Applicability

1(1) Section 502.1 applies to the **ISO**, and subject to the provisions of subsections 1(2), (3) and (4) to any:

(a) new wind **aggregated generating facilities** to be connected to the **transmission system**, and to their **legal owner;** and

(b) wind **aggregated generating facilities** in existence and connected to the **transmission system** as of the effective date of this section 502.1, and to their **legal owner**, if such facilities were connected to the **transmission system** under the *Wind Power Facility Technical Requirements* dated November 15, 2004.

(2) The **legal owner** of any existing wind **aggregated generating facilities**, who executed a *Construction Commitment Agreement* and completed the **ISO's** approval process for connection to the **transmission system** under the *Technical Requirements for connecting generators (1999),* is exempt from this section 502.1 but must remain in compliance with those 1999 requirements.

(3) If any existing wind **aggregated generating facilities** undergo any:

(a) facilities addition such that the resulting accumulative **real power** capability is increased by an amount equal to or greater than five (5) **MW**; or

(b) facilities equipment replacement of five (5) **MW** or more;

then the facilities addition or replacement equipment and associated **real power** will be subject to and must comply with the provisions of this section 502.1 in its entirety.

(4) Notwithstanding subsection 1(2) above, all new and existing wind **aggregated generating facilities** with a **maximum authorized real power** of five (5) MW or more must comply with the meteorological collection tower and measurement devices provisions contained in subsection 25 below and the historical data and records requirements contained in subsection 29 below.

Requirements

Functional Specification

2(1) The **ISO** may, in accordance and consistent with this section 502.1 and any other applicable **ISO rules**, approve of a written functional specification containing further details, direction and discrete work requirements and specifications for the design, construction and operation of any wind **aggregated generating facilities** and associated **transmission system** connection facilities.

(2) The functional specification must be generally consistent with the provisions of this Section 502.1 but may contain material variances approved of by the **ISO** based upon its discrete analysis of any one or more of the technical, economic, safety, operational and system reliability requirements related to the specific facility project.

Successor to Prior Requirements

3 Subject to subsection 4(2), the provisions of this Section 502.1 succeed the *Wind Power Facility Technical Requirements* dated November 15, 2004, and those requirements no longer will be in force and effect as of the effective date of this Section 502.1.

Maximum Authorized Real Power for Wind Aggregated Generating Facilities

4(1) The **legal owner** of any new wind **aggregated generating facilities** must submit to the **ISO** the **maximum authorized real power** for those wind **aggregated generating facilities,** and once the **ISO** approves the value, it will form part of the functional specification for the project.

(2) The **maximum authorized real power** for any existing wind **aggregated generating facilities** will be the "WPF Aggregated MW Capacity" as provided to the **ISO** under the requirements of section 5.1 set out in the *Wind Power Facility Technical Requirements* dated November 15, 2004.

(3) In accordance with the illustration set out in Appendix 2, the **ISO** will determine the **reactive power** capability requirements for any wind **aggregated generating facilities**, based on the **maximum authorized real power** determined under this subsection 4.

Operating Voltage Requirements

5(1) The **legal owner** of any wind **aggregated generating facilities** must submit to the **ISO** the value to be used for rated root mean square phase-to-phase voltage at:

(a) the **point of connection** to the **transmission system,** based on the normal operating voltage levels at the specific location of the wind **aggregated generating facilities**; and

(b) all **collector busses.**

(2) Once that value is approved by the **ISO**, it will form part of the functional specification for the project.

(3) The rated root mean square phase-to-phase voltage will be used in the application of this Section 502.1 to determine and apply:

(a) the voltage ride-through requirements;

(b) voltage regulation; and

(c) the **reactive power** capability;

of the wind **aggregated generating facilities**.

Voltage Ride-Through Requirements

6(1) Wind **aggregated generating facilities** with a **maximum authorized real power** amount equal to or greater than five (5) **MW** must meet the voltage ride-through requirements specified in this subsection 6.

(2) Each **legal owner** of wind **aggregated generating facilities** must ensure they are capable of continuous operation between ninety percent (90%) and one hundred and ten percent (110%) of the root mean squared rated phase-to-phase voltage at the **point of connection**.

(3) Subject to subsection 6(4), wind **aggregated generating facilities** must not trip off-line any **wind turbine generator** that is producing **real power** due to voltage dips or post-transient voltage rises described in Appendix 1, resulting from normally cleared **transmission system** faults on any phase or combination of phases at or beyond the **point of connection**.

