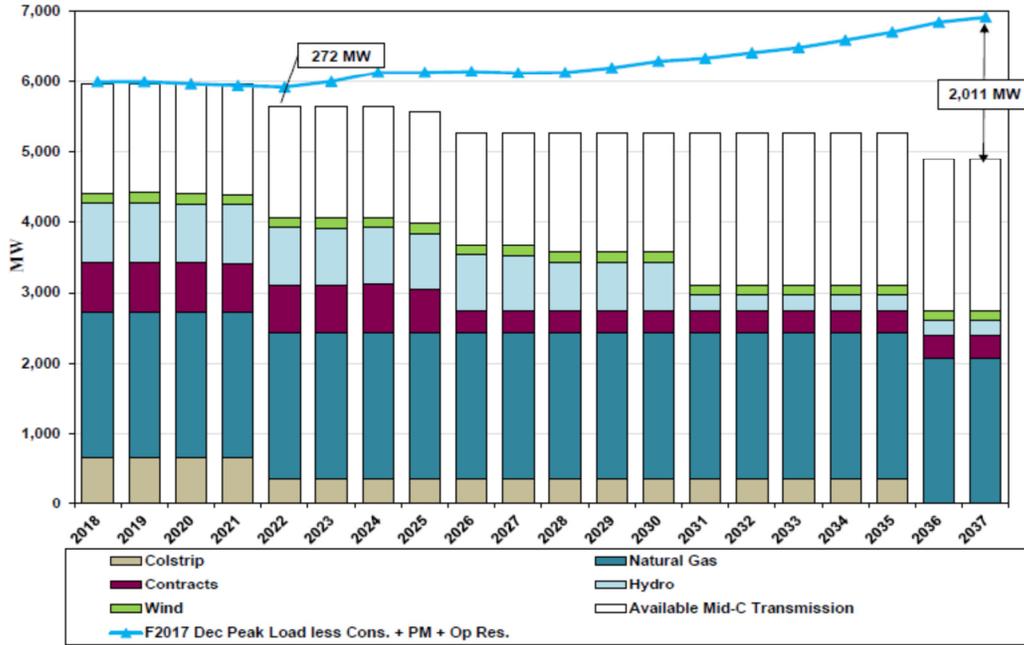


PSE’s most recent preliminary forecasts released in the advisory committee for the 2019 Integrated Resource Plan effectively estimate no growth rate for the next decade:

Needs and Costs of Energize Eastside

March 19, 2019

Page 8



24

The load forecasts used in the studies cited in the EIS response are now obsolete. These older forecasts were used to establish the need for the transmission project.

The chart that best illustrates PSE’s needs analysis can be found in the Supplemental Eastside Needs Assessment Report:

²⁴ 2019 IRPAG Meeting #2, PSE, August 28, 2018, page 24.

