EXHIBIT NO. ___(RG-4)
DOCKET NO. UE-11___/UG-11___
2011 PSE GENERAL RATE CASE
WITNESS: ROGER GARRATT

BEFORE THE
WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION, **Complainant,** **v.** **PUGET SOUND ENERGY, INC.,** **Respondent.**	**Docket No. UE-11____** **Docket No. UG-11____**

THIRD EXHIBIT (NONCONFIDENTIAL) TO THE PREFILED DIRECT TESTIMONY OF ROGER GARRATT ON BEHALF OF PUGET SOUND ENERGY, INC.

JUNE 13, 2011

Integrated Resource Plan

Addendum **January 2010**

PSE.com

PUGET SOUND ENERGY
The Energy To Do Great Things

2009 IRP Addendum

Purpose of this Addendum

This addendum to Puget Sound Energy's (PSE) 2009 Integrated Resource Plan (IRP) presents the company's current electric resource outlook and refinements to the way PSE calculates its need for electric capacity resources. Chapter 5 of the 2009 IRP included resource planning analysis based on two different ways of calculating resource needs. The difference between them was how operating reserves were treated in the analysis. The first method assumed a 15% planning margin[1] was needed to reliably meet load but did not reflect operating reserve obligations. Operating reserves were reflected by derating generating units. The second method assumed the 15% planning margin was sufficient to cover load AND operating reserves. Resource need under this method is, therefore, lower.

This 2009 IRP Addendum (Addendum) presents a summary of the analysis used to answer a simple question: *Did PSE's 15% planning margin fully reflect the obligations and operational benefits of operating reserves?*

[1] *Planning margin is the amount of resource above load at normal peak temperature to achieve a desired capacity level to meet reliability targets.*

Summary Finding

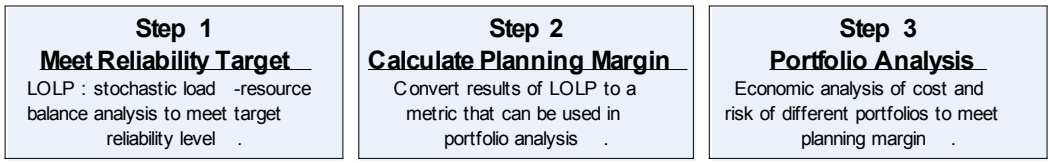
Refinements to our analysis demonstrate that to achieve our desired reliability target, a Planning margin of 15.7% plus operating reserve obligations will be necessary. The Resource Plan from PSE's 2009 IRP was based on a resource need that reflected a Planning margin of 15%, without adding operating reserves obligations. Thus, PSE's resource need is approximately 250 MW higher than projected in the IRP's resource plan.

I. Question from 2009 IRP: Operating Reserves and Resource Need

Resource planning analysis entails examining the cost-risk trade-offs of different combinations of resources to meet customer needs into the future. In addition to meeting sales loads, the company must also maintain operating reserves to ensure reliable operation of the bulk wholesale power grid. There are three different steps in the analytical process wherein operating reserve obligations could be reflected, as shown below in Figure Add-1.

Figure Add-1

Overview of Capacity Need Assessment Process



In the analysis leading up to PSE's draft IRP, the company reflected operating reserve obligations in Step 3, by derating generation units by their specific contingency reserve obligations.

Operating reserves are resources required to maintain a stable bulk electrical delivery system. Under operating agreements with the Northwest Power Pool, PSE must maintain two kinds of operating reserves: contingency reserves and regulating reserves. Contingency reserves are intended to bolster short-term reliability. The contingency reserves sharing agreement with the Northwest Power Pool will replace the energy from a generating unit that experiences a forced outage, for up to one hour. This short-term operational benefit, however, was not reflected in the analysis for the 2009 IRP.

