Appendix A
GENERATING FACILITY DATA

To GIP Attachment 2
Interconnection Request

Provide two copies of this completed form pursuant to Section 7 of GIP Attachment 2.

1. **Provide two original prints and one reproducible copy (no larger than 36" x 24") of the following:**

   A. Site drawing to scale, showing generator location and Point of Interconnection with the CAISO Controlled Grid.
   B. Single-line diagram showing applicable equipment such as generating units, step- up transformers, auxiliary transformers, switches/disconnects of the proposed interconnection, including the required protection devices and circuit breakers. For wind and photovoltaic generator plants, the one line diagram should include the distribution lines connecting the various groups of generating units, the generator capacitor banks, the step up transformers, the distribution lines, and the substation transformers and capacitor banks at the Point of Interconnection with the CAISO Controlled Grid.

2. Generating Facility Information

A. Total Generating Facility rated output (MW): _____

B. Generating Facility auxiliary Load (MW): _____

C. Project net capacity (A-B)(MW): _____

D. Standby Load when Generating Facility is off-line (MW): _____

E. Number of Generating Units: _____
(Please repeat the following items for each generator)

F. Individual generator rated output (MW for each unit): _____

G. Manufacturer: _____

H. Year Manufactured: _____

I. Nominal Terminal Voltage (kV): _____

J. Rated Power Factor (%): _____

K. Type (Induction, Synchronous, D.C. with Inverter): _____

L. Phase (three phase or single phase): _____

M. Connection (Delta, Grounded WYE, Ungrounded WYE, impedance grounded): _____

N. Generator Voltage Regulation Range (+/- %): _____

O. Generator Power Factor Regulation Range: _____

P. For combined cycle plants, specify the plant net output capacity (MW) for an outage of the steam turbine or an outage of a single combustion turbine _____

3. Synchronous Generator – General Information:

(Please repeat the following for each generator model)

A. Rated Generator speed (rpm): _____

B. Rated MVA: _____

C. Rated Generator Power Factor: _____

D. Generator Efficiency at Rated Load (%): _____

E. Moment of Inertia (including prime mover): _____

F. Inertia Time Constant (on machine base) H: _____ Sec or MJ/MVA

G. SCR (Short-Circuit Ratio - the ratio of the field current required for rated open- circuitvoltage to the field current required for rated short-circuit current) _____

H. Please attach generator reactive capability curves.

I. Rated Hydrogen Cooling Pressure in psig (Steam Units only): _____

J. Please attach a plot of generator terminal voltage versus field current that shows the air gap line, the open-circuit saturation curve, and the saturation curve at full load and rated power factor.

4. Excitation System Information

(Please repeat the following for each generator model)

A. Manufacturer _____

Type of excitation system used for the generator _____

For exciter type, please choose from 1 to 9 below or describe the specific excitation system.

- (1) Rotating DC commutator exciter with continuously acting regulator. The regulator power source is independent of the generator terminal voltage and current.
- (2) Rotating DC commentator exciter with continuously acting regulator. The regulator power source is bus fed from the generator terminal voltage.
- (3) Rotating DC commutator exciter with non-continuously acting regulator (i.e., regulator adjustments are made in discrete increments).
- (4) Rotating AC Alternator Exciter with non-controlled (diode) rectifiers. The regulator power source is independent of the generator terminal voltage and current (not bus-fed).
- (5) Rotating AC Alternator Exciter with controlled (thyristor) rectifiers. The regulator power source is fed from the exciter output voltage.
- (6) Rotating AC Alternator Exciter with controlled (thyristor) rectifiers.
- (7) Static Exciter with controlled (thyristor) rectifiers. The regulator power source is bus-fed from the generator terminal voltage.
- (8) Static Exciter with controlled (thyristor) rectifiers. The regulator power source is bus-fed from a combination of generator terminal voltage and current (compound-source controlled rectifiers system.
- (9) Other (specify): _____

_____

B. Attach a copy of the block diagram of the excitation system from its instruction manual. The diagram should show the input, output, and all feedback loops of the excitation system.

C. Excitation system response ratio (ASA): _____

D. Full load rated exciter output voltage: _____

E. Maximum exciter output voltage (ceiling voltage): _____

F. Other comments regarding the excitation system?

_____

5. Power System Stabilizer Information

(Please repeat the following for each generator model. All new generators are required to install PSS unless an exemption has been obtained from WECC. Such an exemption can be obtained for units that do not have suitable excitation systems.)

