

BEFORE THE WASHINGTON UTILITIES AND TRANSPORTATION
COMMISSION

DOCKET UE-112133

COMMENTS OF TACOMA POWER RESPONDING TO NOTICE OF
OPPORTUNITY TO COMMENT ON DRAFT INTERCONNECTION
RULES ISSUED FEBRUARY 5, 2013

March 6, 2013

Thank you for the opportunity to comment on the proposed changes to WAC section 480-108 via docket (UE-112133) regarding the interconnection of small generators. Tacoma Power believes the proposed rules will simplify and streamline the interconnection process for most customers. For the few customers that do not qualify for Tier 1 or Tier 2, we appreciate that the Tier 3 process provides the ability to conduct detailed studies of the impact to the electrical system.

We have organized our feedback into two sections. Section I outlines Tacoma Power's concerns with the newly proposed language in WAC-480-108-FFF(23) regarding voltage irregularities. Section II consist editorial changes to make the proposed rules easier to understand. In order to make our comments clear, we have copied the relevant draft language in black italics, and then indented our comments in blue. Our proposed changes are further indented and underlined in black.

Section I

One of the goals of this rulemaking is to distinguish simple interconnections from complex interconnections, and then to fast track the simple interconnections. This goal has been accomplished by having Tier 1 and Tier 2 projects evaluated by a simple checklist and having complex studies for Tier 3 projects. Section WAC-480-108-FFF(23) undoes this accomplishment because analyzing the voltage profile of a feeder requires a complex simulation, even for a Tier 1 or Tier 2 project. Although Tacoma Power believes all of WAC-480-108-FFF(23) should be removed due to this fundamental flaw, we have provided suggestions to improve the requirement if the UTC retains the section.

Tacoma Power agrees with the previously submitted [comment](#) by the Interstate Renewable Energy Council, Inc. ("IREC") that "a problem is likely to occur when a PV system is exporting on a feeder that is already using the maximum allowable voltage." However, we disagree that is a serious impediment to generation interconnections. Fortunately, this issue is unlikely to occur for installations meeting the other proposed Tier 1 and Tier 2 requirements because the generation is limited to 15 %; any proposed generation over 15% would become a Tier 3 application.

The costs WAC-480-108-FFF(23) imposes on both the utility and other customers should be weighed against the low possibility of generation problems. There are three distinct costs this section imposes:

1. Study: All other requirements for Tier 1 and Tier 2 can be evaluated by examining the peak load on the feeder. Examining the voltage under “likely” or “routine” conditions would involve determining how each of the following variables might impact the voltage:
 - a. Normal vs. alternate feeder configurations
 - b. Time of day
 - c. Time of year
 - d. Sunny vs. cloudy weather
 - e. Seasonal switch of capacitor banks
2. Voltage Optimization: In accordance with the requirements of I-937, many utilities are in the process of implementing Voltage Optimization to save energy by providing voltage at the low end of the allowable range. The Northwest Power and Conservation Council estimates the reduced voltage will save more than 600,000 MWh by 2024. After completing the optimization, many customers will routinely experience voltages within two volts of the lower limit. The reduced allowable voltage range proposed in WAC-480-108-FFF(23) would prevent electric utilities from utilizing Voltage Optimization.
3. System reconfiguration: The proposed draft would require utilities to modify the electric system to use a tighter voltage bandwidth for feeders with interconnected generation unless the electric utility can prove that the modification would harm other customers. Unless the utility begins using the smaller voltage bandwidth regularly, the utility would have to demonstrate harm each time a generator proposes to connect. Given this burden, this requirement is a *de facto* requirement to use much tighter voltage regulation. If the UTC believes that a tighter voltage bandwidth is needed in general, this should be implemented in a more appropriate section of the WAC rather than in the generation interconnection section.

WAC-480-108-FFF (23) Notification of anticipated voltage irregularities.

Section WAC-480-108-FFF(23) should be titled “Notification of anticipated voltage limited export.” Utilizing the entire limit of the ANSI voltage range is not an irregularity as suggested by the currently proposed section title. In accordance with the requirements of I-937, Tacoma Power is in the process of implementing voltage optimization to save energy by providing voltage at the low end of the allowable range. As mentioned above, after completing this optimization, we expect that most customers will routinely see voltages within two volts of the ANSI lower limit and outside the limit currently proposed in WAC-480-108-FFF(23). The reduced allowable range purposed in WAC-480-108-FFF(23) would cut Tacoma Power’s expected energy savings by more than 50%.

