BEFORE THE STATE OF WASHINGTON
ENERGY FACILITY SITE EVALUATION COUNCIL

IN RE APPLICATION NO. 99-1 SUMAS ENERGY 2 GENERATION FACILITY	EXHIBIT_____(RW-T)

COUNSEL FOR THE ENVIRONMENT'S PREFILED DIRECT TESTIMONY

WITNESS #1: RICHARD WATSON

Q. Please tell us your name and professional affiliation.

A. Richard Watson, Director of the Power Division of the Northwest Power Planning Council (NWPPC)

Q. Please summarize the scope of your testimony.

A. I will provide an overview of my professional background. Then I will discuss how the NWPPC developed the Regional Power Supply Adequacy/Reliability Phase I Report (Report). Finally, I will provide my opinion and its basis regarding the need for power in the Pacific Northwest and Washington State in the context of the Report.

Q. Please give the EFSEC an overview of your professional background.

A. I have BS and MS degrees in aeronautical engineering from the University of Illinois. I worked as a research engineer for the Boeing Company and pursued doctoral studies in technology and public policy at the University of Washington. I became involved in energy

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issues while at the University of Washington. I subsequently worked as a senior research analyst for the Washington State Senate Energy and Utilities Committee. In 1981 I was appointed director of the Washington State Energy Office. In that capacity I provided Governors Spellman and Gardner with energy policy advice and guided the development of numerous energy analyses and programs at the Energy Office. I was chairman of the Western Interstate Energy Board and the National Association of State Energy Officials. In 1992 I became director of the Power Division of the Northwest Power Planning Council. In that capacity I managed the development of the Council's current power plan, managed the staff support of the Comprehensive Review of the Northwest Energy System and oversaw and participated in analyses of a number of issues associated with the competitive transition of the electricity industry. I have attached my resume Exhibit (RW-1) for more detail

Q. Would you provide some background regarding what the NWPPC is and its function.

A. The NWPPC is a four-state compact formed by Idaho, Montana, Oregon and Washington to guide electric power system planning and fish and wildlife recovery in the Columbia River Basin. The Council was created by the four Northwest states under an act of Congress, the Northwest Power Act of 1980 (Public Law 96-501). The Council is composed of two representatives of each of the Governors of the Northwest States. The central staff is housed in Portland, Oregon. The Council produces a regional power plan at least every 5 years and monitors and analyzes developments in the Northwest electric power industry.

Q. Did you review any information in preparation for this testimony?

A. Yes, I reviewed the NWPPC 2000 Report (Report), Exhibit (RW-2), the prefiled testimony of Darrell Jones and James Litchfield, the Northwest Regional Forecast prepared by the Pacific Northwest Utilities Conference Committee (PNUCC) and the "White Book" prepared by the Bonneville Power Administration (BPA).

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Q. What was your role in the development of the Report?

A. As director of the Council's Power Division, I oversaw the analysis and was the author of major parts of the report.

Q. Would you please explain to us the purpose of the Report and how the NWPPC created the Report.

A. The Report is an analysis intended for policy makers and others in the region with responsibility for or interest in the adequacy of regional power supplies. By adequacy I mean the ability of the system to meet the demands of consumers and maintain operating reserves needed for system security. System security is the ability of the system to withstand sudden disturbances like a major transmission line going down. The analysis focuses on the ability of the regional system to meet possible needs over the next few years (through 2003). The analysis recognizes that the Northwest is part of the much larger West Coast system and includes the potential for imports of power into the Northwest.

The problems that this report was intended to assess were the adequacy of the system under conditions that lead to higher than normal loads and/or lower than normal generating capability. Typically these occur in the winter months (December, January and February) when there are incursions of cold arctic air for a few days, relatively dry years in which hydro electric generation is lower than normal, and situations when there are unplanned outages of existing generating units. The analysis uses probabilistic methods to assess the likelihood of the occurrence of such situations leading to inadequate power supplies.

The analysis also attempted to assess the level of new generation development in the Northwest that would be supported by forecast market prices over the next several years.

Q. What is a probabilistic analysis?

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A. A probabilistic analysis recognizes that there are a number of uncertainties that affect the performance of a power system. In this instance, the major uncertainties are temperatures and, consequently, the temperature-dependent demand for electricity; the amount, form and timing of precipitation and, consequently, the energy and peaking capability of the hydroelectric system; and unplanned outages of generating units. In each of these instances we have a historical record from which we can derive the frequency of occurrence of water conditions, temperatures or the outage state of each generating unit in the system. In this analysis, frequently termed a "Monte Carlo" simulation, we performed hundreds of simulations of the operation of the regional power system over the winters of 2001, 2002, and 2003. Hydro conditions and temperatures were sampled according to the 50-year historical record (1929 - 1978) while the operating states of generating units were determined by their forced outage rates. The model incorporates a demand model that adjusts "normal" demand for the effect of temperature. The model attempts to operate the power system on an hourly basis to meet those demands, using hydro to follow load variations.

