



UM 2111

Screens, Study Methods, and Modern Configurations Workshop

9-14-2022



Agenda



Item	Schedule	Time
Welcome	9:00	15 min
Review Comments received on proposals <ul style="list-style-type: none">• Export Controls• Supplemental Review	9:15	75 min
Break (time depending)	10:30	10 min
New Topics – Screen Comparison Table <ul style="list-style-type: none">• Level 1• Level 2 (time permitting)	10:40	70 min
Next Steps	11:50	10 min
Adjourn	12:00	

Current Status



- IREC submitted two proposals for stakeholders to opine on
 - Export Controls
 - Supplemental Review
- Received comments from:
 - Utilities
 - The Renewable Energy Coalition
- IREC provided responses/additional comments
- Participation from other stakeholders encouraged
 - Send email to ted.drennan@puc.Oregon.gov to be added to workgroup emails

Discussion



- Export Controls
- Supplemental Review

Break



Screen Comparisons



- Level 1
- Level 2

Next Steps



- Interested Stakeholders collaborate on proposal(s)
 - Via email or,
 - Virtually
- Circulate proposal(s) to service list by September 29
- Next workshop in this workstream on October 6 1:30 pm-4:30pm
 - Discussion of proposal(s) received
 - Potential discussion of other topics
 - Screens – Level 1 and 2 (dependent on 9/14 progress)
 - Further Definitions
- Further refinement of initial proposal(s), and
- Development of proposal(s) for new topics
- Continuation cycle of proposals-workshops-refinements as needed

Save the Date(s)



Workshop 3: Screens, Study Methods, and Modern Configurations

- Date: October 6
- Time: 1:30 AM – 4:30 PM
- Location: Zoom
 - [Link to Meeting](#)
 - Dial-in: 1-971-247-1195
 - Meeting ID: 815 1290 4309
 - Passcode: 5464541110

Workshop 2: Incorporating Updated Standards

- Date: September 28
- Time: 9:00 AM – 12:00 PM
- Location: Zoom
 - [Link to Meeting](#)
 - Dial-In: 1-971-247-1195
 - Meeting ID: 881 9272 2528
 - Passcode: 0060565574

The schedule for workshops through March 2023 can be found [here](#).

Attachment B
BATRIES Project Standardized Screen Results

Standardized 100% minimum load result

Where 12 months of line section minimum load data (including onsite load but not station service load served by the proposed DER) are available, can be calculated, can be estimated from existing data, or determined from a power flow model, the aggregate Export Capacity on the line section is less than 100% of the minimum load for all line sections bounded by automatic sectionalizing devices upstream of the proposed DER. If minimum load data is not available, or cannot be calculated, estimated or determined, the Distribution Provider shall include the reason(s) that it is unable to calculate, estimate or determine minimum load in its Supplemental Review results notification.

Export Capacity of DER Application		kW
Export Capacity of DER Active on Feeder		kW
Export Capacity of DER ahead in Queue		kW
Relevant time period	__ am/pm to __ am/pm	
Minimum Load		kW
Aggregate Export Capacity, including proposed DER		kW
DER as % of Load		%
Passes Screen	No	

Standardized 15% screen result

For interconnection of a proposed DER to a radial distribution circuit, the aggregated Export Capacity, including the proposed DER, on the circuit shall not exceed 15% of the line section annual peak load as most recently measured. A line section is that portion of a Distribution Provider's electric system connected to a customer bounded by automatic sectionalizing devices or the end of the distribution line.

Export Capacity of DER Application		kW
Export Capacity of Active DER on Feeder		kW
Export Capacity of DER ahead in Queue		kW
15% of Peak Load		kW
Aggregate Export Capacity, including proposed DER		kW
Export Capacity of DER, as % of Load		%
Passes Screen	No	

Attachment B
BATRIES Project Standardized Screen Results

<u>Standardized shared transformer screen result</u>		
If the proposed DER is to be interconnected on single-phase shared secondary, the aggregate Export Capacity on the shared secondary, including the proposed DER, shall not exceed 20 kW or 65% of the transformer Nameplate Rating.		
Export Capacity of DER Application		kW
Export Capacity of DER Active on Feeder		kW
Export Capacity of DER ahead in Queue		kW
Export Capacity of Aggregate DER on Shared Secondary:		kW
Transformer Nameplate Rating:		kW
Export Capacity of Aggregate DER, as a % of Transformer Nameplate Rating:		%
Passes Screen	No	

<u>Standardized protection screen result</u>		
The fault current of the proposed DER, in aggregate with the fault current of other DERs on the distribution circuit, shall not cause any distribution protective devices and equipment (including, but not limited to, substation breakers, fuse cutouts, and line reclosers), or Interconnection Customer equipment on the system to exceed 87.5% of the short circuit interrupting capability; nor shall the interconnection be proposed for a circuit that already exceeds 87.5% of the short circuit interrupting capability.		
Nameplate Rating of DER Application		kW
Nameplate Rating of DER Active on Feeder		kW
Nameplate Rating of DER ahead in Queue		kW
Lowest short circuit interrupting rating of equipment in-line with DER:		Amps
Aggregate DER fault current contribution:		Amps
Distribution Circuit Maximum Fault Current nearest the PCC:		Amps
Total available short circuit current		Amps
% of short circuit interrupting rating:		%
Passes Screen	No	

IREC has not developed a template for standardized results of the other screens. However, IREC reviewed the each screen in SGIP developed a description of data that utilities should be required to provide when a Project fails that screen. This information is provided in the following table.

