

Appendix 3A
Generator Interconnection Study Documents and
Proof of Payment

Appendix 1 Interconnection Request
INTERCONNECTION REQUEST

Provide **three copies** of this completed form pursuant to Section 7 of this GIP Appendix 1 below.

1. The undersigned Interconnection Customer submits this request to interconnect its Generating Facility with the CAISO Controlled Grid pursuant to the CAISO Tariff (check one):
 - Fast Track Process.
 - Independent Study Process.
 - Queue Cluster Process.
 - One-Time Deliverability Assessment pursuant to GIP Section 8.1.
 - Annual Deliverability Assessment pursuant to GIP Section 8.

2. This Interconnection Request is for (check one):
 - A proposed new Generating Facility.
 - An increase in the generating capacity or a Material Modification to an existing Generating Facility.

3. Requested Deliverability Status is for (check one):
 - Full Capacity (For Independent Study Process and Queue Cluster Process only)
(Note – Deliverability analysis for Independent Study Process is conducted with the next annual Cluster Study – See GIP Section 4.6)
 - Energy Only

4. The Interconnection Customer provides the following information:
 - a. Address or location, including the county, of the proposed new Generating Facility site or, in the case of an existing Generating Facility, the name and specific location, including the county, of the existing Generating Facility;

Project Name: **Huntington Beach**

Project Location:
Street Address: **21730 Newland Street**
City, State: **Huntington Beach, California**
County: **Orange**
Zip Code: **92646**
GPS Coordinates (decimal format):
Latitude: **33.64540833** Longitude: **-117.9778917**

 - b. Maximum net megawatt electrical output (as defined by section 2.c of Attachment A to this appendix) of the proposed new Generating Facility or the amount of net megawatt increase in the generating capacity of an existing Generating Facility;

Maximum net megawatt electrical output (MW): **938.612 MW at 85 °F** **OR**
Net Megawatt increase (MW):

- c. Type of project (i.e., gas turbine, hydro, wind, etc.) and general description of the equipment configuration (if more than one type is chosen include net MW for each);

<input type="checkbox"/>	Cogeneration	(MW)
<input type="checkbox"/>	Reciprocating Engine	(MW)
<input type="checkbox"/>	Biomass	(MW)
<input type="checkbox"/>	Steam Turbine	(MW)
<input type="checkbox"/>	Gas Turbine	(MW)
<input type="checkbox"/>	Wind	(MW)
<input type="checkbox"/>	Hydro	(MW)
<input type="checkbox"/>	Photovoltaic	(MW)
<input checked="" type="checkbox"/>	Combined Cycle	938.612 (MW)
<input type="checkbox"/>	Other (please describe):	(MW)

General description of the equipment configuration (e.g. number, size, type, etc):

The project is comprised of two CCGT blocks (Block 1 and Block 2) having a maximum net output of 938.612 MW. Each block is comprised of 3 gas turbines rated at 113.825 MW, 119.815 MVA each and 1 steam turbine rated at 145.148 MW, 152.787 MVA.

- d. Proposed In-Service Date (first date transmission is needed to the facility), Trial Operation date and Commercial Operation Date by day, month, and year and term of service (**dates must be sequential**):

Proposed In-Service Date: **Block 1: 01/01/2017, Block 2: 01/01/2020**
Proposed Trial Operation Date: **Block 1: 06/01/2018, Block 2: 06/01/2021**
Proposed Commercial Operation Date: **Block 1: 01/01/2019, Block 2: 01/01/2022**
Proposed Term of Service (years): **30 years (All blocks)**

- e. Name, address, telephone number, and e-mail address of the Interconnection Customer's contact person (primary person who will be contacted);

Name: **John Kistle**
Title: **Project Development Team**
Company Name: **AES Southland**
Street Address: **690 N. Studebaker Road**
City, State: **Long Beach, California**
Zip Code: **90803**
Phone Number: **(562) 493-7894**
Fax Number:
Email Address: **John.Kistle@AES.com**
DUNS Number:

- f. Approximate location of the proposed Point of Interconnection (i.e., specify transmission facility interconnection point name, voltage level, and the location of interconnection);

230 kV Huntington Beach Switching Station as shown in attached Site Drawing.

- g. Interconnection Customer data (set forth in Attachment A)

The Interconnection Customer shall provide to the CAISO the technical data called for in GIP Appendix 1, Attachment A. Three (3) copies are required.

5. Applicable deposit amount as specified in the GIP made payable to California ISO. Send check to CAISO (see section 7 for details) along with the:
- a. Appendix 1 to GIP (Interconnection Request) for processing.
 - b. Attachment A to Appendix 1 (Interconnection Request Generating Facility Data).

6. Evidence of Site Exclusivity as specified in the GIP and name(s), address(es) and contact information of site owner(s) (check one):
Current Title Report is available upon request.

Site is an existing generating facility, wholly owned by AES.

Plant Manager: Weikko Wirta
21730 Newland Street
Huntington Beach, CA 92646
714-374-1421

- Is attached to this Interconnection Request
 Deposit in lieu of Site Exclusivity attached, Site Exclusivity will be provided at a later date in accordance with this GIP

7. This Interconnection Request shall be submitted to the CAISO representative indicated below:

New Resource Interconnection
California ISO
P.O. Box 639014
Folsom, CA 95763-9014

Overnight address: California ISO, Attn: Grid Assets, 250 Outcropping Way, Folsom, CA 95630

8. Representative of the Interconnection Customer to contact:

[To be completed by the Interconnection Customer]

Name: **Hala Ballouz, PE**
Title: **President**
Company Name: **Electric Power Engineers, Inc. (EPE)**
Street Address: **9433 Bee Caves Road, Building 3, Suite 210**
City, State: **Austin, Texas**
Zip Code: **78733**
Phone Number: **(512) 382-6700**
Fax Number: **(866) 379-3635**
Email Address: **hballouz@epeconsulting.com**

9. This Interconnection Request is submitted by:

Legal name of the Interconnection Customer:

By (signature): _____

Name (type or print):

Title:

Date:

**Attachment A Generating Facility Data
To GIP Appendix 1
Interconnection Request**

GENERATING FACILITY DATA

Provide three copies of this completed form pursuant to Section 7 of GIP Appendix 1.

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): **Gross: 973.246 MW at 85 °F and 95% PF**
 - B. Generating Facility auxiliary Load (MW): **34.634 MW at 85 °F**
 - C. Project net capacity (A-B)(MW): **938.612 MW at 85 °F and 95% PF**
 - D. Standby Load when Generating Facility is off-line (MW): **0.9**
 - E. Number of Generating Units: **2 blocks (each composed of 3 gas turbines and 1 steam turbine)**
(Please repeat the following items for each generator)
 - F. Individual generator rated output (MW for each unit):
Gas: 113.825 MW at 38.8°C rated coolant inlet temperature.
Steam: 145.148 MW at 38.8°C rated coolant inlet temperature.
 - G. Manufacturer: **BRUSH (for all generators)**
 - H. Year Manufactured: _____
 - I. Nominal Terminal Voltage (kV): **13.8 (for all generators)**
 - J. Rated Power Factor (%): **0.95 (for all generators)**
 - K. Type (Induction, Synchronous, D.C. with Inverter): **Synchronous (for all generators)**
 - L. Phase (three phase or single phase): **Three Phase (for all generators)**
 - M. Connection (Delta, Grounded WYE, Ungrounded WYE, impedance grounded):
Impedance grounded
 - N. Generator Voltage Regulation Range (+/- %):
Gas: +/- 10%,
Steam: Selectable from +/- 10% to +/- 25%.
 - O. Generator Power Factor Regulation Range:
Please refer to the attached generators PQ curves.
 - 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 **710.962 MW at 85 °F and 95% PF for 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): **3600 (for all generators)**
 - B. Rated MVA:

Gas: 119.815 MVA each,
Steam: 152.787 MVA each

- C. Rated Generator Power Factor: **0.95 (for all generators)**
- D. Generator Efficiency at Rated Load (%):
Gas: 98.62% each
Steam: 98.67% each
- E. Moment of Inertia (including prime mover):
42,707 kgm² for each Gas Turbine + Generator.
6102 kgm² for each Steam Turbine + Generator.
- F. Inertia Time Constant (on machine base) H:
1.28 kW sec/kVA for each gas turbine generator,
1.09 kW sec/kVA for each steam turbine generator sec or MJ/MVA
- G. SCR (Short-Circuit Ratio - the ratio of the field current required for rated open-circuit voltage to the field current required for rated short-circuit current): **Gas: 0.53 each,**
Steam: 0.49 each
- 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. Indicate the Manufacturer **Gas: ABB inc., Steam: Brush** and Type **Gas: UNITROL 6000, Steam: Brushless** 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 commutator 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):
Steam: as in #1 above.
Gas: Static Exciter with controlled (thyristors) rectifiers. The main power source for the Exciter is fed from an AC auxiliary source through a step down transformer
- 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):
Gas: 180% Ceiling Voltage; Steam: 2.4

- D. Full load rated exciter output voltage: **Gas: 145 VDC (Based on Generator Field Data provided); Steam: 174 VDC**
- E. Maximum exciter output voltage (ceiling voltage): **Gas: 263 VDC (Based on 180% Ceiling voltage requirement); Steam: 365 VDC**
- 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: **Gas: ABB; Steam: Brush**
- B. Is the PSS digital or analog? **Gas: Digital; Steam: Digital**
- C. Note the input signal source for the PSS:
 Bus frequency Shaft speed Bus Voltage
 Other (specify source):
Gas: Three phase generator CT's (Current Measurement);
Steam: Active Electrical Power Frequency & Generator Internal Voltage. Both
inputs derived from sensing transformer signals.
- 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) List type of unit (Steam, Gas, or Combined-cycle): **2 x Combined-cycle blocks (3 x Gas and 1 x Steam per block)**
 - (2) If steam or combined-cycle, does the turbine system have a reheat process (i.e., both high and low pressure turbines)? **Non- Reheat**
 - (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: **MHI for both Gas and Steam**
- (2) Maximum turbine power output: _____MW
- (3) Minimum turbine power output (while on line): _____MW
- (4) Governor information:
 - (a) Droop setting (speed regulation): **Gas: 4%, Steam: >4%**
 - (b) Is the governor mechanical-hydraulic or electro-hydraulic (Electro-hydraulic governors have an electronic speed sensor and transducer.)? **Electro-Hydraulic for both Gas and Steam**
 - (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:

- X¹ – positive sequence subtransient reactance: **Gas: 0.121, Steam: 0.14** p.u.**
- X² – negative sequence reactance: **Gas: 0.15, Steam: 0.182** p.u.**
- X⁰ – zero sequence reactance: **Gas: 0.082, Steam: 0.091** p.u.**

Generator Grounding (select 1 for each model):

- A. Solidly grounded
- B. Grounded through an impedance
(Impedance value in p.u. on generator base R: **614.66 on 100 MVA base (for all generators)** p.u. X: **249.95 on 100 MVA base (for all generators)** 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: **230kV**
 Line Length: **Block 1 two 3-phase lines, 0.22 Miles each**
Block 2 two 3-phase lines, 0.16 Miles each
 Line termination Points: _____
 Conductor Type: **ACSR** Size: **1033.5 kcmil**
 If bundled. Number per phase: _____, Bundle spacing: _____in.
 Phase Configuration. Vertical: **X**, Horizontal: _____
 Phase Spacing: A-B: **15ft.**, B-C: **15ft.**, C-A: **30ft.**
 Distance of lowest conductor to Ground at full load and 40°C: **44.8 ft**

Ground Wire Type: **AW** Size: **313.7** Distance to Ground: **49** ft
 Attach Tower Configuration Diagram
 Summer line ratings in amperes (normal and emergency) **Normal: 1001.5 Amps (x 2; two 3-phase lines per blocks); Emergency: 1057.5 Amps (x 2; two 3-phase lines per block)**
 Positive Sequence Resistance (R): **Block 1: 0.000038; Block 2: 0.000027** p.u.** (for entire line length)
 Positive Sequence Reactance: (X): **Block 1: 0.000308; Block 2: 0.000224** p.u.** (for entire line length)
 Zero Sequence Resistance (R0): **Block 1: 0.000157; Block 2: 0.000114** p.u.** (for entire line length)
 Zero Sequence Reactance: (X0): **Block 1: 0.001064; Block 2: 0.000774** p.u.** (for entire line length)
 Line Charging (B/2): **Block 1: 0.0003328; Block 2: 0.00024203** 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 Gas Generators (6 Identical Generators, 3 per Block)

NUMBER OF TRANSFORMERS 1 per Gas Generator

PHASE Three

RATING	H Winding	X Winding	Y Winding
Rated MVA	<u>73/96/120</u>	<u>73/96/120</u>	_____
Connection (Delta, Wye, Gnd.)	<u>Wye Grounded</u>	<u>Delta</u>	_____
Cooling Type (OA,OA/FA, etc) :	<u>ONAN/ONAF/O NAF</u>	<u>ONAN/ONAF/ON AF</u>	_____
Temperature Rise Rating	<u>65 °C</u>	<u>65 °C</u>	_____
Rated Voltage	<u>230</u>	<u>13.8</u>	_____
BIL	<u>900</u>	<u>95</u>	_____
Available Taps (% of rating)	<u>+/- 10%</u>	<u>N/A</u>	_____
Load Tap Changer? (Y or N)	<u>Y</u>	<u>N</u>	_____
Tap Settings		<u>N/A</u>	_____
IMPEDANCE	H-X	H-Y	X-Y
Percent	<u>10%</u>	_____	_____
MVA Base	<u>73</u>	_____	_____
Tested Taps	_____	_____	_____
WINDING RESISTANCE	H	X	Y
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

TABLE 1

TRANSFORMER DATA
 (Provide for each level of transformation)

UNIT Steam Generators (2 Identical Generators, 1 per Block)