The model keeps track of the magnitude and duration of events when supplies are inadequate to meet needs. It estimates the probability that supplies will be inadequate to meet needs, including adequate operating reserves, by counting the number of winter periods out of the 500 that were simulated in which there were one or more instances where supply was inadequate to meet needs.

Q. Are there other important features of this analysis?

A. Yes, the availability of imports is estimated from seasonal and on- and off-peak supply curves developed for the major import regions – Northern California, Southern California, the Desert Southwest, and British Columbia and Alberta. The model also incorporates key transmission and supply constraints on the ability to import. Finally, the model incorporates an as-realistic-as-possible representation of the operation of the hydro system. If necessary to meet

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loads, the hydro system will be temporarily drafted below non-power constraints (i.e. reservoir levels specified to provide spring and summer flows for the downstream migration of juvenile salmonids or to provide resident fish habitat). This is done only as a last resort after the use of all available thermal generation, imports, water from non-treaty Canadian storage and provisional draft of Canadian reservoirs. This water is replaced as soon as possible by running thermal generation more heavily and through additional imports. At present, the model does not evaluate the economics of this operation. That will be incorporated as part of the Phase 2 analysis.

Q. Does the Council consider energy-generating facilities that are permitted but not operational in its calculations for future availability?

A. No. The analysis considers only those facilities that are currently in operation or that are actually under construction. To do otherwise would give an unrealistically optimistic view of our resource situation. The fact that a site is permitted is no guarantee that construction will be undertaken soon enough to address the kind of power supply adequacy problems we anticipate. There are approved site certificates or licenses in the region for approximately 3500 megawatts of additional capacity - all gas-fired combustion turbines. As of yet, however, none of the certificate holders for these sites have commenced field construction. There is one plant that we understand has begun field construction that was not included in the analysis. That is the Avista/Cogentrix plant at Rathdrum Prairie, Idaho. It is a 250 megawatt combined cycle combustion turbine. Its inclusion in the analyses would not significantly alter the conclusions.

Q. What does it mean when the Report discusses short-term need?

A. Our analysis was focused on the short term (2001 – 2003) because it is important to know whether we have more or less immediate problems as opposed to problems in the relatively more distant future.

Q. How does the analysis performed in the Council study differ from analyses of regional load/resource balance done by BPA and the PNUCC?

A. The approaches that these analyses take differ significantly. The PNUCC Northwest Regional Forecast(NRF) is compiled from data provided by the individual regional utilities and Bonneville. It is the most conservative view. It provides annual energy generation and loads and January instantaneous peak resources and loads. The analysis assumes so-called "critical" hydro conditions and the amount of generation associated with those water conditions. This is the hydro generation resulting from the worst water year in the record. This generation is approximately 4000 average megawatts less than average hydro generation and 8000 average megawatts less than maximum water conditions. Its load-resource balance is also limited to current resources and existing export and import contracts. Market transactions are not included. Bonneville's White Book provides estimates of the energy balance on a monthly basis for all 50 years in the water record. It also provides an estimate of the 50 hour sustained peaking capability of the system (essentially the maximum amount of energy that can be produced to serve the 10 daily heavy load hours over the Monday through Friday period). An extreme weather adjustment to the sustained peak loads is also used. The White Book also assumes no new resources and only existing contractual import and exports. Because the White Book provides monthly data over the 50-year historical water year record, it allows a better assessment than does the NRF of the likelihood of problems occurring and when in the year they might occur. Nonetheless, it is still a relatively conservative view in that it assumes a very conservative operation of the hydro system and does not include the potential for market imports. By conservative operation of the hydro system, I mean there is no contribution from the use of non-treaty storage from Canadian reservoirs (as much as 1000 MW); no use of provisional draft of Canadian reservoirs (a few hundred megawatts); and strict adherence to non-power constraints in the operation of the reservoirs even when the effects of temporarily violating those constraints can effectively be mitigated.

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In the Council's analysis, we tried to provide as realistic a simulation of how the system would actually be operated as possible. As noted earlier, our analysis provides an hourly simulation of loads and resources taking into account temperature-driven variation in loads; the availability of imports from outside the region; forced outages on generating units; and operation of the hydro system that, if necessary, takes advantage of non-treaty storage, provisional draft of Canadian reservoirs and temporary drafting of reservoirs below non-power constraints when necessary to meet loads. Hydro conditions, temperatures and unplanned outages are treated probabilistically.

