

Interconnection Service Request – Generation

Requestor to represent and warrant that the data submitted in this exhibit is complete and accurate. Preliminary or manufacture design modeling data is acceptable. Data submitted must be complete and accurate before assessment will start. Any errors or omissions are the responsibility of the submitter. Changes to submitted information will require a new interconnection service request be submitted.

Submitted by: _____

Title: _____

Date: _____

How to Fill Out the Application

1. The purpose of this application is to submit the required information to proceed with a detailed service design (including a Feasibility Study or a System Impact Study).
 - a. For a Feasibility Study, fill in the light orange shaded fields. Additional information for non-shaded fields is helpful but not required. For fields that are not applicable to your project please mark them with N/A.
 - b. For a System Impact Study, fill in all applicable fields including the light orange shaded fields. For fields that are not applicable to your project please mark them with N/A.

INTERCONNECTION CONTACT	
Company Name: OR SaskPower Department:	
Project Description (Optional)	
Contact Name:	
Mailing Address:	
E-mail Address:	
Telephone Number:	

INTERCONNECTION SERVICE REQUESTED / INFORMATION (Choose one of the five options)		
Network Resource Interconnection Service (NRIS)¹	<input type="checkbox"/>	Provide Details under the SERVICE INFORMATION Section.
Energy Resource Interconnection Service (ERIS)²	<input type="checkbox"/>	Provide Details under the SERVICE INFORMATION Section.
Intra-Provincial Transmission Tariff (IPTT)³	<input type="checkbox"/>	Provide Details under the SERVICE INFORMATION Section.
SERVICE INFORMATION	Check if True	Additional Comment (if any)
Have conversations been held with SaskPower about commercial terms regarding selling energy to SaskPower?	<input type="checkbox"/>	Provide Details.

¹ NRIS: Interconnection service allows customer to interconnect generating facility with SaskPower transmission system to serve load as a network resource. Network upgrades will be determined to allow generation deliverability to the SaskPower transmission system. This typically requires physical interconnection facilities and system reinforcement facilities. NRIS in and of itself does not convey transmission service.

² ERIS: Interconnection service allows customer to interconnect generating facility with SaskPower system to deliver generating facility output using non-firm (or existing firm) transmission capacity on available basis. This typically requires only physical interconnection facilities. ERIS in and of itself does not convey transmission service.

³ IPPT: Interconnection service allows a customer to connect its generating facility to the SaskPower transmission system and be eligible to deliver the generating facility's output to a Specified RAS customer pursuant to the Intra-Provincial Transmission Tariff. IPPT in and of itself does not convey transmission service.

Intend to request service under OATT	<input type="checkbox"/>	If true, please refer to this page .
Request for point-to-point service (long term firm)	<input type="checkbox"/>	
Point of Delivery (POD) / Sink	<input type="checkbox"/>	Provide Details.
Point of Receipt (POR) / Source	<input type="checkbox"/>	Provide Details.
Request for network integrated transmission service	<input type="checkbox"/>	
Intend to sell/supply power to a load under IPTT	<input type="checkbox"/>	Provide name of customer.
Is this SaskPower's existing customer?	<input type="checkbox"/>	Provide Details.
Identify who will be providing balancing service to the load.	SaskPower <input type="checkbox"/> Requester <input type="checkbox"/>	Provide Details.
Identify if load is taking capacity reservation service from SaskPower.	<input type="checkbox"/>	Provide MW reserved.
Load Customer Self-Supply	<input type="checkbox"/>	Provide Details under the SERVICE INFORMATION Section.
SERVICE INFORMATION	Check if True	Additional Comment (if any)
Existing load customer adding new generation to offset existing load.	<input type="checkbox"/>	
Intend to self-generate/own generating facility.	<input type="checkbox"/>	
Intend to purchase from other independent power producer (IPP).	<input type="checkbox"/>	Provide Details.
Intend to supply additional power to SaskPower under commercial agreement.	<input type="checkbox"/>	Provide Details.
Identify who will be providing balancing service to the load.	SaskPower <input type="checkbox"/> IPP <input type="checkbox"/>	Provide Details.
Identify if load is taking capacity reservation service from SaskPower.	<input type="checkbox"/>	Provide MW reserved.
Modification of Existing Generating Facility	<input type="checkbox"/>	Provide Details. If true, please refer to this link .