Would reflecting the short-term operational reliability benefits of contingency reserves in the LOLP, along with the obligation, demonstrate a lower resource need? Such operational benefit would have to be reflected in Step 1 of the capacity need assessment process. PSE did not have time to consider that question for the 2009 IRP. Therefore, we completely removed the contingency reserve obligations from the analysis by not derating units for contingency reserves—referred to as "Full-Cap" in the 2009 IRP. This adjustment was made to avoid overstating the need. In the analysis for this Addendum, we have fully reflected operating reserve obligations and the short-term reliability benefits of contingency reserves in the LOLP. We are now confident that the results of our resource need analysis fully reflect all resource needs, including the reliability benefits and obligations of operating reserves.

Contingency Reserves

To ensure continuous reliable operation of the regional electric grid, utilities must maintain a "reserve" in excess of end-use sales as a contingency in case any generator unexpectedly fails or experiences a forced outage. Under the Northwest Power Pool's contingency reserve sharing agreement, generators must reserve an additional 5% of hydro or wind resources and 7% of thermal resources, when such units are dispatched to meet firm sales obligations. For example, if a 100 MW thermal generator is dispatched to meet firm sales, the utility must have an additional 7 MW of resources available to meet the contingency reserve sharing obligation. Each member of the power pool maintains such reserves. If any member's generator experiences a forced outage, the contingency reserve sharing agreement is activated. Reserves from other members come online to make up for the lost generation. This is a very short-term arrangement. Contingency reserve sharing covers such forced outages for up to one hour. After that, the utility must balance its load (firm sales plus operating reserves) by either purchasing resources on the market or, if necessary, shedding load.

Regulating Reserves

Utilities must have sufficient resources available to maintain a constant frequency on the system by ramping up and down as loads and resources fluctuate instantaneously. For PSE, that amount is 35 MW. Regulating reserves do not provide the same kind of short-term, forced-outage reliability benefits as contingency reserves. Thus, this component of operating reserves did not impact the question posed in this addendum.

II. Refinements to LOLP Framework

Loss of load probability (LOLP) is the probability that system loads will exceed resources. LOLP is a stochastic load-resource balance analysis. Loads and resources are subject to uncertainty factors; e.g., temperature impacts on loads are considered and the likelihood that a generating unit will fail is reflected in the load-resource balance. This analysis results in a probabilistic expression of the likelihood that loads will exceed resources, such as a 5% loss of load probability.

LOLP analysis performed for the 2009 IRP is described in Appendix I, pages I-23 to I-26. In summary, PSE performed Monte Carlo simulation with 3000 trials of hourly load-resource balance assessment for an entire year, with uncertainty in a number of factors:

- Forced outage rates—probability that a unit will fail when needed and a distribution around the amount of time such failure might last if it occurs;
- Hourly system loads—variations based on temperature;
- Hydro availability—based on potential for bad hydro conditions;
- Availability of market purchases—blend of hydro and thermal unity reliability metrics over firm transmission rights;
- Load forecast error.

LOLP was defined as the number of trials where PSE observed load in excess of resources. “Load” in this analysis did not include operating reserve obligations. Similarly, the short-term reliability benefit of operating reserves was not reflected in the analysis. Operating reserves obligations were reflected later, in Step 3 of Figure Add-1, by derating generating units, as mentioned above.

The LOLP model was refined for this Addendum. PSE’s LOLP model now fully reflects both the obligations and short-term benefits of the contingency reserves:

- Contingency reserve obligations: An “event” now reflects the need to have sufficient resources to meet both sales and operating reserve obligations.
- Contingency reserve benefits: The benefit of holding contingency reserves is that other members of the Northwest Power Pool will cover the capacity of a unit that experiences a forced outage for the first hour. It does not mean that the first hour doesn’t count. Contingency reserves cannot be called upon if load exceeds resources without forced outages. Additionally, contingency reserves are only sufficient to cover the capacity of the specific unit that is out of service. Essentially, a loss of capacity due to a forced outage does not count toward an event in the LOLP for the first hour—but it does count in hours 2+.

