



**Operations Requirements for Generation
Interconnection
STD-N-000002 REVISION 02 CN 01**

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TABLE OF CONTENTS

1. INTENT	1
2. REVISION HISTORY	1
3. DEFINITIONS	2
3.1 Acronyms	2
4. POLICY AND APPLICATION	3
4.1 Summary of Requirements	3
4.2 BPA Operations Full Requirements	3
5. REFERENCES	11
APPENDIX	12

1. INTENT

The following document contains mandatory requirements for both new and existing generator, generating plant, generating facility, or generation storage facility (“generator”) connecting to the BPA Transmission System.

An existing generator must follow these requirements when it:

- Requests to change the generation within a utility’s local service territory from serving resource load or not using BPA’s transmission to serve resource load [formerly known as “behind the meter” status] to marketing its generation [formerly known as “in front of the meter” status].
- Is adding an additional unit or units to its existing capacity through an interconnection request.

The purpose of these requirements is to ensure that BPA dispatchers have full visibility of the generator and that the overall power system is not adversely affected by the new/existing generator. This is accomplished by having metering, communication circuits, remedial action schemes, protective relaying, Automatic Generation Control (AGC), and Supervisory Control and Data Acquisition (SCADA) information.

2. REVISION HISTORY

- Change Notice 02 (Current Revision), 07/25/2018: Changed from “Not Approved for Public Release”, to “Approved for Public Release” per request of standard owner.
- Revision 02, 01/31/2018: Reformatted using the latest Standards Template. General updates throughout.

- Revision 01, 2/6/2013: Major revisions including the requirement of providing a Voltage Schedule to Generator Operators.
- Revision 00, 4/13/2010: Initial development of the standard.

3. DEFINITIONS

3.1 Acronyms

AGC: Automatic Generation Control

AE: Account Executive

AVR: Automatic Voltage Regulator

BAA: Balancing Authority Area

BAASA: Balancing Authority Area Services Agreement

CSE: Customer Service Engineer

CT: Current Transformer

EA: Energy Accounting

EIR: Electric Industry Registry

EMS: Energy Management System

iCRS: Integrated Curtailment and Redispatch System

LGIA: Large Generator Interconnection Agreement

LTW: Limit to Wind

NERC: The North American Electric Reliability Corporation

OCBR: Operational Control of Balancing Reserves

OR90: Operations Release from 90 Day requirement

POD: Point of Delivery

POR: Point of Receipt

PRD: Project Requirements Diagram

PSC: BPA Power System Control group (Field Telecommunications)

PSS: Power System Stabilizer

PT: Potential Transformer

RAS: Remedial Action Scheme

RTU: Remote Terminal Unit

SCADA: Supervisory Control and Data Acquisition

SEMM: Sequential Events Monitor Master

SER: Sequential Events Recorder

SGIA: Small Generator Interconnection Agreement

TOP: Transmission Operator

WECC: Western Electric Coordinating Council

4. POLICY AND APPLICATION

4.1 Summary of Requirements

- All generators with an aggregate nameplate rating of 3MVA and greater shall have working MW/MWh meters before being allowed to connect to the Transmission grid. These meter outputs will be visible to Dispatch, AGC, and SCADA.
- Generators with separate reactive devices shall send all available device status outputs to BPA via appropriate or available communication methods.
- Reactive capability of all generators will be sent to BPA. [Section 4.2.2.1]
- The Final Meter Test associated with the affected generator must be scheduled and performed prior to scheduling power. [Section 4.2.4]
- Once a generator has performed Initial Synchronization to the Transmission grid, the generator shall have 90 days to complete all BPA Operations requirements. [Section 4.2.5]

See supporting document STD-N-000002-01-01 for a basic process outline.