Attachment B
BATRIES Project Standardized Screen Results

SGIP Screen	Description	Data to provide	
2.2.5 Initial Review	2.2.1.2	15% of annual section peak load (or 100% min load)	Load (peak or min), aggregate generation (or Export Capacity), and percentage of load. For interconnection rules that integrate time-based load data into the screening process, provide the minimum load time window.
	2.2.1.3	Spot network (5% of network peak load or 50 kW)	Peak load, aggregate generation on network, and percentage of load.
	2.2.1.4	10% of maximum fault current	Aggregate generation fault current on circuit, distribution circuit max fault current, percentage of max fault current, assumptions for customer's DER (e.g., fault current = 1.2x inverter Nameplate Rating).
	2.2.1.5	87.5% of short circuit interrupting capability	Short circuit interrupting rating at limiting (lowest rated) equipment in-line with DER, aggregate DER fault current contribution, distribution circuit max fault current nearest PCC, total short circuit current, percentage of short circuit interrupting rating.
	2.2.1.6	Line configuration	Distribution line type, interconnection (customer service) type.
	2.2.1.7	Shared secondary transformer 20 kW	Aggregate DER rating (or export) on shared secondary, for screens that use 65% of transformer rating instead of 20 kW provide transformer rating and percentage of rating.
	2.2.1.8	Single-phase imbalance	Transformer rating, imbalance as percentage of rating.
	2.2.1.9	10 MVA transient stability	Aggregate generation, whether there are known transient stability limitations.
	2.2.27 Supplemental	2.4.4.1	100% minimum load
2.4.4.2		Voltage and power quality	This list is not exhaustive and would be dependent on the applied criteria. E.g., if non-bidirectional regulators experiencing reverse flow: maximum reverse power at regulator; If overvoltage is flagged at minimum load: maximum reverse power with customer's DER, maximum reverse power before triggering voltage limit violation.
2.4.4.3		Safety and Reliability	This list is not exhaustive and would be dependent on the applied criteria. E.g., conductor loading: limiting conductor ampacity, total current, loading as a percentage of ampacity.
<i>Covering all screens</i>		kW of existing DER in-line section and DER ahead in queue.	

Attachment B
BATRIES Project Standardized Screen Results

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	OAR 860-082-0045 SGIP	2019 IREC Model Rules , as modified by the 2022 Energy Storage Interconnection Toolkit	OAR 860-039-0030 NEM
	Tier 1 Interconnection Review	Level 1	Level 1 Net Metering Interconnection Review
Application		<p>IIIA.1. Application: An Applicant must submit a Level 1 Application, pursuant to Section I.C.1, using the standard form provided in Attachment 3 to these Interconnection Procedures, which may be sent electronically to a recipient designated by the Utility. An Applicant executes the standard Interconnection Agreement for Level 1 by submitting a Level 1 Application. A Utility may elect to charge a standard Application fee of up to \$100 for Level 1 review.</p>	<p><i>The rules allow a customer to sign an interconnection agreement at the same time as submitting an application. Consider requiring all OR NEM & OR SGIP Level 1 applications to include a signed interconnection agreement.</i></p>
Eligibility/Size	<p>(1) A public utility must use the Tier 1 review procedures for an application to interconnect a small generator facility that meets the following requirements:</p> <p>(a) The small generator facility must use lab-tested, inverter-based interconnection equipment;</p> <p>(b) The small generator facility must have a nameplate capacity of 25 kilowatts or less; and</p>	<p>III.A.2.a. Facility Size: The Generating Facility has an Export Capacity not greater than 25 kW, a Nameplate Rating not greater than 50 kW and uses a UL 1741 Certified inverter.</p> <p><i>FERC SGIP, OR SGIP, and IREC Model allow interconnections to network systems, while OR NEM does not. Consider standardizing to allow any projects on a network to use OR NEM & OR SGRIP Level 1 & Level 2.</i></p>	<p>(1) A net metering facility meeting the following criteria is eligible for Level 1 interconnection review:</p> <p>(a) The facility is inverter-based; and</p> <p>(b) The facility has a capacity of 25 kilowatts or less.</p> <p>(2)(b) A net metering facility's point of common coupling will not be on a transmission line, a spot network, or an area network.</p>

	(c) The small generator facility must not be interconnected to a transmission line.		
Fault Current Screen	Not included	Not included. Consider standardizing no fault current screen for OR NEM Level 1 projects.	(2)(a) The aggregate generation capacity on the distribution circuit to which the net metering facility will interconnect, including the capacity of the net metering facility, will not contribute more than 10 percent to the distribution circuit's maximum fault current at the point on the high voltage (primary) level that is nearest the proposed point of common coupling.
Penetration Screen	(2)(b) For interconnection of a small generator facility to a radial distribution circuit, the aggregated nameplate capacity on the circuit must not exceed 15 percent of the line section annual peak load as most recently measured at the substation or calculated for the line section.	<p>Since the 2019 IREC Model Rules were published, leading states have switched to using 100% of daytime minimum load, i.e., IL, or a hosting capacity analysis, i.e., CA, instead of 15% of peak load.</p> <p>As noted in IREC's July 15 presentation, IREC supports, where the data is available, switching to a 100% of min load threshold. However, the threshold for the Level 1 and Level 2 Penetration Screens would look different than the detailed calculations found in the Supplemental Review Penetration Screen. The Level 1 and Level 2 Penetration Screens are typically designed to fail more projects than the Supplemental Review Penetration Screen. Considering Oregon's current use of substation minimum load data to establish generation limited feeders, IREC requests that the work group have a discussion before designing new Level 1 and Level 2 penetration screens.</p>	(2)(c) If a net metering facility is to be connected to a radial distribution circuit, the aggregate generation capacity connected to the circuit, including that of the net metering facility, will not exceed 10 percent (15 percent for solar electric generation) of the circuit's total annual peak load, as most recently measured at the substation.