NUMBER OF TRANSFORMERS 1 per Steam Generator

PHASE Three

RATING	H Winding	X Winding	Y Winding
Rated MVA	<u>93/123/153</u>	<u>93/123/153</u>	_____
Connection (Delta, Wye, Gnd.)	<u>Wye Grounded</u>	<u>Delta</u>	_____
Cooling Type (OA,OA/FA, etc) :	<u>ONAN/ONAF/O NAF</u>	<u>ONAN/ONAF/ON AF</u>	_____
Temperature Rise Rating	<u>65 °C</u>	<u>65 °C</u>	_____
Rated Voltage	<u>230</u>	<u>13.8</u>	_____
BIL	<u>900</u>	<u>95</u>	_____
Available Taps (% of rating)	<u>+/- 10%</u>	<u>N/A</u>	_____
Load Tap Changer? (Y or N)	<u>Y</u>	<u>N</u>	_____
Tap Settings		<u>N/A</u>	_____
IMPEDANCE	H-X	H-Y	X-Y
Percent	<u>10%</u>	_____	_____
MVA Base	<u>93</u>	_____	_____
Tested Taps	_____	_____	_____
WINDING RESISTANCE	H	X	Y
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

HUNTINGTON BEACH POWER PLANT

CAISO APPLICATION Supplemental Information:

Appendix 1:

6. AES Legal Structure

Attachment A:

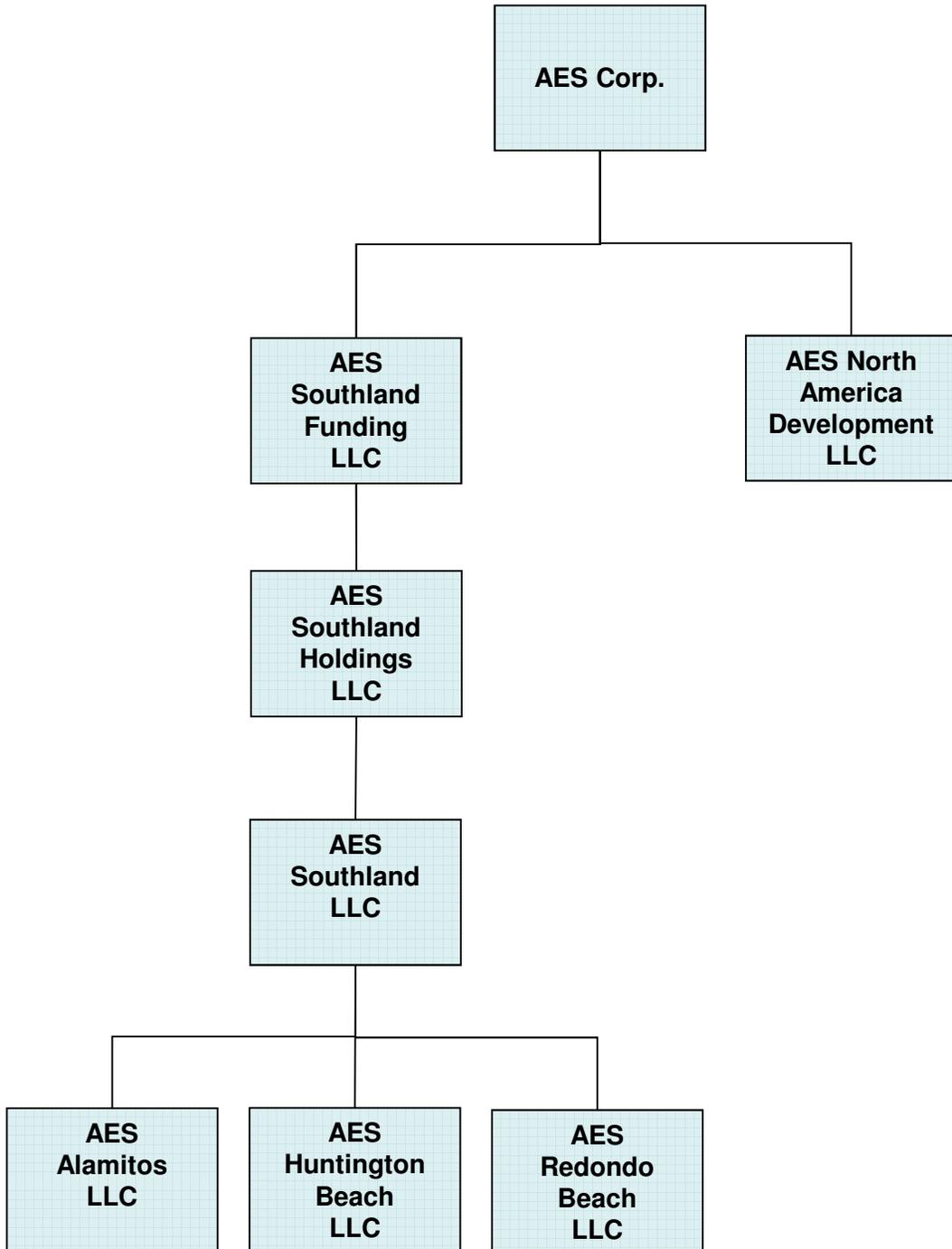
1.A. Project Site Drawing

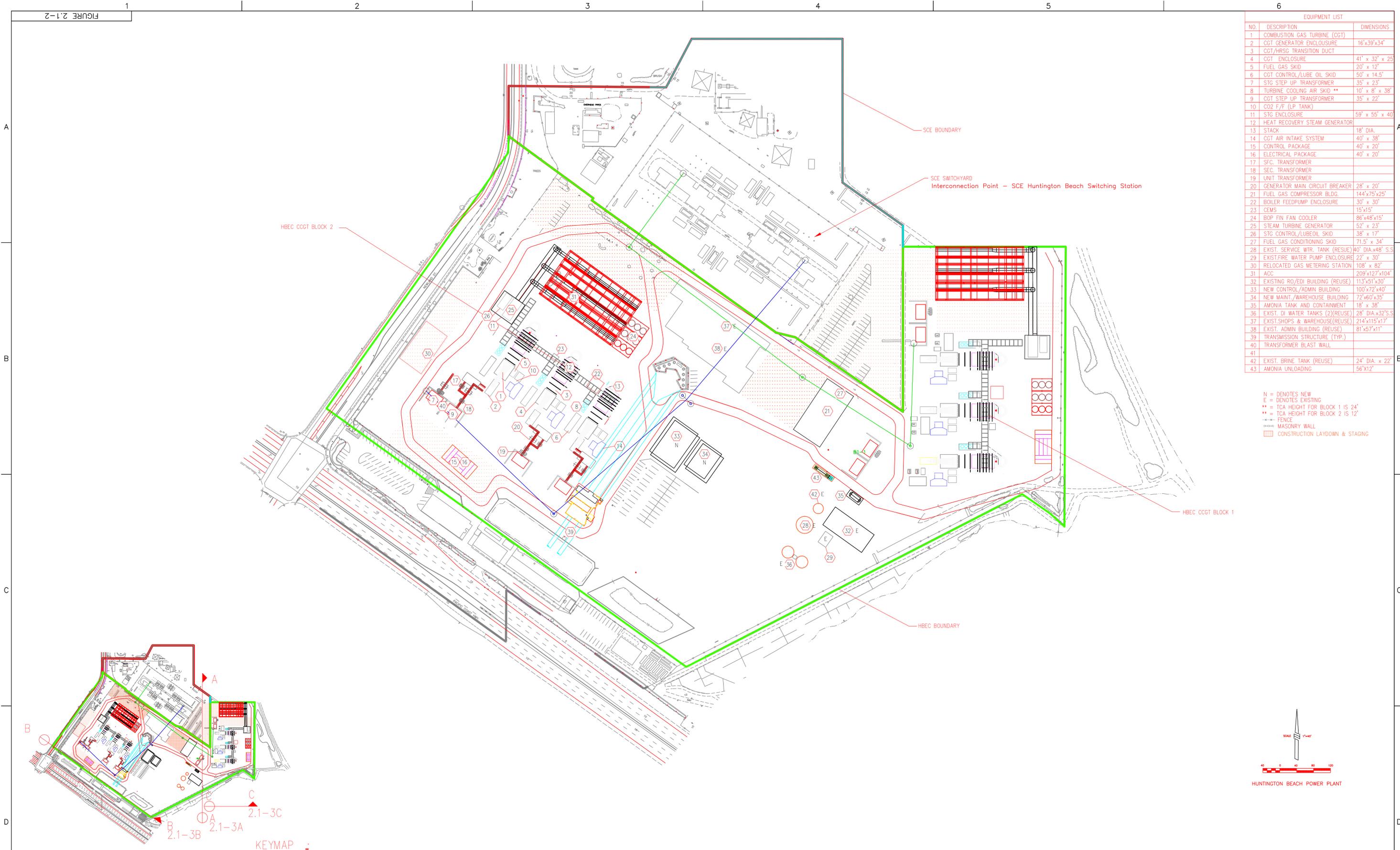
1.B. Project single line diagram

10. Transmission Tower Configuration Diagram

AES Legal Structure

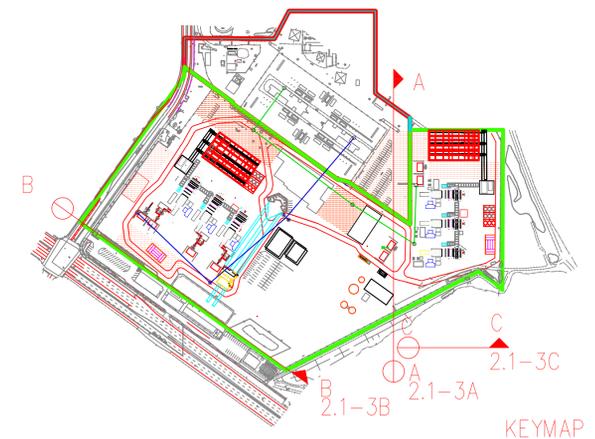
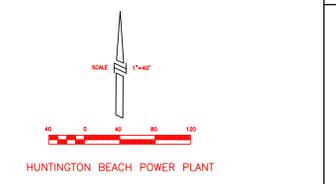
March 9, 2012





EQUIPMENT LIST		
NO.	DESCRIPTION	DIMENSIONS
1	COMBUSTION GAS TURBINE (CGT)	
2	CGT GENERATOR ENCLOSURE	16'x39'x34'
3	CGT/HRSG TRANSITION DUCT	
4	CGT ENCLOSURE	41' x 32' x 25'
5	FUEL GAS SKID	20' x 12'
6	CGT CONTROL/LUBE OIL SKID	50' x 14.5'
7	STG STEP UP TRANSFORMER	35' x 23'
8	TURBINE COOLING AIR SKID **	10' x 8' x 38'
9	CGT STEP UP TRANSFORMER	35' x 22'
10	CO2 F/F (LP TANK)	
11	STG ENCLOSURE	59' x 55' x 40'
12	HEAT RECOVERY STEAM GENERATOR	
13	STACK	18' DIA.
14	CGT AIR INTAKE SYSTEM	40' x 38'
15	CONTROL PACKAGE	40' x 20'
16	ELECTRICAL PACKAGE	40' x 20'
17	SFC TRANSFORMER	
18	SEC. TRANSFORMER	
19	UNIT TRANSFORMER	
20	GENERATOR MAIN CIRCUIT BREAKER	28' x 20'
21	FUEL GAS COMPRESSOR BLDG.	144'x75'x25'
22	BOILER FEEDPUMP ENCLOSURE	30' x 30'
23	CEMS	15'x15'
24	BOP FIN FAN COOLER	86'x48'x15'
25	STEAM TURBINE GENERATOR	52' x 23'
26	STG CONTROL/LUBE OIL SKID	38' x 17'
27	FUEL GAS CONDITIONING SKID	71.5' x 34'
28	EXIST. SERVICE WTR. TANK (REUSE)	40' DIA.x48' S.S
29	EXIST.FIRE WATER PUMP ENCLOSURE	22' x 30'
30	RELOCATED GAS METERING STATION	108' x 82'
31	ACC	209'x127'x104'
32	EXISTING RO/EDI BUILDING (REUSE)	113'x51'x30'
33	NEW CONTROL/ADMIN BUILDING	100'x72'x40'
34	NEW MAINT./WAREHOUSE BUILDING	72'x60'x35'
35	AMONIA TANK AND CONTAINMENT	18' x 38'
36	EXIST. DI WATER TANKS (2)(REUSE)	28' DIA.x32'S.S
37	EXIST.SHOPS & WAREHOUSE(REUSE)	214'x115'x17'
38	EXIST. ADMIN BUILDING (REUSE)	81'x57'x11'
39	TRANSMISSION STRUCTURE (TYP.)	
40	TRANSFORMER BLAST WALL	
41		
42	EXIST. BRINE TANK (REUSE)	24' DIA. x 22'
43	AMONIA UNLOADING	56'x12'

N = DENOTES NEW
 E = DENOTES EXISTING
 ** = TCA HEIGHT FOR BLOCK 1 IS 24'
 * = TCA HEIGHT FOR BLOCK 2 IS 12'
 --- FENCE
 --- MASONRY WALL
 --- CONSTRUCTION LAYDOWN & STAGING



REV	DATE	DESCRIPTION	DWN	DGN	CHK	APP
B	3/7/12	Updated transmission tie lines	TLI	HEM	HNB	HNB
	01-23-12		TCH	TCH	HL	HL

SCALE: AS NOTED

WARNING: IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

D SIZE 36"x24"

Power Engineers Collaborative, L.L.C.