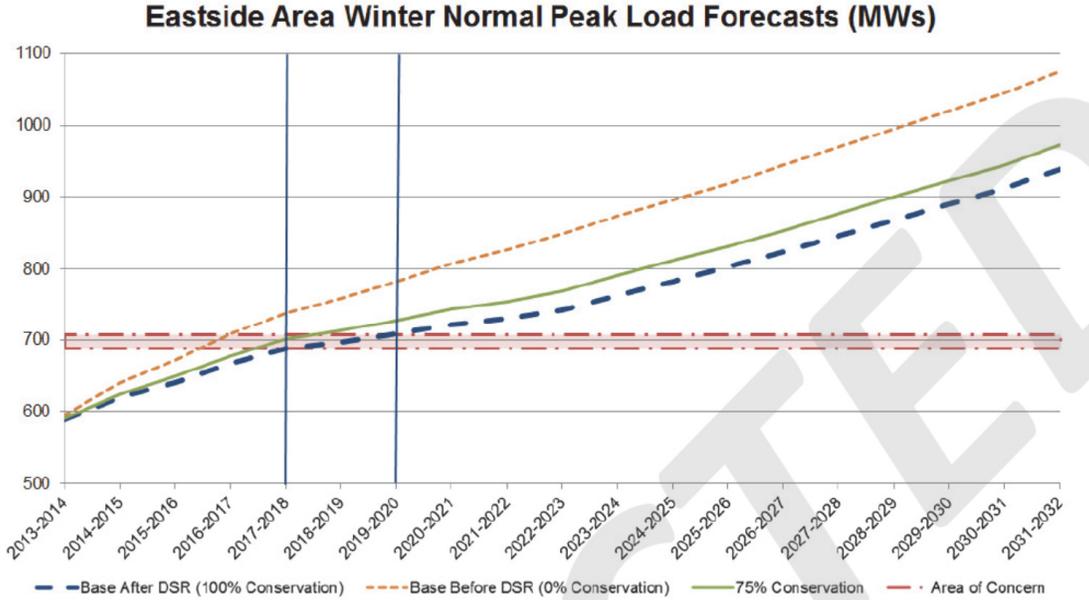


Figure 3-1: Capacity Need Results with 2015 Updated Information

This table illustrates a need for the project in the winter 2017/2018 time frame – as the load forecast crosses the line representing “the area of concern”. The “area of concern” is represented by the horizontal line approximating 700 MW.²⁶

If the load forecast is lower than 700 MW, the need for the upgrade is minimal at best. We know the actual loads five years from the City of Bellevue Independent Technical Analysis.²⁷

In the chart below the dashed red line indicates the actual values for winter 2008/2009 through 2013/2014. As is clear from the revised chart, actuals were significantly below forecasts through winter 2013/2014.

²⁵ Supplemental Eastside Needs Assessment Report, PSE, April 2015, page 15.

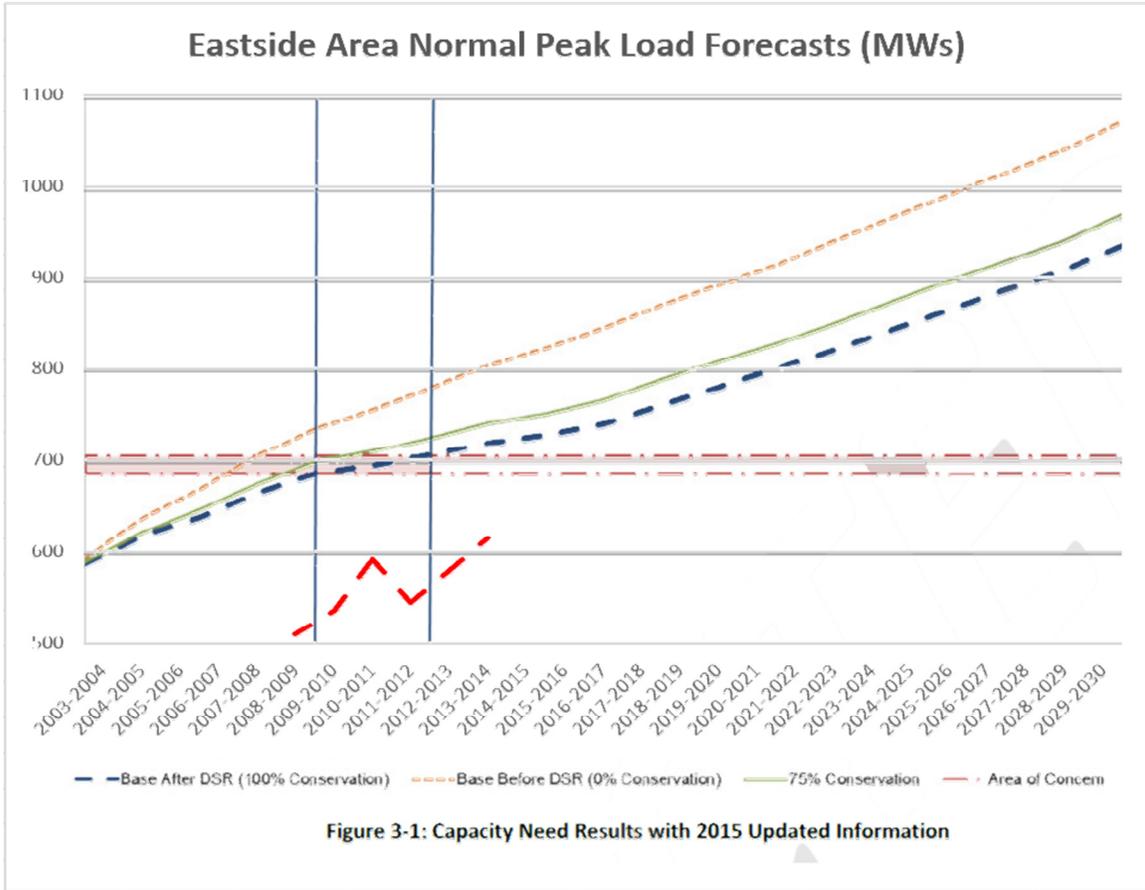
²⁶ PSE’s actual language is a bit confusing on whether the chart represents MVA (active plus reactive load) or MW, the standard measure used in load forecasting. We have assumed MW since this is the amount cited in the following paragraph.

