Comments on Puget Sound Energy's 2017 Integrated Resource Plan

Washington Utilities and Transportation Commission
Docket Nos. UE-160918 & UE-1609819

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I. Introduction

I am Cynthia Mitchell, a 40 year energy economist and utility consumer advocate -- IRP and demand side resources (DSR) expert. [1] My comments are high-level, providing analysis and findings of PSE's IRP from a demand side perspective, identifying opportunities for PSE utility scale distributed energy resources. I applaud PSE, UTC, Sierra Club, and many others in the movement toward retirement of Colstrip. I suggest as a next step restating the "Beyond Coal" campaign to "Beyond Fracked Natural Gas."

PSE's IRP outcome showing 1,912 MW of natural gas power plants as the least cost best fit resource is not surprising. In fact, it is rather predictable. As the Colstrip units retire PSE must add other large assets to rate base to maintain and grow earnings

From my decades of IRP experience, the impact on utility earnings from changing the trajectory of utility built generation through the lowering and and shaping electric demand, particularly peak loads, is the most essential overlooked issue.

And, I believe PSE when they state "The carbon emission profile presented…does not represent PSE's 'preferred outcome' -- we would prefer emissions to be lower."[2]

Here's what I see as the bottom line: If the State of Washington wants a different energy future other than a slew of natural gas power plants, then the regulatory rules of the game need to

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[1] See Attachment A Statement of Qualifications of Cynthia Mitchell.

[2] "We are keenly aware of our customers' interest in reducing PSE's carbon emissions, and we share their concern and commitment to achieving meaningful carbon reduction that will mitigate climate change… The carbon emission profile presented in this section does not represent PSE's "preferred" outcome – we would prefer emissions to be lower. These emissions result from policies that require PSE to serve customers with the least cost combination of demand- and supply-side resources and carbon regulation policies that have been or may be enacted."

change. While the legislation increasing carbon tax $40 a ton is a good step in right direction, it must be matched by nimble regulations that allow PSE to meaningfully respond. Meaningful response means embracing distributed energy – the triad of integrated energy efficiency, demand response, and energy storage -- as PSE's next utility scale resource. The Commission needs to make the utility's profit tied to their economic and environmental performance, rather than to their investment in assets included in rate base. Jim Lazar's PBR paper[3] shows how to do this with objectively measurable performance criteria unrelated to investment.

Though PSE's IRP includes energy efficiency, demand response, and energy storage, the analyses constrain these resources as a near term resource bridge to significant gas peaker additions beginning in 2025. PSE IRP Figure 1-4 reproduced below summarizes the forecast for additions to the electric resource portfolio in terms of peak hour capacity over the next 20 years.[4] The last row shows the tremendous run up in gas peakers to 717 MW by 2027 and 1,912 MW by 2037. Row 2 shows demand response additions barely breaking 100 MW (103) by 2023, increasing to only 139 MW by 2027, and essentially leveling out over the next 10 years to 148 MW by 2037. Row 4 similarly shows lackluster energy storage additions of 50 MW by 2023, increasing to 75 MW by 2027 and remaining constant at 75 MW over the next 10 years.

Figure 1-4: Electric Resource Plan Forecast,
Cumulative Nameplate Capacity of Resource Additions

	2023	2027	2037
Conservation (MW)	374	521	714
Demand Response (MW)	103	139	148
Solar (MW)	266	378	486
Energy Storage (MW)	50	75	75
Redirected Transmission (MW)	188	188	188
Baseload Gas (MW)	0	0	0
Peaker (MW)	0	717	1,912

[3] Performance-Based Regulation for EU Distribution System Operators
http://www.raponline.org/
[4] PSE IRP, Figure 1-4. p. 1-18.