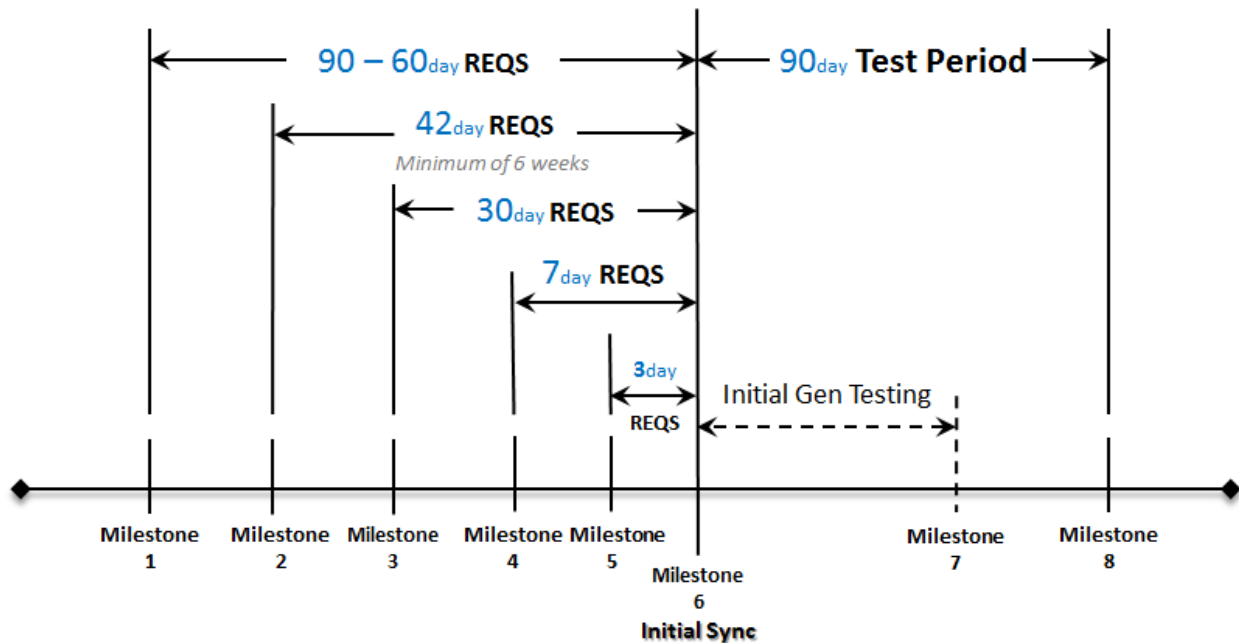


Figure 1.--- Typical Interconnection Generation Project Timeline

4.2 BPA Operations Full Requirements

4.2.1 General Requirements/Notes

Generators that are in BPA’s BAA or connected to the transmission system where BPA is the TOP must follow BPA’s outage and dispatch commands.

The 90 Day Test Period [Section 4.2.5], a part of the Interconnection Generation Project Timeline [Figure 1 above], which contains the Initial Gen Test Period [Section 4.2.3.1], reflects the period when all the BPA Operations requirements have been completed.

Specifically, the order of events leading to the 90 Day Test period is as follows:

1. Back Feed (also referenced as “In Service” date) energization
2. Initial Synchronization
 - A. Start of Initial Gen Test Period.
Start of BPA Operations 90 Day Test Period. (Note: The BPA Operations 90 Day Test Period is a 90 day count down timer.)
3. Final Meter Test
4. 90 Day Test Period

Notes:

- Any customer entity changes and/or ownership changes that require EIR changes, prior to the Initial Synchronization date and during the Initial Gen Test Period, may delay this process a minimum of six weeks.
- Although all affected generators are highly encouraged to complete all required BPA Operations requirements as outlined in this document, BPA Operations reserves the right to evaluate requests for extensions of the 90 Day Test Period on a case-by-case basis.

4.2.2 *Pre-Synchronization Requirements*

All 90-60 day requirements shall be completed before a generator can proceed to the subsequent milestones.