WAC-480-108-FFF(23)(a) The electrical company must examine, through engineering estimates or testing, the typical distribution system circuit voltage for a proposed interconnection to

determine if the voltage is likely to routinely be at or within two volts of the upper or lower nominal voltage range limit of plus or minus five percent. If the voltage is expected to be routinely at or within two volts of the upper or lower limits of the nominal range

Although the phrase “is likely to routinely be” does give some flexibility to the electrical company, using such nebulous language also poses a large liability risk if the UTC or interconnection customer disagrees with the electric company's interpretation. These words should be replaced with “in the normal configuration will likely be.” Tacoma Power performs many types of routine maintenance that could affect voltage, including regulator testing for approximately 1 hour each month and transformer testing for 1 day every 3 years. Both of these maintenance activities are “routine;” however, they represent very little lost production capability from interconnected generation. Thus, most electric company feeders would “routinely” be outside the allowable bandwidth and require notification per WAC-480-108-FFF (23).

WAC-480-108-FFF (23) (b) If the high or low voltage condition can be remedied by adjusting existing voltage regulation equipment without degrading service quality to other customers, the electrical company shall implement such adjustments and advise the interconnection customer of the expected timeline. For Tier 1 systems, minor modifications to the electric system to provide voltages that allow power to be transferred from the generating facility to the electric system, such as adding voltage control equipment to existing circuits, shall be expensed to distribution system operating accounts. For Tier 2 and Tier 3 systems, any required voltage control systems shall be paid by the interconnection customer.

If the UTC retains WAC-480-108-FFF (23), it should be rewritten to more clearly address the fundamental problem of anticipated voltage limited export of generation. It is unclear what technical justification went into selecting the 2 volt limit rather than some other limit. Distribution generation may cause higher voltage near the generator than at the point of interconnection, possibly resulting in excess high voltage on the customer's equipment if the point of interconnection is at plus 5%. Although some areas with very high photovoltaic penetration feeders sometimes experience high voltage, the 15% generation criteria for Tier 1 and Tier 2 limits the likelihood for excess voltage at these sites. Thus, it is unlikely that elevated feeder voltage would coincide with high generation output for lengthy periods of time for a significant portion of interconnection customers that otherwise qualify for Tier 1 or Tier 2. Since voltage limited export will occur quite rarely for Tier 1 or Tier 2 customers, the cost to the electric company to perform the voltage study far outweighs the minor possible benefit to a few generation interconnections. In the event there is a high voltage problem, there are a variety of ways for the interconnection customer to deal with voltage limited export of power besides having the electrical company redesign the entire distribution system. Changing transformer taps or installing a dedicated step up transformer would be common solutions to reduce the voltage at the generator without impacting the feeder voltage.

WAC-480-108-FFF(23)(a) The electrical company must examine, through engineering estimates or testing, the typical distribution system circuit voltage for a proposed interconnection to determine if the voltage is likely to routinely be at or within two volts of the upper or lower nominal voltage range limit of plus or minus five percent. If the voltage is expected to be routinely at or within two volts of the upper or lower limits of the nominal range

Section WAC-480-108-FFF(23)(a) mixes units by first referring to “two volts” and then to “five percent.” Instead it should be a single value such as "3.3%." Alternatively, it could also be listed as 118 volts to 124 volts on a 120 volt base.

WAC-480-108-FFF(23)(a) The electrical company must examine, through engineering estimates or testing, the typical distribution system circuit voltage for a proposed interconnection to determine if the voltage is likely to routinely be at or within two volts of the upper or lower nominal voltage range limit of plus or minus five percent. If the voltage is expected to be routinely at or within two volts of the upper or lower limits of the nominal range

While there is a clear technical reason generators are limited by high voltage, Tacoma Power is not aware of any technical justification for having a lower voltage limit tighter for interconnected generation than the normal utility limits for serving loads. As such, we suggest removing the lower limit entirely.