216 South Jefferson Street Suite 103 Chicago, Illinois 60661

150 North Sunny Slope Road Suite 110 Brookfield, Wisconsin 53005

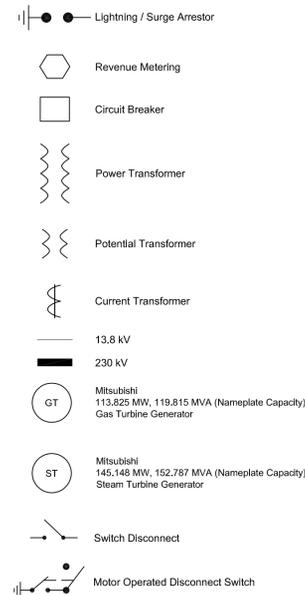
WWW.PECLLC.COM

HUNTINGTON BEACH ENERGY PROJECT
 HUNTINGTON BEACH, CA.

HUNTINGTON BEACH ENERGY PROJECT
 SITE DRAWING
 GENERAL ARRANGEMENT
 FIGURE2.1-2

DWG# _____ REV. _____

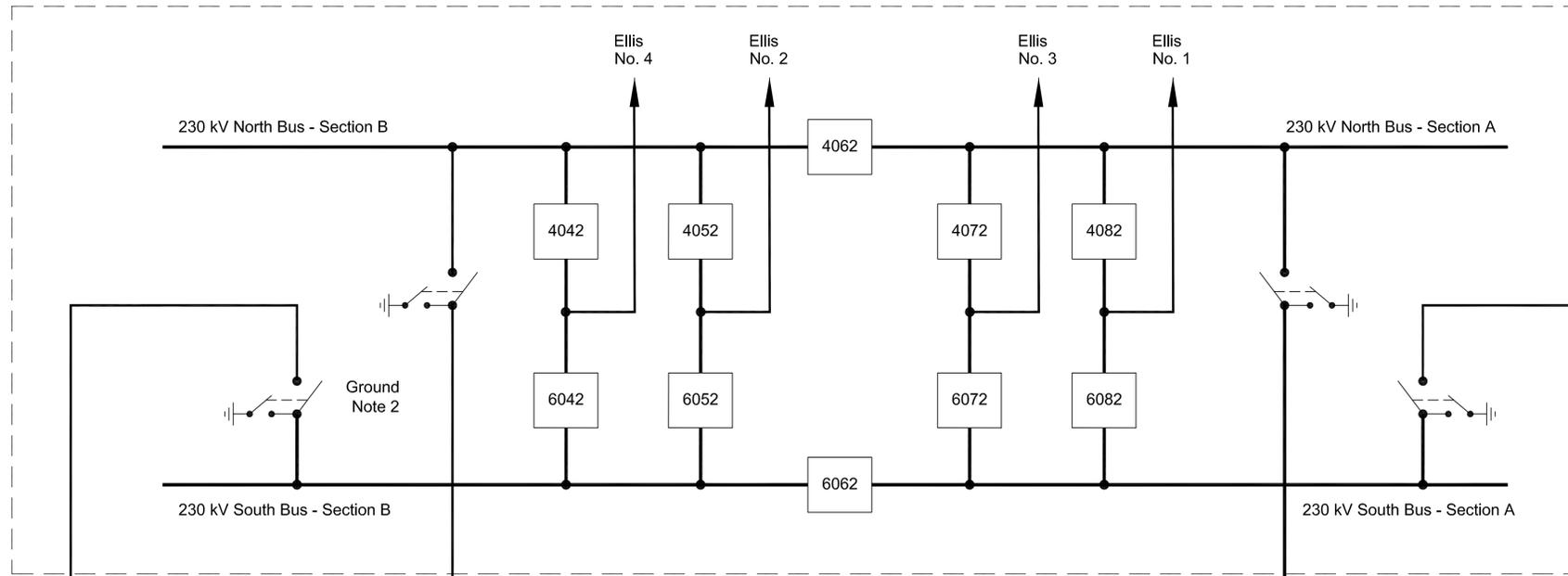
LEGEND



Notes:

1. Breakers shown in switching station are currently existing; rating TBD.
2. Ground is optional.
3. Total project size is 938.612 MW @ 95% PF (Net Capacity)

Southern California Edison (SCE)
230 kV Huntington Beach Switching Station

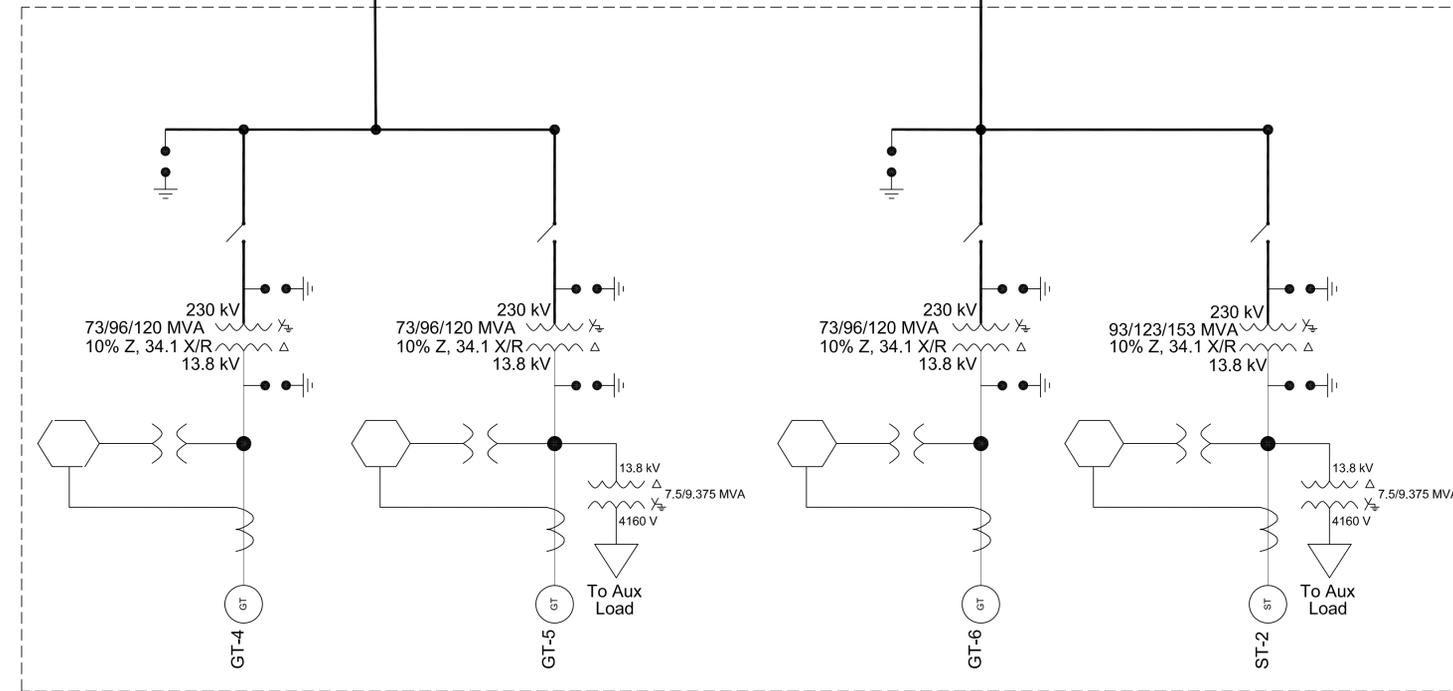
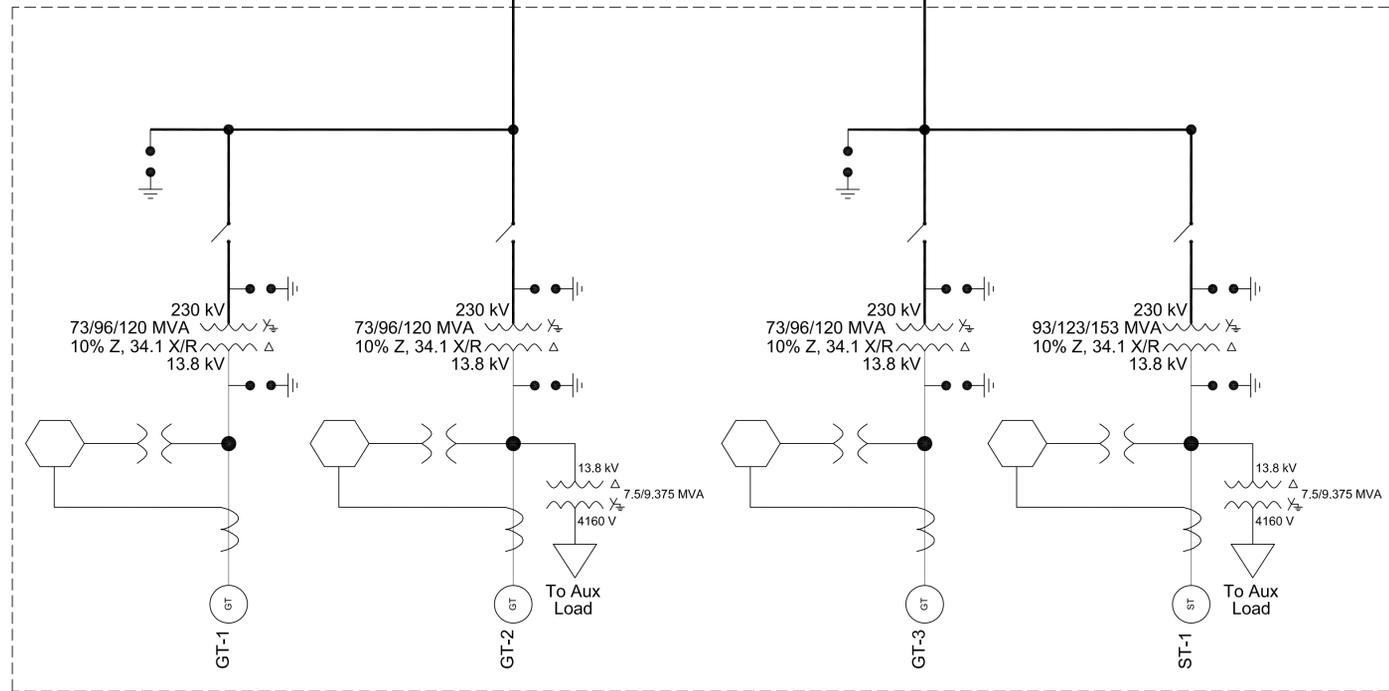


Transmission Tie Line, ~0.22 mile,
1033.5 ACSR
 $Z1 = 0.0.0908 + 0.7413 \Omega/\text{mile}$
 $Z0 = 0.3775 + 2.5591 \Omega/\text{mile}$

Transmission Tie Line, ~0.16 mile,
1033.5 ACSR
 $Z1 = 0.0.0908 + 0.7413 \Omega/\text{mile}$
 $Z0 = 0.3775 + 2.5591 \Omega/\text{mile}$

BLOCK 1:
470.006 MW (Net Capacity)

BLOCK 2:
470.006 MW (Net Capacity)



EPE ELECTRIC POWER ENGINEERS, INC.
Registration # 3386
9433 Bee Caves Rd, Building 3, Suite 210
Austin, TX 78733
Office: (512) 382-6700
Fax: (866) 379-3635
Email: hballouz@epeconsulting.com

This document is released for the purpose of preliminary design for generation interconnection under the authority of Hugo E. Mena, P.E. 110112 on 03/07/12. It is not to be used for construction and/or procurement process.



"The seal appearing on this document was authorized by Hugo E. Mena, P.E. 110112, on March 7, 2012."

DATE	REVISIONS

HUNTINGTON BEACH PROJECT

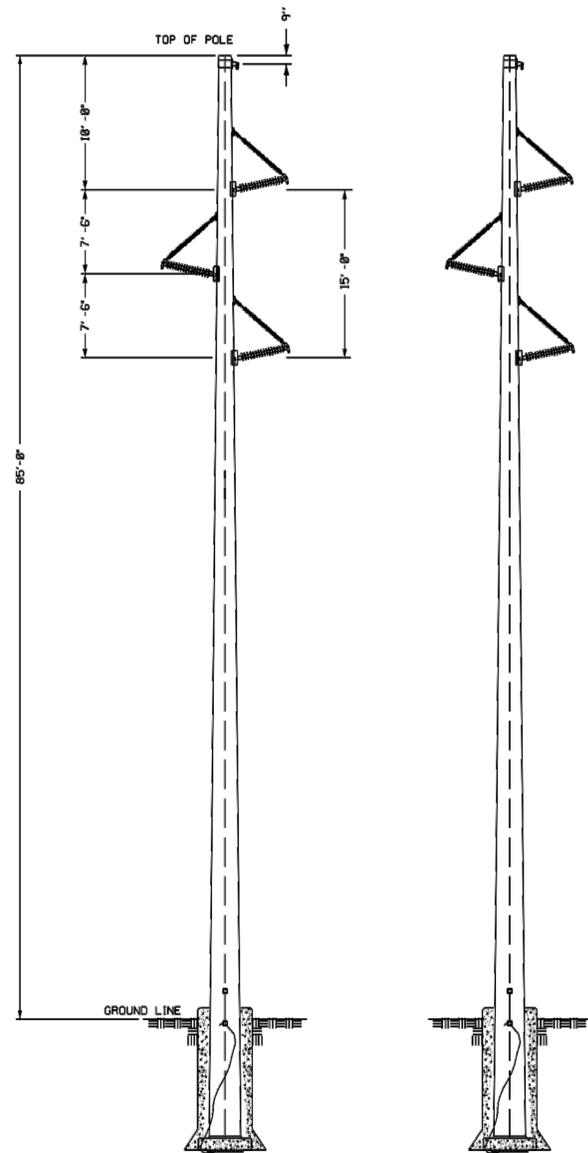
SIMPLIFIED ONE-LINE DIAGRAM
AES Southland

EPE ELECTRIC POWER ENGINEERS, INC.