(4) Notwithstanding any other provision of this subsection 6, wind **aggregated generating facilities** are not required to ride through **transmission system** faults that:

(a) cause a **forced outage** of a radial transmission line to the wind **aggregated generating facilities**;

(b) occur on the wind **aggregated generating facilities** side of the **point of connection,** including the lower voltage network and the substation, or

(c) result in a transfer trip or anti-islanding protection scheme to activate at the wind **aggregated generating facilities.**

Voltage Regulation

7(1) The **ISO** will assess voltage regulation performance of wind **aggregated generating facilities** at the **collector busses** in accordance with this subsection 7.

(2) Wind **aggregated generating facilities** must be able to regulate voltage at the **voltage regulation system** point of control and as documented in the functional specification for the project, under both non-disturbance and disturbance conditions.

(3) Wind **aggregated generating facilities** must have a continuously variable, continuously acting, closed loop, centralized control **voltage regulation system** that measures voltage compared to a set point, and will control reactive devices including **wind turbine generators**, dynamic **reactive power** resources, capacitor and reactor banks.

(4) The **voltage regulation system** must be continuously in service and controlling while the wind **aggregated generating facilities** are connected to the **transmission system** and regardless of the quantity of actual **real power** output from the wind **aggregated generating facilities**.

(5) The **voltage regulation system** set point must be adjustable by the **operator** of the wind **aggregated generating facilities** to a percentage between ninety five percent (95%) and one hundred and five percent (105%) of rated voltage.

(6) The **voltage regulation system** must operate in a voltage set point control mode to the exclusion of any other modes.

(7) The **voltage regulation system** must measure voltage that represents the overall voltage response of the wind **aggregated generating facilities**.

(8) The **voltage regulating system** must be capable of:

(a) adjustable gain, or reactive droop compensation adjustable from zero to ten percent (0 to 10%); and

(b) reactive current compensation to compensate for any step-up transformers connected to the **transmission system**.

(9) The combined settings of the **voltage regulation system** must be able to achieve a steady state voltage regulation of plus or minus zero point five percent (+/- 0.5%) of the voltage controlled by the **voltage regulation system**.

(10) The **ISO** will specify whether the **reactive current compensation** in the **voltage regulation system** must be implemented, which will form part of the functional specification for the project.

(11) The **ISO** may, upon no less than ninety (90) days notice in writing to the **legal owner** of any commissioned wind **aggregated generating facilities**, require a change to the setting of the reactive droop compensation gain or the reactive current compensation settings for those commissioned wind **aggregated generation facilities**.

(12) The **voltage regulation system** must be calibrated such that a change in **reactive power** will achieve ninety five percent (95%) of its final value, no sooner than zero point one (0.1) seconds and no later than one (1) second following a step change in voltage.

(13) When the **voltage regulation system** requires the switching of a shunt reactive device, the switching operation must be delayed by ten (10) seconds.

External Voltage Regulation

8 No wind **aggregated generating facilities** may use or rely upon any **voltage regulation system** or **reactive power** resources that are external to the wind **aggregated generating facilities** without the approval of the **ISO,** which approval will form part of the functional specification for the project.

Wind Aggregated Generating Facilities Reactive Power Capability

9(1) Dynamic and non-dynamic **reactive power** requirements must be based on the rated voltage at the **collector busses**.

(2) As illustrated in Appendix 2, the minimum continuous **reactive power** capability of any wind **aggregated generating facilities** to supply **reactive power** must meet or exceed plus zero point nine (+0.9) **power factor,** based on the **gross real power** up to and including the **maximum authorized real power** of the wind **aggregated generating facilities**.

(3) As illustrated in Appendix 2, the minimum continuous **reactive power** capability of any wind **aggregated generating facilities** to absorb **reactive power** must meet or exceed minus zero point nine five (-0.95) power factor, based on the **gross real power** up to and including the **maximum authorized real power** of the wind **aggregated generating facilities**.

(4) Continuous **reactive power** capability referred to in subsections 10 and 11 may be aggregated to meet the requirements set out in subsections 9(2) and (3).

(5) All **reactive power** resources used to vary the **reactive power** output of the wind **aggregated generating facilities** within the requirements set out in subsections 9(2) and (3) must be under control of the **voltage regulation system**.

(6) The **operator** must not intentionally, and the control systems of wind **aggregated generating facilities** must not be designed to, reduce the **reactive power** capability from the dynamic reactive devices described in subsection 10, or the non-dynamic reactive resources described in subsection 11.