SITE LOCATION AND PROPOSED IN-SERVICE DATES:		
Proposed Location of Project: (Provide Section-Township-Range-Meridian or UTM or GPS coordinates or provide name of site if this is a modification to an existing generating facility.)		
Proposed Commercial Operation Date for Generating Facility:		
Proposed In-Service Date for Interconnection Facilities: (Proposed date by which the facilities needed to interconnect to the SaskPower system are in-service.)		
GENERATING FACILITY ⁴ DATA ⁵ :		
Number of units (include # of generating units/wind turbines/inverters):		
Type (synchronous, induction, doubly-fed induction, full back-to-back converter, inverter etc.):		
Energy source: (steam turbine, gas/combustion turbine, wind turbine, hydro turbine, solar, etc.)		
Modes of operation: (base-load, peaking, synchronous condense, intermittent, etc.)		
Rated Output (MVA, MW):		
Rated reactive power capability ⁶ (+/-MVar):		
Rated output capability:	Nominal/ISO rating: (MW@ rated power factor ⁶)	
	Summer rating (@40°C): (MW@ rated power factor, or MW, +/-MVar)	
	Winter rating (@0°C): (MW@ rated power factor, or MW, +/-MVar)	

⁴ Generating Facility means supplier's generating power plant including any associated facilities and equipment required to deliver energy to the point of interconnection (point of change of ownership).

⁵ Refer to SaskPower [Generator Owner Data Requirement and Reporting Procedure](#)

⁶ Refer to [SaskPower Generation Interconnection Requirement](#) for reactive power capability/power factor requirements.

	Absolute maximum output at reduced ambient temperature: (MW@ rated power factor, or MW, +/-MVA, temperature in °C)		
For inverter-based resources (if applicable):	Cold temperature cut out (°C):		
	Hot temperature cut out (°C):		
	Wind speed cut-out (m/s):		
Production capacity range (Gross):	Maximum (MW at power factor, or MW, +/-MVA) at	40°C	
		0°C	
	Minimum (MW at power factor, or MW, +/-MVA) at	40°C	
		0°C	
Net output to SaskPower System (Cumulative production capacity range):	Maximum (MW at power factor, or MW, +/-MVA) at	40°C	
		0°C	
	Minimum (MW at power factor, or MW, +/-MVA) at	40°C	
		0°C	
Station Power Requirements: (MW, MVA)	At Maximum Production:	40°C	
		0°C	
	At Minimum Production:	40°C	
		0°C	

GENERATOR/TURBINE/INVERTER DATA (to be filled out separately for each different type of generator)

GENERATOR/INVERTER DATA – CHARACTERISTICS:

Type of generator: (Synchronous, Induction Generator, back-to-back convertor, inverter, etc.)		
Make & Model:		
Generator rating (MVA):		
Power factor at rated output (in per unit):		
Generator rated terminal voltage (kV):		
Capability of generator/prime mover:	Nominal/ISO rating: (MW@ rated power factor)	
	Summer rating (@40°C): (MW@ rated power factor or MW, +/-MVA)	
	Winter rating (@0°C): (MW@ rated power factor or MW, +/-MVA)	

GENERATOR/TURBINE/INVERTER DATA (to be filled out separately for each different type of generator)		
GENERATOR/INVERTER DATA – CHARACTERISTICS:		
	Absolute maximum rating at reduced ambient temperature (MW @ rated power factor, or MW, +/-MVar, temperature in °C)	
Production capacity range of individual generators (Gross):	Maximum (MW at power factor, or MW, +/-MVar) at	40°C
		0°C
	Minimum (MW at power factor, or MW, +/-MVar) at	40°C
		0°C
Attach reactive capability curve (include ambient temperature and voltage dependency):	Comments:	
PSS/E ⁷ power flow and short circuit models (in PSSE file formats such as '.sav', '.raw', '.sld' etc.) representing the individual generator or the generating facility (including generator/inverter/turbine, collector systems and auxiliary equipment) ⁸ .	Comments:	
PSS/E short circuit data representing the individual generator or the generating facility (include sequence impedances of generator/inverter/turbine, collector systems and auxiliary equipment). <ul style="list-style-type: none"> • Unsaturated values are required. Saturated values should also be provided if available. • Provide separately the sequence impedances for the collector system. • For type 3 and type 4 wind and PV solar inverters, also provide positive and negative sequence voltage and current relationships during the unbalanced fault conditions in a tabular format, separately. 	Sub-transient impedance ($R''+jX''$)	
	Transient impedance ($R'+jX'$)	
	Synchronous impedance ($R+jX$)	
	Positive sequence impedance (R_1+jX_1)	
	Negative sequence impedance (R_2+jX_2)	
	Zero sequence impedance (R_0+jX_0)	

⁷ Request current PSS/E version format from SaskPower.