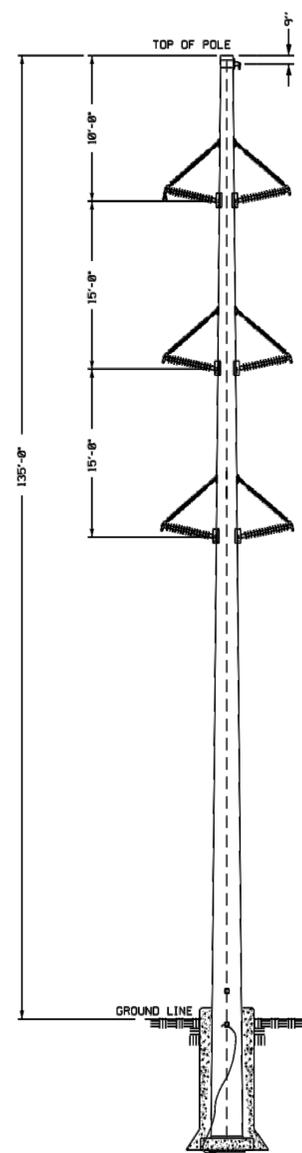
AUSTIN, TEXAS

FILENAME: Huntington_Beach_One_Line_Diagram.dwg

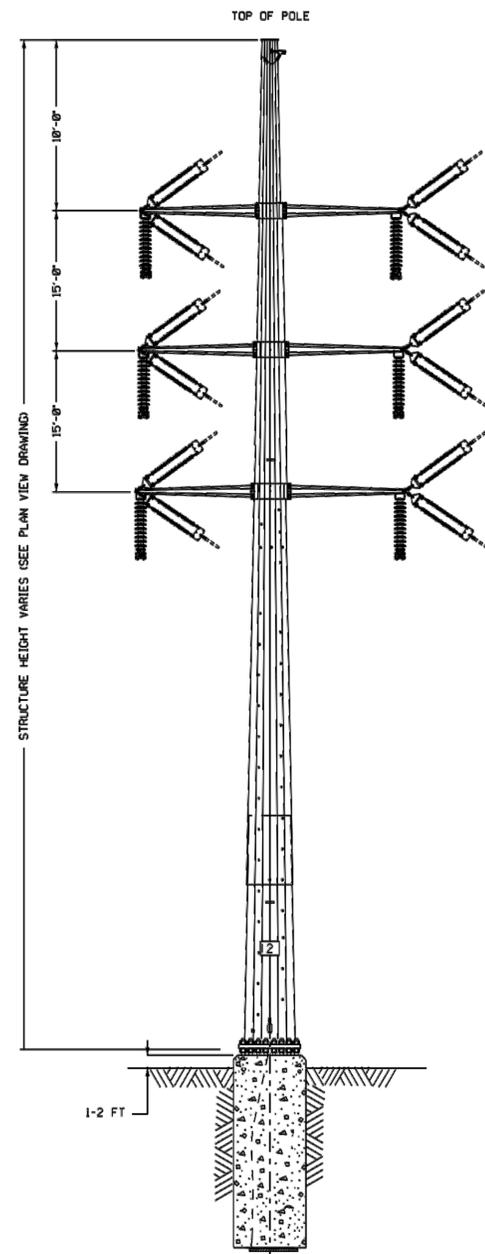
DWN BY: E.P.E. | DATE: 03/07/2012 | SCALE: NONE



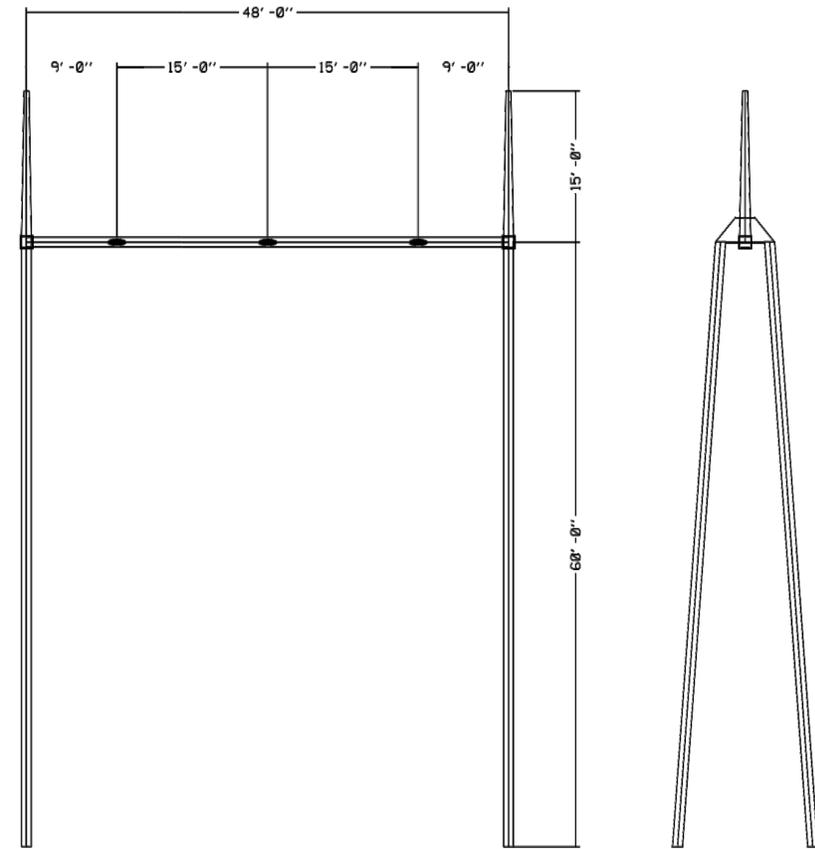
Single Circuit Braced Post Delta
Structures: B2 - 2A & 2B



Double Circuit Braced Post
Structures: B1 - 2



Double Circuit Dead End
Structures: B1 - 1, B1 - 3, B2 - 1



230kV 60' A-Frame Dead End

NOT TO SCALE

HUNTINGTON BEACH POWER PLANT

CAISO APPLICATION

Gas Generator:

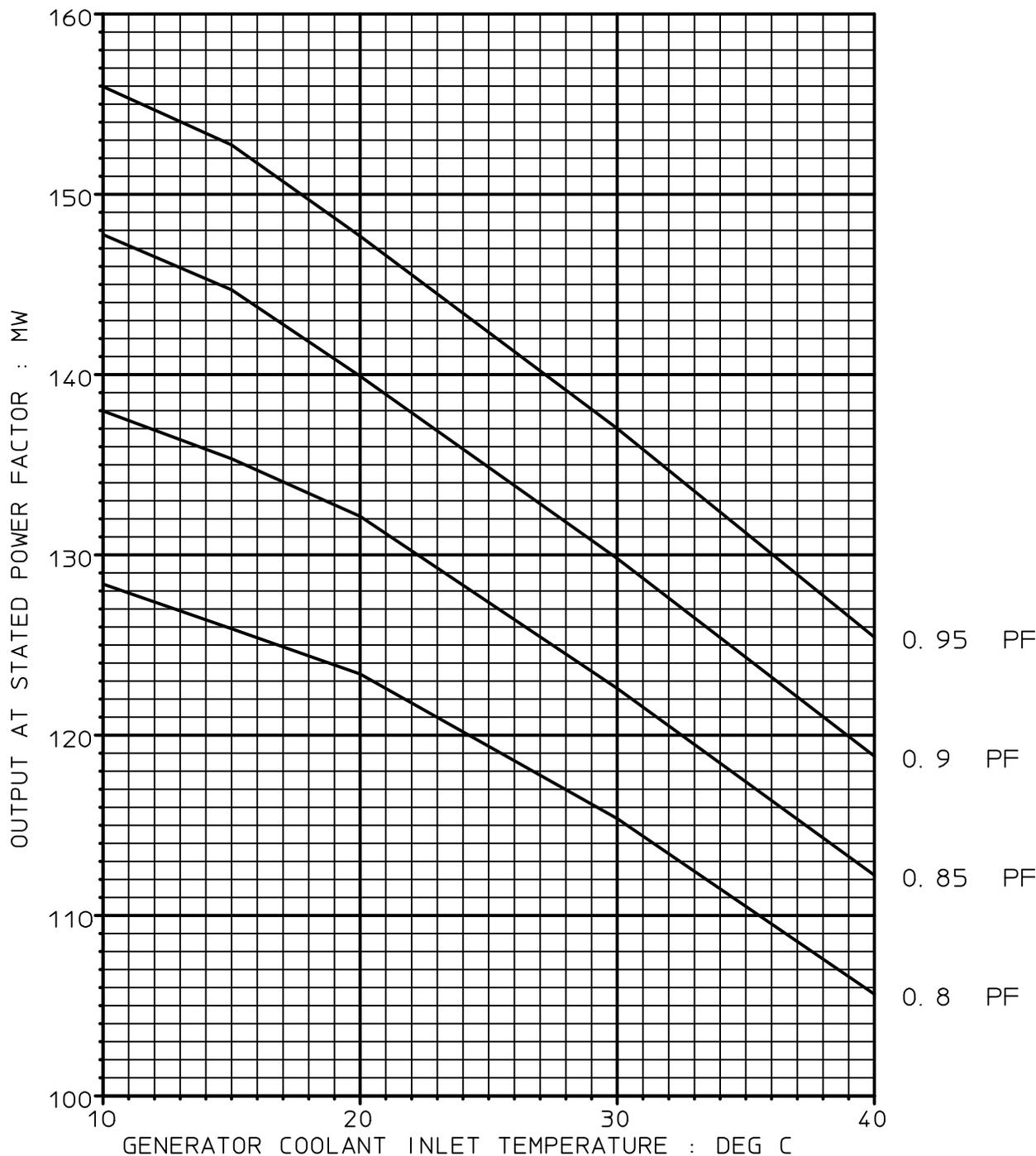
3.H. Reactive Capability Curves

3.J. Generator Terminal Voltage curves

4.B. Excitation System block diagram

5.D. PSS Block Diagram

VARIATION OF GENERATOR OUTPUT WITH COOLANT TEMP



YDAX 8-400ERH
13.80KV, 3 Ph, 60Hz.

Up to 1000 meters ASL

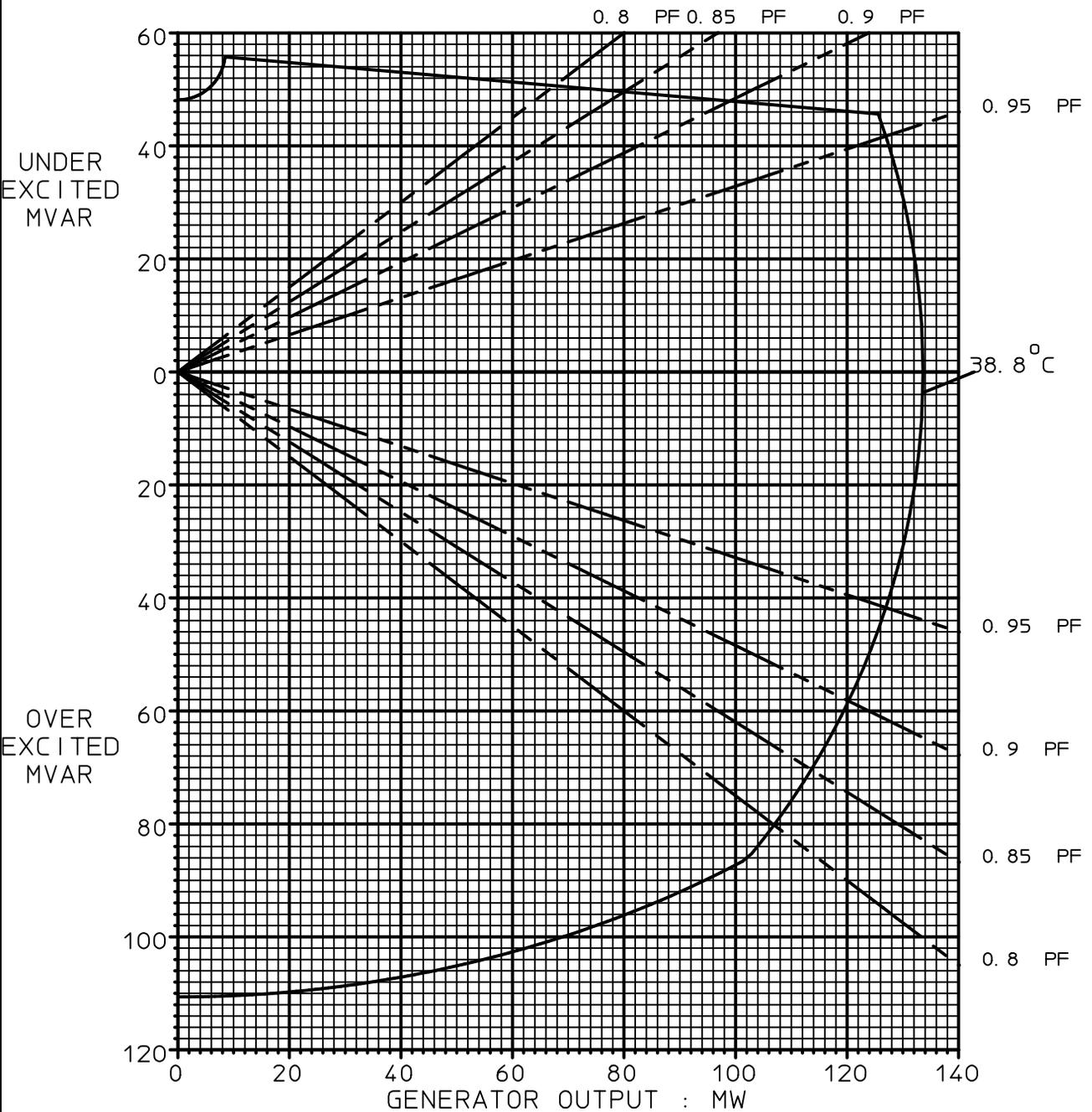
Coolant:

IN ACCORDANCE WITH
IEEE C50.13
Class B temperatures.