Dynamic Reactive Power Capability

10(1) As illustrated in Appendix 2, the minimum dynamic **reactive power** capability of any wind **aggregated generating facilities** must meet or exceed plus zero point nine five (+0.95) **power factor** based on the **gross real power** up to and including the **maximum authorized real power** of the wind **aggregated generating facilities**.

(2) As illustrated in Appendix 2, the minimum dynamic **reactive power** capability of any wind **aggregated generating facilities** must meet or exceed minus zero point nine eight five (-0.985) **power factor** based on the **gross real power** up to and including the **maximum authorized real power** of the wind **aggregated generating facilities**.

(3) Wind **aggregated generating facilities** must have **reactive power** resources that are continuously acting and continuously variable under control of the **voltage regulation system**, and be able to respond to **transmission system** voltage fluctuations.

(4) For the purposes of subsections 10(1) and (2), a short term **reactive power** capability for a period of up to one (1) second will be deemed to meet the dynamic **reactive power** capability set out in those subsections.

(5) The short term **reactive power** capability referred to in subsection 10 (4) does not qualify for continuous **reactive power** described in subsection 9.

Non-Dynamic Reactive Power Capability

11(1) For any wind **aggregated generating facilities**, the **MVAr** size of the individual shunt **reactive power** resources under control of the **voltage regulation system** must not be larger than the total range of the continuous capability of dynamic **reactive power** set forth in subsection 10.

(2) Any shunt **reactive power** resources installed in any wind **aggregated generating facilities** must be capable of being switched on no later than five (5) minutes after having been switched off.

Operator Availability

12 The **legal owner** of any wind **aggregated generating facilities** must have a designated and qualified **operator** available twenty four (24) hours a day every day for contact and communication with the **ISO,** in accordance with **ISO rules** and other communication policies and protocols.

WECC Stability Control Requirements

13 After the effective date of this Section 502.1, if any **WECC** standards or policies specify the use of a **power system stabilizer** for wind **aggregated generating facilities** using a synchronous **wind turbine generator,** then based on those standards or policies the **ISO** by written notice to the **legal owner** may require the wind **aggregated generating facilities** to use such a **power system stabilizer**.

Transmission System Step-Up Transformer

14(1) The voltage ratio, tap changer type, range and step size specifications for any transmission step-up transformer of any wind **aggregated generating facilities** must be such that the **reactive power** requirements specified in subsection 9 are fully available throughout the operating voltage range documented in the functional specification for the project.

(2) The connection of the **wind turbine generator** step-up transformer, **transmission system** step-up transformer or any combination of the two transformers for any wind **aggregated generating facilities** must be designed to provide:

(a) a favorable circuit to block the transmission of harmonic currents; and

(b) isolation of **transmission system** and **wind turbine generator** side ground fault current contributions.

(3) The wind **aggregated generating facilities** must utilize an effectively grounded wye connection on the high side of the **transmission system** step up transformer**.**

Off Nominal Frequency Requirements

15(1) For wind **aggregated generating facilities** that have a requirement to protect equipment for off-nominal frequency operation, the **legal owner** must install protective relays so as to accommodate operation for the specified time frames shown in the Table set out in Appendix 3.

(2) The trip setting of the protective relays must either:

(a) be set to the requirements set out in Appendix 3 with respect to the frequency versus time setting; or

(b) automatically trip **load** to match the anticipated generation loss and at comparable frequency levels.

(3) Any frequency relays installed to protect equipment for off-nominal frequency operation must:

(a) be solid state or microprocessor based;

(b) use a definite time characteristic; and

(c) not be disabled for **transmission system** voltages that are below eighty percent (80%) of the rated voltage without the approval of the **ISO,** which approval will form part of the functional specification for the project.

Over Frequency Control System Requirements

16(1) Any wind **aggregated generating facilities** must have an over frequency control system that continuously monitors the frequency of the **transmission system** at a sample rate of at least thirty (30) per second and a resolution of at least zero point zero zero four (0.004) Hertz, and the over frequency control system must automatically control the **gross real power** output of the wind **aggregated generating facilities** at all times.

(2) The over frequency control system may have an intentional deadband of up to zero point zero three six (0.036) Hertz.