⁸ For a generating facility ≤1MW, data is not required during initial submission.

GENERATOR/TURBINE/INVERTER DATA (to be filled out separately for each different type of generator)

GENERATOR/INVERTER DATA – CHARACTERISTICS:

<p>For inverter-based generation provide:</p>	<p>Minimum Grid Short Circuit Ratio (SCR) required for stable operation:</p>	
<p>PSS/E dynamic models representing the individual generator or the generating facility (including generator/turbine/inverter, applicable protection and controls, auxiliary equipment, and collector system)⁸.</p>	<p>The Interconnection Customer must provide a PSS/E standard library model suitable for use in dynamics studies using the PSS/E engineering simulation program.</p> <p>Refer to below link for the acceptable models list: Generator Owner Data Requirement and Reporting Procedure</p> <p>A vendor specific User-Defined model is also required to be provided.</p> <p>The models representing the generator/inverter, auxiliary equipment performances must meet or exceed the performance requirements in SaskPower Generation Interconnection Requirement.</p>	
<p>For inverter-based generation with an aggregate installed capacity of greater than 20 MVA, a preliminary electromagnetic transient simulation model in PSCAD software⁹ is required to be submitted along with the interconnection service request:</p> <p>For all other generation, PSCAD model will be requested by SaskPower during the interconnection study process.</p>	<p>The PSCAD model must be provided as per SaskPower's PSCAD model submittal guideline which is available upon request.</p>	
<p>Data Required for Synchronous Machines¹⁰:</p> <ul style="list-style-type: none"> • Impedances expressed in per unit on machine base. • Unsaturated values are required. Saturated values should also be provided if available. 	<p>Rating of generator (MVA):</p>	
	<p>Power factor at rated output (%)</p>	
	<p>Speed (RPM)</p>	
	<p>Inertia constant (H) (Generator)</p>	
	<p>Inertia constant (H) (Prime mover)</p>	
	<p>Direct axis synchronous reactance (x_d)</p>	
	<p>Direct axis transient reactance (x'_d)</p>	
	<p>Direct axis sub-transient reactance (x''_d)</p>	
	<p>Quadrature axis synchronous reactance (x_q)</p>	
<p>Quadrature axis transient reactance (x'_q)</p>		

⁹ Request current PSCAD version format from SaskPower.

¹⁰ Not required for inverter based (e.g., PV solar, wind) generation

GENERATOR/TURBINE/INVERTER DATA (to be filled out separately for each different type of generator)

GENERATOR/INVERTER DATA – CHARACTERISTICS:

	Quadrature axis subtransient reactance (x''_q)	
	Open circuit direct axis transient time constant (T'_{do})	
	Short circuit direct axis transient time constant (T'_d)	
	Open circuit direct axis sub-transient time constant (T''_{do})	
	Short circuit direct axis sub-transient time constant (T''_d):	
	Quadrature axis transient time constant (T'_{qo})	
	Quadrature axis sub-transient time constant (T''_{qo})	
	Armature Resistance (R_a)	
	Stator leakage reactance (X_l)	
	Armature short circuit time constant (T_a)	
	Saturation factor at 1.0 per-unit flux	
	Saturation factor at 1.2 per-unit flux	
	K_{is} current multiplier for saturation calculation	
<p>Data Required for Induction Machines¹⁰:</p> <p>Impedances expressed in per unit on machine base.</p> <p>Include additional data if necessary.</p>	Rating of generator (MVA):	
	Power factor at rated output (%)	
	Speed (RPM)	
	Inertia constant (H) (Generator and prime mover)	
	Synchronous reactance (x)	
	Transient reactance (x')	
	Sub-transient reactance (x'')	
	Leakage reactance (x_l)	
	Open circuit transient time constant (T')	
	Open circuit sub-transient time constant (T'')	
	Per-unit flux (E_1)	
	Open Circuit Saturation Factor (E_1)	
	Per-unit flux (E_2)	
	Open Circuit Saturation Factor (E_2)	