Total temperatures Stator 123 Deg C
Rotor 125 Deg C

Fresh Water

GENERATOR CAPABILITY DIAGRAM



YDAX 8-400ERH
13.80KV, 3 Ph, 60Hz.

Up to 1000 meters ASL

Coolant:

IN ACCORDANCE WITH
IEEE C50.13

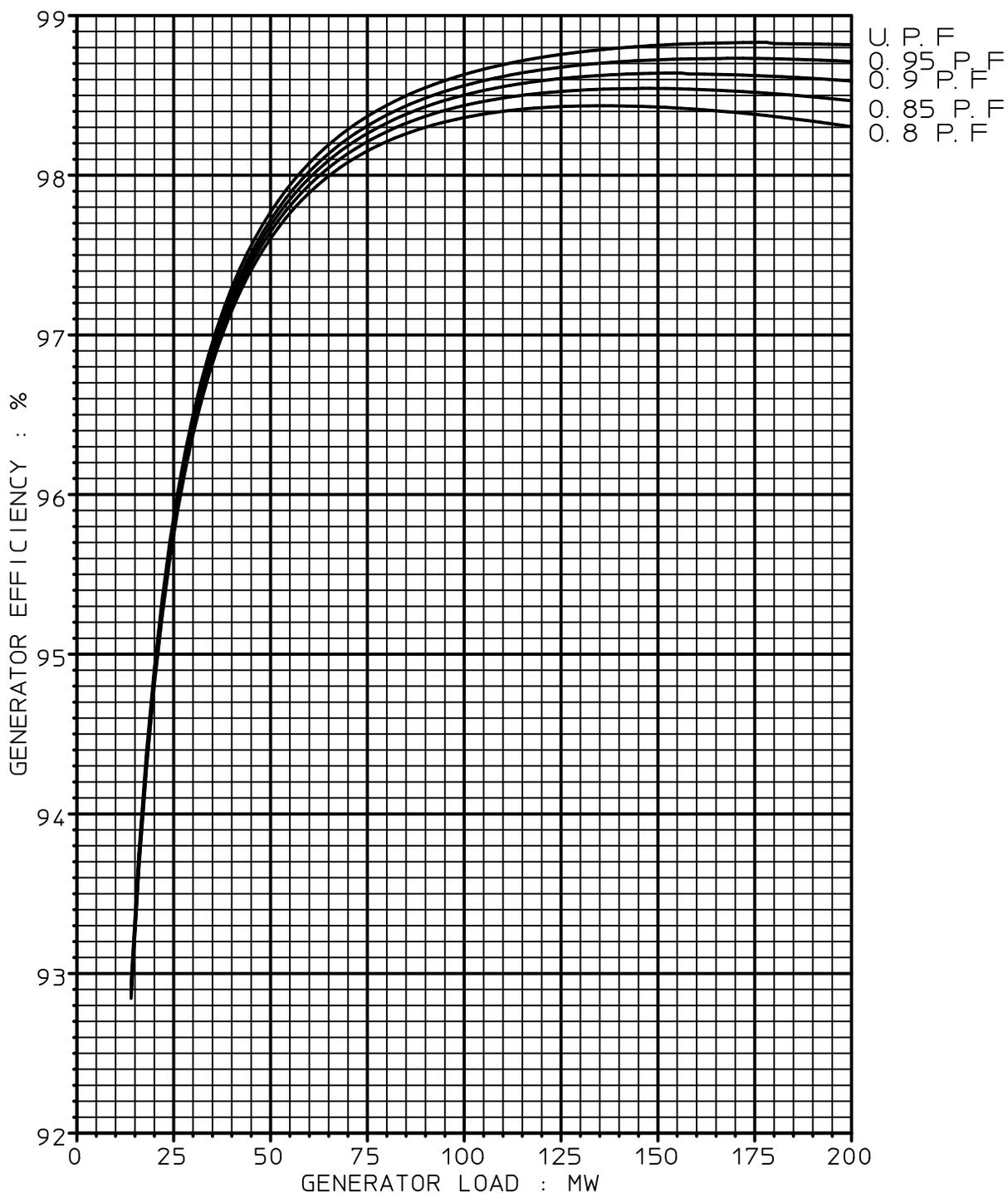
Class B temperatures.

Total temperatures Stator 123 Deg C

Rotor 125 Deg C

Fresh Water

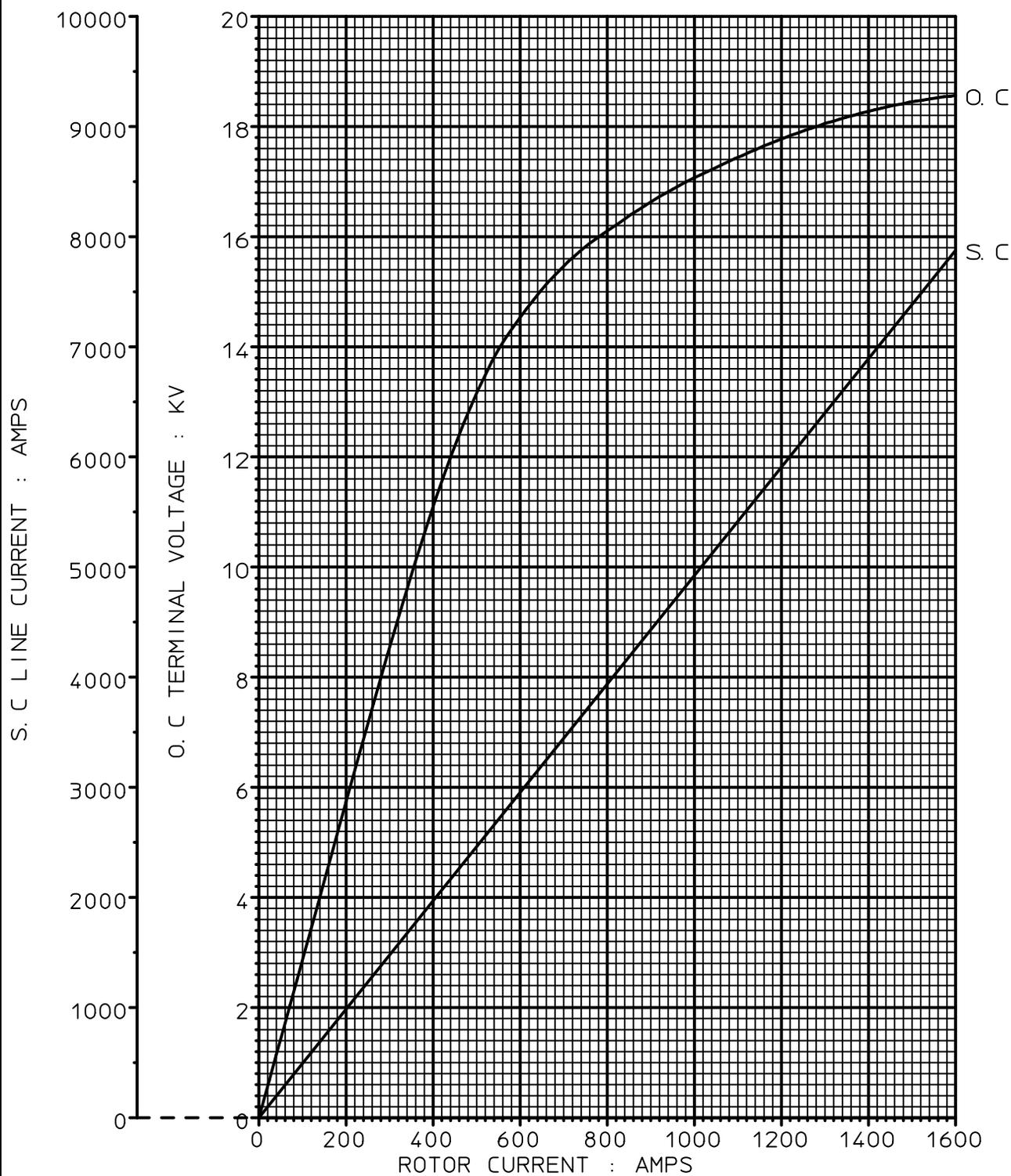
 VARIATION OF GENERATOR EFFICIENCY WITH LOAD



 YDAX 8-400ERH
 13.8 KV, 3 Ph, 60 Hz.

Efficiencies shown are guaranteed subject to the tolerance specified in IEC 60034-1.

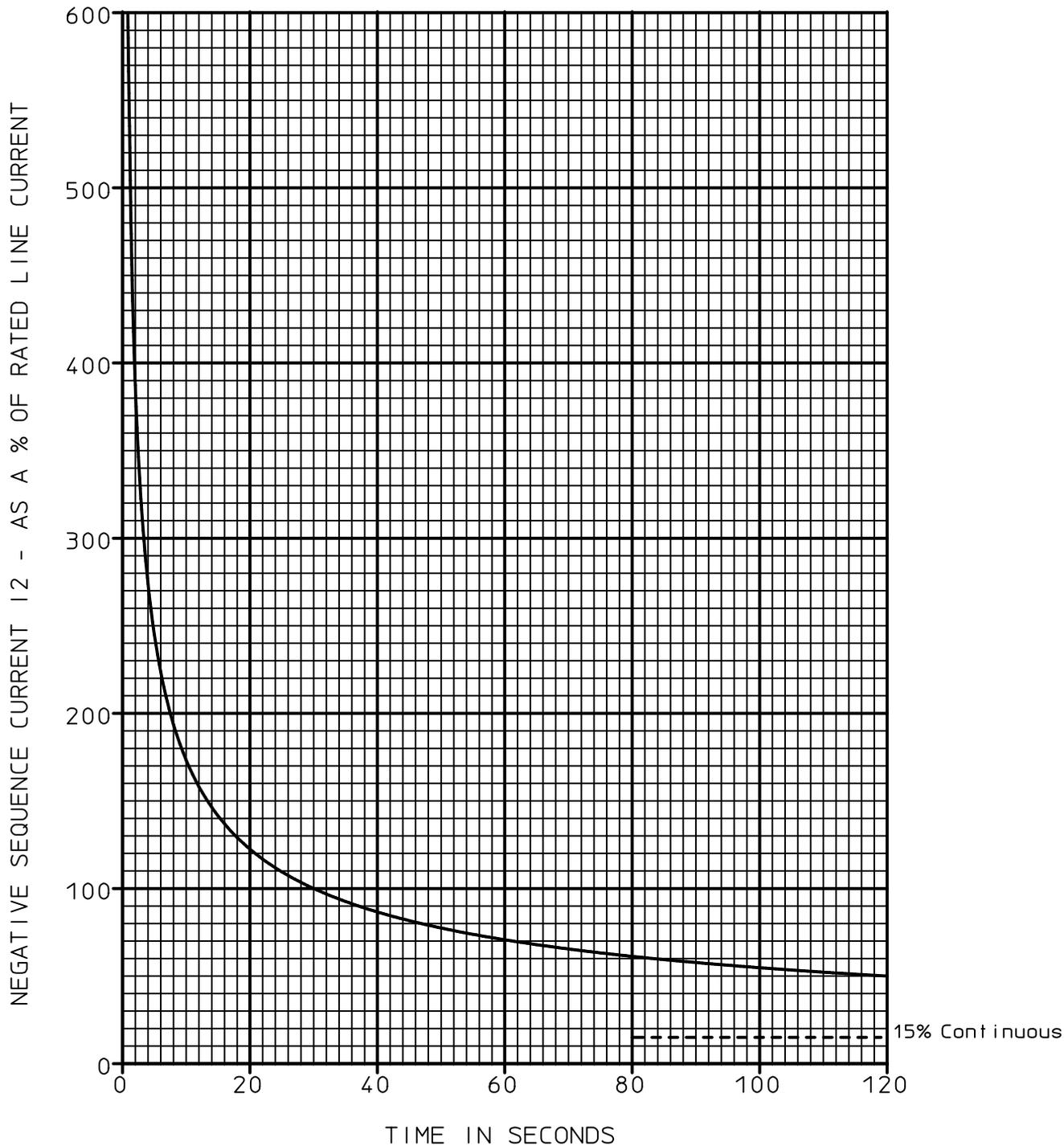
OPEN CIRCUIT AND SHORT CIRCUIT CHARACTERISTIC



YDAX 8-400ER
3Ph, 60Hz, 3600 RPM.

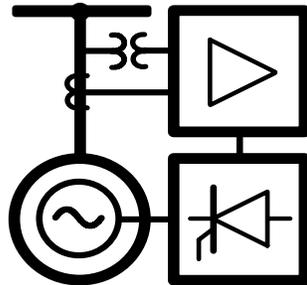
PERMISSIBLE DURATION OF NEGATIVE SEQUENCE CURRENT

$$\frac{I_2}{I_1} = 30$$



NOTE: For continuous operation rated current must not be exceeded in any one phase.

Unitrol® 6000



Static Excitation System Model Conversion to IEEE Type ST1A

Type des.	Unitrol 6000	Part no.			
Prep.	A. Tristan	2010-11-15	Doc.kind	Technical description	No. of p.
Appr.	P. Smulders	2010-11-22	Title	Static Excitation System Model Conversion to IEEE Type ST1A	4
Resp.dept.	DMPE				
ABB		ABB Inc.		Doc. no.	-
				Lang.	en
				Rev. ind.	-
				Page	1

1. UNITROL 6000 AVR PARAMETERS AND IEEE MODEL

The Unitrol 6000 Model for Static Excitation Systems is directly represented by the ST5B model as defined in IEEE Standard 421.5-2005. The introduction of this model into the IEEE standard is relatively recent and as a consequence, power system simulator software for modeling and analysis of excitation systems performance may not have the ST5B model included. Since the ST5B is a variation of the ST1A model (figure 1) the later can be used as an alternate model to represent the Unitrol 6000 static excitation system.