WAC-480-108-FFF (23) (b) If the high or low voltage condition can be remedied by adjusting existing voltage regulation equipment without degrading service quality to other customers, the electrical company shall implement such adjustments and advise the interconnection customer of the expected timeline. For Tier 1 systems, minor modifications to the electric system to provide voltages that allow power to be transferred from the generating facility to the electric system, such as adding voltage control equipment to existing circuits, shall be expensed to distribution system operating accounts. For Tier 2 and Tier 3 systems, any required voltage control systems shall be paid by the interconnection customer.

Tacoma Power suggests removing the requirement to modify the electric system from WAC-480-108-FFF (23) (b) for Tier 1 facilities. As stated in **480-108-BBB (1)(a)(v)**, a Tier 1 project “does not require an upgrade to ... electrical company facilities.” If a proposed generator requires utility upgrade, it cannot be a Tier 1 project. We are also concerned about shifting costs from the Tier 1 interconnection customer to the rest of the customer classes.

WAC-480-108-FFF (23) (b) If the high or low voltage condition can be remedied by adjusting existing voltage regulation equipment without degrading service quality to other customers, the electrical company shall implement such adjustments and advise the interconnection customer of the expected timeline. For Tier 1 systems, minor modifications to the electric system to provide voltages that allow power to be transferred from the generating facility to the electric system, such as adding voltage control equipment to existing circuits, shall be expensed to distribution system operating accounts. For Tier 2 and Tier 3 systems, any required voltage control systems shall be paid by the interconnection customer.

Tacoma Power suggests removing the requirement from WAC-480-108-FFF (23) (b) to modify the electric system for Tier 2 interconnections. Section **480-108-BBB (2)(b)(ii)** allows for the use of the Tier 2 process at the electric company’s discretion if minor modifications have to be made. In contrast, the modifications proposed by WAC-480-108-FFF (23) are neither minor, nor are they at the electrical company’s discretion. Adjusting the existing voltage regulation equipment for any individual interconnection customer will require analyzing the possible impacts to the thousands of other customers that share the distribution substation. Adding new voltage regulation equipment will be even more complex.

480-108-CCC (1)c ...If the electrical company anticipates that the interconnection customer will experience voltage irregularity, as described in WAC-480-108-FFF(23)(a), the appropriate notification must be included in the electrical company's letter approving the application...

480-108-CCC (2)c ...If the electrical company anticipates that the interconnection customer will experience voltage irregularity, as described in WAC-480-108-FFF(23)(a), the appropriate notification must be included in the electrical company's letter approving the application...

480-108-CCC (3)c If the electrical company anticipates that the interconnection customer will experience voltage irregularity, as described in WAC-480-108-FFF(23)(a), the appropriate notification must be included in the notification described in this subsection.

As explained above, conduction of the analysis necessary to meet 480-108-CCC (1)c for Tier 1 interconnections, or 480-108-CCC (2)c for Tier 2 customers will significantly raise the cost for the electric company, and in most cases provide very little benefit to the customer. Tacoma Power suggests removing these requirements. Tier 3 projects are more likely to influence the feeder voltage, and therefore more likely to benefit from voltage analysis. Tacoma Power suggests changing 480-108-CCC (3)c to "If the electrical company anticipates that the interconnection customer will experience voltage as described in WAC-480-108-FFF(23)(a), the appropriate notification must be included in the notification described in this subsection."

As previously stated, Tacoma Power suggests removing WAC-480-108-FFF(23). However, if the UTC would prefer to maintain this section, provided below is a revision including all of the edits listed above:

WAC-480-108-FFF(23) Notification of anticipated voltage limited export.

(a) The electrical company may examine, through engineering estimates or testing, the typical distribution system circuit voltage for a proposed interconnection to determine if the voltage in the normal configuration will likely be higher than four percent above the nominal voltage. If the voltage is expected to normally be higher than this limit, the electrical company must notify the interconnection customer in writing within the timelines described in WAC 480-108-CCC(2)(c) and (3)(c). This notification must explain the implications of the anticipated voltage range and how this may limit the ability of a generating facility to export power to the electrical system at the proposed location.

(b) If the anticipated voltage condition can be remedied by adjusting existing voltage regulation equipment without degrading service quality to other customers, the electrical company may implement such adjustments and advise the interconnection customer of the expected timeline.