II. PSE From a Demand Side Perspective.

PSE is winter peaking with electric loads about two times year round load requirements.[5] PSE projects to be resource short for peaking requirements only, and otherwise resource rich for year round requirements.[6] PSE's winter peak is due to "extremely cold weather conditions", with increasing extreme summer weather conditions driving up PSE's electric summer peak.[7]

Simply stated, **the winter peak is** of limited duration, generally driven by extreme weather and thus generally predictable, and most importantly, **managable. It can be managed with curtailment of water heaters, laundry equipment, and other non-essential loads during extreme weather hours.**

Even so, PSE's IRP analysis follows a general uncontrolled peak approach where generation follows load for virtually immediate consumption,[8] finding natural gas power plants a more flexible resource than conservation by defining conservation as a winter peaking resource, and peakers as "an option to generate that can be exercised at any time." [9] It is far cheaper to control load to follow available generation, and progressive utilities around the world are finding that this works well in an environment where variable renewables are a least-cost resource. With wind costing $.02/kWh and solar costing $.03/kWh, less than the fuel and operating costs for

[5] PSE IRP Figure 5-1: Electric Demand Forecast before DSR and Figure 5-3: Electric Peak Demand Forecast before DSR, pp. 5-4 and 5-5.

[6] PSE IRP p. 1-"Figure 1-2 illustrates the company's energy position across the planning horizon, based on the energy load forecasts and economic dispatches of the 2017 IRP Base Scenario presented in Chapter 4, Key Analytical Assumptions….The challenge for PSE is shaping that energy into peak hours. Should regional resource deficits in the future result in periods where market purchases were unavailable, PSE's thermal resources would be able to ramp up to minimize the number of non-peak hours that PSE customers were affected, but we would still face peak need constraints. This is why PSE has a peak capacity constraint, not an energy constraint."

[7] PSE IRP p. 1-19.

[8] Dubbed "grow and build" utility IRP approach in the 1980s the Edison Electric Policy Resource Institute (EPRI).

[9] PSE IRP p. 2-17. "Conservation for PSE reduces exposure to gas and power prices by reducing load – typically winter loads – which avoids the need to build additional generation resources. Peakers represent an option to generate that can be exercised at any time. There may be circumstances in which summer market prices and heat rates are quite high. Conservation programs that primarily target heating loads have no value during those periods. Peakers, on the other hand, can provide value in the summer during times when natural gas and power prices diverge and capture margins that pass through to customers as an offset to power costs in rates. The analysis still shows conservation provides a significant reduction in risk.

PSE's gas resources, it's time to begin ramping up these low-cost, low-emission resources, and ramping down the gas.

PSE also generally applies a "grow and build" IPR analysis to the projected significant transmission and distribution infrastructure requirements from peak loads.[10]

While PSE's IRP discusses its plans for expanding AMI, CVR, and Smart Grid technology demonstrations, utility scale deployment is not modeled in any sort of IRP sensitivity analyses.

Energy efficiency, demand response and energy storage on a combined or bundled basis can be applied to the critical space heating and cooling and water heating loads that correlate with PSE's electric and natural gas winter and summer peaking conditions. And, while I appreciate the general utility engineering logic of "test first" -=- AMI, CVR, Smart Grid, and EE, DR, ES, et al. -- are distributed energy resource markets, well beyond the test stage in many parts of the country. This begs the question of why not consider the possibility in PSE's service territory as well? What we know today is that PSE has over a half-million electric water heaters, each of them effectively a 15 kWh storage battery. If the water heaters were all on during peak demand periods, they would draw more than 2,000 MW, but curtailing them for a few hours will leave almost no one depleting their tank. PSE also serves over a half-million electric ranges, plus clothes dryers and other high-wattage appliances that could be scheduled or curtailed to follow available low-cost, low-emission generation. This is even more potent given PSE's forecast of how charging electric vehicles will exacerbate peaking loads.[11] These EVs can be charged at low-cost, low-emission times. Evidence from Dallas and San Diego proves the effectiveness of time-varying rates in influencing when EVs are charged.