²⁷ Independent Technical Analysis of Energize Eastside for the City of Bellevue, WA. Utility System Efficiencies, Inc., April 28, 2015, page 34.

Needs and Costs of Energize Eastside

March 19, 2019

Page 10



Puget Sound Energy has not released eastside actual capacity figures since the winter of 2013/2014. It is logical to infer that the data may follow trends in the industry of low (or negative) rates of load growth. We have estimated eastside capacity loads using an econometric forecast based on the relationship between PSE and Eastside capacity loads in the Independent Technical Analysis.²⁸ In the words of the econometrician, the relationship is significant at the 95% level. Translated into standard English, this means that rejecting the relationship as just pure chance would be wrong nineteen times out of twenty.

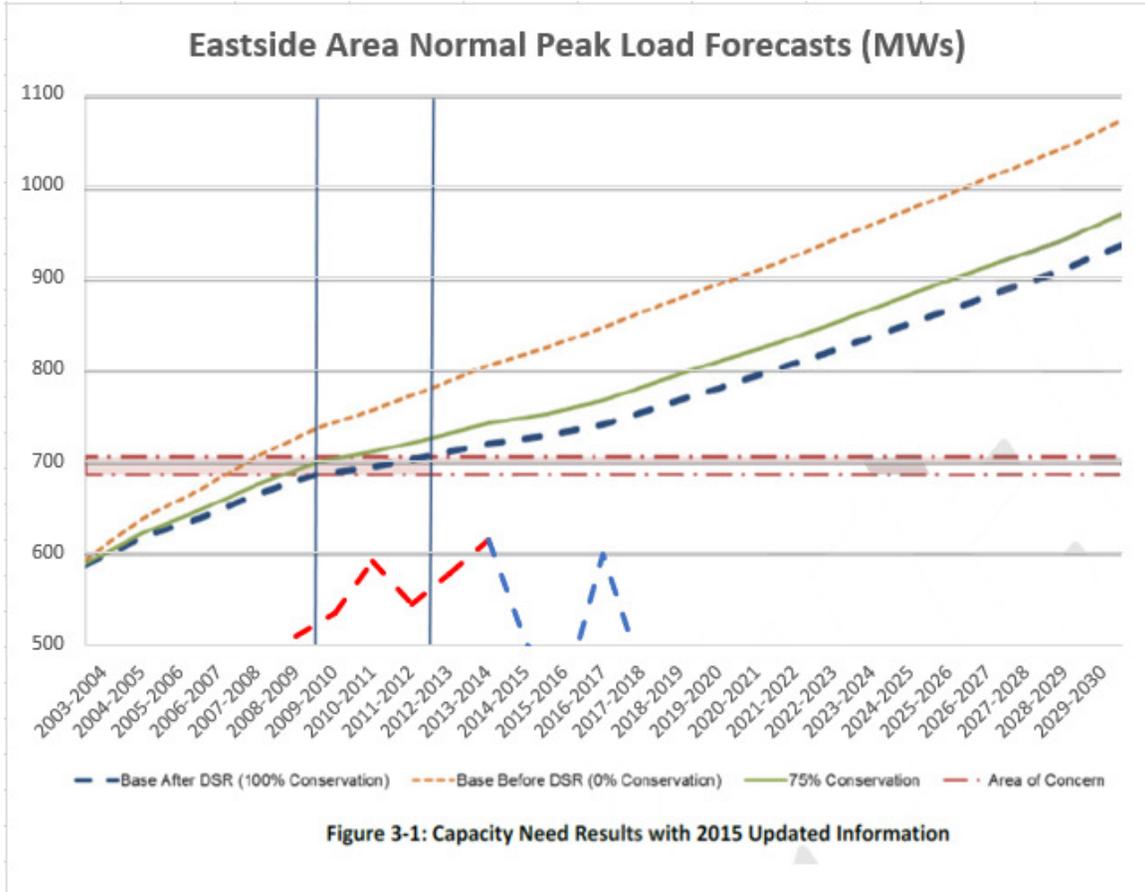
Using this relationship, we can fill in actuals through last winter:

²⁸ Ibid., page 34.