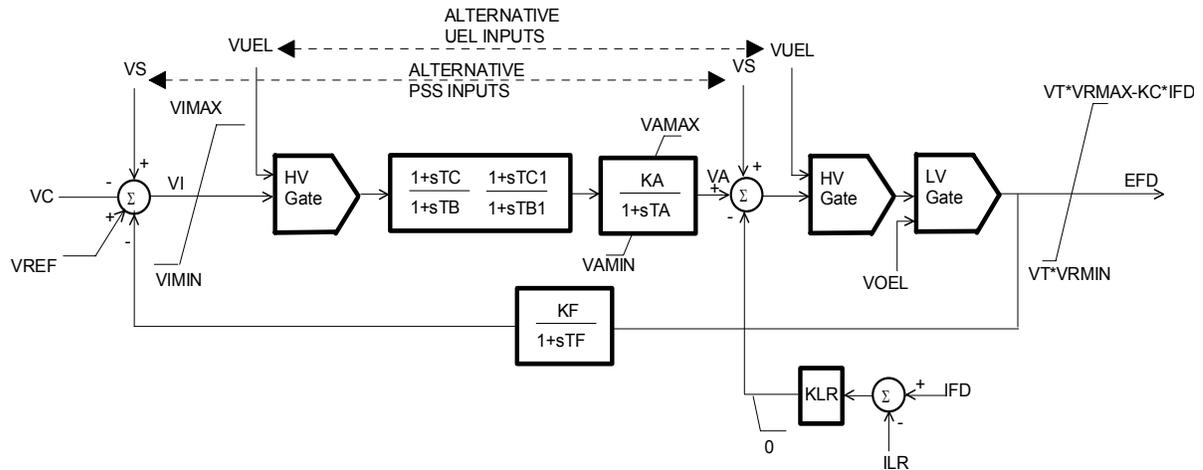


Figure 1 IEEE Model Type ST1A for Static Excitation

The following illustrates the conversion from Unitrol 6000 parameters to ST1A format

$$V_{RMax} = V_{Amax} = \text{Upper Ceiling Factor Limit} = 1.35 \cdot U_{ac} \cdot \cos(\alpha_{min}) / (I_{fAGL} \cdot U_{fn} / I_{fn}) \text{ [pu]}$$

$$V_{RMin} = V_{Amin} = \text{Lower Ceiling Factor Limit} = 1.35 \cdot U_{ac} \cdot \cos(\alpha_{max}) / (I_{fAGL} \cdot U_{fn} / I_{fn}) \text{ [pu]}$$

$$V_{IMax} \cong V_{RMax} / V_p \text{ [pu]}$$

$$V_{IMin} \cong V_{RMin} / V_p \text{ [pu]}$$

$$T_C = T_a \text{ [s]}$$

$$T_B = T_a (V_o / V_p) \text{ [s]}$$

$$T_{B1} = T_b (V_p / V_\infty) \text{ [s]}$$

$$T_{C1} = T_b \text{ [s]}$$

$$K_A = V_o \text{ [pu]}$$

$$T_A = T_s = 0.003s$$

$$K_F = 0.0 \text{ (not applicable to Unitrol)}$$

$$T_F = 0.001 \text{ (not applicable to Unitrol, but some programs do not accept 0.0)}$$

$$I_{LR} = 1.6 \cdot (I_{fn} / I_{fAGL}) \text{ [pu]}$$

$$K_{LR} \cong V_p \text{ (oel) [pu] (proportional gain of the Over-Excitation Limiter)}$$

K_C can be set to 0 since the excitation transformer calculation already considers the voltage drop caused by commutation overlap

V_T variable representing the generator terminal voltage (excitation is fed from generator terminals).

Abbreviations:

α_{\min}	: Minimum thyristor firing angle (typically 10deg)
α_{\max}	: Maximum thyristor firing angle (typically 150deg)
I_{fAGL}	: Field current on air gap line to give rated terminal voltage (@ no-load)
I_{fn}	: Nominal (rated) excitation current
U_{ac}	: Excitation transformer rated secondary voltage
U_{fn}	: Nominal (rated) excitation voltage
V_o	: PID AVR low frequency gain
V_p	: PID AVR proportional gain
V_{∞}	: PID AVR high frequency gain
T_a	: PID AVR time constant
T_b	: PID AVR time constant
$V_{p(oel)}$: PID Maximum Field Current Limiter proportional gain
T_s	: Converter time delay (power stage)

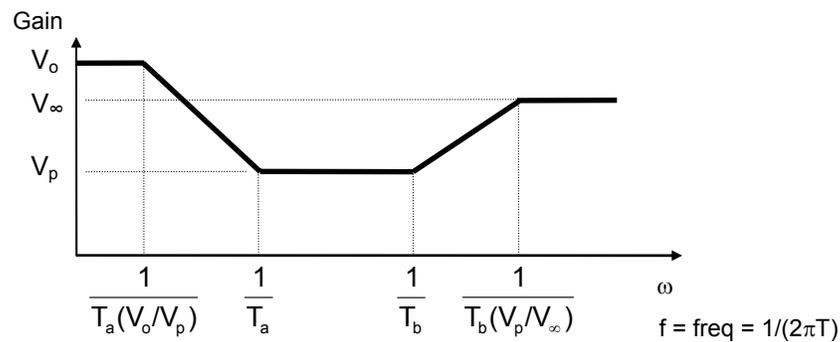


Figure 2 Unitrol 6000 PID-Filter characteristic

Unitrol 6000 parameter ranges		
Name	Description	Value range
UpperCeilingFactorLimit	Calculated automatically by software	-100..100
LowerCeilingFactorLimit	Calculated automatically by software	-100..100
vo	PID AVR low frequency gain	0.01..10000
vp	PID AVR proportional gain	0.01..10000
voo	PID AVR high frequency gain	0.01..10000
ta	PID AVR time constant	0..100 s
tb	PID AVR time constant	0..10 s
vp (oel)	PID Maximum Field Current Limiter proportional gain	0.01..10000

REVISION

Rev. ind.	Page (P) Chapt. (C)	Description	Date Dept./Init.

3 Power system stabilizer

3.1 Computer representation of IEEE PSS 2B

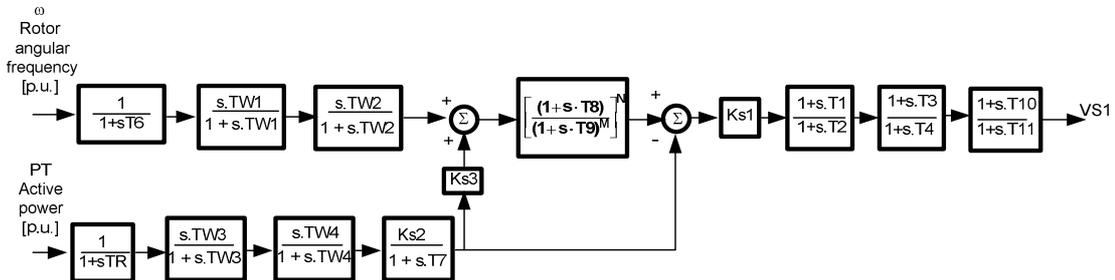


Figure 3-1: Computer representation of PSS2B according to IEEE 421.5 2005

Short model description of PSS2B (ref. to Figure 3-1)

The model consists of the following sub models:

- Calculation of driving power
- Filtering of torsional oscillations and noise components
- Calculation of acceleration power
- Phase and gain conditioning for stabilizing signal

The required signals for the generations of stabilizing signals are the active power PT and the rotor angular frequency deviation.

Both signals are submitted to two wash-out stages which are provided for the elimination of steady state signal component.

An approach for the integral of electric power is obtained by applying the output of the second washout filter of power channel to a first order transfer function. The value T7 shall correspond washout time constants TW1, TW2, TW3 that are selected to allow the operation of the PSS in the frequency range of interest (e.g. >0.1 Hz). The constant Ks2 shall be equal to T7/(2H) in order to obtain a proper signal relationship for the calculation of the acceleration power.

Ks3 is provided for the fine scaling between signals coming from power and frequency channels. Normally Ks3 is equal to 1.

The integral of driving power is obtained from the summation of conditioned frequency signal and the calculated integral of electric power variation.

A selective low pass filter so called "ramp tracking filter" is provided for the suppression of high frequency components (e.g. shaft torsional oscillations).

The integral of acceleration power is calculated from the difference between integral of driving power and integral of electric power.

The conditioning network consisting of the gain Ks1 and three lead-lag stages are provided in order to achieve the required phase and gain compensation for the stabilizing signal. Finally the maximum and minimum amplitudes of stabilizing signal can be limited as well by individual and adjustable maximum and minimum adjustable limitation parameters (ref. PSS control logic).

3.2 Parameter list of PSS2B

Parameter	Description	Unit	Standard settings	Proposed setting
TW1,TW2	Wash out time constants	s	2.0	
TW3,TW4	Wash out time constants	s	2.0	
Ks1	PSS gain factor	p.u.	5.0	
Ks2	Compensation factor for calculation of integral of electric power	p.u.	0.2	
Ks3	Signal matching factor	p.u.	1.0	
T1,T3,T10	Lead time constants of conditioning network	s	0.20 0.36 0.01	
T2,T4,T11	Lag time constants of conditioning network	s	0.04 0.12 0.01	
TR	Active power transducer time constant	s	0.02	0.02
T6	Rotor angular frequency deviation transducer time constant	s	0.02	0.02
T7	Time constant for integral of electric power calculation	s	2.0	
T8	Ramp tracking filter time constant	s	0.0	
T9	Ramp tracking filter time constant	s	1.0	
M	Ramp tracking filter degree	-	5	
N	Ramp tracking filter degree	-	1	

3.3 Correspondence between model parameters and equipmet settings

Parameter	Equipment settings correspondece for PSS2B
TR and T6	No correspondence, constant values
TW1	Reg_PSS_IEEE_2B.TW1
TW2	Reg_PSS_IEEE_2B.TW2
TW3	Reg_PSS_IEEE_2B.TW3
TW4	Reg_PSS_IEEE_2B.TW4
Ks1	Reg_PSS_IEEE_2B.Ks1
Ks2	Reg_PSS_IEEE_2B.Ks2
Ks3	Reg_PSS_IEEE_2B.Ks3
T1	Reg_PSS_IEEE_2B.T1
T2	Reg_PSS_IEEE_2B.T2
T3	Reg_PSS_IEEE_2B.T3
T4	Reg_PSS_IEEE_2B.T4
T7	Reg_PSS_IEEE_2B.T7
T8	Reg_PSS_IEEE_2B.T8
T9	Reg_PSS_IEEE_2B.T9
T10	Reg_PSS_IEEE_2B.T10
T11	Reg_PSS_IEEE_2B.T11
M	Reg_PSS_IEEE_2B.m
N	Reg_PSS_IEEE_2B.n

HUNTINGTON BEACH POWER PLANT

CAISO APPLICATION

Steam Generator:

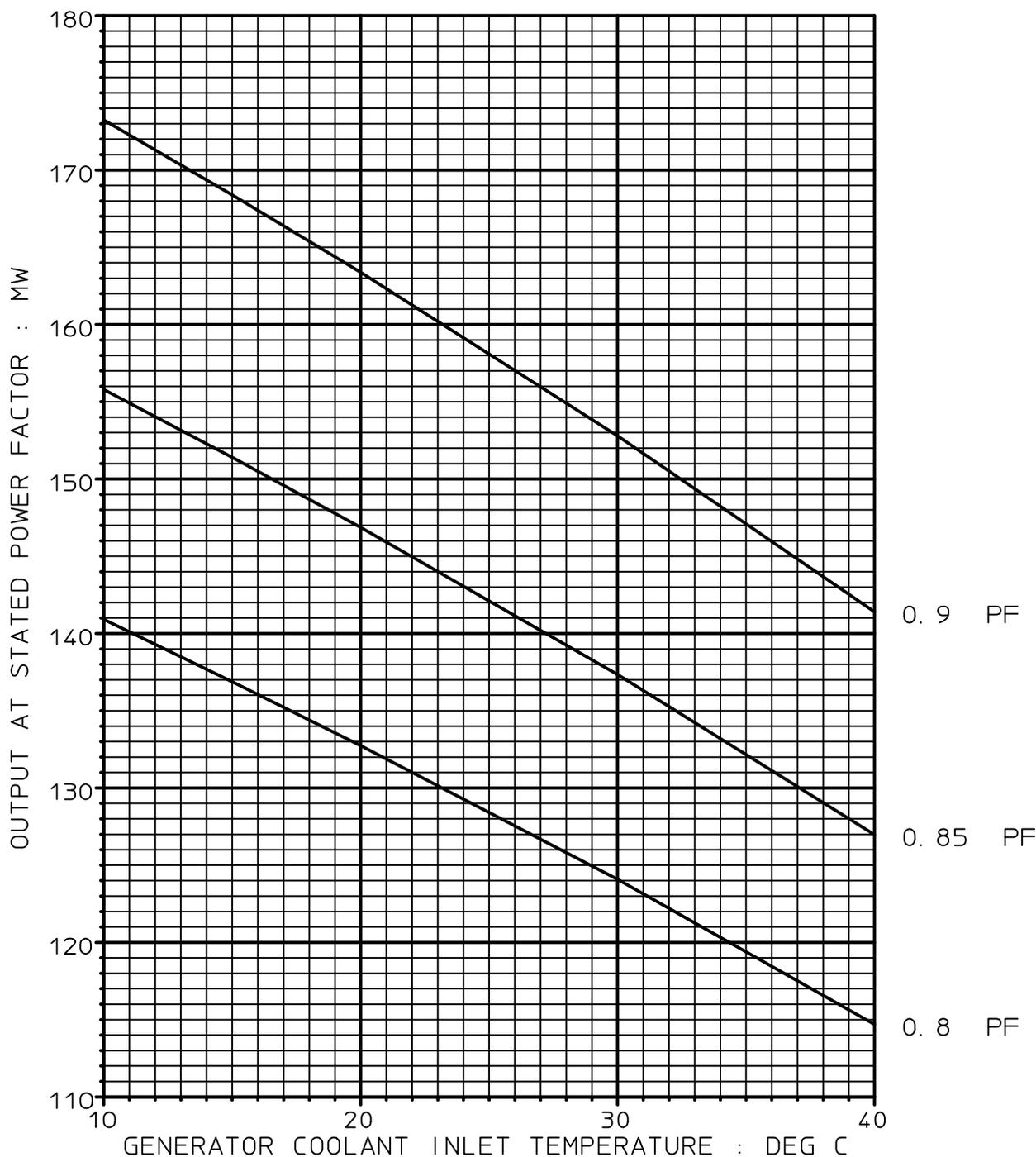
3.H. Reactive Capability Curves

3.J. Generator Terminal Voltage curves

4.B. Excitation System block diagram

5.D. PSS Block Diagram

VARIATION OF GENERATOR OUTPUT WITH COOLANT TEMP



BDAX 82-445ERH
13.80KV, 3 Ph, 60Hz.