Q. Please summarize the findings of the NWPPC Report.

A. We found that under more or less "normal" circumstances, i.e., hydro conditions that are not in the lowest part of the distribution and weather that is not extremely cold, the region can access sufficient power resources to meet needs. There are, however, combinations of poor water, cold temperatures and unplanned generation outages that can lead to problems of inadequate power resources in the winter months. These events take three forms: insufficient energy, i.e., not enough water available to run through the turbines to meet energy needs; insufficient capacity, i.e., insufficient generating capacity to use the available water; and reserve violations; i.e., insufficient generation to provide required operating reserves. The probability of one or more such events reaches 24 percent in the winter of 2003. These events can be quite small - a hundred megawatts lasting an hour - or relatively large - a few thousand megawatts lasting a day or more. The less severe events are more probable, but that does not rule out more severe events. Of all the observed problems in the 500 simulations, 51 percent were energy deficiencies; 21 percent were capacity deficiencies and 28 percent were reserve violations.
We also calculated what would be required to reduce the 24 percent number to a more comfortable level. We did this by simply adding generation to the system and observing the

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effect. We found that it took almost 3000 megawatts to bring the probability of inadequate power supplies down to 5 percent.

Q. What would be the best way to deal with the kinds of problems identified in your study?

A. Simply adding base-load generation, while helpful, is probably not the best way to deal with these problems. While the potential consequences of these problems are significant, they are still infrequent and short duration events. Typically, one would want to address these sorts of problems with resources that have relatively low fixed costs because those fixed costs have to be recovered over relatively few hours of operation. Operating costs are of lesser importance, again because these resources would not operate that much. If new generation were to be built specifically to address the problems identified in the Report, it would probably be single cycle gas turbines. Other kinds of resources that would fit this description and possibly be more economical would include: use of existing customer-side back-up generation; curtailment of loads (e.g., an industrial plant that ceases or reduces operation for a period) where the cost of curtailing those loads is less than the costs avoided by curtailing; relatively low-cost load reduction such as lowered thermostat and lighting levels; and peak-shifting such as water heater controls (where capacity is the issue).

Q. What is the difference between base load generation and peak load generation?

A. Base load generation is generation which is planned to operate a large percentage of the time at relatively constant levels of output. A combined cycle combustion turbine is an example of base load generation. It is characterized by high efficiency and low operating costs but higher fixed costs than some alternatives. Peak load generation is generation which is typically operated to meet daily or seasonal peaks. Here in the Northwest, most peaking or load following is done with the hydro system because of its flexibility. However, when up against the limits of available hydro generation, you might turn to a technology like single cycle combustion turbines.

These have higher operating costs but lower capital costs than a combined cycle unit. You would also want to explore the kind of load management techniques discussed above.

Q. If the region is not able to access sufficient resources to address the kinds of problems identified in the Report, what are the likely effects?

A. The effects vary as a function of the severity of the event. The electric power system is one in which generation and demand must be kept in balance. If generation and demand become unbalanced, the system can become unstable and widespread power outages can occur.

If the event is limited to violation of operating reserve requirements, it might not be noticed by consumers, provided nothing else goes wrong on the system. However, operating reserves are to be maintained to protect the system against sudden disturbances, say, a power line going down. Violations of operating reserve requirements should not be taken lightly as they greatly increase the risk of system instability. At present, operating reserve requirements are voluntary standards. However, many members of the Western Systems Coordinating Council have recently agreed to participate in a Reliability Management System (RMS) in which they could be fined for reserve violations.[1] Federal legislation has been introduced that could make standards like these mandatory.

Beyond reserve violations, if faced with insufficient generation, system operators would attempt to shed load to balance loads and resources. This could be done through curtailment contracts as mentioned earlier, or even public appeals for consumers to reduce their electricity use. Lacking sufficient voluntary curtailment, system operators could keep loads and resources in balance by resorting to rolling blackouts where power would be cut periodically on a substation by substation basis. In this instance customers would be without power for

[1] Western Systems Coordinating Council (WSCC) is an organization of utility systems, independent developers, marketers and others that provides the coordination in operating and planning a reliable and adequate electric power system for the western part of the continental United States, Canada, and Mexico.

intermittent periods. If none of these actions were sufficient, the system could become unstable, causing widespread blackouts.