4.2.2.1 90-60 Day Requirements (Milestone 1)

The following are a list of requirements to be met within 60-90 days prior to Initial Synchronization:

- The applicable interconnection agreement [e.g. LGIA, SGIA or BAASA] document will be signed prior to Back Feed, but preferably not less than 60 days before the Initial Synchronization date.
- A customer coordination meeting or conference call involving the appropriate BPA CSE, BPA Transmission AE representatives from BPA Operations and representatives from the GO/GOP shall be conducted. The results of this meeting will help determine the generation levels for testing purposes.
- Any applicable RAS NERC requirements will be met during this period, if needed. This includes the WECC level review of design. The BPA *RAS Operating Requirements* documentation contains additional information on applicable RAS requirements for BPA Operations.

- The developer associated with the generator will supply all required technical data concerning the plant to the BPA Transmission Planning/ BPA CSE representative who will distribute the data to appropriate representatives in BPA Operations Planning, BPA Operations Control and BPA Grid Modeling organizations. This data will include, but not be limited to, the following:
 - Generator Max output,
 - Reactive capability,
 - Line impedances/ratings,
 - Breaker configurations,
 - Final plant substation one-line,
 - Generator Reactance and Time Constants,
 - Exciter, Governor, PSS and Step-up Transformer Parameter data,
 - Generator protective relays and settings.

4.2.2.2 42 Day Requirements (Milestone 2)

The following are a list of requirements to be met within 42 days prior to Initial Synchronization:

- The organization representing the generator will submit an EIR application to register the generator Source/Sink and POR/POD names a minimum of 6 Weeks before Initial Synchronization.
- All generators subject to OCBR or OMP will submit an iCRS application for “Security Officer” and “Generation Advisor Users” (or update its existing applications with the new generator) 6 weeks before Initial Synchronization.
- Any registration, i.e. name changes, may immediately push back the synchronization time by 6 weeks.
- The BPA Communications Test and Energization representative at the Control Center will supply a complete SCADA points list to the BPA Energy Management System SCADA representative during this period.

4.2.2.3 30 Day Requirements (Milestone 3)

The following are a list of requirements to be met within 30 days prior to Initial Synchronization:

- The BPA Field Communications (PSC) group that has jurisdiction over the affected generator location will verify that all non-BPA installed communication systems conform to BPA standards and design practices.
- All new communication systems will be “burned in” for 30 days prior to Initial Synchronization during the *30 Day Turn-up Period*.

The appropriate BPA Field Communications (PSC) personnel will have released all equipment to BPA Operations.

The generator will receive its generation limit from BPA Operations for the Initial Gen Test period [Section 4.2.2.1].

- The generator shall provide a 24/7 contact list.

Notes:

- The contact list shall include actual plant operators or dispatchers with the capacity to perform immediate operational actions.
- The contact list shall be provided to BPA Dispatch a minimum of 30 days before Back Feed. This is to allow the dispatchers time to verify that all supplied names and phone numbers are correct.
- Any updates to the 24/7 contact list shall be provided to BPA Dispatch and BPA Real-time Scheduling.
- A Voltage Schedule may be issued by BPA to the generator operator, depending on the location, electrical connection and size of the generator:
 - If required, BPA will provide a time-of-day voltage schedule or a minimum/maximum voltage range with a target voltage. As a registered TOP, BPA is required to direct the GO/GOP to comply with the voltage schedule.
 - The generator must operate in automatic voltage control mode (AVR in service and controlling voltage).
 - Synchronous generators must have their PSS in service. If for any reason AVR or PSS becomes unavailable, the GO/GOP must notify BPA Dittmer Control Center AGC Generation Dispatcher and follow applicable NERC Standards/Requirements.
 - To the extent practicable, the voltage schedules that BPA prepares shall not require voltage support from the generator that is greater than the voltage support that BPA requires from other comparably sized generating facilities that provide effective voltage support to the area in which the generator is located. BPA will periodically (annually at a minimum) modify or update the voltage schedule and post to the BPA external web page.
 - Generators will be notified that the voltage schedule has been modified as changes occur or, at a minimum, notified of the voltage schedule once near the beginning of each calendar year via email. The GO/GOPs will be directed to the BPA external web page. GO/GOPs should follow this voltage schedule until notified otherwise.