(c) If minor modifications to the electrical system can be made to provide voltages that allow power to be transferred from the generating facility to the electrical system, such as changing taps on or replacing a distribution transformer, such modifications may take place pursuant to section 480-108-BBB (2)(b)(ii).

(d) If complex modifications to the electrical system such as modifying voltage control equipment are required, the electrical company shall notify the customer of the costs for studies and upgrades per section 480-108-CCC (3)(c)(ii).

Section II

WAC 480-108-BBB (a) Tier 1. Interconnection of a generating facility will use Tier 1 processes and technical requirements if the proposed generating facility meets all of the following:

- (i) Uses inverter-based interconnection equipment;
- (ii) Is single phase and has a nameplate capacity of 25 kW or less;
- (iii) Is connected through a single phase transformer on a radial distribution circuit;
- (iv) Is proposed for interconnection at secondary voltages (600 V class);
- (v) Does not require an upgrade to or construction of new electrical company facilities, other than meter changes;
- (vi) The aggregate generating capacity on the shared secondary does not exceed the lesser of the service wire capability or the nameplate of the transformer when interconnected on single-phase shared secondary;
- (vii) If proposed to be interconnected on a center tap neutral of a 240 volt service, its addition shall not create an imbalance between the two sides of the 240 volt service of more than 5 kVA;
- (viii) The aggregated nameplate capacity of all interconnected generating facilities, including that of the proposed generating facility, on any line section does not exceed 15 percent of the line section annual peak load as most recently measured or calculated for that line section, or fifteen percent of the circuit annual peak load as most recently measured or calculated for the circuit. A line section is that portion of an electric system connected to the generating facility and bounded by sectionalizing devices or the end of the distribution line; and
- (ix) Is not proposed for interconnection to either a radial distribution circuit, or to a spot network distribution circuit limited to serving one customer.

Lack of parallel syntax in section WAC 480-108-BBB (a) makes it hard to comprehend. Tacoma Power suggests the syntax alterations below to ensure that each enumerated phrase contains only one requirement. In addition, Section **480-108-BBB(1)(a)(ix)** appears to have been moved from different section and inadvertently made negative. In its current form, **480-108-BBB(1)(a)(ix)** excludes almost all projects from Tier 1 consideration. Since **480-108-BBB(1)(a)(iii)** is more restrictive, **480-108-BBB(1)(a)(ix)** should be removed.

(a) Tier 1. Interconnection of a generating facility will use Tier 1 processes and technical requirements if the proposed generating facility meets all of the following:

- (i) Uses inverter-based interconnection equipment;
- (ii) Is single phase;
- (iii) Has a nameplate capacity of 25 kW or less;
- (iii) Is connected through a single phase transformer;
- (iv) Is connected on a radial distribution circuit;
- (v) Is proposed for interconnection at secondary voltages (600 V class);
- (vi) Requires no construction of, or upgrades to electrical company facilities, other than meter changes;
- (vii) The aggregated generating capacity on the service wire does not exceed the service wire capability;
- (viii) The aggregated generating capacity on the transformer secondary does not exceed the nameplate of the transformer;
- (ix) If proposed to be interconnected on a center tap neutral of a 240 volt service,

its addition shall not create an imbalance between the two sides of the 240 volt service of more than 5 kVA;

(x) The aggregated nameplate capacity of all interconnected generating facilities, including that of the proposed generating facility, does not exceed fifteen percent of the annual peak load on any portion of an electric distribution system connected to the generating facility.

(b) Tier 2. Interconnection of a generating facility will use Tier 2 processes and technical requirements if the proposed generating facility meets all of the following criteria:

(i) It does not qualify for Tier 1 interconnection applicability requirements;

(ii) Has a nameplate capacity of 500 kW or less;

(iii) Is proposed for interconnection to an electric system distribution facility operated at or below 38 kV class;

(iv) Is not a synchronous generator;

(v) If it is proposed to be interconnected on a shared secondary, the aggregate generating capacity on the shared secondary, including the proposed generating facility, must not exceed the lesser of the service wire capability or the nameplate of the transformer;

(vi) The aggregated nameplate capacity of all interconnected generating facilities, including that of the proposed generating facility, on any line section does not exceed fifteen percent of the line section annual peak load as most recently measured or calculated for that line section, or fifteen percent of the circuit annual peak load as most recently measured or calculated for the circuit. A line section is that portion of an electric system connected to the generating facility and bounded by sectionalizing devices or the end of the distribution line;