(3) The over frequency control system must be designed and calibrated to reduce the **gross real power** output at the **collector bus** based on the capability of all on-line **wind turbine generators** producing **real power** during an over frequency excursion, and such reductions must be:

(a) proportional to the frequency increase by a factor of thirty three percent (33%) per Hertz of the **gross real power** output;

(b) at a rate of five percent (5%) of the **gross real power** output per second; and

(c) with no intentional time delay added to the control system.

(4) In accordance with subsection 15, for **transmission system** over frequency events greater than sixty one point seven (61.7) Hertz, wind **aggregated generating facilities** may trip due to the over frequency, but if the wind **aggregated generating facilities** remain connected to the **transmission system** then the over frequency control system must continue to ramp down the **gross real power** output in accordance with the requirements of this subsection 16.

(5) The over frequency control system requirements of this subsection 16 must have control priority over the power limiting control function and must reduce the **gross real power** output for an over frequency condition even when the requirements of subsection 18 are in effect.

Wind Aggregated Generating Facilities Disconnection

17(1) Wind **aggregated generating facilities** must have systems, controls and related procedures to electrically disconnect the wind **aggregated generating facilities** from the **transmission system** either at:

(a) the **point of connection**; or

(b) the **collector bus** feeder breakers; or

both of them as documented in the functional specification, after consultation among the **ISO**, the **legal owner** of the wind **aggregated generating facilities** and the **legal owner** of the applicable **transmission facility**.

(2) Wind **aggregated generating facilities** connecting to a **transmission facility** must provide the functionality and remote control capabilities to enable the **operator** of the **transmission facility** to open or trip any connecting breaker either at the **point of connection** or any **collector bus** feeder breakers, as applicable.

(3) Once a connecting breaker or feeder breaker of any wind **aggregated generating facilities** has been opened or tripped, then the **operator** may only electrically reconnect to the **transmission facility** after receiving approval from the **ISO**.

Wind Aggregated Generating Facilities Real Power and Ramp Rate Limitations

18(1) Wind **aggregated generating facilities** must have the control capability to limit the **real power** output at the **point of connection** in accordance with any limits or instructions contained in any **directive,** and in any event the **real power** output must not exceed the tolerances described in this subsection 18.

(2) The **real power** control limit referred to in subsection 18(1) must be adjustable from the minimum operating output to the **maximum authorized real power,** at an average resolution of one (1) **MW**.

(3) When a **real power** control limit is in effect in accordance with a **directive** and wind speed conditions at the wind **aggregated generating facilities** are increasing, then subject to subsection 18(4), the **real power** limiting controls of the wind **aggregated generating facilities** must be capable of keeping the one (1) minute average **real power** output from exceeding the wind **aggregated generating facilities** limit specified in the **directive** by two percent (2%) of the **maximum authorized real power**.

(4) If a wind gust results in the **real power** control limit set out in the **directive** being instantaneously exceeded, then the wind **aggregated generating facilities** will remain in compliance if the **real power** output at the **point of connection** does not exceed the **real power** control limit by more than five percent (5%) of the **maximum authorized real power**.

(5) Wind **aggregated generating facilities** must be equipped with **ramp rate** limiting controls.

(6) The **ramp rate** limiting controls must be capable of limiting the ramp up of the **real power** of the wind **aggregated generating facilities,** and must be adjustable such that the **ramp rate** does not exceed, in **MW** per minute, a range equal to five percent (5%) of the **maximum authorized real power** to twenty percent (20%) of the **maximum authorized real power**.

(7) The default setting for the **ramp rate** limiting controls must be set at ten percent (10%), unless otherwise approved by the **ISO**, which approval will form part of the functional specification for the project.

(8) Any difference in the **real power** at the **point of connection** and any **collector busses** must be compensated for in the **real power** limiting and **ramp rate** limiting controls.

Wind Aggregated Generating Facilities Power Quality

19(1) Wind **aggregated generating facilities** must be designed and operated to meet or exceed the minimum power quality standards set out in this subsection 19.

(2) With regard to voltage flicker as measured at the **point of connection**, the **legal owner** of any wind **aggregated generating facilities** must comply with the specifications set out in the version of the *International Electrotechnical Commission 61000-3-7, Electromagnetic compatibility (EMC) – Part 3-7: Limits - Assessment of emission limits for the connection of fluctuating installations to MV, HV and EHV power systems* that is in effect as of the date of the first **ISO** approved revision of the functional specification for the project.

(3) Upon request from the **legal owner** of any new wind **aggregated generating facilities**, the **ISO** must provide a written description of the specific harmonic-impedance envelope at a proposed **point of connection** for those wind **aggregated generating facilities**.