<p style="text-align: center;">Network Screen</p>	<p>(2)(c) For interconnection of a small generator facility to the load side of spot network protectors, the aggregated nameplate capacity on the load side of the spot network protectors must not exceed five percent of a spot network's maximum load or 50 kilowatts, whichever is less.</p>	<p>IIIA.2.e. For interconnection of a Generating Facility within a Spot Network or Area Network, the aggregate Nameplate Rating including the Generating Facility's Nameplate Rating may not exceed 50 percent of the Spot Network or Area Network's anticipated minimum load. If solar energy Generating Facilities are used exclusively, only the anticipated daytime minimum load shall be considered. The Utility may select any of the following methods to determine anticipated minimum load:</p> <ul style="list-style-type: none"> i. the Spot Network or Area Network's measured minimum load in the previous year, if available; ii. five percent of the Spot Network or Area Network's maximum load in the previous year; iii. the Applicant's good faith estimate, if provided; or iv. the Utility's good faith estimate if provided in writing to the Applicant along with the reasons why the Utility considered the other methods to estimate minimum load inadequate. 	<p><i>Note: FERC SGIP, OR SGIP, and IREC Model allow interconnections to network systems, while OR NEM does not.</i></p>
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Single-Phase Shared Secondary Screen	<p>(2)(d) For interconnection of a small generator facility to a single-phase shared secondary line, the aggregated nameplate capacity on the line must not exceed 20 kilowatts.</p>	<p>III.A.2.c. If the Generating Facility is to be interconnected on a single-phase shared secondary, then the aggregate Export Capacity on the shared secondary, including the Generating Facility's Export Capacity, will not exceed 65 percent of the transformer nameplate power rating.</p> <p><i>Consider using the 65% threshold instead of 20 kW. Consider using Export Capacity instead of Nameplate Rating.</i></p>	<p>(2)(d) If a net metering facility is to be connected to a single-phase shared secondary, the aggregate generation capacity connected to the shared secondary, including the net metering facility, will not exceed 20 kilovolt-amps.</p>
Service Imbalance Screen	<p>(2)(e) For interconnection of a single-phase small generator facility to the center tap neutral of a 240-volt service line, the addition of the small generator facility must not create a current imbalance between the two sides of the 240-volt service line of more than 20 percent of the nameplate rating of the service transformer.</p>	<p>III.A.2.d. If the Generating Facility is single-phase and is to be interconnected on a transformer center tap neutral of a 240-volt service, its addition will not create an imbalance between the two sides of the 240-volt service of more than 20 percent of the nameplate rating of the service transformer.</p>	<p>(2)(e) If a single-phase net metering facility is to be connected to a transformer center tap neutral of a 240 volt service, the addition of the net metering facility will not create a current imbalance between the two sides of the 240 volt service of more than 20 percent of nameplate rating of the service transformer.</p>

Approval Timeline	<p>(3) In addition to the timelines and requirements in OAR 860-082-0025, the public utility must provide written notice to the applicant stating whether the small generator facility meets the Tier 1 approval criteria no later than 15 business days from the date a Tier 1 interconnection application is deemed complete.</p>	<p>III.A.3. Time to process screens: Within seven (7) Business Days after the Utility notifies the Applicant that the Application is complete, the Utility shall notify the Applicant whether the Generating Facility meets all of the applicable Level 1 screens.</p> <p><i>Consider standardizing the timeline for projects at 7 business days for OR NEM & OR SGIP Level 1 applications.</i></p>	<p>(3) Within 10 business days after the public utility notifies a Level 1 applicant that the application is complete, the public utility must notify the applicant that:</p> <p>(a) The net metering facility meets all applicable criteria and the interconnection will be approved upon installation of any required meter upgrade, completion of any required inspection of the facility, and execution of an interconnection agreement; or</p> <p>(b) The net metering facility has failed to meet one or more of the applicable criteria and the interconnection application is denied.</p>
Deemed Approval	<p><i>Not included.</i> <i>Consider standardizing deemed approval for OR SGIP Level 1.</i></p>	<p>III.A.5. Approval: If the proposed interconnection passes the screens, the Application shall be approved, and the Utility will provide the Applicant an executable Interconnection Agreement within the following timeframes.</p> <p>a. If the proposed interconnection requires no construction of facilities by the Utility on its own system, the Utility shall provide the Applicant with a copy of the Level 1 Application form, signed by the Utility, forming the Level 1 Interconnection Agreement, at the time the screen results are provided. If the Utility does not notify an Applicant whether an Application is approved or denied</p>	<p>(4) If a public utility does not notify a Level 1 applicant in writing or by electronic mail whether the interconnection is approved or denied within 20 business days after the receipt of an application, the interconnection will be deemed approved. Interconnections approved under this section remain subject to section 7 below.</p>

		<p>in writing within twenty (20) Business Days after notification of the Level 1 review results, the Interconnection Agreement signed by the Applicant as part of the Level 1 Application shall be deemed effective.</p>	
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Inspection Timelines</p>		<p>III.A.7. Within ten (10) Business Days of receiving the notice of the anticipated start date of the Generating Facility, the Utility may conduct an inspection of the Generating Facility at a time mutually agreeable to the Parties. If the Generating Facility passes the inspection, the Utility shall provide written notice of the passage within three (3) Business Days. If a Generating Facility initially fails a Utility inspection, the Utility shall offer to redo the inspection at the Applicant's expense at a time mutually agreeable to the Parties. If the Utility determines that the Generating Facility fails the inspection, the Utility must provide the Applicant with a written explanation detailing the reasons for the failure and any standards violated. If the Utility determines no inspection is necessary, it shall notify the Applicant within three (3) Business Days of receiving the notice of the anticipated start date.</p>	<p><i>Do the rules include a requirement for utility to schedule the inspection on a specific timeline?</i></p>