Needs and Costs of Energize Eastside

March 19, 2019

Page 11



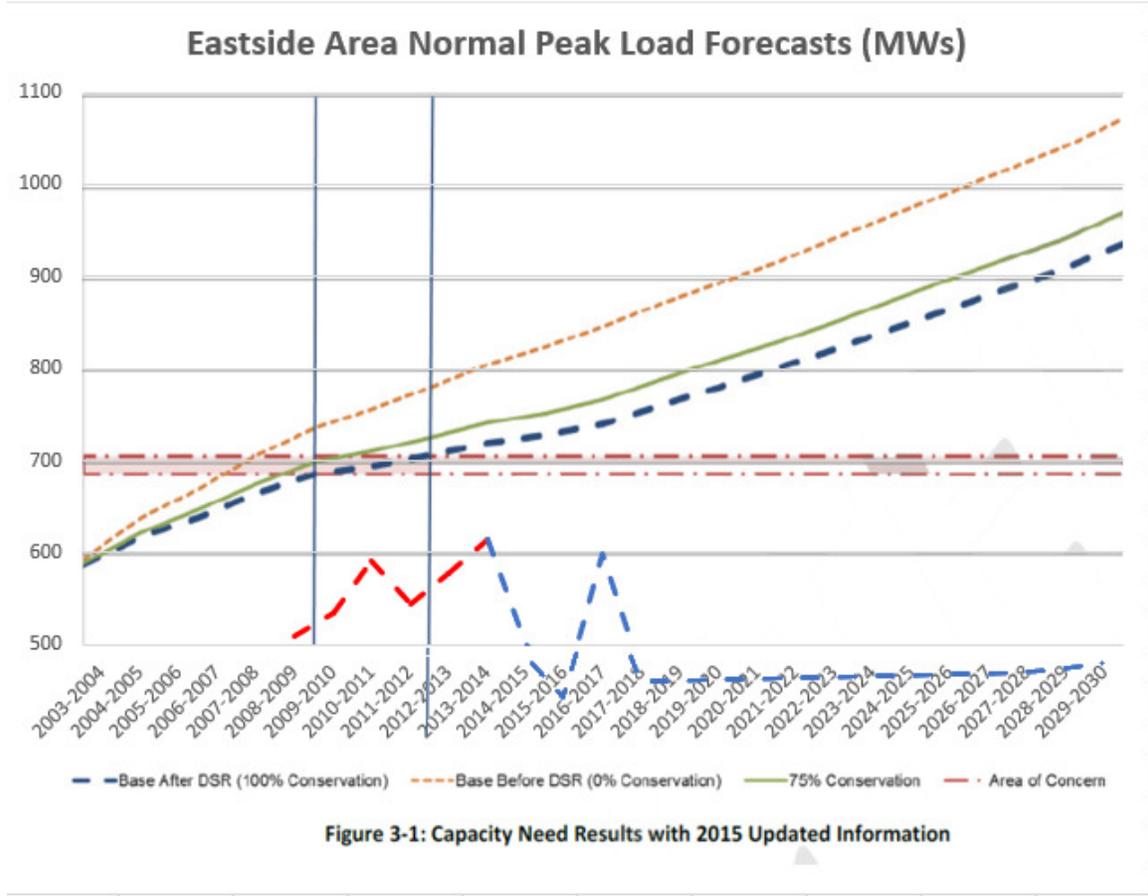
The blue dashed line represents a best guess of actuals for the past four winters. As can be seen, the values remain low since overall Puget Sound Energy capacity loads are falling. The areas of the chart where the blue line disappears represent years where the values are lower than the minimum level shown in Puget's chart.

We can extend the estimate into future years using Puget's own forecast. They estimate a growth rate of just one quarter of one percent over the next decade. This value can be used to forecast eastside loads for the next decade:

Needs and Costs of Energize Eastside

March 19, 2019

Page 12



The evidence so far released by Puget Sound Energy indicates that actual eastside capacity loads will not reach the “area of concern” in many years to come.

It is logical to question the rapid change in capacity load forecasts over the past five years.