(4) With regard to harmonics as measured at the **point of connection,** the **legal owner** of any wind **aggregated generating facilities** must comply with the version of the *IEEE Standard 519, Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems – Section 11* that is in effect as of the date of the first **ISO** approved revision of the functional specification for the project.

(5) Any wind **aggregated generating facilities** must include systems and components designed to avoid introducing resonance into the **transmission system**, with such design specifications to apply to self-excitation of induction machines, transformer ferroresonance, resonant effects of capacitor additions and the capacitance of collector cables.

(6) Wind **aggregated generating facilities** must not cause any voltage unbalance on the **transmission system**, as measured at the **point of connection**, in excess of the value specified by the **ISO**, which will form part of the functional specification for the project.

Grounding

20 Any wind **aggregated generating facilities** must be designed and constructed to take in to account that the **transmission system** operates as an effectively grounded system.

Lightning Surge Protection

21 The lightning surge protection for any substation facilities associated with any wind **aggregated generating facilities** must be designed to take into account the average isokeraunic level for the site location of the wind **aggregated generating facilities**, and to be compatible with the connecting **transmission facility** to ensure coordination of insulation levels.

Fault Interrupting Devices

22(1) Any wind **aggregated generating facilities** must be designed to:

(a) account for the fault contributions from both the **transmission system** and the wind **aggregated generating facilities**; and

(b) have fault interrupting and momentary withstand ratings that are adequate to meet the maximum expected fault levels, with a margin for future anticipated fault levels as approved by the **ISO** which approval will form part of the functional specification for the project.

(2) The wind **aggregated generating facilities** must not use high voltage fuses at sixty (60) kilovolts or higher.

Isolating Devices

23(1) Any wind **aggregated generating facilities** must be designed with manually operable isolation switches at all points of isolation as documented in the functional specification, after consultation among the **ISO**, the **legal owner** of the wind **aggregated generating facilities** and the **legal owner** of the applicable **transmission facility.**

(2) The isolation switches must permit visual verification of electrical isolation and have the capability of being locked open with multiple locks.

Supervisory Control and Data Acquisition Additional Requirements

24 In addition to complying with the version of the *AESO SCADA Standard* referenced in the functional specification for the project any wind **aggregated generating facilities** must provide the following additional specific data and records:

(a) **voltage regulation system** set-point;

(b) potential **real power** capability, being the **real power** that would have been produced at the **point of connection** without wind **aggregated generating facilities** curtailment and based on real time meteorological conditions at each available **wind turbine generator**;

(c) **real power** limit, being the **MW** limit used in the power limiting control system at the wind **aggregated generating facilities;** and

(d) on / off status for the wind power limiting control system at the wind **aggregated generating facilities**.

Meteorological Collection Tower and Measurement Devices Requirements

25(1) Any wind **aggregated generating facilities** must have a meteorological collection tower and related devices installed in accordance with the provisions of this subsection 25.

(2) The tower must be equipped with two (2) sets of weather measurement devices in accordance with the following:

(a) for any new wind **aggregated generating facilities**:

(i) one device must take measurements at the **wind turbine generator** hub height; and

(ii) the must take measurements at a height that the **ISO** specifies in the functional specification.

(b) for any existing wind **aggregated generating facilities,** the measurements must be taken at heights specified by the **ISO** in writing after consultation with the **legal owner**.

(3) The measurement devices must measure, on a ten (10) minute average value;

(a) wind speed in meters per second (m/s), with a precision for instantaneous measurements to the nearest zero point one (0.1) meters per second;

(b) wind direction in degrees from true north, with a precision for instantaneous measurements to the nearest one (1) degree;

(c) barometric pressure in HectoPascals (HPa), with a precision for instantaneous measurements to the nearest six (6)-Pa; and

(d) ambient temperature in degrees Celsius ($^{\circ}$C), with a precision for instantaneous measurements to the nearest zero point one (0.1) degrees Celsius.

(4) The **legal owner** must submit to the **ISO** the data specified in this subsection 25 in the method and format the **ISO** specifies:

(a) in the functional specification for any new wind **aggregated generating facilities**; or

(b) in writing to the **legal owner** for any existing wind **aggregated generating facilities**.