A. Manufacturer: _____

B. Is the PSS ◉ digital or ◉ analog?

C. Note the input signal source for the PSS:

☐ Bus frequency ☐ Shaft speed ☐ Bus Voltage

☐ Other (specify source): _____

D. Please attach a copy of a block diagram of the PSS from the PSS Instruction Manual and the correspondence between dial settings and the time constants or PSS gain.

E: Other comments regarding the PSS? _____

6. Turbine-Governor Information

(Please repeat the following for each generator model)

Please complete Part A for steam, gas or combined-cycle turbines, Part B for hydro turbines, and Part C for both.

A. Steam, gas or combined-cycle turbines:

(1) Type of unit ◉ Steam ◉ Gas or ◉ Combined-cycle

(2) If steam or combined-cycle, does the turbine system have a reheat process (i.e., both high and low pressure turbines)? ◉ Yes ◉ No

(3) If steam with reheat process, or if combined-cycle, indicate in the space provided, the percent of full load power produced by each turbine:

Low pressure turbine or gas turbine: _____%

High pressure turbine or steam turbine: _____%

B. Hydro turbines:

(1) Turbine efficiency at rated load: _____%

(2) Length of penstock: _____ft

(3) Average cross-sectional area of the penstock: _____ft2

(4) Typical maximum head (vertical distance from the bottom of the penstock, at the gate, to the water level): ____ft

(5) Is the water supply run-of-the-river or reservoir: _____

(6) Water flow rate at the typical maximum head: _____ft3/sec

(7) Average energy rate:_____kW-hrs/acre-ft

(8) Estimated yearly energy production:_____kW-hrs

C. Complete this section for each machine, independent of the turbine type.

(1) Turbine manufacturer: _____

(2) Maximum turbine power output: _____MW

(3) Minimum turbine power output (while on line):_____MW

(4) Governor information:

(a) Droop setting (speed regulation):_____

(b) Is the governor mechanical-hydraulic or electro-hydraulic (Electro-hydraulic governors have an electronic speed sensor and transducer.)?_____

(c) Other comments regarding the turbine governor system?

_____

7. Induction Generator Data:

A. Rated Generator Power Factor at rated load: _____

B. Moment of Inertia (including prime mover): _____

C. Do you wish reclose blocking? ◉ Yes ◉ No

Note: Sufficient capacitance may be on the line now, or in the future, and the generator may self-excite unexpectedly.

8. Generator Short Circuit Data

For each generator model, provide the following reactances expressed in p.u. on the generator base:

- X"1 – positive sequence subtransient reactance: _____p.u**
- X2 – negative sequence reactance: _____p.u**
- X0 – zero sequence reactance:_____

Generator Grounding (select 1 for each model):

A. ☐ Solidly grounded

B. ☐ Grounded through an impedance

(Impedance value in p.u on generator base R:_____p.u. X: _____p.u.) C.

☐ Ungrounded

9. Step-Up Transformer Data

For each step-up transformer, fill out the data form provided in Table 1.

10. Interconnection Facilities Line Data

There is no need to provide data for new lines that are to be planned by the Participating TO. However, for transmission lines that are to be planned by the generation developer, please provide the following information:

- Nominal Voltage: _____kV
- Line Length: _____miles
- Line termination Points: _____
- Conductor Type: _____ Size:_____
- If bundled. Number per phase: _____
- Bundle spacing: _____in.
- Phase Configuration. Vertical: _____Horizontal: _____
- Phase Spacing: A-B: ____ft. B-C: _____ft. C-A: _____ft.
- Distance of lowest conductor to Ground at full load and 40 C:_____ft
- Ground Wire Type: _____ Size: _____
- Distance to Ground: _____ft (Attach Tower Configuration Diagram)
- Summer line ratings in amperes (normal and emergency) _____
- Positive Sequence Resistance (R): _____ p.u.** (for entire line length)
- Positive Sequence Reactance: (X): _____ p.u**(for entire line length)
- Zero Sequence Resistance (R0): _____ p.u.** (for entire line length)
- Zero Sequence Reactance: (X0): _____ p.u** (for entire line length)
- Line Charging (B/2): _____ p.u**

** *On 100-MVA and nominal line voltage (kV) Base*

10a. For Wind/photovoltaic plants, provide collector System Equivalence Impedance Data

Provide values for each equivalence collector circuit at all voltage levels.

