ISO Rules
Part 500 Facilities
Division 503 Technical & Operating Requirements
Section 503.11 Power Quality

Applicability

1 Section 503.11 applies to:

(a) the **legal owner** and **operator** of a **generating unit**, **aggregated facility**, or **energy storage resource** that is directly connected to the **transmission system** or to **transmission facilities** within the City of Medicine Hat, including a **generating unit**, **aggregated facility**, or **energy storage resource** situated within an industrial complex that is directly connected to the **transmission system**;

(b) the **legal owner** of a load facility, where for purposes of this Section 503.11:

(i) "**legal owner**" refers to:

a. the **legal owner** of an **electric distribution system**;

b. a **person** who has entered into an arrangement directly with the **ISO** for the provision of **system access service** under subsection 101(2) of the **Act**;

and

(ii) "load facility" refers to a facility connecting industrial load or distribution load to the **transmission system**;

(c) the **legal owner** of a **transmission facility** that a load facility is directly connect to;

and

(d) the **ISO**.

Requirements

Voltage Flicker, Harmonics and Resonance

2 The **legal owner** of a **generating unit**, **aggregated facility**, **energy storage resource**, or load facility must design and operate the **generating unit**, **aggregated facility**, **energy storage resource**, or load facility to meet the following power quality requirements at the **point of connection** or **point of common coupling**:

(a) the voltage flicker must:

(i) comply with the specifications set out in most recent 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* in effect; and

(ii) without limiting the generality of subsection 2(a)(i), comply with the short and long term flicker limits as set out in the following Table 1:

Table 1
Short and Long Term Flicker Limits

Planning Levels		
	≤ 25 kV	>25 kV
P_{st}	0.9	0.8
P_{lt}	0.7	0.6

where:

P_{st} is an index representing the magnitude of the resulting short term flicker level for the considered aggregation of flicker sources (probabilistic value);

P_{lt} is an index representing the magnitude of the resulting long term flicker level for the considered aggregation of flicker sources (probabilistic value);

and

(iii) meet the:

(A) 99% probability weekly value for P_{st}; and

(B) 95% probability weekly value for P_{lt}

based on measurement period of one week of normal operation;

(b) the harmonics must comply with the specifications set out in the most recent version of *IEEE Standard 519, Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems* in effect;

and

(c) undamped resonance must not be introduced into the **transmission system**, including self-excitation of induction machines, transformer ferroresonance, resonant effects of capacitor additions, and the capacitance of the lines and cables.

Voltage Unbalance

3(1) The **legal owner** of a load facility must design and operate the load facility to meet the following additional power quality requirements at the **point of common coupling**:

(a) the increase of the phase-to-phase voltage unbalance caused by the load facility project must not exceed 1%, where the phase-to-phase voltage unbalance is measured based on normal operating conditions for 95% of the time over any continuous 7 **day** measurement period, calculated in accordance with the following formula:

$$\text{Voltage unbalance} = \frac{\text{Negative sequence voltage component}}{\text{Positive sequence voltage component}} \times 100\%$$

and

(b) rapid voltage changes caused by any change of load, including the start of large motors, must be below the allowable limits set out in Table 2:

Table 2
Maximum Rapid Voltage Change Limits

Number of changes (n)	≤ 25 kV	> 25 kV
n ≤ 4 per **day**	5%	4%
n ≤ 2 per hour and > 4 per **day**	4%	3%
2 < n ≤ 10 per hour	3%	2.5%

(2) The **legal owner** of a **transmission facility** must design and operate the **transmission facility** at the **point of common coupling**:

(a) such that the phase-to-phase voltage unbalance is below the allowable limits set out in Table 3:

Table 3
Maximum Phase-to-Phase Voltage Unbalance Limits

≤ 25 kV	1.8%
138/144 kV	1.4%
240/260 kV	1.4%
500 kV	0.8%

and

(b) the phase-to-phase voltage unbalance percentages must be based on normal operating conditions for 95% of the time over any continuous 7 **day** measurement period, calculated in accordance with the following formula:

$$\text{Voltage unbalance} = \frac{\text{Negative sequence voltage component}}{\text{Positive sequence voltage component}} \times 100\%$$

(3) The **legal owner** of the **transmission facility** must, if an existing **transmission facility** to which the load facility will be connected exceeds the maximum phase-to-phase voltage unbalance limits in this Table 3, submit to the **ISO** a proposal with an estimate to remedy such non-compliance.

Assessment of Voltage Unbalance

4 The **ISO** must, where voltage unbalance is identified on the **transmission system**, address the unbalance in accordance with the specifications set out in the version of the *International Electrotechnical Commission 61000-3-13, Electromagnetic compatibility (EMC) – Part 3-13: Limits - Assessment of emission limits for the connection of unbalanced installations to MV, HV and EHV power system* at all **points of connection** between the **generating unit**, **aggregated facility**, or **energy storage resource** and the **transmission system**.

Power Quality Investigations

5 The **legal owner** and **operator** of a **generating unit**, **aggregated facility**, or **energy storage resource** must assist the **ISO** in a power quality investigation.

Revision History

Date	Description
2024-04-01	Initial release.