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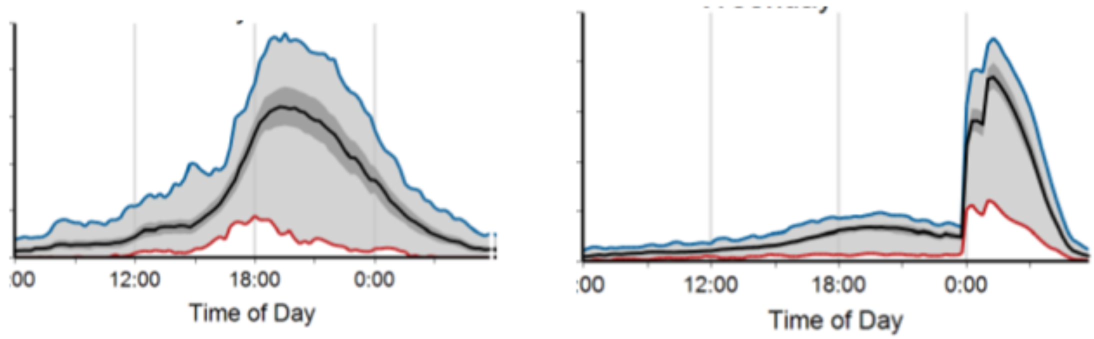
[10] PSE IRP p. 8-23. "In the next decade, PSE anticipates the need to build approximately 6 to 8 new distribution substations to serve load as existing substation capacity is exceeded and another 2 to 4 newsubstations to serve specific point loads. We also anticipate upgrading approximately 3 existing substations to replace aging infrastructure and adding additional capacity to serve local load growth. In total, the new or expanded substations will require 32 to 48 new distribution lines. PSE will continue work on improving reliability of its worst performing circuits as well as installing smart ready equipment for increasing the resiliency of the grid."

[11] PSE IRP Figure 6-37. p. 6-65



Dallas/Ft Worth (standard rates)

San Diego (time-of-use rates)

Copied from: M.J. Bradley, 2017

With the regulatory process appearing to be on generally linear methodical course,[12] the distributed energy resource markets are growing exponentially, with PSE already experiencing large load reductions from customers such as Microsoft, Boeing, REI and Starbucks.

III. Opportunities for PSE utility scale distributed energy resources (DERs).

The electric utility industry is becoming a more decentralized system. The most important part of electric system transformation is at the distribution level where utilities can prioritize 'negawatts versus megawatts' – distributed energy resources (DER) – EE, DR, and ES, to become part of the energy exchange, with customers become part of the exchange with behind the meter resources. Much is being written, researched, tested, demonstrated by utilities, regulators, and think tanks around the country. These are just a few examples:

[12] PSE IRP pp. 1-7 & 1-8. PSE's Action Plan discussion calls out as a policy issue "that "demand response has been excluded from the program planning and design and cost recovery process used for conservation. The current processes for establishing prudence related to acquiring power plants or contracts and recovering costs through a Power Cost Only Rate Case (PCORC) do not fit for a portfolio of demand response programs that build over time. The WUTC has begun exploring these issues." PSE continues on to state that once there is some clarity on these policy barriers, it will issue a demand response RFP, and based on those findings, re-examine re-examine the peak capacity value of demand response programs in the 2019 IRP.

A. Gridworks' (previously More Than Smart) "Planning for More DER on the Grid: A Summary For Policy-Makers on the Walk-Jog-Run Model"[13]

Gridworks outlines framework and methodology that any utility, utility commission, and community can use to achieve DER deployments in an optimized, cost-effective and scalable manner using tools readily available to help enable increasing DER loads, combined with other DER solutions, while maintaining grid reliability and power quality. In sum, this methodology will accelerate a substantial, existing asset – the distribution grid – towards a more highly utilized, cost-effective, and sustainable electric system. The Walk-Jog-Run model is used for characterizing the current and anticipated future state of DER growth in a given jurisdiction, with incremental steps growing the volume and diversity of DER penetration while shaping the regulatory, market and contractual framework in which DERs can provide products and services to the distribution utility, end-use customers, and potentially to each other.