<p>(5) If a small generator facility is not approved under the Tier 1 interconnection review procedure, then the applicant may submit a new application under the Tier 2, Tier 3, or Tier 4 review procedures. At the applicant's request, the public utility must provide a written explanation of the reasons for denial within five business days of the request.</p> <p><i>Consider providing written information on any screen failure to all projects. See recommendations from the Energy Storage Interconnection Toolkit.</i></p>	<p>III.A.4. Screens failure: Despite the failure of one or more screens, the Utility, at its sole option, may approve the interconnection provided such approval is consistent with safety and reliability. If the Utility cannot determine that the Generating Facility may nevertheless be interconnected consistent with safety, reliability, and power quality standards, the Utility shall provide the Applicant with specific information on the reason(s) for failure in writing. In addition, the Utility shall allow the Applicant to select one of the following, at the Applicant's option:</p> <p>a. Undergo Supplemental Review in accordance with Section III.D; or</p> <p>b. Continue evaluating the Application under Level 4, Section III.F.</p> <p>The Applicant must notify the Utility of its selection within ten (10) Business Days or the Application will be deemed withdrawn.</p>	<p>(8) If an application for Level 1 interconnection review is denied because it does not meet one or more of the applicable requirements in this section, an applicant may resubmit the application under the Level 2 or Level 3 interconnection review procedure, as appropriate.</p> <p><i>Consider providing written information on any screen failure to all projects. See recommendations from the Energy Storage Interconnection Toolkit.</i></p>
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	OAR 860-082-0050 SGIP	2019 IREC Model Rules , as modified by the 2022 Toolkit	OAR 860-039-0035 NEM																	
	Tier 2 Interconnection Review	Level 2	Level 2 Net Metering Interconnection Review																	
Fast Track Eligibility	(1)(b) The small generator facility must have a nameplate capacity of two megawatts or less;	<p>III.B.2.a. Facility Size: Generating Facility’s Export Capacity does not exceed the limits identified in the table below, which vary according to the voltage of the line at the proposed Point of Interconnection. Generating Facilities located within 2.5 miles of a substation and on a main distribution line with minimum 600-amp capacity are eligible for Level 2 interconnection under higher thresholds.</p> <table border="1"> <thead> <tr> <th rowspan="2">Line Capacity</th> <th colspan="2">Level 2 Eligibility</th> </tr> <tr> <th>Regardless of location</th> <th>On ≥ 600 amp line and ≤ 2.5 miles from substation</th> </tr> </thead> <tbody> <tr> <td>≤ 4 kV</td> <td>< 1 MW</td> <td>< 2 MW</td> </tr> <tr> <td>5 kV – 14 kV</td> <td>< 2 MW</td> <td>< 3 MW</td> </tr> <tr> <td>15 kV – 30 kV</td> <td>< 3 MW</td> <td>< 4 MW</td> </tr> <tr> <td>31 kV – 60 kV</td> <td>≤ 4 MW</td> <td>≤ 5 MW</td> </tr> </tbody> </table>	Line Capacity	Level 2 Eligibility		Regardless of location	On ≥ 600 amp line and ≤ 2.5 miles from substation	≤ 4 kV	< 1 MW	< 2 MW	5 kV – 14 kV	< 2 MW	< 3 MW	15 kV – 30 kV	< 3 MW	< 4 MW	31 kV – 60 kV	≤ 4 MW	≤ 5 MW	(1)(a) The facility has a capacity of two megawatts or less; and
	Line Capacity	Level 2 Eligibility																		
Regardless of location		On ≥ 600 amp line and ≤ 2.5 miles from substation																		
≤ 4 kV	< 1 MW	< 2 MW																		
5 kV – 14 kV	< 2 MW	< 3 MW																		
15 kV – 30 kV	< 3 MW	< 4 MW																		
31 kV – 60 kV	≤ 4 MW	≤ 5 MW																		
	(1)(d) The small generator facility must not be interconnected to a transmission line	III.B.2.i. The Generating Facility’s Point of Common Coupling will not be on a transmission line.	(2)(i) A net metering facility's point of common coupling will not be on a transmission line.																	

Penetration Screen	<p>(2)(a) For interconnection of a small generator facility to a radial distribution circuit, the aggregated nameplate capacity on the circuit must not exceed 15 percent of the line section annual peak load as most recently measured at the substation or calculated for the line section</p>	<p><i>Since the 2019 IREC Model Rules were published, leading states have switched to using 100% of daytime minimum load, i.e., IL, or a hosting capacity analysis, i.e., CA, instead of 15% of peak load.</i></p> <p><i>As noted in IREC’s July 15 presentation, IREC supports, where the data is available, switching to a 100% of min load threshold. However, the threshold for the Level 1 and Level 2 Penetration Screens would look different than the detailed calculations found in the Supplemental Review Penetration Screen. The Level 1 and Level 2 Penetration Screens are typically designed to fail more projects than the Supplemental Review Penetration Screen. Considering Oregon’s current use of substation minimum load data to establish generation limited feeders, IREC requests that the work group have a discussion before designing new Level 1 and Level 2 penetration screens.</i></p>	<p>(2)(d) If a net metering facility is to be connected to a radial distribution circuit, the aggregate generation capacity connected to the electric distribution system by non-public utility sources, including the net metering facility, will not exceed 10 percent (or 15 percent for solar electric generation) of the total circuit annual peak load. For the purposes of this subsection, annual peak load will be based on measurements taken over the 12 months previous to the submittal of the application, measured for the circuit at the substation nearest to the net metering facility.</p>
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Network Screen	<p>(2)(b) For interconnection of a small generator facility to the load side of spot network protectors, the aggregated nameplate capacity on the load side of the spot network protectors must not exceed the lesser of five percent of a spot network's maximum load or 50 kilowatts.</p> <p><i>Note: Only projects on "a spot network distribution circuit limited to serving one customer" are eligible. (1)(c).</i></p> <p><i>Consider standardizing to allow any projects on a network to use OR NEM or OR SGIP Level 1 and Level 2.</i></p>	<p>III.B.2.j. For interconnection of a Generating Facility within a Spot Network or Area Network, the Generating Facility must be inverter-based and use a minimum import relay or other protective scheme that will ensure that power imported from the Utility to the network will, during normal Utility operations, remain above one percent of the network's maximum load over the past year or will remain above a point reasonably set by the Utility in good faith. At the Utility's discretion, the requirement for minimum import relays or other protective schemes may be waived.</p> <p><i>Note: Any project on a network eligible in 2019 IREC Model, FERC SGIP, and Oregon NEM.</i></p>	<p>(2)(j) If a net metering facility's proposed point of common coupling is on a spot or area network, the interconnection will meet the following additional requirements:</p> <p>(A) For a net metering facility that will be connected to a spot network circuit, the aggregate generation capacity connected to that spot network from the net metering facilities, and any generating facilities, will not exceed five percent of the spot network's maximum load;</p> <p>(B) For a net metering facility that utilizes inverter-based protective functions, which will be connected to an area network, the net metering facility, combined with any other generating facilities on the load side of network protective devices, will not exceed 10 percent of the minimum annual load on the network, or 500 kilowatts, whichever is less. For the purposes of this paragraph, the percent of minimum load for solar electric generation net metering facility will be calculated based on the minimum load occurring during an off-peak daylight period; and</p> <p>(C) For a net metering facility that will be connected to a spot or an area network that does not utilize inverter-based protective functions, or for an inverter-based net metering facility that does not meet the requirements of paragraphs (A) or (B) of this subsection, the net metering facility will utilize low forward power relays or other protection devices that ensure no export of power from the net metering facility, including inadvertent export (under fault conditions) that could adversely affect protective devices on the network.</p>
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Fault Current Screen	<p>(2)(c) The aggregated nameplate capacity 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.</p>	<p>III.B.2.c. The Generating Facility, aggregated with other generation on the distribution circuit, will not contribute more than 10 percent to the distribution circuit's maximum Fault Current at the point on the high-voltage (primary) level nearest the proposed Point of Common Coupling.</p>	<p>(2)(c) The aggregate generation capacity connected to the distribution circuit, including the net metering facility, will not contribute more than 10 percent to the distribution circuit's maximum fault current at the point on the high voltage (primary) level nearest the proposed point of common coupling.</p>
Short-Circuit Interrupting Capability Screen	<p>(2)(d) The aggregated nameplate capacity on the distribution circuit must not cause any distribution protective devices and equipment (including substation breakers, fuse cutouts, and line reclosers) or other public utility equipment on the transmission or distribution system to be exposed to fault currents exceeding 90 percent of the short circuit interrupting capability. The small generator facility's point of interconnection must not be located on a circuit that already exceeds 90 percent of the short circuit interrupting capability.</p>	<p>III.B.2.d. The Generating Facility, aggregated with other generation on the distribution circuit, will not cause any distribution protective devices and equipment (including but not limited to substation breakers, fuse cutouts, and line reclosers), or Utility customer equipment on the system, to exceed 90 percent of the short circuit interrupting capability; nor is the interconnection proposed for a circuit that already exceeds 90 percent of the short circuit interrupting capability.</p>	<p>(2)(a) The aggregate generation capacity on the distribution circuit to which the net metering facility will interconnect, including the capacity of the net metering facility, will not cause any distribution protective equipment (including, but not limited to, substation breakers, fuse cutouts, and line reclosers), or customer equipment on the electric distribution system, to exceed 90 percent of the short circuit interrupting capability of the equipment. In addition, a net metering facility will not be connected to a circuit that already exceeds 90 percent of the short circuit interrupting capability, prior to interconnection of the facility.</p>