Q. Does the Report mean that this will occur without additional peak load capacity?

A. No, not necessarily. We could go through the next several years with average or better water, relatively mild winters and no problems.

Q. Does the advent of the merchant plant change how energy will be generated in the northwest?

A. In the restructured electricity industry, the development of new power plants is undertaken largely by non-utility entities. These entities base their construction decisions on their assessment of their ability to cover their costs and make a reasonable return on investment from selling power on the open market. (Some power may be sold under short to long term contracts but it is unlikely that the average prices associated with these contracts can differ significantly from average market prices for very long). Estimates of forward market prices must be high enough to allow these developers to satisfy their investment criteria. The kinds of supply adequacy problems identified in our analysis are problematic in this environment. This is because of their relatively short, relatively infrequent nature. While the market prices during and leading up to such events are likely to be very high, they are not at those levels long enough or frequently enough to support the fixed costs of the capacity needed to address these adequacy problems. At the same time, most consumers do not see real time prices that would provide them with an incentive to reduce their loads during such periods.

This contrasts with the utility world of vertically-integrated, regulated monopolies of the recent past in which those costs could be recovered from a utility's captive customer base. Arguably, the regulated world resulted in excess capacity on the system. For the most part, it

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avoided adequacy problems of the kind we have identified but possibly at a higher cost to consumers.

Q. Do you have an opinion regarding the ability of the proposed SE2 merchant plant to meet the energy needs of the region identified in the Report?

A. Yes.

Q. What is this opinion?

A. SE2 represents one method of generation that could meet the needs identified in the Report. However, as noted above, to address the relatively short duration, infrequent problems identified in our study, short lead time, low capital cost alternatives are probably more appropriate.

The region will need additional generation to meet load growth. We undertook an analysis using a commercial electricity market model, AURORA™, to assess how much development in the Northwest would be supported by estimated future market prices. Such analyses are driven by assumptions and, as a consequence, subject to a great deal of uncertainty. Nonetheless, our analysis suggests that market prices will support approximately 500 MW per year of new generation beginning in 2004. This new capacity would, for the most part, be in the form of combined cycle combustion turbines and would both serve load growth in this region and sell power out of the region, primarily during the summer. If cost-competitive and able to access markets, SE2 could be one of these plants. In addition to this development, the Council's current plan identifies 1500 average megawatts of energy that could be saved cost-effectively through end-use efficiency improvements through 2017. By cost-effective, we mean that its cost is less than the cost of the next least costly alternative which, in this time frame is the combined cycle combustion turbine. Capturing this conservation should be a priority.

Q. Are there any other factors which need to go into an analysis regarding the viability of any energy-generating resource to meet the identified needs?

A. Yes, one would need to look at how the proposed generating capacity would bring its energy into the transmission grid and the grid's ability to move it.

Q. Why is the ability of the grid to move the power important?

A. Our analysis of how much new development could be supported by market prices assumed no constraints on the movement of power within the region except from the East Side of the Cascades to the West Side. This means that any location on the West Side was assumed to be equally able to access export markets or load centers within the region. This ability, of course, is important to the market viability of any particular power plant. However, the grid's capability to accept and to move power is not everywhere the same. Like the highway system, the grid can present physical constraints and congestion that may limit the amount of power that can be transmitted. If the transmission system is limited in its ability to accept and move the power from a specific location, the ability of an energy-generating resource at that location to market it power may be limited.

Q. Has the Power Council done a study to determine whether the capability of the transmission grid is adequate to accept and move power to be generated by the Sumas Energy 2 project to load centers in Washington and the region?

A. No.

Q. Would it be beneficial to conduct such a study prior to siting any new large generation resources to determine the potential costs or benefits to the transmission grid of siting generation

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in any particular location on the grid, or conversely to require a siting applicant (or EFSEC) to perform such a study itself or ask that it be performed as part of the siting application?

A. I think it would be essential for the applicant to be able to demonstrate its ability to get its power to a diverse set of markets at a competitive price if it is to obtain project financing. If North to South transmission from that area is constrained, SE2 would be limited to available transmission capacity after existing contract rights have been exercised. If that capacity were insufficient, SE2 could make an application to the Bonneville Power Administration for additional transmission under Section 211 of the Federal Power Act. Bonneville could, in turn, charge SE2 for the costs of any required transmission upgrade. This could affect SE2's cost and, therefore, its ability to sell into the market. We have not specifically analyzed this question with respect to Sumas Energy 2.

END OF TESTIMONY

I declare under penalty of perjury that the above testimony is true and correct to the best of my knowledge.

DATED this _____ day of July, 2000.

By___________________________

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