- The Walk stage represents the state of distribution utility grid modernization and reliability investments currently underway. In this stage, the level of customer DER adoption is low and can be accommodated within the existing distribution system without material changes to planning, infrastructure or operations.
- The Jog stage is where DER adoption reaches a threshold level of roughly 5-10% of peak load and may require changes to grid capabilities and operations as well as to the potential to realize material system benefits. Bi-directional power flows will begin on high-penetration DER circuits. In response, more advanced control technologies and operations capabilities will be required to manage these parts of a distribution grid in a safe and reliable manner
- The Run stage enables a combination of high DER adoption and advanced policies supporting distribution system markets with multi-sided transactions ("many-to-many" or

[13] https://gridworks.org/

"peer-to-peer"). Here, DER providers and "prosumers" go beyond providing services to the wholesale market or distribution utility and engage in transactions with each other.[14]

B. "Teaching the Duck to Fly"[15]

Jim Lazar's "Teaching the Duck to Fly" includes a package of strategies including but not limited to energy efficiency, demand response, peak-oriented renewables, and rate design, to produce a gradual change in the load shape, that if aggressively deployed, can dramatically reshape the electricity load. Of the nine strategies, at minimum the following are top prime for PSE:

- Strategy 1: Target Energy Efficiency to the Hours When Load Ramps Up. Acquire energy efficiency measures with a focus on measures that provide savings in key hours of system stress.

- Strategy 4: Control Electric Water Heaters to Reduce Peak Demand and Increase Load at Strategic Hours. Control electric water heaters to increase electricity usage during night hours and mid-solar-day hours, and decrease usage during morning and evening peak demand periods. Electric water heaters controlled to provide high reliability of hot water service, low draw of hot water heaters during key morning and evening hours, and increased draw of water heater loads during off-peak and solar-day hours.

- Strategy 6: Rate Design: Focus Utility Prices on the "Ramping Hours" to Enable Price-Induced Changes in Load. Modify rate design for all customer classes to focus pricing on the most crucial hours. Time of use rates replace flat rates and demand charge rate forms. Avoid high fixed charges that reduce customer incentive to control usage levels.

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[14] Ibid. The scope of the Walk-Jog-Run framework is on basic distribution utility functions limited to those of a distribution wires company. The focus at the beginning is not to define "new business model" frameworks determining who provides competitive DER services to customers beyond standard distribution wires company functions. This does not start in earnest until a state evolves into the Jog phase. Finally, it is helpful to focus planning on the services technologies provide to the grid and not on the specific technologies themselves.

[15] http://www.raponline.org/document/download/id/7956/

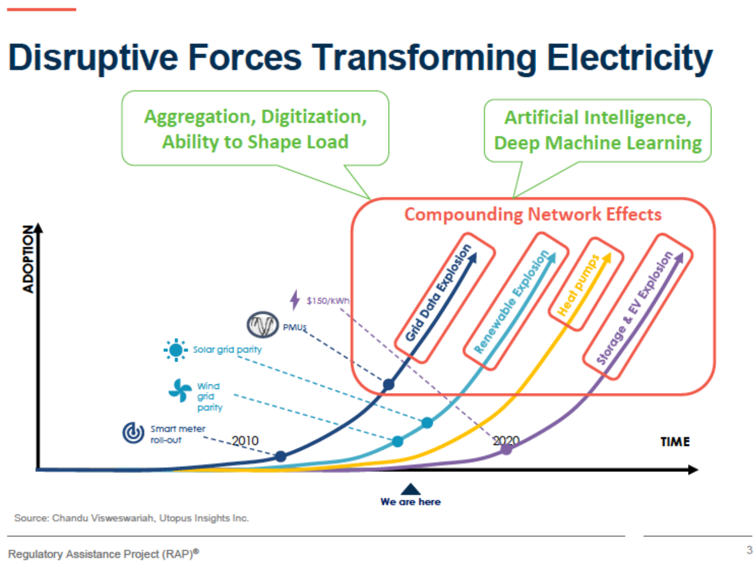
- Strategy 7: Deploy Electrical Energy Storage in Targeted Locations. Identify locations where electricity storage, including batteries, can provide more than one function. Deploy storage to simultaneously reduce the investment needed for transmission and distribution, and to provide intra-day storage of energy from intermittent renewable resources.