<p style="text-align: center;">Transient Stability Screen</p> <p>(2)(e) The aggregated nameplate capacity on the distribution side of a substation transformer feeding the circuit where the small generator facility proposes to interconnect must not exceed 10 megawatts in an area where there are known or posted transient stability limitations to generating units located in the general electrical vicinity (for example, three or four distribution busses from the point of interconnection).</p>	<p>III.B.2.h. The Generating Facility’s Nameplate Rating, in aggregate with other generation interconnected to the distribution low-voltage side of the substation transformer feeding the distribution circuit where the Generating Facility proposes to interconnect, will not exceed 10 MW in an area where there are known or posted transient stability limitations to generating units located in the general electrical vicinity (e.g., three or four transmission voltage level busses from the Point of Common Coupling), or the proposed Generating Facility shall not have interdependencies, known to the Utility, with earlier-queued Interconnection Requests, that would necessitate further study.</p>	<p>(2)(b) If there are posted transient stability limits to generating units located in the general electrical vicinity of the proposed point of common coupling, including, but not limited to within three or four transmission voltage level busses, the aggregate generation capacity, including the net metering facility, connected to the distribution low voltage side of the substation transformer feeding the distribution circuit containing the point of common coupling will not exceed 10 megawatts.</p>
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Line Configuration Screen	<p>(2)(f) If the small generator facility interconnection is to a primary line on the distribution system, then the interconnection must meet the following criteria:</p> <p>(A) If the small generator facility is three-phase or single-phase and will be connected to a three-phase, three-wire primary line, then the small generator facility must be connected phase-to-phase.</p> <p>(B) If the small generator facility is three-phase or single-phase and will be connected to a three-phase, four-wire primary line, then the small generator facility must be connected line-to-neutral and effectively grounded.</p>	<p><i>The latest national model for this screen is found in the Toolkit and Guidance for the Interconnection of Energy Storage and Solar-Plus-Storage at pp. 132-135, as shown below:</i></p> <p>Using the table below, determine the type of interconnection to a primary distribution line. This screen includes a review of the type of electrical service provided to the Project, including line configuration and the transformer connection to limit the potential for creating over-voltages on the Interconnecting Utility's electric power system due to a loss of ground during the operating time of any anti-islanding function.</p>	<p>(2)(e) If a net metering facility is to be connected to three-phase, three wire primary public utility distribution lines, a three-phase or single-phase generator will be connected phase-to-phase.</p> <p>(2)(f) If a net metering facility is to be connected to three-phase, four wire primary public utility distribution lines, a three-phase or single-phase generator will be connected line-to-neutral and will be effectively grounded.</p>											
	<table border="1"> <thead> <tr> <th>Primary Distribution Line Type</th> <th>Type of Interconnection to Primary Distribution Line</th> <th>Result/Criteria</th> </tr> </thead> <tbody> <tr> <td>Three-phase, three-wire</td> <td>If ungrounded on primary or any type on secondary</td> <td>Pass screen</td> </tr> <tr> <td>Three-phase, four-wire</td> <td>Single-phase line-to-neutral</td> <td>Pass screen</td> </tr> <tr> <td>Three-phase, four-wire or mixed three-wire and</td> <td>All others</td> <td>Pass screen for inverter-based generation if the aggregate Nameplate Rating, including the Nameplate Rating of the proposed Project, is <ul style="list-style-type: none"> • $\leq 100\%$ feeder or line section minimum load, </td> </tr> </tbody> </table>	Primary Distribution Line Type	Type of Interconnection to Primary Distribution Line	Result/Criteria	Three-phase, three-wire	If ungrounded on primary or any type on secondary	Pass screen	Three-phase, four-wire	Single-phase line-to-neutral	Pass screen	Three-phase, four-wire or mixed three-wire and	All others	Pass screen for inverter-based generation if the aggregate Nameplate Rating, including the Nameplate Rating of the proposed Project, is <ul style="list-style-type: none"> • $\leq 100\%$ feeder or line section minimum load, 	
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		four-wire		<ul style="list-style-type: none"> or if minimum load data is not available: $\leq 30\%$ feeder or line section peak load. <p>Pass screen for rotating generation if the aggregate Nameplate Rating, including the Nameplate Rating of the proposed Project, is:</p> <ul style="list-style-type: none"> $\leq 33\%$ of feeder or line section minimum load, or if minimum load data isn't available: $\leq 10\%$ of feeder or line section peak load. 	
Single-Phase Shared 2ndry	(2)(g) For interconnection of a small generator facility to a single-phase shared service line on the transmission or distribution system, the aggregated nameplate capacity on the shared secondary line must not exceed 20 kilowatts.	III.B.2.f. If the Generating Facility is to be interconnected on a single-phase shared secondary, then the aggregate Export Capacity on the shared secondary, including the Generating Facility's Export Capacity, will not exceed 65 percent of the transformer nameplate power rating.			(2)(g) If a net metering facility is to be connected to a single-phase shared secondary, the aggregate generation capacity on the shared secondary, including the net metering facility, will not exceed 20 kilovolt-amps.