- Nominal Voltage:_____
- Summer line ratings in amperes (normal and emergency) _____
- Positive Sequence Resistance (R1): _____p.u. ** (for entire line length of each collector circuit)
- Positive Sequence Reactance: (X1): _____ p.u** (for entire line length of each collector circuit)
- Zero Sequence Resistance (R0): _____ p.u. ** (for entire line length of each collector circuit)
- Zero Sequence Reactance: (X0): _____ p.u** (for entire line length of each collector circuit)
- Line Charging (B/2): _____ p.u** (for entire line length of each collector circuit)

** On 100-MVA and nominal line voltage (kV) Base

11. Wind Generators

Number of generators to be interconnected pursuant to this Interconnection Request:

Average Site Elevation:_____ ◉ Single Phase ◉ Three Phase

Inverter manufacturer, model name, number, and version:

_____

List of adjustable set points for the protective equipment or software:

- Field Volts: _____
- Field Amperes: _____
- Motoring Power (MW): _____
- Neutral Grounding Resistor (If Applicable): _____ I22t or K (Heating Time Constant)
- Rotor Resistance: _____
- Stator Resistance: _____
- Stator Reactance: _____
- Rotor Reactance: _____
- Magnetizing Reactance: _____
- Short Circuit Reactance: _____
- Exciting Current: _____
- Temperature Rise: _____
- Frame Size: _____
- Design Letter: _____
- Reactive Power Required In Vars (No Load): _____
- Reactive Power Required In Vars (Full Load): _____
- Total Rotating Inertia, H: _____Per Unit on 100 MVA Base

Note: A completed General Electric Company Power Systems Load Flow (PSLF) data sheet must be supplied with the Interconnection Request. If other data sheets are more appropriate to the proposed device then they shall be provided and discussed at Scoping Meeting.

12. Load Flow and Dynamic Models:

- **Provide load flow model for the generating plant and its interconnection facilities in GE PSLF *.epc format, including new buses, generators, transformers, interconnection facilities. An equivalent model is required for the plant with generation collector systems. This data should reflect the technical data provided in this Attachment A.**

For each generator, governor, exciter and power system stabilizer, select the appropriate dynamic model from the General Electric PSLF Program Manual and provide the required input data. The manual is available on the GE website at www.gepower.com. Select the following links within the website: 1) Our Businesses, 2) GE Power Systems, 3) Energy Consulting, 4) GE PSLF Software, 5) GE PSLF User's Manual. **Include any user written *.p EPCL files to simulate inverter based plants' dynamic responses (typically needed for inverter based PV/wind plants). Provide a completed *.dyd file that contains the information specified in this section.**

There are links within the GE PSLF User's Manual to detailed descriptions of specific models, a definition of each parameter, a list of the output channels, explanatory notes, and a control system block diagram. The block diagrams are also available on the CAISO Website.

If you require assistance in developing the models, we suggest you contact General Electric. Accurate models are important to obtain accurate study results. Costs associated with any changes in facility requirements that are due to differences between model data provided by the generation developer and the actual generator test data, may be the responsibility of the generation developer.

TABLE 1
TRANSFORMER DATA
(Provide for each level of transformation)

Unit_____
Number of Transformers_____ Phase_____

Rating	H Winding	X Winding	Y Winding
Rated MVA	_____	_____	_____
Connection (Delta, Wye, Gnd.)	_____	_____	_____
Cooling Type (OA, OA/FA, etc)	_____	_____	_____
Temperature Rise Rating	_____	_____	_____
Rated Voltage	_____	_____	_____
BIL	_____	_____	_____
Available Taps (% of rating)	_____	_____	_____
Load Tap Changer? (Y or N)	_____	_____	_____
Tap Settings	_____	_____	_____
Impedance			
Percent	_____	_____	_____
MVA Base	_____	_____	_____
Tested Taps	_____	_____	_____
Winding Resistance			
Ohms	_____	_____	_____

CURRENT TRANSFORMER RATIOS

H_____ X_____ Y_____ N_____

Percent exciting current at 100% Voltage _____ 110% Voltage _____

Supply copy of nameplate and manufacture's test report when available