GENERATOR/INVERTER DATA: VOLTAGE/REACTIVE POWER/POWER FACTOR CONTROL:			
Voltage control range (in per unit):		To	
Power factor control range (in per unit):		To	
Power factor or voltage regulator setting tolerance (%):			
For synchronous generators provide ¹⁰ :	1. A description of the excitation system (rotating brushless, static, etc.) and power system stabilizer ¹¹		
	2. An AVR/Exciter Laplace-domain control block diagram showing all control blocks with all time constants greater than or equal to 0.0085s, completely specifying the transfer function from the generator terminal voltage, and field current, to the generator field voltage		
For inverter-based generator/generating facility provide ¹² :	1. A description of voltage, reactive power, power factor control and, power oscillation damping control mode under continuous normal and abnormal voltage conditions 2. Dynamic model(s) representing the voltage, reactive power, power factor and power oscillation damping controls		

GENERATOR/INVERTER DATA: GOVERNOR/ACTIVE POWER/FREQUENCY CONTROL:	
For synchronous generators provide ¹⁰ :	1. A description of the proposed governor system ¹¹
	2. A Laplace-domain control block diagram showing all control blocks with all-time constants greater than or equal to 0.0085s, completely specifying the transfer function for the prime mover/governor system
For inverter-based generator/generating facility provide ¹² :	1. A description of active power frequency controls (fast-frequency control, primary frequency control and automatic generation control) 2. Dynamic model(s) representing the active power and frequency control (include fast-frequency control, primary frequency control)
For sites with fluctuations (such as wind, solar, etc.) in prime mover output provide:	1. A description of expected, and maximum frequency and magnitude variations in power output
	2. Rate at which unit output can increase or decrease:

¹¹ Specify excitation system, power system stabilizer, and governor data in PSS/E standard library model format. If they cannot be adequately modeled as PSS/E standard library model, the interconnection service requestor will also have to provide a vendor specific User Defined model suitable for dynamics studies created for the PSS/E engineering simulation program.

¹² Specify voltage/reactive power/power factor control, active power frequency control data in PSS/E standard library model format. If they cannot be adequately modeled as PSS/E standard library model, the interconnection service requestor will also have to provide a vendor specific User Defined model suitable for dynamics studies created for the PSS/E engineering simulation program.

GENERATOR STEP-UP (GSU) TRANSFORMER DATA:		
Rating ONAN/ONAF (MVA):		
Winding voltage (kV) and connections (Delta, Wye, Wye Gnd.):	HV winding (H)	Voltage: Connection:
	LV winding (L)	Voltage: Connection:
Positive sequence impedance: (% on ONAN base):		
Zero sequence impedance: (% on ONAN base):		
On-load tap range (if equipped):		
On-load tap step size (%):		
Off-load tap range:		
Off load tap step size (%):		

GENERATOR SUBSTATION MAIN STEP-UP TRANSFORMER¹³ DATA (if applicable), provide data in additional table(s) for more than one transformer if not identical:		
Rating ONAN/ONAF (MVA):		
Winding voltage (kV) and connections (Delta, Wye, Wye Gnd.):	HV winding (H)	Voltage: Connection:
	LV winding (L)	Voltage: Connection:
	Tertiary winding (T)	Voltage: Connection:
Positive sequence impedance(s): (H-L, H-T, L-T, % on ONAN base):		
Zero sequence impedance(s): (% on ONAN base):		

¹³ Transformer(s) stepping the high voltage side of the GSU to the voltage level at the point of interconnection.

On-load tap range (if equipped):	
On-load tap step size (%):	
Off-load tap range:	
Off load tap step size (%):	

GENERATOR SUBSTATION INTERRUPTING DEVICE:	
Type of HV interrupting device (circuit breaker, fuses, etc.):	
Interrupting rating (Amperes):	
Rated Interrupting Time (cycles):	
Type of LV interrupting device (circuit breaker, fuses, etc.):	
Interrupting rating (Amperes):	
Rated Interrupting Time (cycles):	