Wind Aggregated Generating Facilities Synchrophasor Measurement

26(1) Any wind **aggregated generating facilities** must have equipment installed for synchronized phasor measurements that complies with the specifications contained in the version of the *AESO Requirements for Phasor Measurement Units* standard as referenced in the functional specification for the project

(2) Synchronized phasor measurements must take place at the following points:

(a) all three (3) phase to ground voltages at each **collector bus** of the wind **aggregated generating facilities;**

(b) all three (3) phase currents for each transmission step-up transformer on the low voltage side of the transformer; and

(c) all three (3) phase to ground voltages and currents at each **point of connection** of the wind **aggregated generating facilities.**

Wind Aggregated Generating Facilities Testing Post Connection

27(1) Following the connection of any wind **aggregated generating facilities** to the **transmission system,** the **legal owner** must test the wind **aggregated generating facilities** in accordance with the provisions of subsection 27(2), and must provide the test results and report as per the **ISO** document *"Requirements for Model Validation"* no later than sixty (60) days following the date upon which wind speed conditions reasonably will allow for the tests to be conducted.

(2) The following specific tests must be completed:

(a) A **voltage regulation system** and **reactive power** response test, which demonstrates the ability of the wind **aggregated generating facilities** to control the **collector bus** and **transmission system** voltage in a stable manner, and which test consists of injecting a test signal to the voltage reference point of the **voltage regulation system**;

(b) A **reactive power** capability test, which demonstrates the ability of the wind **aggregated generating facilities** to provide continuous **reactive power** in accordance with subsection 9 of this rule*;*

(c) A voltage set-point capability test, which demonstrates the ability of the wind **aggregated generating facilities** to adjust the voltage set-point of the **voltage regulation system** to any applicable provisions of the **ISO rules**.

(3) The **ISO** may specify the additional following tests in the functional specification for the project:

(a) a harmonic test which must demonstrate that harmonic levels for the wind **aggregated generating facilities** are within the specifications set out in subsection 19(4); and

(b) A voltage flicker test, which must demonstrate that the flicker levels for the wind **aggregated generating facilities** are within the specifications set out in subsection 19(2).

(4) The **ISO,** by written notice, may require the **legal owner** of any wind **aggregated generating facilities** to repeat any of the tests set out in this subsection 27 if:

(a) there is evidence that the results of the tests do not correlate with the actual response, except in instances where the lack of correlation was caused by equipment problems that were subsequently corrected; or

(b) there are changes in any applicable **NERC** or **WECC** policy or standards requirements which necessitate a repeat of any of the tests

Provision of Modeling Information from Wind Aggregated Generating Facilities

28(1) The **legal owner** of any wind **aggregated generating facilities** must provide to the **ISO** all reasonably requested data and records to allow for the modeling of the **wind turbine generators**, transformers, collector systems, control systems and other installations of the wind **aggregated generating facilities**.

(2) Where an appropriate model is not available within Siemens' PSS/E software, the **legal owner** must supply a working user written PSS/E model.

(3) If the **legal owner** supplies such a model to the **ISO**, then in addition the **legal owner** must provide a compiled code of the model, and maintain the user written model compatible with current and new releases of PSS/E until such time as the **legal owner** provides a standard model to the **ISO**.

(4) The **legal owner** must also provide the **ISO** with power system studies which demonstrate that the wind **aggregated generating facilities** are capable of meeting the voltage ride-through requirements specified in subsection 6.

(5) The **legal owner** must provide a **voltage regulation system** model with validated data demonstrated by a physical performance test of at least one (1) **voltage regulation system** device used at the wind **aggregated generating facilities.**

(6) The **legal owner** must re-validate all model data if the **ISO** provides written notice that there is evidence that the modeled response of the wind **aggregated generating facility** does not correlate with the actual response, except in instances where the lack of correlation was caused by equipment problems that were subsequently corrected.

Wind Aggregated Generating Facilities Data and Records Requirements

29(1) Subject to the provisions of this subsection 29, the **legal owner** of any wind **aggregated generating facilities** must retain historical data and records consisting of ten (10) minute averaged meteorological data, including wind speed, wind direction, temperature, barometric pressure, and details on the height of the measurements.

(2) The **legal owner** must provide the historical data and records referred to in this subsection 29 to the **ISO**.

(3) Upon the **ISO's** written request**,** the **legal owner** must, subject to availability, provide such historical data and records for up to two (2) calendar years prior to the **commissioning** period for any new wind **aggregated generating facilities,** and the most recent two (2) year period for existing wind **aggregated generating facilities**.

