NERC Standard: FAC-008-3 Generation

Generating Facility Rating Methodology and Communication

For

Associated Electric Cooperative, Inc.

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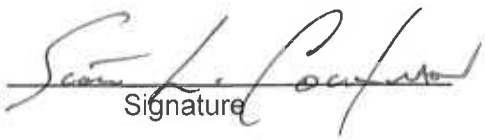
Manager Approval: Scott L. Cochran (Print Name)  (Signature)

Revision No.	Revision History	Date Revised
0	**Original Issue**	**05/21/2007**
1	**Major revision to fully establish methodology**	**May 17, 2010**
2	**Revision for FAC-008-3**	**February 3, 2012**
3	**Added "terminal equipment" language per CAN – 0018..**	**December 21, 2012**
4	**Changes to Attachment 1 because of new nameplate data**	**November 30, 2015**

AECI's Generating Facility Rating Methodology And Communication.

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I. Definitions

Equipment Rating – The maximum and minimum voltage, current, frequency, real and reactive power flows on individual equipment under steady state, short-circuit and transient conditions, as permitted or assigned by the equipment owner.

Facility Rating – The maximum or minimum voltage, current, frequency, or real or reactive power flow through a facility that does not violate the applicable equipment rating of any equipment comprising the facility.

II. Purpose / Introduction

The purpose of this document is to ensure that AECI generating Facility Ratings used in the planning and operation of the Bulk Electrical System (BES) are determined based on an established methodology.

This rating criteria applies to AECI's generating facilities, and discusses the methodology used to determine their Facility Ratings. The methodology also verifies that the established Facility Rating is within the Equipment Ratings of the equipment that comprises the generating facility. Facility Rating is interpreted to be the generating unit's maximum gross continuous MVA (MW + MVAR) capability. Additionally, AECI interprets that the maximum MVA capability will be achieved with the generator operating in an over-excited condition (exporting MVARs), and therefore bases its Facility Rating methodology on this.

For the purposes of this document, the generating facility is interpreted to be all equipment within the generating plant, extending to the high voltage terminals of the generator step-up transformer (GSU). This rating criteria specifically addresses turbines, generators, excitation equipment, iso-phase bus systems, protective relay devices, generator circuit breakers, and GSU's

It is recognized that abnormal system or ambient conditions, or abnormal generating equipment operating issues may affect facility ratings. It is understood that reporting for these abnormal conditions is accounted for in other Standards.

II.1 Limiting Factor

The maximum Facility Rating of an AECI generating facility is limited by the maximum Equipment Rating of any of the components within the generating facility as described in the methodology.

III. Facility Rating Methodology

The Facility Rating of AECI generating facilities is interpreted to be the maximum gross continuous MVA (MW + MVAR) capability as noted above.

The real power (MW) capability of an AECI generating facility shall be equal to the turbine nameplate rating. In the case where the nameplates of any equipment is not obtainable or does not provide all the necessary information, data from the OEM manual or from the OEM itself will be used.

The reactive power (MVAR) capability of an AECI generating facility shall be determined from the over-excited portion of the generator capability curve. Reactive power capability, as determined from the generator capability curve, shall be selected at the real power value corresponding to the generating unit's MW capability as determined above.

The total facility MVA (MW + MVAR) capability as determined above shall be checked against the Equipment Ratings that are established using the criteria below in order to determine if any of the Equipment Ratings are exceeded by this capability. If no Equipment Ratings are exceeded, then this capability becomes the generating unit's Facility Rating. If any Equipment Rating is exceeded, then the most limiting Equipment Rating is used to establish the generating unit's Facility Rating, and in this case the MVAR capability is decreased based on this Facility Rating and the previously established MW capability. Terminal equipment will also be evaluated when establishing the final rating of a facility.

It should be noted that the AECI generating Facility Ratings as determined by the methodology in this document may not correlate directly with capabilities validated as required by related Standards MOD-024 and MOD-025. The SERC Supplement related to Standards MOD-024 and MOD-025 focuses on validation of Seasonal Capabilities. AECI has interpreted this Supplement and focused their validation of Seasonal Capabilities at specific regional ambient temperatures chosen for both summer and winter. Therefore the MOD-024 and MOD-025 Seasonal Capabilities may contrast to the Facility Ratings of this document, which are interpreted to be based on maximum equipment ratings determined according to criteria related to the specific equipment sections below. It is also noted that these Facility Ratings are determined based solely on Equipment Ratings and the maximum output from generating facilities can vary depending upon transmission system, ambient, and other conditions.

IV. Equipment Ratings

IV.1 Turbines

Turbine ratings shall be based on the manufacturer's maximum nampeplate rating at nominal design and ambient conditions. For the purposes of this document the turbine rating is used to establish the real power capability of the generating facility and is the real power (MW) component of the Facility Rating as described above.

IV.2 Generators

Maximum generator ratings shall be based on the generator manufacturer's capability curves. For hydrogen cooled generators, capability curves are determined at maximum rated hydrogen pressure and rated cooling medium temperature. For air cooled generators, capability curves are determined at rated cold gas temperature (typically 30 – 40 degrees C).

IV.3 Excitation Equipment

Voltage regulators allow for full operation within the over-excited region of the generator capability curves, so the excitation equipment is not considered a limiting device.