4.2.2.4 7 Day Requirements (Milestone 4)

The following are a list of requirements to be met within 7 days prior to Initial Synchronization:

- All applicable generators shall have installed and tested the “Gen Breakers Trip” command.

“Gen Breakers Trip” command is a signal that the generator provides to BPA that will effectively disconnect the generation from the system. This requirement will be documented in the PRD and will be called the “Gen Breakers Trip” command.

- RAS will be installed, tested and released to BPA Operations. This includes:
 - A functional test that trips the appropriate circuit breakers that isolate the generator from the transmission grid from each RAS controller.
 - Testing of applicable SER/SCADA alarms.
 - The generator will be made aware of its post RAS trip event requirements.
 - Verification of situational awareness/ICCP indications for RAS.
 - Perform AGC Suspend test (if applicable) to the Balancing Authority that operates that generator.
- An initial meter test will be performed.
 - The site MW/MWh meters will have had an initial test performed. The test will use injected values to simulate full scale calibration & polarity of an actual line value.
 - Until BPA successfully performs an initial meter test, the plant will not be allowed to proceed to Back Feed and Initial Synchronization.
- All site equipment will be installed and have passed all required initial/in-service tests.
 - This will include all relays, RTU's, Gen Breakers Trip controls, CTs, PTs, meters, and communication equipment.
 - All relays and associated communication equipment will have been released to BPA Operations.
- The GO/GOP and applicable Transmission AE or Transmission CSE will coordinate with BPA Operations to ensure all Initial Synchronization requirements are being met.
- The generator will be made aware of all generation operational requirements by the appropriate BPA Transmission AE or BPA CSE. These shall include but not be limited to:
 - How to call for contingency reserves.
 - How to schedule.
 - Points of contacts for BPA Operational requirements

4.2.2.5 3 Day to 1 Day Requirements (Milestone 5)

The following are a list of requirements to be met within 1-3 days prior to Initial Synchronization

- All required EMS applications will be operational. These include:

- SCADA displays will be finished, show the current meter values, and possess the ability to perform the “Gen Trip” Command. (Ability to open the plant breakers for wind farms only)
- kWh system will be connected and receiving data from the MWh meter for applicable generating plants.
- EA Application will be populated with the output of the MWh meter.
- AGC system will be linked with the correct real time meter data.
- LTW signaling system (for wind farms) will be fully connected and tested. This does not mean that the system will be fully integrated into both control centers; i.e., the software and hardware implementation do not have to be operational but the hardware has to be in place and tested. In order for the generator to be released from the 90 day requirement, the LTW communication system must be fully integrated and in operation.
- RAS SCADA display operational.
- Generators greater than 50MW will have the Gen Inter-Control Center Communications Protocol (Gen-ICCP) system running.

4.2.3 *Back Feed, Initial Synchronization & Initial Generation Test Period Requirements*

The following are a list of requirements associated with Back Feed:

- The generator operator will coordinate with the BPA AGC Generation Dispatcher and BPA Operations representative before any power can be back-fed or put on the Transmission grid.
- All contact data will be current on the 24/7 contact list.
- The generator operator shall coordinate with the BPA Operations representative the day of the Back Feed or Initial Synchronization.
- Before the generator begins to Back Feed or generate, the generator operator shall contact the appropriate BPA Dispatch Center.
- Back Feed will be completed before any generator performs Initial Synchronization to the Transmission grid.
- If BPA is supplying the Back Feed, all appropriate billing meters will be installed, tested and in-service or operational.
- Before the generator can receive Back Feed for station services, the generator will coordinate with BPA Field Personnel (System Protection Control (SPC) group), and the local utility to ensure that all protective relays are in place and working. The generator operator will contact BPA Operations 48 hours before any energization action occurs.