Reductions in peak loads are now common in the industry. Seattle City Light --Puget Sound Energy’s closest neighbor sharing similar weather and demographics – has just issued a new load forecast showing peak load reduction far into the future:

Needs and Costs of Energize Eastside

March 19, 2019

Page 13

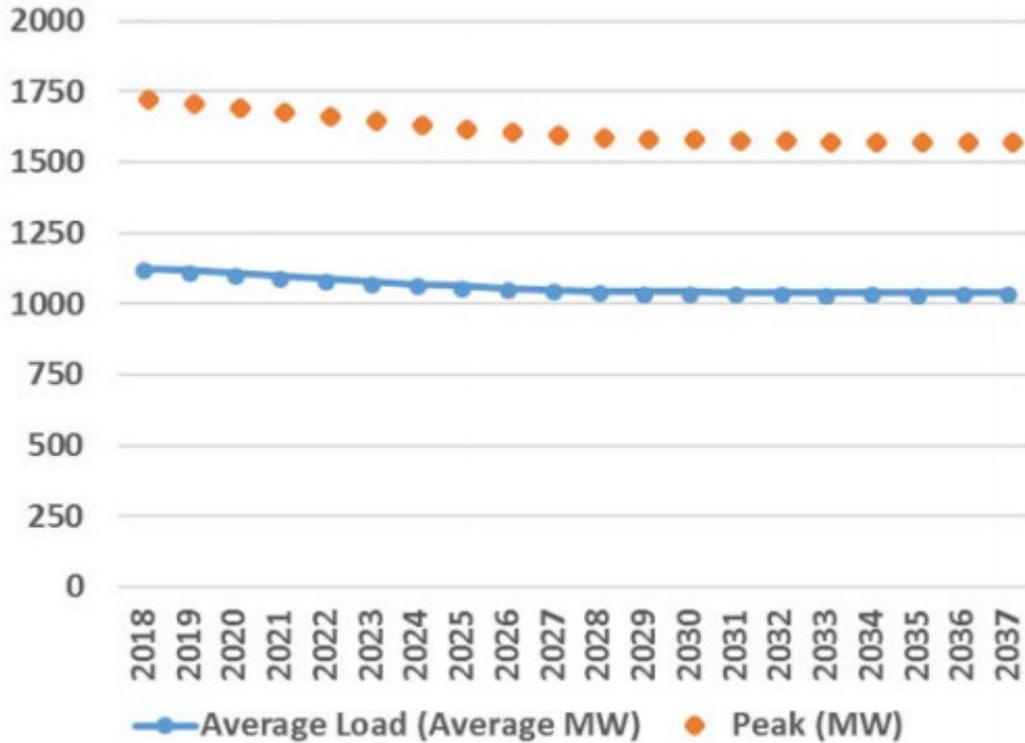


Figure 1. City Light's normal peak and retail load forecast

29

Overall, substantial evidence exists that the high growth scenarios presented in early integrate resource plans did not materialize.

PSE’s continued enthusiasm for this project is more likely to be explained by costs and their regulatory treatment than engineering.

The cost of Energize Eastside is a mystery. In the beginning, PSE indicated that the project had a price tag of \$70 million.³⁰ For some years, PSE has indicated that the costs are between \$150 and \$300 million.^{31,32}

²⁹ 2018 Progress Report, Seattle City Light, September 4, 2018, Page 10.

³⁰ 2013 Biennial Transmission Expansion Plan, ColumbiaGrid, February 2013, page 6.

³¹ “We don’t yet know the total cost of the project, but estimates range from \$150 million to \$300 million.” <https://energizeeastside.com/faq/who-will-pay-for-the-project-and-how-much-will-it-cost>

³² “[Willow] is the least expensive (\$154 million total cost; \$0.90 estimated monthly increase to an average residential customer)”, PSE Energize Eastside Community Advisory Group Final Report, January 2015, page 22.