III. Results: Planning Margin, Resource Needs, and Portfolio Analysis

Impact on Planning Margin

The planning margin calculation is used to translate the results of the LOLP analysis into a metric useful for long-term portfolio modeling. The planning margin is expressed as a function of normal peak load. It is the incremental amount in excess of a normal peak load needed to cover uncertainty in temperature and resource availability to achieve the desired level of reliability (loss of load probability). As mentioned above, the planning margin used in the 2009 IRP was 15%. Figure Add-2 presents results of the refined LOLP and calculation of the planning margin, net of operating reserves. This analysis indicates that the refined planning margin of 15.7% plus operating reserves is needed to meet the 5% LOLP target[2].

Figure Add-2

Updated LOLP Results and Calculation of Net Planning Margin

LOLP Results				Planning Margin Calculation			
Existing Resource Capacity (MW)	Additional Capacity (MW)	Total Capacity (MW)	Resulting LOLP	Required Operating Reserves (MW)	Total Capacity Net of Op Reservs (MW)	Normal Peak Load (MW)	Planning Margin Net of Op Reserves
a	b	c = a+b	d	e	f = c-e	g	h = (f/g) - 1
5260	0	5260	55.9%	250	5010	5236	-4.3%
5260	150	5410	38.2%	261	5149	5236	-1.7%
5260	300	5560	23.5%	271	5289	5236	1.0%
5260	450	5710	17.4%	282	5428	5236	3.7%
5260	600	5860	13.9%	292	5568	5236	6.3%
5260	750	6010	11.0%	303	5707	5236	9.0%
5260	900	6160	8.8%	313	5847	5236	11.7%
5260	1050	6310	6.1%	324	5986	5236	14.3%
5260	**1125**	**6385**	**5.0%**	**329**	**6056**	**5236**	**15.7%**
5260	1200	6460	3.9%	334	6126	5236	17.0%
5260	1350	6610	2.6%	345	6265	5236	19.6%
5260	1500	6760	0.8%	355	6405	5236	22.3%

[2] *Note: In addition to reflecting the obligations and short-term reliability benefits of operating reserves, other minor updates to the LOLP model were made, including refinements to short-term resource capacity, which account for the additional 0.7% to the net planning margin.*

Impact on Resource Needs

The updated planning margin of 15.7% plus operating reserves is quite close to the resource need in the 2009 IRP in which resources had been derated for contingency reserves. Thus, the updated capacity resource need is also similar to the resource need in analysis that assumed a planning margin of 15% plus operating reserves. Figure Add-3 compares capacity resource deficits from the Full-Cap resource need (which does not reflect operating reserve obligations) and the resource need based on resources net of contingency reserve obligations, with the updated capacity deficits in this Addendum. Figure Add-3 illustrates that the resource need identified in the IRP Addendum is very similar to the resource need in the IRP, using resources net of operating reserves for the early years. In the later years, resource needs diverge because the updated load forecast grows faster in the outer years as the economy is projected to recover[3]. Analysis consistent with the 2009 IRP Addendum Capacity Deficit will be used to evaluate resources in the company's upcoming Request for Proposal and resource acquisition process.

Figure Add-3
Comparison of Capacity Deficits

	2009 IRP "Full Capacity" Deficit (MW)[4]	**2009 IRP Resources net of Op. Reserves Deficit (MW)**	**2009 IRP Addendum Capacity Deficit (MW)**
2012	676	924	934
2016	1084	1332	1362
2020	2453	2640	2787
2029	4239	4376	4727

It may also be helpful to compare the revised load-resource balance chart with the version presented in the 2009 IRP. Figure Add-4 is Figure 1-1 from the 2009 IRP, followed by the corresponding updated chart in Figure Add-5.

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[3] The load forecast was updated for the 2009 IRP Addendum Capacity Deficit. This is based on the "May 2009 Revised Base Forecast" presented in the 2009 IRP. The other two use the "2009 Low Growth Forecast." The use of a different load forecast accounts for the divergence in later years between the draft 2009 deficits and 2009 IRP Addendum deficits. Note, both load forecasts were presented in the 2009 IRP. Chapter 4, p. 4-21, of the 2009 IRP illustrates that the two load forecasts are very similar in the early years.