Up to 1000 meters ASL

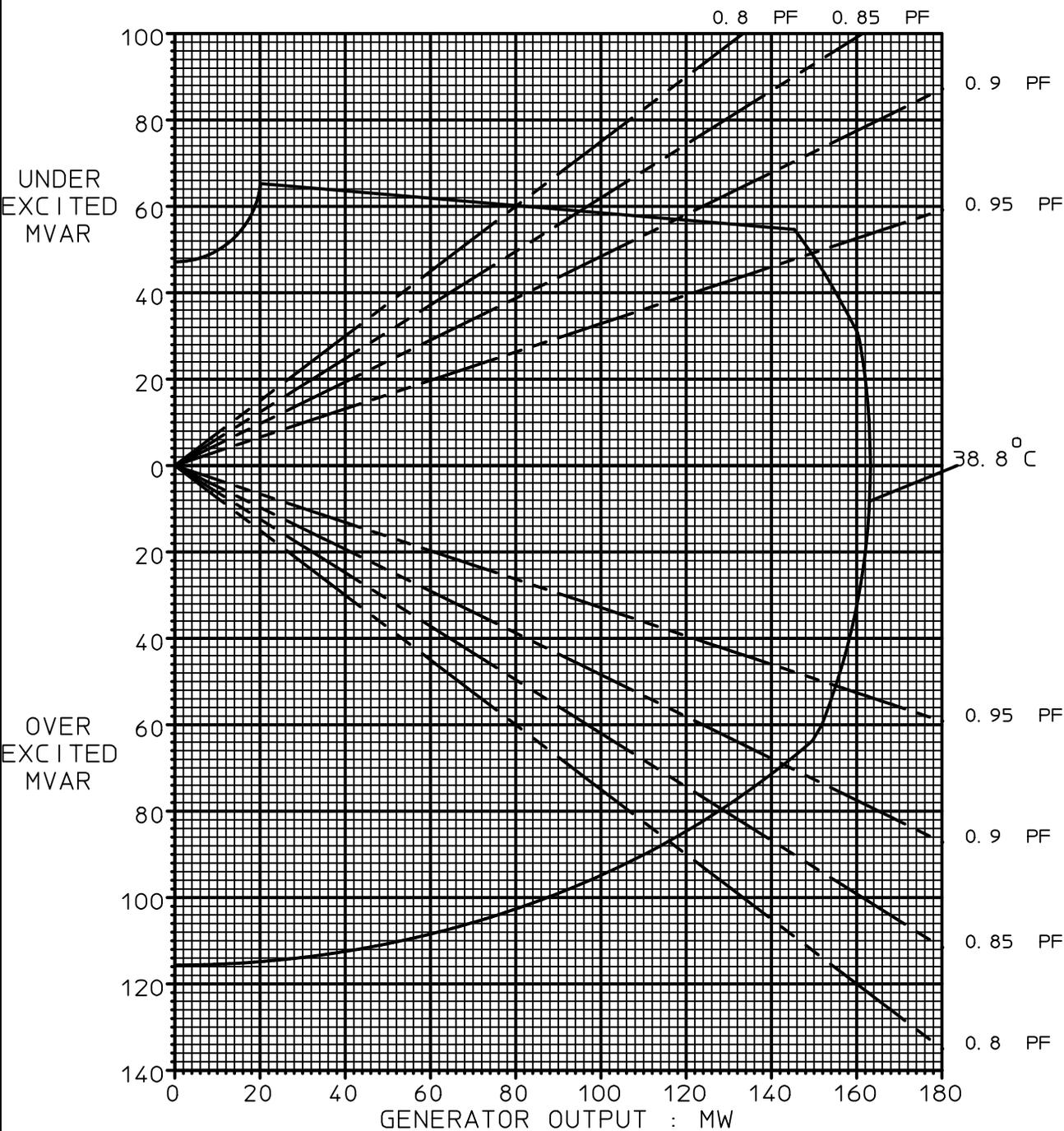
Coolant:

IN ACCORDANCE WITH
IEEE C50.13
Class B temperatures.

Total temperatures Stator 123 Deg C
Rotor 125 Deg C

Fresh Water

GENERATOR CAPABILITY DIAGRAM



BDAX 82-445ERH
13.80KV, 3 Ph, 60Hz.

Up to 1000 meters ASL

Coolant:

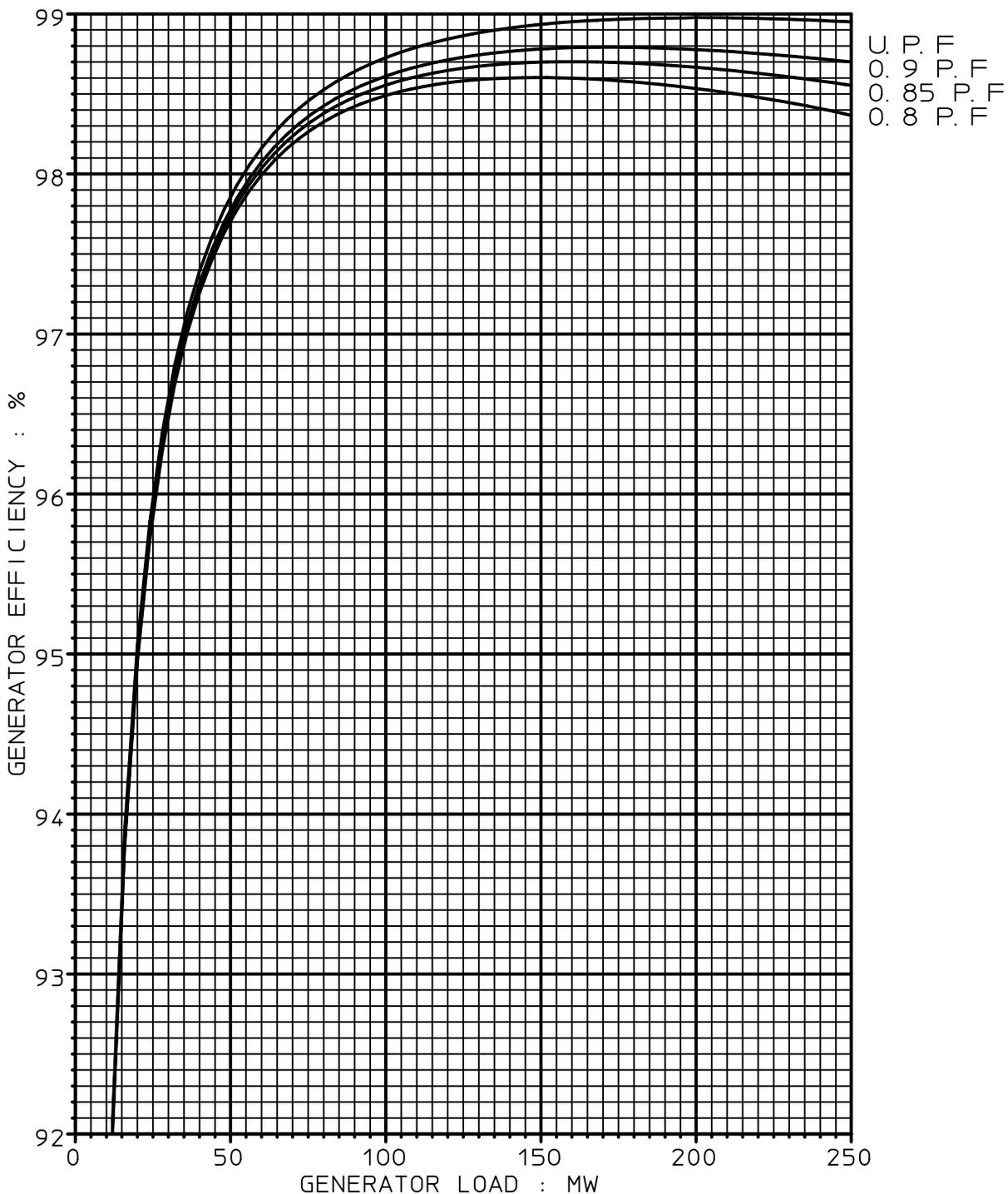
IN ACCORDANCE WITH
IEEE C50.13

Class B temperatures.

Total temperatures Stator 123 Deg C
Rotor 125 Deg C

Fresh Water

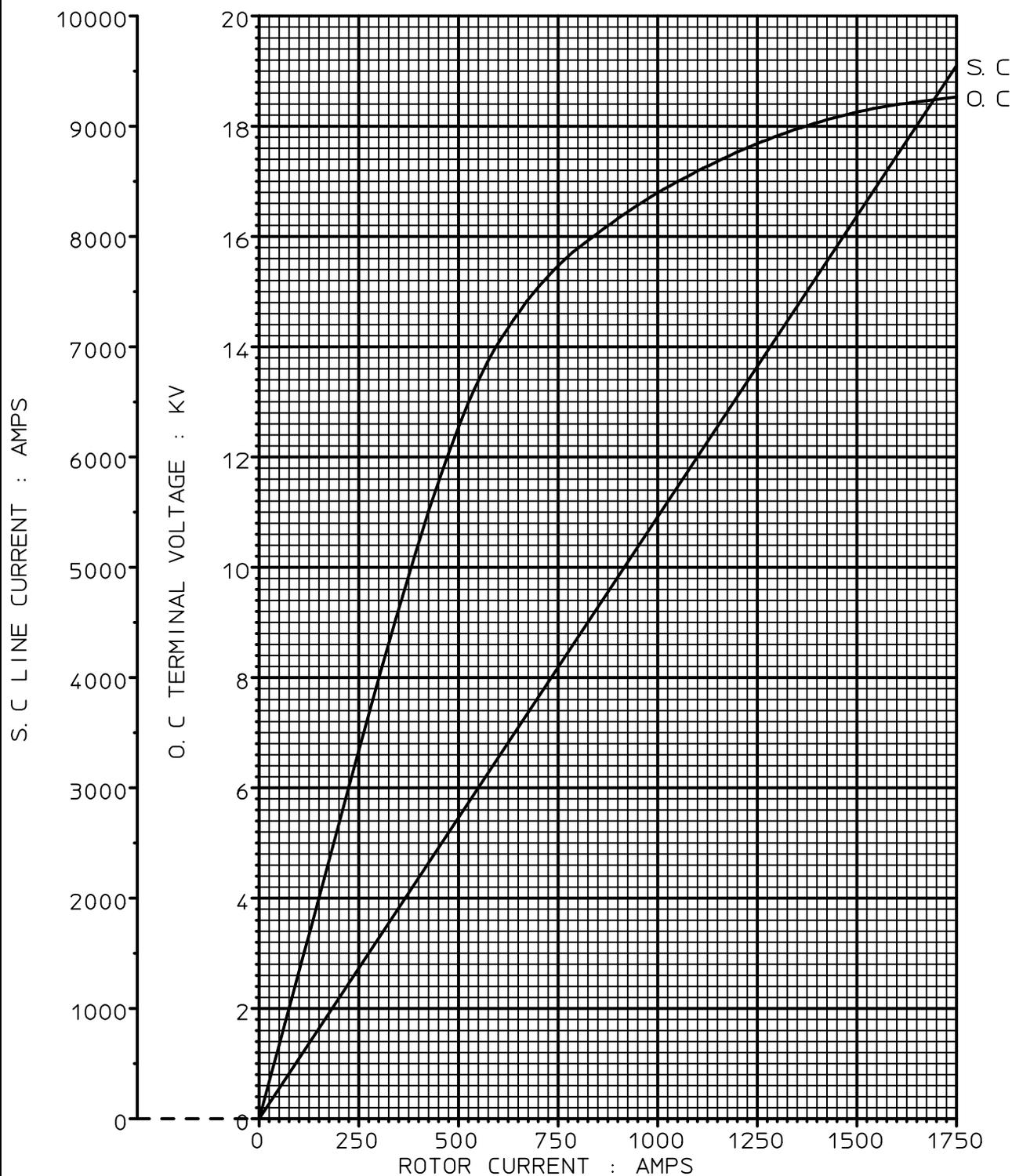
VARIATION OF GENERATOR EFFICIENCY WITH LOAD



BDAX 82-445ERH
13.8 KV, 3 Ph, 60 Hz.

Efficiencies shown are guaranteed
subject to the tolerance
specified in IEC 60034-1.