- Strategy 8: Implement Aggressive Demand-Response Programs Strategy. Deploy demand-response programs that shave load during critical hours of the year, only on days when system stress is severe. Much of the potential could be achieved through Strategies 3 (water pumping), 4 (water heat), 5 (air conditioning), and customer response to Strategy 7 (TOU rates).

C. The Regulatory Assistance Project (RAP)

The following slide from RAP's "Getting Started: Rethinking Utility Regulation in an Era of Exponential Change" February 8, 2018 Roundtable Webinar illustrates the distributed energy revolution.[16]

[16] http://www.raponline.org/knowledge-center/getting-started-rethinking-utility-regulation-era-exponential-change/. Slide 3.



The webinar focused on several opportunities for utility regulators to best prepare for this changing world, including though not limited to the following:

- The rapidly falling cost of renewables and what it means for markets: Excel's Energy's December 2017 All Source Solicitation revealing solar bids less than the operating costs of coal and equivalent with gas, and wind bids less than the operating costs of both coal and gas.[17]

- New tools that enable utilities to shape load: Shifting investments from capital intensive G,T&D into more sophisticated energy services (ramping, stability, reactive, reserve);[18] new technologies including EVs, heat pumps and HP water heaters providing new interactive choices for utility customers to consume and produce; and virtual power plants via aggregating buildings with batteries.[19]

RAP offered that regulators could align power sector transformation with the public interest via:

[17] Ibid slide 15. Solar at $30/MWH and Wind at $18/MWh. Coal operating costs $37/MWh ($26 fuel, $11 O&M), and Gas operating costs $30 MWh ($25 fuel, $5 O&M).
[18] Ibid slide 22.
[19] Ibid slide 37. California August 28, 2017 Stem dispatches 14 virtual power plants (VPPs) to support the grid during a heatwave.

- In structuring and operation of more open transactive electricity markets;
- In new approaches to rate design and transparent price formation; and
- In business models used to provide clean, affordable, and resilient energy services to consumers.

IV. Conclusion

Edison Electric Institute's (EEI) "Disruptive Challenges: Financial Implications and Strategic Responses to a Changing Retail Electric Business", January 2013, framed distributed energy resoruces (DER) as a direct threat to the centralized utility business model that should be addressed in part by revising tariffs structures to increase fixed charge or demand charge service components, repeal of net metering, changes to deprecation recovery lives, stranded cost charges, construction work in progress (CWIP), increased allowed cost of capital.

At the end of the document (p. 18), EPRI opens the door to a possible strategic opportunity for the industry to realize growth in earnings by "develop[ing] profit streams to counterbalance the impact of disruptive forces. Examples of new profit sources would include ownership of distributed resources with the receipt of an ongoing service fee or rate basing the investment and financial incentives for utilities to encourage demand side/energy efficiency benefits for customers."

The imperative for change is compelling and immediate. Energy efficiency, demand response, and energy storage bundled as distributed energy resources, can be a new utility resource and asset type, with flexible load management and reliable measurements. Washington State will need its distribution grid for a long time to come. But if it fails to take advantage of DERs that exists in abundance it will bring upon itself the claim that, as it has been managed, the grid is too expensive. Customers will be inclined to seek bypass options, whether through self-supply or microgrids.[20] Washington State needs a smart grid. But a grid cannot be smart if it fails to take advantage of the lowest cost options to provide reliable service. Such a grid would be the opposite of smart. You know the word.