[4] The Resource Plan from the 2009 IRP is based on this resource need assessment.

Figure Add-4
Load-Resource Balance for Resource Plan in 2009 IRP

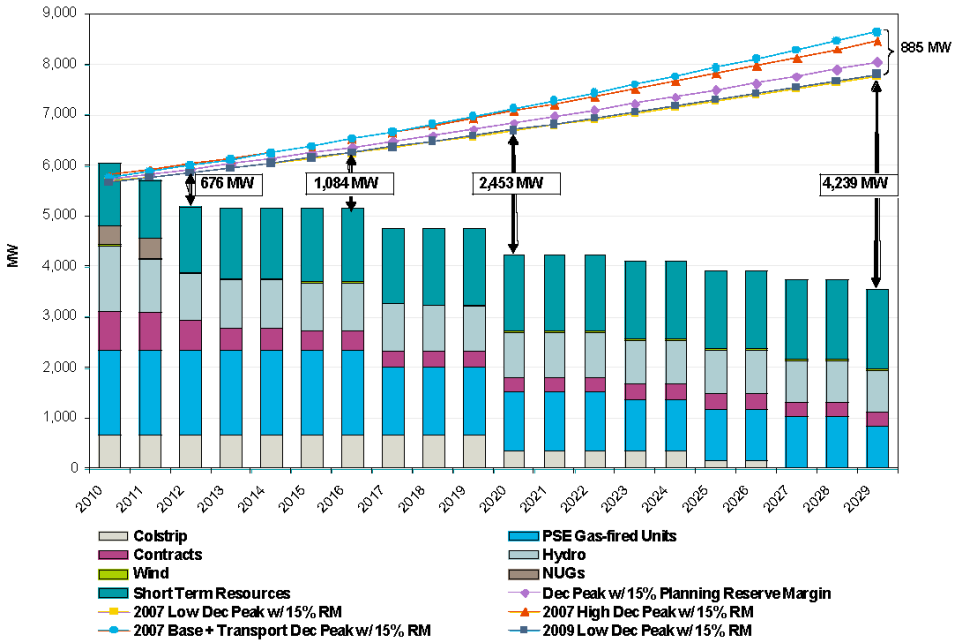
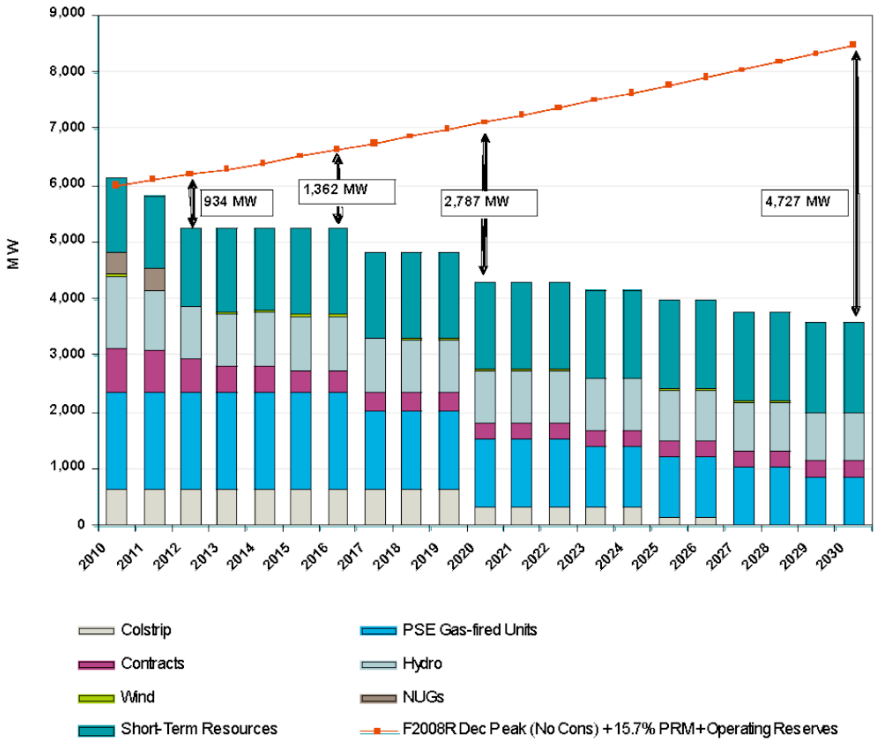