Service Imbalance Screen	(2)(h) For interconnection of a single-phase small generator facility to the center tap neutral of a 240-volt service line, the addition of the small generator facility must not create a current imbalance between the two sides of the 240-volt service line of more than 20 percent of the nameplate rating of the service transformer.	III.B.2.g. If the Generating Facility is single-phase and is to be interconnected on a transformer center tap neutral of a 240-volt service, its addition will not create an imbalance between the two sides of the 240-volt service of more than 20 percent of nameplate rating of the service transformer.	(2)(h) If a net metering facility is single-phase and is to be connected to a transformer center tap neutral of a 240 volt service, the addition of the net metering facility will not create a current imbalance between the two sides of the 240 volt service that is greater than 20 percent of the nameplate rating of the service transformer.
	(2)(i) Except as provided in subsection (2)(1), the interconnection of the small generator facility must not require system upgrades or interconnection facilities different from or in addition to the applicant's proposed interconnection equipment.		
	(2)(j) The aggregated nameplate capacity, in combination with existing transmission loads, must not cause the transmission system circuit directly connected to the distribution circuit where the small generator facility interconnection is proposed to exceed its design capacity.		

<p>(2)(k) If the public utility's distribution circuit uses high speed reclosing with less than two seconds of interruption, then the small generator facility must not be a synchronous machine. If the small generator facility is a synchronous machine, then the applicant must submit a Tier 4 application.</p>		
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Inadvertent Export Screen		<p>For interconnection of a proposed DER that can introduce Inadvertent Export, where the Nameplate Rating minus the Export Capacity is greater than 250 kW, the following Inadvertent Export screen is required. With a power change equal to the Nameplate Rating minus the Export Capacity, the change in voltage at the point on the medium voltage (primary) level nearest the Point of Interconnection does not exceed 3%. Voltage change will be estimated applying the following formula:</p> <div style="border: 1px solid black; padding: 10px; margin: 10px auto; width: fit-content;"> $\frac{(R_{SOURCE} \times \Delta P) - (X_{SOURCE} \times \Delta Q)}{V^2}$ </div> <p>Where:</p> <p style="text-align: center;">$\Delta P =$ (DER apparent power Nameplate Rating – Export Capacity) × PF,</p> <p style="text-align: center;">$\Delta Q =$ (DER apparent power Nameplate Rating – Export Capacity) × $\sqrt{(1 - PF^2)}$,</p> <p>R_{SOURCE} is the grid resistance, X_{SOURCE} is the V is the grid voltage, PF is the power factor</p>	
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New Section for Export Controls

1: Export Controls

2: If a DER uses any configuration or operating mode in subsection (4) to limit the export of electrical power across the Point of Interconnection, then the Export Capacity shall be only the amount capable of being exported (not including any Inadvertent Export). To prevent impacts on system safety and reliability, any Inadvertent Export from a DER must comply with the limits identified in this Section. The Export Capacity specified by the interconnection customer in the application will subsequently be included as a limitation in the interconnection agreement.

3: An Application proposing to use a configuration or operating mode to limit the export of electrical power across the Point of Interconnection shall include proposed control and/or protection settings.

4: Acceptable Export Control Methods

4.1: Export Control Methods for Non-Exporting DER

4.1.1: Reverse Power Protection (Device 32R)

To limit export of power across the Point of Interconnection, a reverse power protective function is implemented using a utility grade protective relay. The default setting for this protective function shall be 0.1% (export) of the service transformer's nominal base Nameplate Rating, with a maximum 2.0 second time delay to limit Inadvertent Export.

4.1.2: Minimum Power Protection (Device 32F)

To limit export of power across the Point of Interconnection, a minimum import protective function is implemented utilizing a utility grade protective relay. The default setting for this protective function shall be 5% (import) of the DER's total Nameplate Rating, with a maximum 2.0 second time delay to limit Inadvertent Export.

4.1.3: Relative Distributed Energy Resource Rating

This option requires the DER's Nameplate Rating to be so small in comparison to its host facility's minimum load that the use of additional protective functions is not required to ensure that power will not be exported to the electric distribution system. This option requires the DER's Nameplate Rating to be no greater than 50% of the interconnection customer's verifiable minimum host load during relevant hours over the past 12 months. This option is not available for interconnections to area networks or spot networks.