(4) The **legal owner** in addition must provide the **ISO** with specific **wind turbine generator** data and records, including hub height, turbine land coordinates, turbine power curves, high wind speed cut-out and any applicable temperature cut-outs.

(5) The **legal owner** must provide to the **ISO** the data and records referred to in this subsection 29 in a method and format the **ISO** specifies, which for new wind **aggregated generating facilities** will be contained in the in the functional specification for the project.

Appendices

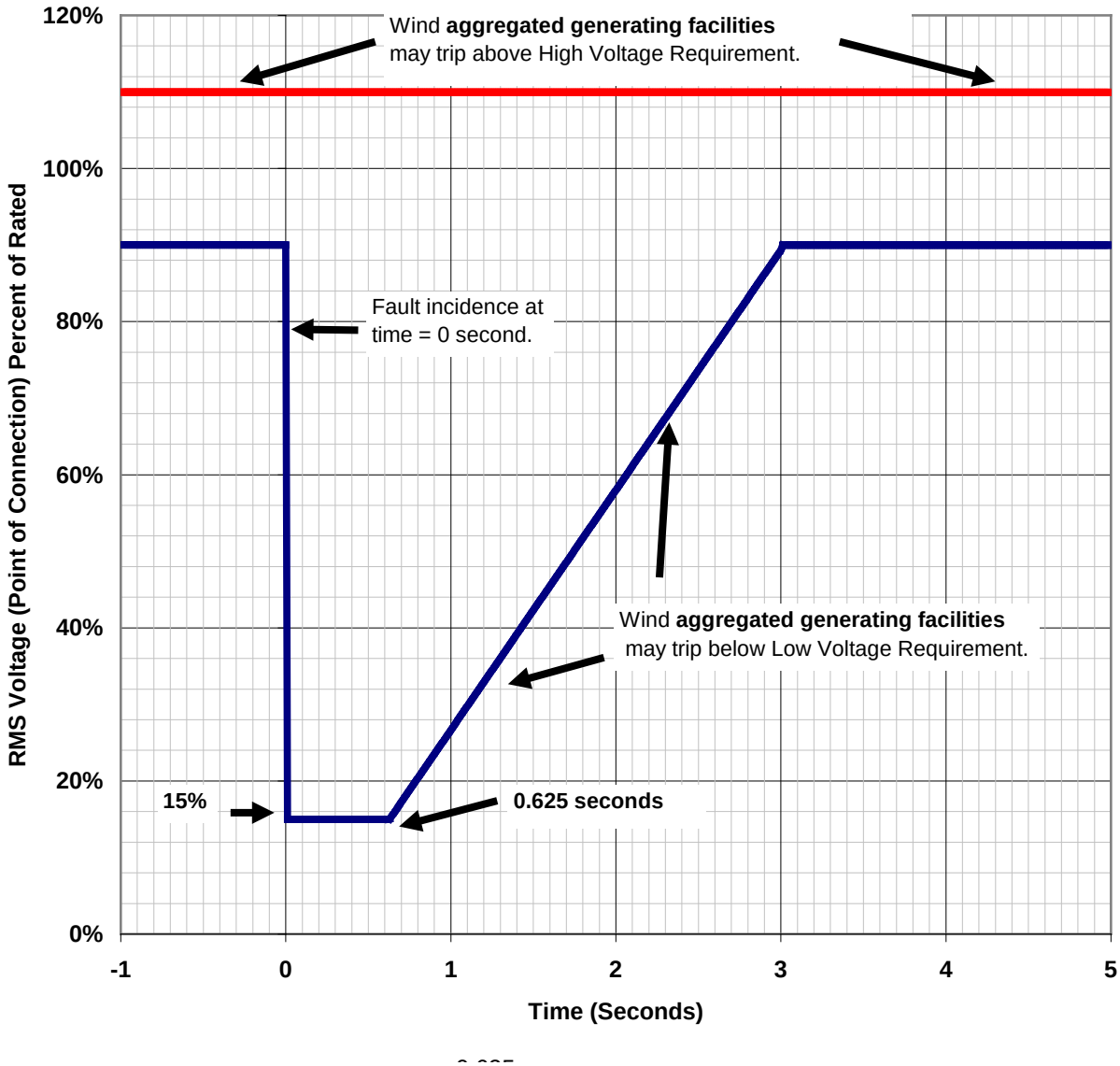
Appendix 1 – Voltage Ride Through Requirements
Appendix 2 – Reactive Power Capability
Appendix 3 - Trip Settings of Off-Nominal Frequency Protective Relays