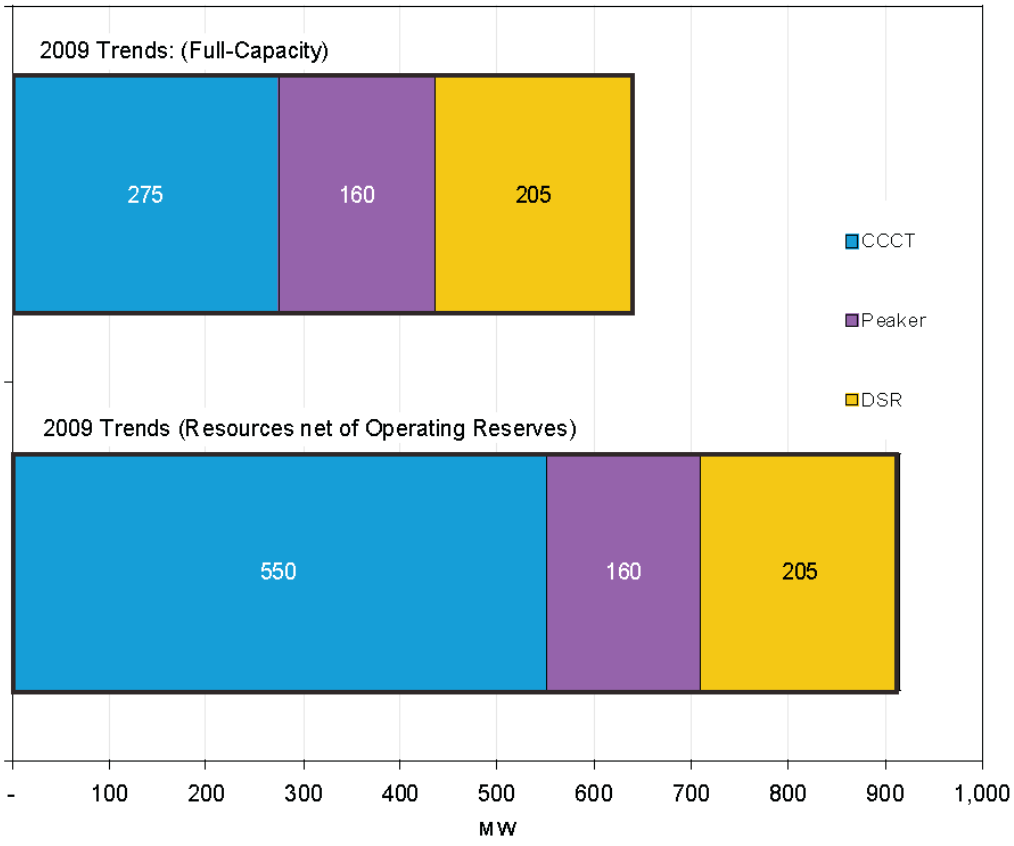
Figure Add-5
Load-Resource Balance in the 2009 IRP Addendum



