Exh. DCG-15C
Dockets UE-170033/UG-170034
Witness: David C. Gomez
REDACTED VERSION

BEFORE THE WASHINGTON
UTILITIES AND TRANSPORTATION COMMISSION

WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION, **Complainant,** **v.** **PUGET SOUND ENERGY,** **Respondent.**	**DOCKETS UE-170033 and UG-170034 (*Consolidated*)**

EXHIBIT TO
TESTIMONY OF

David C. Gomez

STAFF OF
WASHINGTON UTILITIES AND
TRANSPORTATION COMMISSION

***WUTC v. Puget Sound Energy, Inc.*, Dockets UE-111048 and UG-111049, prefiled direct testimony of David E. Mills, Exhibit No. __ (DEM-1CT), pages 19 through 21**

CONFIDENTIAL PER PROTECTIVE ORDER – REDACTED VERSION

projects based on:

(i) wind resource information provided in pre-construction energy assessments; and

(ii) previous analysis conducted for PSE related to these or nearby projects.

Q. What were the results of this evaluation?

A. DNV-GEC's analysis indicates that the capacity factor and annual energy estimates at both Hopkins Ridge and Wild Horse would have been reduced if the evaluation methodology used today had been applied to the original analyses. Based on the latest methodology, the estimated capacity factors for Hopkins Ridge and Wild Horse would be reduced to [redacted] percent and [redacted] percent, respectively.

Q. How has the evaluation methodology changed?

A. Industry wide, capacity factor is strongly influenced by the production availability of the turbines, the reliability of the wind resource itself, and externalities, such as transmission availability. In 2006, Global Energy Concepts ("GEC") performed a study comparing pre-construction energy estimates for 24 wind power facilities across North America having a combined 99 facility-years of operation to actual first year production. The results clearly show reduced actual production relative to expectations due to:

1) over-estimation of gross energy production due to wind speed estimating bias; and

2) energy estimate process bias (losses higher than estimated).

Examination of the causes shows that many effects, both meteorological and mechanical, were not quantitatively evaluated in the uncertainty analysis performed as part of pre-construction energy analysis. For example, turbine availability or power performance may have been assumed to be fixed at relatively high levels, while actual operating experience indicates that these levels decline somewhat over the operating life of the facility. In some cases, entire categories of losses were not considered or were underestimated. For example, at some projects, weather losses were evaluated based on expected icing downtime, while actual operations have shown that more energy is lost through other weather-related problems such as lightning, hail, weather-related faults, and reduced site access. As the differences between pre-construction energy estimates and actual production performance have gradually been recognized, developers and consultants alike have refined their wind resource analyses.

Q. What are the wind resource capacity factors included in the rate year power costs?

A. PSE's prior rate cases have included the original capacity factors based upon the Garrad-Hassan pre-construction estimates for Hopkins Ridge and Wild Horse. For this rate proceeding, however, PSE used DNV-GEC's updated capacity factors for both Hopkins Ridge and Wild Horse as inputs to the AURORA model: [redacted] percent and [redacted] percent, respectively. DNV-GEC's lower capacity factors for Hopkins Ridge and Wild Horse reduced the wind generation included in the

AURORA model by 29,532 and 35,327 MWhs, respectively, for a total reduction of 64,859 MWhs. The AURORA model replaces the lost wind generation with market purchases, resulting in an increase to power costs which are mitigated by lower wind integration costs calculated in the "Not in Models" calculation discussed below. As a result, the rate year power costs increased approximately $2.0 million.

B. Wind Integration Costs

1. Wind Integration Overview

Q. What are wind integration costs?

A. Generally, wind integration costs incurred by PSE, internally and through BPA, are equal to the opportunity costs of having to reserve capacity to balance wind generation. In essence, generation capacity that may have been dispatched but for the presence of wind is withheld from the energy market. Conversely, generation that would not have been dispatched, but for the presence of wind, may be committed into the market. Rate year power costs include the cost of integrating PSE's wind resources and include wind integration costs paid to BPA, as well as internal wind integration costs.

Q. Does the integration of wind present any unique challenges for PSE?

A. Yes. Wind generation is an intermittent and non-dispatchable generation resource. Although the variability can be managed in a manner similar to managing PSE's