4.2.3.1 Initial Gen Test Period/Initial Synchronization Requirements (Milestone 6)

The following are a list of requirements to be met during Initial Synchronization and Initial Generation Test Period:

- Back Feed will have been completed.
- For Variable Energy Resources (wind & solar generation):
 - The generator will be required to stay below a BPA Operations specified MW value during the Initial Gen Testing period.
 - This value will be supplied to the generator operator prior to Initial Synchronization by a BPA Operations representative.
- For Combustion/Fuel Generators:
 - The generator operator should provide a generation testing schedule for coordination purposes with BPA Operations prior to the Initial Gen Testing period.

Note: If the generator operator does not supply all required technical data (i.e. dynamic data for BPA Operations Planning studies and reactive power capability data), this value will not be released and the generator will not be given permission to perform Initial Synchronization to the Transmission grid. This note applies to all generators.

- All applicable generators are required to follow OCBR requirements.

The generating plant will be required to monitor iCRS for notifications of OCBR events and command levels or have the LTW system fully integrated.

The generator will be responsible to follow all OCBR commands.

If the plant fails to follow the stated commands, they will be subject to BPA's Failure to Comply penalty and risk being assessed operational strikes. See OCBR for more information.

If not scheduling, the generator will be required to reduce generation output to zero during an OCBR Limit event.

If scheduling, the plant is required to reduce output to the LTW command level.

- During the Initial Gen Test/Initial Synchronization period, the generator will not be allowed to schedule power until the Final Meter Test is performed and completed.
- Once the generator has performed Initial Synchronization to the Transmission grid, the BPA Operations 90 day timer starts. (Start of 90 Day Test Period)

4.2.4 *Final Meter Test* (Milestone 7)

The following are a list of requirements associated with the Final Meter Test Period:

The Final Meter Test will be defined as the value or point when the generator has enough generating units commissioned and available to fully test all meters on the site. This value is dependent on the size and configuration of the CTs and is determined by BPA SPC Field Personnel.

After the Final Meter Test, the generator will be freed from all generation limits except the following:

- The generator will be allowed to generate up to a predetermined MW value without scheduling the output. This value is contingent on system conditions. This value will also be dependent on input from the BPA Field Personnel, BPA Operations Planning Group, and BPA Dispatch and the status of the requirements for the *90-day Test Period* [Section 4.2.5].

An exception to this would be the case where items such as planned or unplanned line work have not been completed. In this situation, there will be a limit imposed on the generator. This value will be determined by the appropriate BPA Operations Planning study engineer.

Any other exception would be planned and communicated accordingly.

4.2.5 *90 Day Test Period* (Milestone 8)

The following are a list of requirements associated with the 90 Day Test Period:

- The 90 Day Test Period is a period of 90 days during which the generator is allowed to generate for test purposes or for the generator to generate its operational limit with a generation schedule/estimate submitted. With approval from BPA Operations, the 90 Day Test Period will begin on the day the generator first performs Initial Synchronization to the Transmission grid (produces power), as determined by the meters at the interconnection point.
- All WECC & NERC applicable reliability standards and guidelines will be followed by the affected generating plant during this 90 Day Test Period.

Notes:

- See the latest published version of the BPA Generation Imbalance Service Business Practice for additional information.
- BPA recommends that the generator perform generation control tests during this period to validate the performance of their controls.
- In the event that the generator does not complete all operational requirements during the allotted time-frame, the generator may be subject to forced disconnection from the Transmission grid unless a request for an extension beyond the 90 Day Test Period is submitted and the request is reviewed and approved by BPA Operations.

4.2.6 *Release from Operations Notification* (Milestone 8)

“Operations Release 90 or OR90” will be defined as the point when all BPA Operations requirements are completed. The “Release from Operations Notification” is a notice (via email) sent out by the BPA Operations representative to affected personnel associated with the generator indicating that all applicable BPA Operations requirements have been completed. These requirements include:

- The LTW functions and systems have been fully tested and validated for the variable generator. (Does not apply to thermal units.) See section 4.2.2.5 for more discussion on this issue.
- Generator is scheduling power.