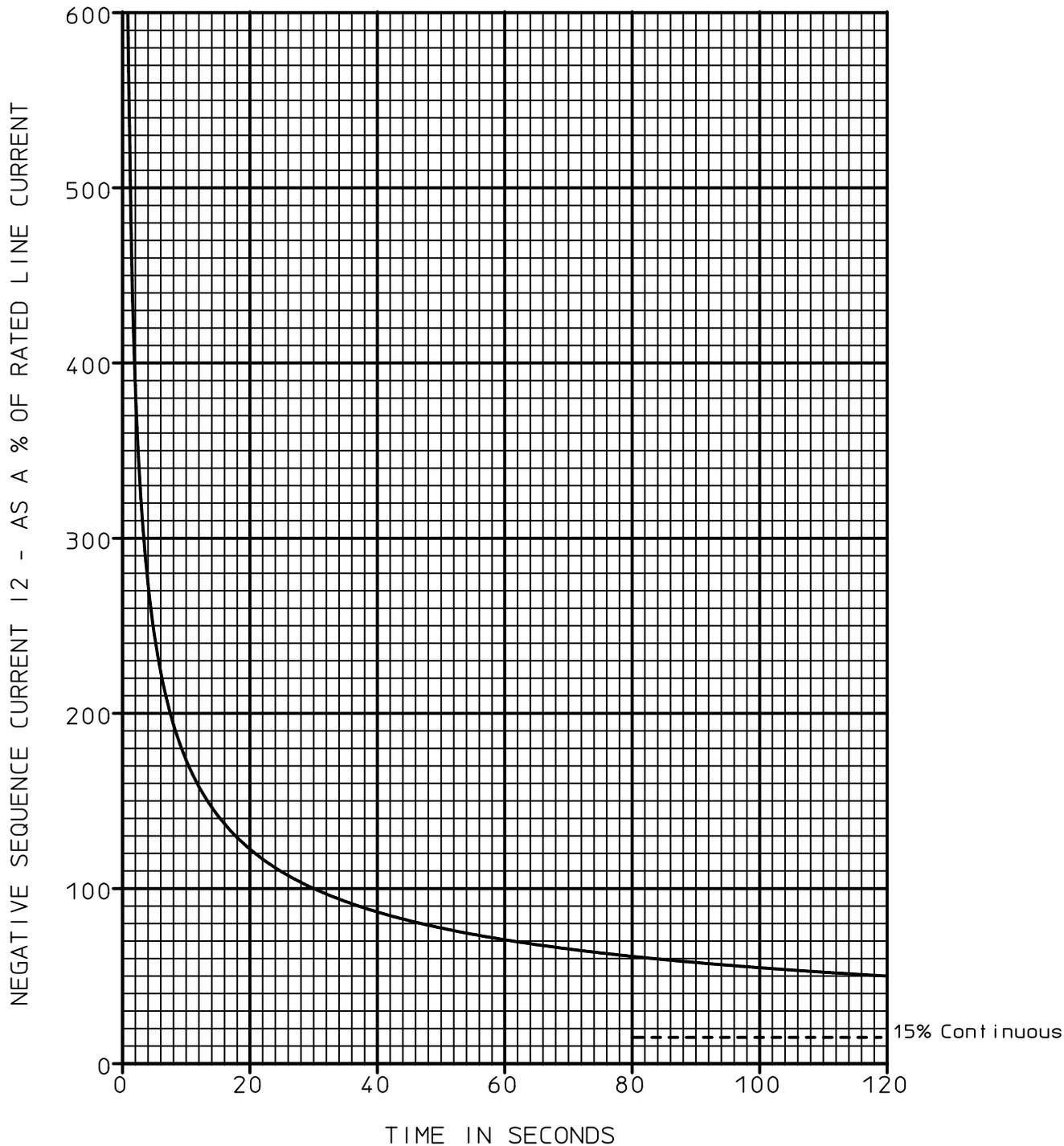
OPEN CIRCUIT AND SHORT CIRCUIT CHARACTERISTIC



BDAX 82-445ERH
3Ph, 60Hz, 3600 RPM.

PERMISSIBLE DURATION OF NEGATIVE SEQUENCE CURRENT

$$\frac{I_2}{I_1} = 30$$



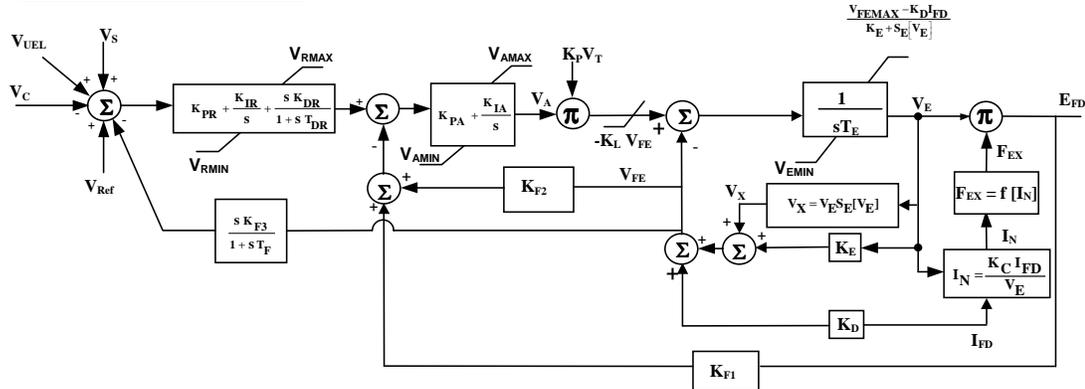
NOTE: For continuous operation rated current must not be exceeded in any one phase.

EXCITATION SYSTEM MODEL



Reference no OPP01562G1 Rating 128.35 MW, 0.85 pf Supply 13.8 kV, 60 Hz
 Frame sizes Generator BDAX 82-445ERH Exciter BXF 20.18-2S Pilot Exciter MX 51.08-A2
 Transfer function diagram for excitation systems based on IEEE Std 421.5-2005 AC7B model.
 Brush AVR Type : A12

Transfer Function Diagram



Generator / Exciter Parameters at 100°C

V_R	1 per unit exciter field voltage on air gap line (hot)	7.7 volts
R_F	Exciter field resistance (hot)	7.8 ohms
V_{PMG}	AVR input voltage	310 volts
E_{FD}	1 p.u. Exciter output voltage	52.1 Volts
T_E	Exciter field time constant	1.4 sec
K_E	Exciter constant	1.0
$S_{E(E1)}$	Exciter saturation function at 75% ceiling voltage	0.15
$E1$	75% ceiling voltage	6.9 p.u.
$S_{E(E2)}$	Exciter saturation function at 100% ceiling voltage	2.07
$E2$	100% ceiling voltage	9.2 p.u.
K_D	Demagnetising factor (function of exciter reactance)	0.92
K_C	Rectifier loading factor	0.47
V_{FEMAX}	Maximum exciter field voltage	13.9 p.u.
V_{EMIN}	Minimum exciter output	0 p.u.

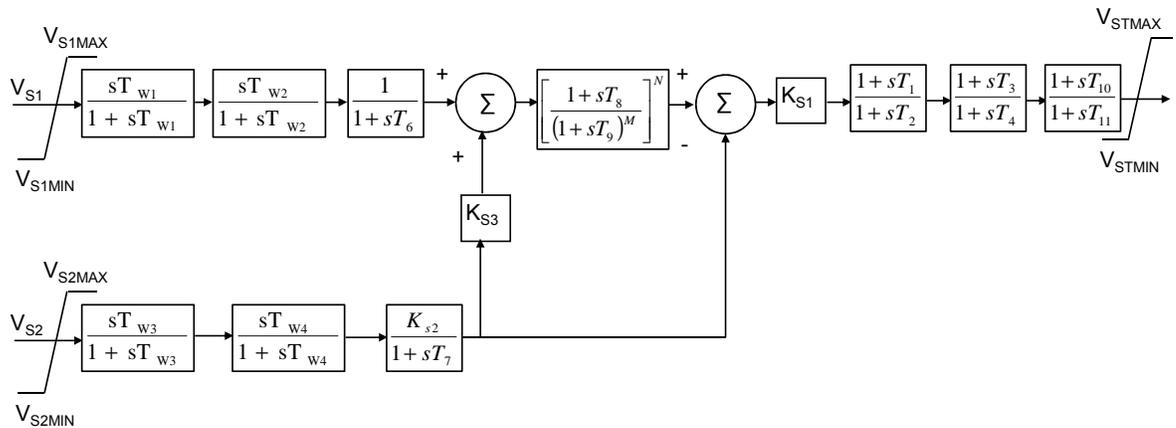
Automatic Voltage Regulator Parameters

K_{PR}	Voltage regulator proportional gain (adjustable in the range 1 to 80)	15 *
K_{IR}	Voltage regulator integral gain	1.88 *
K_{DR}	Voltage regulator derivative gain	0 *
T_{DR}	lag time constant	0.005 sec *
K_{PA}	I_{FE} Regulator proportional gain	48.38 *
K_{IA}	I_{FE} Regulator integral gain	0
K_{F1}	Excitation control stabilizer gain	0
K_{F2}	Excitation control stabilizer gain	0.15
K_{F3}	Field current stabilising feedback gain	0.02 *
V_{Rmax}	Maximum regulator output voltage	3.2 p.u.
V_{Rmin}	Minimum regulator output voltage	-3.2 p.u.
V_{Amax}	Maximum Regulator output V	28.14 p.u.
V_{Amin}	Minimum Regulator output V	-23.32 p.u.
T_F	Field current stabilising feedback time constant	1.5 sec *
K_L		10000
$K_P V_T$		1

POWER SYSTEM STABILISER MODEL



Reference no OPP01562G1 Rating 128.35 MW, 0.85 pf Supply 13.8 kV, 60 Hz
 Frame sizes Generator BDAX 82-445ERH Exciter BXF 20.18-2S Pilot Exciter MX 51.08-A2
 Transfer function diagram for excitation systems based on IEEE Std 421.5-2005 PSS2B model.
 Brush PSS Type : A12



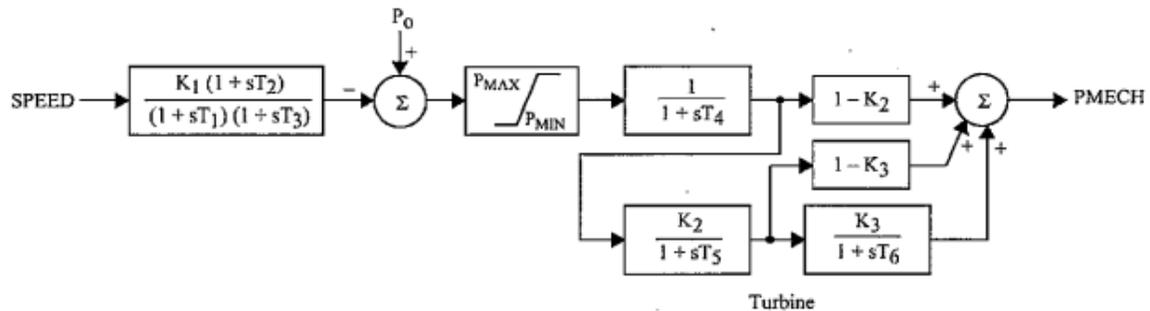
PSS PARAMETERS

		MIN	MAX
Ks1	Total PSS Gain	0	100
Ks2	Power Branch Gain	0	10
Ks3	Gain Mixture Power/Frequency	0	10
Tw1	Washout Time Constant (s)	2	20
Tw2	Washout Time Constant (s)	0	20
T6	LP Filter Time Constant (s)	0	10
Tw3	Washout Time Constant (s)	2	20
Tw4	Washout Time Constant (s)	0	20
T7	LP Filter Time Constant (s)	0	10
T8	Ramp Tracking Filter Time Constant (s)	0	2
T9	Ramp Tracking Filter Time Constant (s)	0	2
M	Grade of Ramp Tracking Filter	1	5
N	Grade of Ramp Tracking Filter	1	2
T1	Phase Lead Time Constant (s)	0	5
T2	Phase Lag Time Constant (s)	0	5
T3	Phase Lead Time Constant (s)	0	5
T4	Phase Lag Time Constant (s)	0	5
T10	Phase Lead Time Constant (s)	0	5
T11	Phase Lag Time Constant (s)	0	10

Note : Actual values should be determined from a power system study. The instruction manual provides additional information including confirmation of maximum and minimum values.

Turbine Dynamic Model Block Diagram

IEESGO : IEEE standard turbine-governor model



0.004	T_1 , Controller Lag (Seconds)
0.02	T_2 , Controller Lead (Seconds)
0.35	T_3 , Governor Lag (>0) (Seconds)
0.06	T_4 , Delay Due To Steam Inlet Volumes Associated With Steam Chest And Inlet Piping (Seconds)
0	T_5 , Reheater Delay Including Hot And Cold Leads (Seconds)
0	T_6 , Delay Due To IP-LP Turbine, Cross-Over Pipes, And LP End Hoods (Seconds)
20	K_1 , 1/Per Unit Regulation
0	K_2 , Fraction
0	K_3 , Fraction
Max output [MW]	P_{MAX} , Upper Power Limit
0	P_{MIN} , Lower Power Limit

Only for Reference



the power of being global

1450 Lake Robbins Drive, Suite 600, The Woodlands, TX 77380

Bank of America, National Association
901 Main St, Lower Level
MCKINNEY TX US 75069

-001103

Date

March 21, 2012

Amount

*****250,000.00

VOID AFTER 180 DAYS

*** Two hundred fifty thousand dollars and zero cents ***

Pay to the Order of:
California ISO
Attn: Grid Assets
250 Outcropping Way
Folsom CA US 95630

Authorized Signature

Authorized Signature

⑈001103⑈ ⑆111000012⑆ 4427110595⑈

AES North America Dev.LLC

Remittance Advice Voucher

Vendor ID	Vendor Name	Check Date	Check No				
50000858	California ISO	March 21, 2012	001103				
Invoice No	Invoice Date	PO#	Text	Gross Amount	Withholding Tax	Cash Discount	Net Amount
CR031912	03/19/2012			250000.00	0.00	0.00	250,000.00
TOTAL:				250,000.00	0.00	0.00	250,000.00