Needs and Costs of Energize Eastside

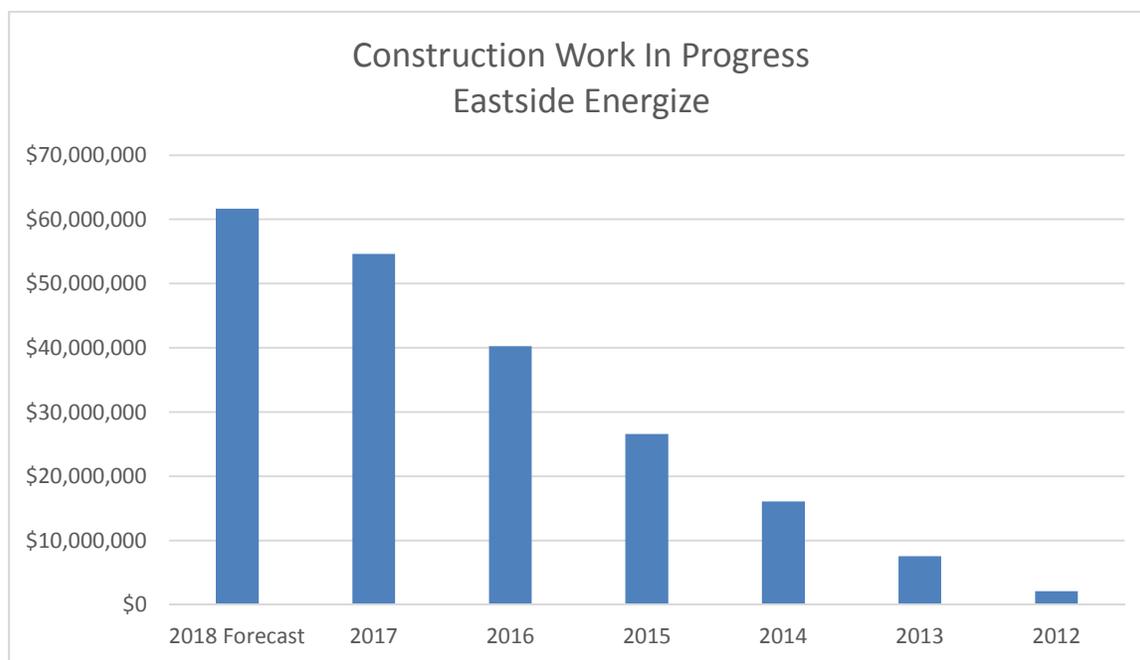
March 19, 2019

Page 14

Utilities are usually very good at cost estimation. A whole industry has grown up around the estimation and control of construction costs. The “Critical-Path Method” was introduced in a 1959 article published in 1959 Proceedings of the Eastern Joint Computer Conference.³³ It represented a significant application of the mathematical programming and computer developments pioneered in the Manhattan Project during the Second World War. A common tool in the industry to implement this approach is software named Primavera. This program assembles the relevant data and helps the engineers develop a logical construction schedule as well as detailed cost estimates.

It is not credible that eight years into the project has been able to use standard industry tools to generate solid cost estimates.

While we do not know the cost of the project, we can track the project from the Construction Work in Progress (CWIP) accounting contained in PSE’s FERC Form 1s:



The most recent ColumbiaGrid report indicates an in-service date of 2020 with an instantaneous cost of \$110 million:

³³ The term was coined by James Kelley and Morgan Walker in the 1950s and first published in their jointly authored article: *Critical-Path Planning and Scheduling* 1959 Proceedings of the Eastern Joint Computer Conference, pages 160-173.

Needs and Costs of Energize Eastside

March 19, 2019

Page 15

No	Project Name	Region	Description	Sponsor	Scheduled Completion	Cost Estimate
11	Denny - Broad and Massachusetts - Union - Broad 115 kV Series Inductors	Puget Sound	Add 6 ohm inductors on Denny - Broad and Massachusetts - Union - Broad 115 kV underground cables. 115kV Capacitor Bank at Broad Substation.	SCL	2018	\$22 M
12	Denny Substation (Phase 1)	Puget Sound	New 225 MVA substation in the north downtown Seattle area. Loop existing East Pine-Broad 115 kV line.	SCL	2018	\$209 M
13	East King County Transformer Capacity (Lake Tradition)	Puget Sound	This project involves looping the Maple Valley-Sammamish #1 230 kV line into PSE's Lake Tradition Substation and installing a new 230/115 kV transformer.	PSE	2025+	\$15-\$30 M
14	Eastside Project: Lakeside 230/115 kV Transformer and Sammamish-Lakeside-Talbot Line Rebuilt to 230 kV	Puget Sound	Rebuild the Sammamish-Lakeside-Talbot 115 kV lines and energize one at 230 kV and install a new 230/115 kV transformer at Lakeside.	PSE	2020	\$110 M

34

At this point, PSE has a \$110 million incentive to proceed with the project whether it is needed or not. When completed, PSE can submit the costs to the Washington Utilities and Transportation Commission for reimbursement from rate payers – including those in Bellevue.

³⁴ 2018 System Assessment, ColumbiaGrid, September 2018, page 60.