4.2: Export Control Methods for Limited Export DER

4.2.1: Directional Power Protection (Device 32)

To limit export of power across the Point of Interconnection, a directional power protective function is implemented using a utility grade protective relay. The default setting for this protective function shall be the Export Capacity value, with a maximum 2.0 second time delay to limit Inadvertent Export.

4.2.2: Configured Power Rating

A reduced output power rating utilizing the power rating configuration setting may be used to ensure the DER does not generate power beyond a certain value lower than the Nameplate Rating. The configuration setting corresponds to the active or apparent power ratings in Table 28 of IEEE Std 1547-2018, as described in subclause 10.4. A local DER communication interface is not required to utilize the configuration setting as long as it can be set by other means. The reduced power rating may be indicated by means of a Nameplate Rating replacement, a supplemental adhesive Nameplate Rating tag to indicate the reduced Nameplate Rating, or a signed attestation from the customer confirming the reduced capacity.

4.3: Export Control Methods for Non-Exporting DER or Limited Export DER

4.3.1: Certified Power Control Systems

DER may use certified power control systems to limit export. DER utilizing this option must use a power control system and inverter certified per UL 1741 by a nationally recognized testing laboratory (NRTL) with a maximum open loop response time of no more than 30 seconds to limit Inadvertent Export. NRTL testing to the UL Power Control System Certification Requirement Decision shall be accepted until similar test procedures for power control systems are included in a standard. This option is not available for interconnections to area networks or spot networks.

4.3.2: Agreed-Upon Means

DER may be designed with other control systems and/or protective functions to limit export and Inadvertent Export if mutual agreement is reached with the Distribution Provider. The limits may be based on technical limitations of the interconnection customer's equipment or the electric distribution system equipment. To ensure Inadvertent Export remains within mutually agreed-upon limits, the interconnection customer may use an uncertified power control system, an internal transfer relay, energy management system, or other customer facility hardware or software if approved by the Distribution Provider.

Definitions

Distributed Energy Resource or **DER** means the equipment used by an interconnection customer to generate and/or store electricity that operates in parallel with the electric distribution system. A DER may include but is not limited to an electric generator and/or Energy Storage System, a prime mover, or combination of technologies with the capability of injecting power and energy into the electric distribution system, which also includes the interconnection equipment required to safely interconnect the facility with the distribution system.

- Compare to OAR 860-082-0015(32): “Small generator facility” means a facility for the production of electrical energy that has a nameplate capacity of 10 megawatts or less. A small generator facility does not include interconnection equipment, interconnection facilities, or system upgrades.”
- Compare to OAR 860-039-0005(3)(o): "Net metering facility" means a net metering facility as defined in ORS 757.300(1)(d).

Energy Storage System or **ESS** means a mechanical, electrical, or electrochemical means to store and release electrical energy, and its associated interconnection and control equipment. For the purposes of these Interconnection Procedures, an Energy Storage System can be considered part of a DER or a DER in whole that operates in parallel with the distribution system.

Export Capacity means the amount of power that can be transferred from the DER to the Distribution System. Export Capacity is either the Nameplate Rating, or a lower amount if limited using an acceptable means identified in Section [Export Controls].

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Nameplate Rating means the sum total of maximum rated power output of all of a DER’s constituent generating units and/or ESS as identified on the manufacturer nameplate, regardless of whether it is limited by any approved means.

- Compare to OAR 860-082-0015(21): “Nameplate capacity” means the full-load electrical quantities assigned by a facility’s designer to a generator and its prime mover or other piece of electrical equipment, such as transformers and circuit breakers, under standardized conditions, as expressed in amperes, kilovoltamperes, kilowatts, volts, megawatts, or other appropriate units. Nameplate capacity is usually indicated on a nameplate attached to the individual device.
- Compare to OAR 860-082-0015(3): “Aggregated nameplate capacity” means the total combined nameplate capacity of: (a) A proposed small generator facility; (b) Existing small generator facilities, net metering facilities, FERC jurisdictional generators, and state jurisdictional generators with a nameplate capacity greater than 10 megawatts; and (c) Small generator facilities, net metering facilities, FERC jurisdictional generators, and state jurisdictional generators with a nameplate capacity greater than 10 megawatts that have pending completed applications with higher queue positions than the proposed small generator facility.
- Compare to OAR 860-039-0005(3)(i): "Generation capacity" means the nameplate capacity of the power generating device(s). Generation capacity does not include the effects caused by inefficiencies of power conversion or plant parasitic loads.

Non-Export or **Non-Exporting** means when the DER is sized and designed, and operated using any of the methods in Section [Export Controls], such that the output is used for Host Load only and no electrical energy (except for any Inadvertent Export) is transferred from the DER to the Distribution System.

Limited Export means the exporting capability of a DER whose Generating Capacity is limited by the use of any configuration or operating mode described in Section [Export Controls].

Power Control System or **PCS** means systems or devices which electronically limit or control steady state currents to a programmable limit.

Host Load means electrical power, less the DER auxiliary load, consumed by the Customer at the location where the DER is connected.

Inadvertent Export means the unscheduled export of active power from a DER, exceeding¹ a specified magnitude and for a limited duration, generally due to fluctuations in load-following behavior.

¹ IEEE P1547.9 uses "beyond" rather than "exceeding."

New Section: Supplemental Review

1. Level 1 or Level 2 Screens failure: Despite the failure of one or more screens, the Utility, at its sole option, may approve the interconnection provided it concludes such approval is consistent with safety and reliability. If the Utility cannot determine that the DER may nevertheless be interconnected consistent with safety, reliability, and power quality standards, the Utility shall provide the Applicant with detailed information on the reason(s) for failure in writing. In addition, the Utility shall allow the Applicant to select one of the following, at the Applicant's option:
 - A. Undergo Supplemental Review in accordance with Section [Supplemental Review]; or
 - B. Continue evaluating the Application under Level 4.

Upon receipt, the Applicant must notify the Utility of its selection within ten (10) Business Days or the Application will be deemed withdrawn.