(vii) Any upgrades required to the electric system must fall within the requirements in subsection (2)(b)(ii) of this section;

(viii) For interconnection of a proposed generating facility to the load side of spot network protectors, the proposed generating facility must utilize an inverter. The aggregate nameplate capacity of all inverter-based systems must not exceed the smaller of five percent of a spot network's maximum load or 50 kW;

(ix) The aggregated nameplate capacity of existing and proposed generating facilities must not contribute more than 10 percent to the distribution circuit's maximum fault current at the point on the primary voltage distribution line nearest the point of interconnection;

(x) The generating facility's point of interconnection must not be on a circuit where the available short circuit current, with or without the proposed generating facility, exceeds 87.5 [9] percent of the interrupting capability of the electrical company's protective devices and equipment (including substation breakers, fuse cutouts, and line reclosers);

Lack of parallel syntax in section WAC 480-108-BBB (b) makes it hard to comprehend. Tacoma Power suggests the syntax alterations below to ensure that each enumerated phrase contains only one requirement.

(b) Tier 2. Interconnection of a generating facility will use Tier 2 processes and technical requirements if the proposed generating facility meets all of the following criteria:

(i) It does not qualify for Tier 1 interconnection applicability requirements;

(ii) Has a nameplate capacity of 500 kW or less;

(iii) Is proposed for interconnection to an electric system distribution facility operated at or below 38 kV class;

- (iv) Is not a synchronous generator;
- (v) The aggregated generating capacity on the service wire, including the proposed generating facility, does not exceed the service wire capability;
- (vi) The aggregated generating capacity on the transformer, including the proposed generating facility, does not exceed the nameplate of the transformer;
- (vii) The aggregated nameplate capacity of all interconnected generating facilities, including that of the proposed generating facility, does not exceed fifteen percent of the annual peak load on any portion of an electric distribution system connected to the generating facility;
- (viii) Any upgrades required to the electric system must fall within the requirements in subsection (2)(b)(ii) of this section;
- (viii) For interconnection of a proposed generating facility to the load side of spot network protectors, the proposed generating facility must utilize an inverter. The aggregate nameplate capacity of all inverter-based systems must not exceed the smaller of five percent of a spot network's maximum load or 50 kW;
- (ix) The aggregated nameplate capacity of existing and proposed generating facilities must not contribute more than 10 percent to the distribution circuit's maximum fault current at the point on the primary voltage distribution line nearest the point of interconnection;
- (x) The generating facility's point of interconnection must not be on a circuit where the available short circuit current, with or without the proposed generating facility, exceeds 87.5 [9]percent of the interrupting capability of the electrical company's protective devices and equipment (including substation breakers, fuse cutouts, and line reclosers);

WAC 480-108-GGG Completion of interconnection process. The interconnection process is complete, the generating facility can begin operation when:

The introduction to **WAC 480-108-GGG** should be revised to read “The interconnection process is complete and the generating facility can begin operation when”

Tacoma power supported the requirements in the previous draft in **WAC 480-108-050** for commissioning the interconnection per IEEE 1547. We suggest that it should be reinstated as a **WAC 480-108-GGG(2)(d)** that states “(d) the commissioning tests have been performed per the requirements of IEEE 1547.”

WAC 480-108-120 Cumulative effects of interconnections with a nameplate capacity greater than 500 kW but no more than 20 MW. Electrical companies will evaluate on an ongoing basis, but not less than once every 5 years, the cumulative effect, including benefits to its other customers, of interconnections made under this chapter on its electric system and will retain appropriate records of its evaluations.

Tacoma Power suggests the removal of section **WAC 480-108-120**. It makes little sense to evaluate only the effects of Tier 2 & 3 projects when it is the cumulative effects of all distributed generation that actually affect the system. It also seems wasteful to evaluate the electric system but then not to have any guidance on what to do with the evaluation once it is complete.

Tacoma Power thanks you for considering these suggestions to **WAC 480**. We hope that these suggestions result in a more efficient interconnection process for both customers and utilities.

Sincerely,

Mark Pigman, P.E.
T&D System Planning
Tacoma Power
3628 S 35th St