[20] "What if utilities had gotten ahead of the curve and seen the opportunity in distributed energy?", Jeff Navin, energy consultant, High Country News, "Solar City," January 20, 2014.

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Education
B.A. Gerontology, 1978, University of Utah
M.S. Economics, 1980, University of Utah

Professional Employment History

- Chief Economist, Nevada Attorney General's Bureau of Consumer Protection 1981-1990, (formerly the Consumer Advocate's Office).

- Energy Economics Inc. Private consultant on energy planning and resource procurement, renewables, energy efficiency. 1990 – present.

Professional Interests

My involvement in energy issues has spanned over 40 years and has included roles as diverse as Utah Community Action Association energy specialist on utility rate issues for seniors and low income, chief economist for the Nevada Attorney General's Consumer Advocate's Office, expert witness to state public utility commissions and consumer advocate offices in over a dozen states and the District of Columbia, and employment and consulting with several public and private energy firms.

My expertise has embraced traditional utility rate making and regulatory matters with emphasis on cost allocation and rate design; to integrated resource planning (IRP), to economic analysis of utility industry competition, restructuring, deregulation, and alternative regulation.

In the newly formed Nevada Consumer Advocate's Office, Jon Wellinghoff secured in 1983 in state legislation– The Nevada Utility Resource Planning Act -- requiring Nevada electric utilities to periodically submit to the Commission their long range "integrated resource plans" (IRP) for meeting future energy needs through the lowest cost, best mix of resources – most often energy efficiency and non-utility generation.

Turning Nevada's IRP legislation into regulations, and then getting the utilities to operationalize the regulations, became essentially my full time job over the next several years as staff economist, deeply engaged in most aspects of operations and planning for Sierra Pacific and Nevada Power (now Nevada Energy) -- engineering, economics, cost allocation, rate design, accounting, and customer service.

Through the eighties and into the nineties Wellinghoff's Nevada integrated resource plan legislation and regulations swept the country, copycatted at the state and federal level.

From 1989 to 1993 I worked in part with the National Consumer Advocates Association (NASUCA) developing a training manual on integrated resource planning and conduct a series of state trainings and workshops around the country. I also conducted a series of surveys tracking IRP substantive and procedural components on a state-by-state basis. This series was instructive in defining appropriate IRP on a national level and was published and referenced by numerous organizations including U.S. Department of Energy, Edison Electric Institute, Lawrence Berkeley Labs, World Resources Institute and World Watch Institute.

At the tail end of the 2000-2001 California energy crisis when the state began re-regulation, I started up with The Utility Reform Network (TURN),[21] on all aspects of utility funded energy efficiency via the state's "Public Good Charge" and "Resource Procurement" (about $1 billion annual ratepayer funds collected for energy efficiency programs). I have been instrumental in establishing utility planning and reporting of EE accomplishments by key end uses and energy using measures (prior undifferentiated Gwh and MW savings), redirecting monies and efficiency efforts to residential space conditioning, accounting for about 20% of the state's system peak, but heretofore largely underserved by California utility efficiency programs, on-bill financing, rigorous EM&V, increased funding for EE programs and activities to local governments and non-utility independent program contractors, consideration of electric and natural gas savings embedded in water extraction, distribution, treatment (pre- / post-), improvements and refinements in EE potential and EE goal-setting analyses and EE cost-effectiveness methodologies, community choice aggregation, codes and standards, and distributed energy resources.

California energy efficiency is breaking new ground to meter based savings and performance that will in part plan and manage large commercial buildings, including their HVAC units and chillers, as part of the building's overall system, and make those savings available to the grid. Energy savings measured against a metered baseline to support business investments in efficiency, with a realistic expectation of profit. EE in concert with demand response and storage are being used to ease the burdens on transmission and distribution infrastructure for greater system reliability and resiliency.

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[21] TURN is a statewide grassroots, nonprofit, consumer advocacy organization that has been active for over 35 years in California energy and utility issues, and was a model for the formulation of consumer advocate organizations throughout the country in the late 1970's.