- For a variable generator, the affected generator must complete the setup for visibility of OCBR functionality in the generating plant's EMS.

Notes:

- This notification can be provided earlier as long as the requirements outlined in this section are met.

5. REFERENCES

Bonneville Power Administration (BPA), U.S. Department of Energy. STD-N-000002-01-01, Process Diagram, Operations Requirements for Generation Interconnection. Portland, Oregon.

Bonneville Power Administration (BPA), Control Center Communications Operations Group (TTCO), U.S. Department of Energy. 30 Day Turn-up Standard for New Communication Equipment Installations, STD-TTCO-002. Portland, Oregon.

Bonneville Power Administration (BPA), Transmission Marketing & Sales Commercial Business Assessment Group (TSPQ), U.S. Department of Energy. BPA Generation Imbalance Service Business Practice. Portland, Oregon.

Bonneville Power Administration (BPA), Transmission Operations Control Group (TOOC), U.S. Department of Energy. BPA RAS Operating Requirements. Portland, Oregon.

Bonneville Power Administration (BPA), Transmission Operations Control Group (TOOC), U.S. Department of Energy. Operational Control of Balancing Reserves (OCBR). Portland, Oregon.

APPENDIX

A. Different Scenarios (examples) on how a generator connects to the BPA Transmission grid

Scenario 1

Plant A had a 50 MW name plate capacity. It wanted to start generating and marketing its power by December 1 of 2013. The current production schedule showed that all BPA equipment installation would be completed on Sept 1, 2013 and that the turbines would be ready to test on Sept 15, 2013. Plant A's Project Manager (PM) contacted the appropriate BPA Transmission AE and requested that BPA facilitate a coordination meeting between all parties involved at least 2 months before Sept 1. After meeting with BPA, Plant A's PM supplied all of the required technical data to the BPA Operations Planning Study group. Plant A then registers with EIR and iCRS applications. A month before Initial Synchronization, Plant A requests from BPA Operations Planning Study group the specified MW value for generation output needed for Initial Gen Testing period [Section 4.2.2.1]. During this time-frame, it was discovered that Plant A would not have the necessary reactive support in place for this generation. Due to this issue, it was determined that the plant would be limited to 4MW of generation output during the Initial Gen Testing period/Initial Synchronization and the limit would go to 10MW of generation output when the reactive support was in place. Once the generator performed Initial Synchronization to the Transmission grid, Plant A was able to begin testing the turbines. BPA field personnel determined that at least 10 MW of generation output would be needed to perform an in-service check for BPA's generation meters (to test the meters). As a result, Plant A was not allowed to conduct a Final Meter Test until the reactive support for this generation was obtained. During this time (Initial Gen Testing Period), Plant A was able to complete other BPA Operations requirements for generation interconnection to the Transmission grid. After 80 days from the Initial Synchronization date, Plant A was able to process the reactive support. What followed was a 9 day period of no wind activity. Realizing that they were approaching the end of the 90 Day Test Period window, Plant A requested an extension to allow them to stay on the Transmission grid as a result of no wind activity [Section 4.2.5]. The extension request was reviewed and approved. On the 91st day after Initial Synchronization, Plant A had sufficient wind activity to perform a Final Meter Test [Section 4.2.4]. The Final Meter Test was successful and Plant A was then allowed to schedule power. Finally, Plant A was sent a Release from Operations Notification [Section 4.2.6] for completing all the required BPA Operations requirements for this generation project.

Scenario 2

Plant B was 6 weeks from the Initial Synchronization date. They had submitted all of the required paperwork and all applicable hardware and software systems were ready and operational. Three weeks prior to the Initial Synchronization date, the owners of Plant B decided to change the name and resubmit to the EIR. As a result of this decision, Plant B could not perform Initial Synchronization on the day as scheduled [Section 4.2.1]. The actual Initial Synchronization date had to be postponed at a

minimum 6 weeks from the original date to accommodate the necessary changes that needed to be made at the BPA Control Center for this project.