Revision History

Effective	Description
2011/12/01	Initial Release

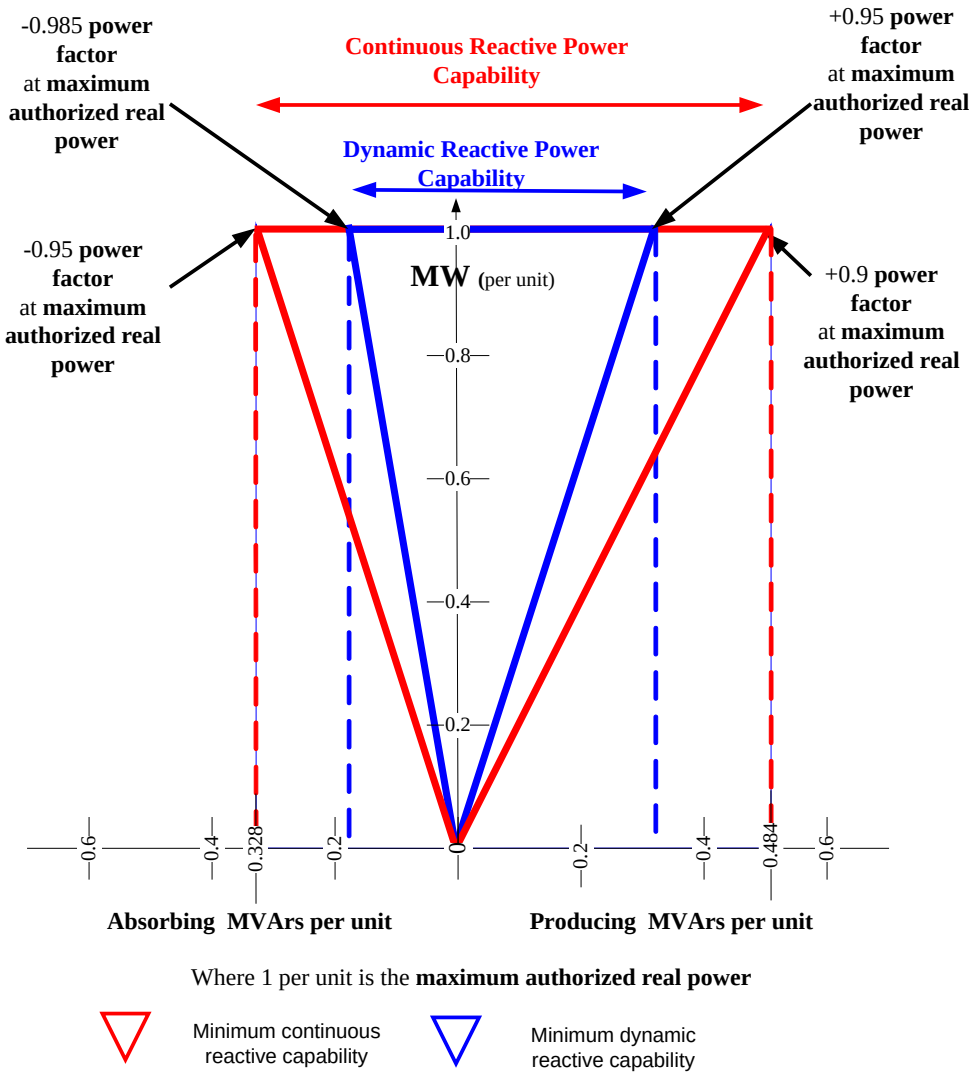
Appendix 1

Voltage Ride Through Requirements



Appendix 2

Reactive Power Capability



Where 1 per unit is the **maximum authorized real power**

Minimum continuous reactive capability

Minimum dynamic reactive capability

Appendix 3

Trip Settings of Off-Nominal Frequency Protective Relays

Frequency (Hz)	Minimum Time Delay
>61.7 Hz	0 seconds
61.6 Hz to 61.7 Hz	30 seconds
60.6 Hz to <61.6 Hz	3 minutes
>59.4 Hz to <60.6 Hz	Continuous Operation
>58.4 Hz to 59.4 Hz	3 minutes
>57.8 Hz to 58.4 Hz	30 seconds
>57.3 Hz to 57.8 Hz	7.5 seconds
>57.0 Hz to 57.3 Hz	45 cycles
≤57.0 Hz	0 seconds