DRAWINGS:
General site location map showing land location of the generation plant facilities.
Site plan showing the station location, layout, and the point of interconnection (point of change of ownership) to the SaskPower system.
Station layout drawing for generation plant facilities.
Electrical single-line diagram of the generation plant electrical equipment and other associated facilities.
Protection and metering single-line drawing for generation plant facilities.
Plot of generator capability curves for plant and units: <ul style="list-style-type: none"> • Capability curves (e.g., MVar output vs. MW output) to account for any variation due to temperature (include curves for 0 deg C and 40 deg C) and/or other dependent variables (e.g., wind speeds, cooling agent temperature and pressure, etc.) if applicable. • For the wind turbine and PV solar generation, provide the plant capability curves (e.g., MVar output vs. MW output) at the HV side of the main substation transformer. • Illustration of reactive power capability as a function of voltage at the HV side of the main substation transformer. • Capability curves for plant and units to include rough operating zones or no operation zones (including hot temperatures and cold temperatures cut out, wind speed cut out etc.), if applicable. • Generator capability curves to identify automatic generation control capability or limitations, if applicable.
Plot of V curves for all synchronous generators ¹⁰ .
Plot of generator air-gap and open-circuit saturation curves and short circuit characteristic for all synchronous generators ¹⁰ .
Plot of off-nominal frequency capability and V/Hz characteristic for all generator/wind turbines/inverters.
Plot of off-nominal voltage capability for all generators/wind turbines/inverters.

OTHER DATA:	
<p>Any other relevant information for the purpose of facilitating interconnection to the SaskPower system. For example,</p> <ul style="list-style-type: none"> - any operating limits of each unit and plant - operating limits during simple cycle operation of a combined cycle generating facility. - operating and maintenance requirements, - backup generation/load requirements, load/generation interdependencies, processes, - expected capacity factor of the generating facility etc. 	
Information regarding any temporary interconnections to the SaskPower system.	
For wind and PV solar generation, provide projected wind/solar generation MW output data (1 year or more) with a resolution of 10 minutes or less.	
<p>Provide Geomagnetically Induced Current (GIC) modeling data for the station step-up transformer with HV winding connection Wye Grounded:</p> <ul style="list-style-type: none"> - Station Grounding resistance - Station transformer design (core/shell type, number of legs) - Transformer DC winding resistance 	
<p>Provide description of proposed modification:</p> <ul style="list-style-type: none"> - Provide additional details of proposed modification for the existing facility (e.g., generator, exciter and governor, wind turbine, inverter modification etc.) if not addressed in the above data tables. 	
<p>Generating Facility compliant with SaskPower's generation interconnection requirements¹⁴</p>	<input type="checkbox"/> Please submit a filled Appendix F (Confirmation of Compliance Agreement) of the SaskPower's generation interconnection requirements document.
<p>Generating Facility compliant with Supplemental Generation Interconnection Requirements¹⁵</p>	<input type="checkbox"/>
<p>For inverter-based resources, confirm whether inverters are compliant with the latest IEEE 1547¹⁶ standard and/or IEEE 2800¹⁷ standards?</p>	IEEE 1547 <input type="checkbox"/> IEEE 2800 <input type="checkbox"/>

¹⁴ [*SaskPower_Generator_Interconnection_Requirements.pdf \(oati.com\)](#)

¹⁵ [Generation Interconnection Requirements Supplement - Nov 16 2023.pdf \(oati.com\)](#)

¹⁶ IEEE Standard for Interconnection and Interoperability of Distributed Energy Resources with Associated Electric Power Systems Interfaces

Generation facilities must comply with applicable SaskPower standards, including but not limited to SaskPower's generation interconnection requirements¹⁴, supplemental generation interconnection requirements¹⁵, Electric Service Requirements¹⁸, and adopted NERC standards in Saskatchewan¹⁹.

Contact Information:

- Please contact SaskPower via email: transmissionservices@saskpower.com for any interconnection service request question and/or clarification.
- Please contact SaskPower via email: interconnectionsplanning@saskpower.com for any interconnection data question and/or clarification.

¹⁷ IEEE Standard for Interconnection and Interoperability of Inverter-Based Resources (IBRs) Interconnecting with Associated Transmission Electric Power Systems

¹⁸ <https://www.saskpower.com/-/media/SaskPower/Accounts-and-Services/Service-Requests/Guide-ElectricalInspections-ServiceRequirements.ashx>

¹⁹ <http://www.sera-sk.ca/resources/>