IV.4 Iso-Phase Bus Systems

Maximum iso-phase bus capability shall be based on the iso-phase bus manufacturer's continuous current rating, with applicable cooling equipment in service, and determined at the system nominal voltage rating.

IV.5 Protective Relay Devices

Relay protective devices and their associated instrument transformers, as applied within AECI generating facilities, are set above the Equipment Ratings that they protect and are therefore not considered a limiting device.

IV.6 Generator Circuit Breakers

Maximum generator circuit breaker capability shall be based on the manufacturer's nameplate nominal current rating and determined at the system nominal voltage rating.

IV.7 Generator Step-Up Transformers

Maximum GSU ratings shall be based on the transformer manufacturer's continuous nameplate rating with all installed cooling equipment in service, and at the maximum specified temperature rise.

IV.8 Terminal Equipment

The overall rating of a generation unit will include most limiting series connected device within that unit. Series connected devices may include, but not be limited to, overhead conductors, switches, wave traps, current transformers, circuit breakers, relays and protective equipment (including primary fuses), and/or reactive devices. Attachment A will only contain this equipment rating if the equipment type is present the facility.

V. Facility Ratings

The Facility Ratings for AECI generating units are shown in Attachment A.

VI. Communication of Facility Ratings and Methodology

This document shall be posted on the AECI Public OASIS domain for use and review by the Reliability Coordinator, Transmission Operators, Transmission Planners and Planning Authorities that have responsibilities within the AECI BES area. It is also available within AECI for all applicable personnel to review as required.

Upon request from the Reliability Coordinator, Transmission Operators, Transmission Planners or Planning Authorities, a certified copy of Documentation and methodology will be submitted within 21 days.

AECI will provide a written response within 45 calendar days to any written comments from a Reliability Coordinator, Transmission Operator, Transmission Planner or Planning Authority associated with this document.

VII. Documentation Retention

AECI shall keep its current documentation and any modifications to the documentation that were in force since last compliance audit

AECI will maintain a copy of all requests from, and dated documentation sent to Reliability Coordinator, Transmission Operators, Transmission Planners or Planning Authorities for a period not less than three years.

UNIT INFORMATION AND PRELIMINARY MVA				EQUIPMENT RATINGS							FACILITY RATING		
GENERATING UNIT	FACILITY MW	MVAR PER GENERATOR CAPABILITY CURVE	PRELIMINARY MVA (CHECK AGAINST EQUIPMENT RATINGS)	ISO-PHASE BUS (RATED CURRENT)	ISO-PHASE BUS (MVA)	GENERATOR CIRCUIT BREAKER (RATED CURRENT)	PLANT RATED VOLTAGE (KV)	GENERATOR CIRCUIT BREAKER (MVA)	GSU RATED MVA	LIMITING EQUIPMENT	MW	MVAR	MVA
Chouteau STG 10	182.75	118	215	9,000	249	NA	16.0	NA	217	Generator	182.8	118	**218**
Chouteau GTG 11	175.95	115	207	9,000	249	NA	16.0	NA	217	Generator	176	115	**210**
Chouteau GTG 12	175.95	115	207	9,000	249	11,500	16.0	319	217	Generator	176	115	**210**
Chouteau STG 20	182	93	204	9,200	255	NA	16.0	NA	260	Generator	182	93	**204**
Chouteau GTG 21	175.6	78	192	9,200	255	8,000	16.0	222	210	Generator	175.6	78	**192**
Chouteau GTG 22	175.6	78	192	9,200	255	8,000	16.0	222	210	Generator	175.6	78	**192**
Dell GTG 1	171	142	222	9,000	281	9,000	18.0	281	230	Generator	171	142	**222**
Dell GTG 2	171	142	222	9,000	281	9,000	18.0	281	230	Generator	171	142	**222**
Dell STG 3	260	190	322	12,000	374	12,000	18.0	374	330	Generator	260	190	**322**
Essex GTG	117	73	125	6,000	143	6,000	13.8	143	138	GSU	107	81	**138**
Holden GTG #1	91.4	65	112	6,000	143	6,300	13.8	151	150	Generator	107	67	**126**
Holden GTG #2	91.4	65	112	6,000	143	6,300	13.8	151	150	Generator	107	67	**126**
Holden GTG #3	91.4	65	112	6,000	143	6,300	13.8	151	150	Generator	107	67	**126**
New Madrid STG 1	650	325	727	20,000	762	NA	22.0	NA	784	Generator	650	325	**727**
New Madrid STG 2	650	325	727	20,000	762	NA	22.0	NA	784	Generator	650	325	**727**
Nodaway GTG 1	91	104	115	6,000	143	5,600	13.8	134	138	Gen. breaker	91	98	**134**
Nodaway GTG 2	91	104	115	6,000	143	5,600	13.8	134	133	GSU	91	98	**133**
St. Francis G/STG 10	250	160	316	11,000	305	NA	16.0	NA	360	Generator	250	160	**297**
St. Francis G/STG 20	262	170	340	11,000	305	NA	16.0	NA	360	Iso-phase bus	262	156	**305**
Thomas Hill STG 1	175	100	202	6,500	225	NA	20.0	NA	212.8	Generator	175	100	**202**
Thomas Hill STG 2	270	170	320	9,000	343	NA	22.0	NA	324.8	Generator	270	170	**319**
Thomas Hill STG 3	673	390	820	20,000	831	NA	24.0	NA	817.6	Generator	673	390	**778**