2. To accept the offer of a Supplemental Review, the Interconnection Requester shall agree in writing and pay a Supplemental Review fee of \$1,000, both within twenty (20) business days of the offer. If the written agreement and fee have not been received within that timeframe, the Interconnection Request shall continue to be evaluated under the Level 4 Study Process unless it is withdrawn by the Interconnection Requester.
3. Within twenty (20) Business Days an Applicant's election to undergo Supplemental Review, the Utility shall perform Supplemental Review using the screens set forth below, notify the Applicant of the results, and include with the notification a written report of the analysis and data underlying the Utility's determinations under the screens.
 - A. **Supplemental Review Penetration Screen**: Where 12 months of Line Section minimum load data (including onsite load but not station service load served by the proposed DER) are available, can be calculated, can be estimated from existing data, or determined from a power flow model, the aggregate Export Capacity on the Line Section is less than 100% of the gross minimum load for all Line Sections bounded by automatic sectionalizing devices upstream of the proposed Project. If minimum load data is not available, or cannot be calculated, estimated, or determined, the Export Capacity of the Project, aggregated with the Export Capacity of other Projects on the Line Section, is less than 30% of the peak load for all Line Sections bounded by automatic sectionalizing devices upstream of the proposed Project.
 - i. The type of Project used by the proposed Project will be taken into account when calculating, estimating, or determining circuit or Line Section minimum load relevant for the application this screen. Solar photovoltaic (PV) Projects with no battery storage use daytime minimum load (*i.e.* 10 a.m. to 4 p.m. for fixed panel systems and 8 a.m. to 6 p.m. for PV systems utilizing tracking systems), while all other Projects use

absolute minimum load.

- ii. Load that is co-located with load-following, non-exporting or export-limited Projects should be appropriately accounted for.
- iii. The Interconnecting Utility will not consider as part of the aggregate Export Capacity for purposes of this screen Project Export Capacity, including combined heat and power (CHP) facility capacity, known to be already reflected in the minimum load data.

B. Voltage and Power Quality Screen. In aggregate with existing generation on the Line Section:

- i. The voltage regulation on the Line Section can be maintained in compliance with relevant requirements under all system conditions;
- ii. The voltage fluctuation is within acceptable limits as defined by IEEE Std 1547™;
- iii. The harmonic levels meet IEEE Std 1547™ limits at the Point of Interconnection; and
- iv. **Supplemental Grounding Screen:** If the Project failed the Line Configuration Screen, apply this Supplemental Grounding Screen:
 - (1) For Projects with a rotating machine, if effective grounding is maintained the Project passes the screen.
 - (2) For Projects with a three-phase inverter, apply one of the following screens:
 - (a) If the Line-to-Neutral connected load on the feeder or line section is greater than 33% of peak load on the feeder or line-section, the Project passes the screen.
 - (b) If using a supplemental grounding software tool:
 - (i) If the tool determines that supplemental grounding is not required to maintain effective grounding, the Project passes this screen.
 - (ii) If the tool determines that supplemental grounding is required, the Applicant must agree to modify the Project to include supplemental grounding. If the Applicant does not agree to modify the Project, the Project fails this screen.
 - (c) If using detailed hosting capacity analysis that incorporates

evaluation of temporary overvoltage risk for inverters: the Project passes the screen if the Nameplate Rating of the Project is below the available hosting capacity at the Point of Interconnection.

If the Project limits export pursuant to Section [Export Controls], the Export Capacity must be included in any analysis including power flow simulations.

- C. **Safety and Reliability Screen.** The location of the proposed DER and the aggregate Export Capacity on the Line Section do not create impacts to safety or reliability that cannot be adequately addressed without application of the Study Process. If the Project limits export pursuant to Section [Export Controls], the Export Capacity must be included in any analysis including power flow simulations, except when assessing fault current contribution. To assess fault current contribution, the analysis must use the Rated Fault Current; for example, the Interconnection Requestor may provide manufacturer test data (pursuant to the fault current test described in IEEE 1547.1-2020 clause 5.18) showing that the fault current is independent of the Nameplate Rating. The Interconnecting Utility may consider the following factors and others in determining potential impacts to safety and reliability in applying this screen:
- i. Whether the Line Section has significant minimum loading levels dominated by a small number of customers (i.e., several large commercial customers).
 - ii. Whether the loading along the Line Section is uniform or even.
 - iii. Whether the Project is located in close proximity to the substation (i.e., less than 2.5 electrical circuit miles), and whether the Line Section from the substation to the Point of Interconnection is a Mainline rated for normal and emergency ampacity.
 - iv. Whether the Project incorporates a time delay function to prevent reconnection of the generator to the system until system voltage and frequency are within normal limits for a prescribed time.
 - v. Whether operational flexibility is reduced by the Project, such that transfer of the Line Section(s) of the Project to a neighboring distribution circuit/substation may trigger overloads or voltage issues.
 - vi. Whether the Project employs equipment or systems certified by a recognized standards organization to address technical issues such as, but not limited to, islanding, reverse power flow, or voltage quality.
4. If the proposed interconnection passes the supplemental screens, the Application shall be approved and the Utility will provide the Applicant an executable Interconnection Agreement pursuant to the procedure set forth in OAR 860-082-0025(7)(e).

5. After receiving an Interconnection Agreement executed by the Utility, the Applicant shall proceed under the terms of the applicable level of review under which the Application was initially studied.

Note about the Level 1 and Level 2 Penetration Screen: As noted in IREC's July 15 presentation, IREC supports, where the data is available, switching to a 100% of min load threshold. However, the threshold for the Level 1 and Level 2 Penetration Screens would look different than the detailed calculations found above in the Supplemental Review Penetration Screen. The Level 1 and Level 2 Penetration Screens are typically designed to fail more projects than the Supplemental Review Penetration Screen. Considering Oregon's current use of substation minimum load data to establish generation limited feeders, IREC requests that the work group, after completing its work on Supplemental Review and Export Controls, have a discussion before designing the new Level 1 and Level 2 penetration screens.