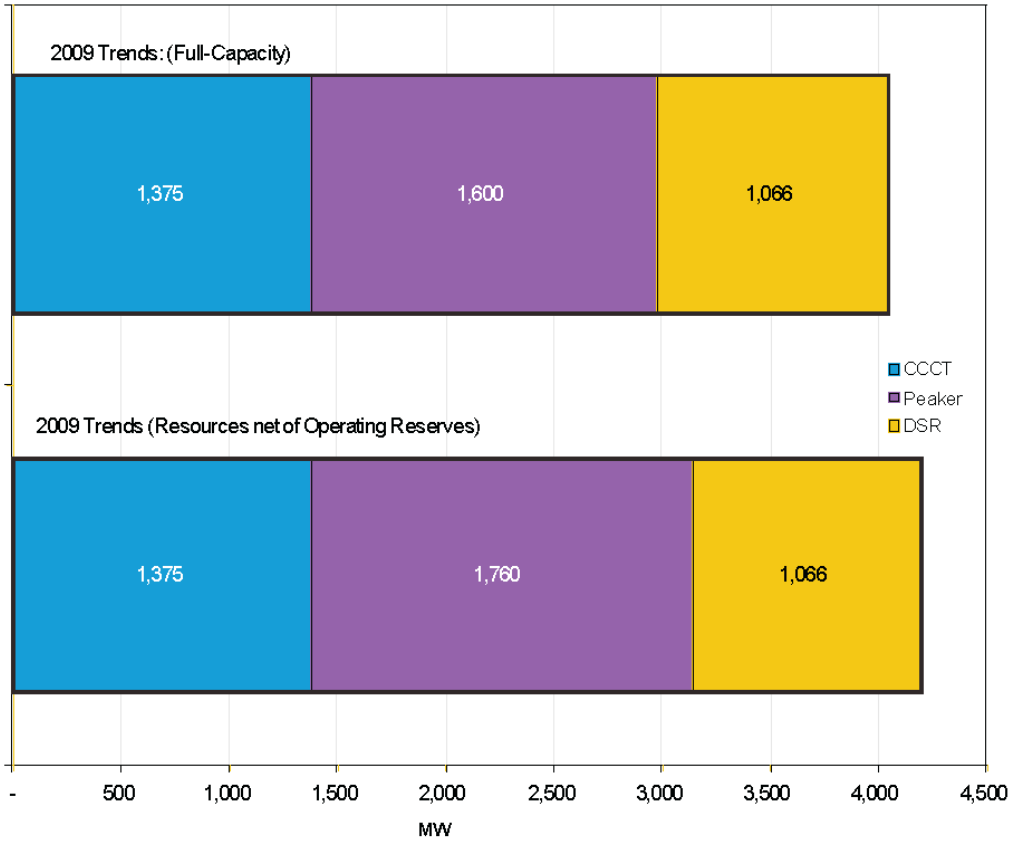
Impact on Resource Portfolio

The analysis presented above demonstrates that the resource plan for the 2009 IRP is based on an understated resource need. The resource plan was based on the "Full Cap" resource need, which does not reflect operating reserve obligations. The refined and updated resource need is very close to the resource need in the case where contingency reserves were netted from generating resources. Full resource planning analysis on both sets of resource needs was presented in Chapter 5 of the 2009 IRP. Focusing on the primary capacity resources of demand side resources, gas CCCT, and peakers, Figure Add-6 illustrates an immediate need for an additional 275 MW gas CCCT plant by 2012. By 2029, Figure Add-7 demonstrates a need for one additional gas-fired peaking plant.

Add-6
Comparison of Least Cost Resource Builds-2012
Higher Resource Need Adds 275 MW Gas CCCT



Add-7
Comparison of Least Cost Resource Builds-2029
By 2029 Higher Need Results in Additional 160 MW Peaker



Additional portfolio analysis reflecting the 15.7% net planning margin and updated load forecast was not performed for this IRP Addendum. The impact of the additional 0.7% planning margin is shown above to be negligible. Most of the revised resource need is a function of using an updated load forecast. A range of load forecasts were considered in the 2009 IRP. Additionally, the company recently issued an RFP for new resources. Because PSE will soon perform analysis using data from actual resources to support acquisition decisions, performing additional resource planning analysis at this time does not appear to provide further benefit to our customers or the public. PSE will update interested parties about our revised resource need.

Conclusion

Refining our LOLP model to fully reflect the obligations and short-term operational benefits of operating reserves provides a more theoretically sound analytical framework, and allows us to confidently conclude the company is not overstating its resource need. Analysis presented in this Addendum demonstrates that the company will need to secure more resources than presented in the 2009 IRP to achieve reliability for our customers consistent with the company's planning standard.