



Market Rule Amendment Written Submission

This form is used to provide comment on a *market rule* amendment under consideration by the *IESO*. Please complete all four sections of this form and submit the completed form by email to the following:

Email Address: Rule.Amendments@ieso.ca
Attention: Market Rules Group
Subject: Market Rule Written Submission

All information submitted in this process will be used by the *IESO* solely in support of its obligations under the *Electricity Act, 1998*, the *Ontario Energy Board Act, 1998*, the *Market Rules* and associated policies, standards and procedures and its licence. All submitted information will be assigned the *confidentiality classification* of “Public” upon receipt. You should be aware that the *IESO* intends to *publish* this written submission.

Terms and acronyms used in this Form that are italicized have the meanings ascribed thereto in Chapter 11 of the *Market Rules*.

PART 1 – SUBMITTER’S INFORMATION

Please enter your organization and contact information in full.

Name: NextEra Energy Canada

(if applicable) *Market Participant / Metering Service Provider* No.¹: 114464

Market Participant Class:
Generator

Telephone: 647.789.5656

Fax: _____

E-mail Address: jennifer.tuck@nexteraenergy.com

PART 2 – MARKET RULE AMENDMENT REFERENCE

Type of Rule Amendment Being Commented on (please indicate with x):

Amendment Submission Proposed Rule Amendment Recommended Rule Amendment

MR Number: MR-00415

This *Market Rule* number is located on the “Current Market Rule Amendment” web page.

Date Relevant *Amendment Submission*, Proposed or Recommended Rule Amendment Posted for Comment: January 20, 2015

¹ This number is a maximum of 12 characters and does not include any spaces or underscore.

PART 3 – COMMENTS ON RULE AMENDMENT

Provide your comments.

February 10, 2015

IESO MARKET RULE AMENDMENT SUBMISSION MR-00415

“GENERATION FACILITY REQUIREMENTS - VOLTAGE RIDE THROUGH AND REACTIVE POWER”

COMMENTS OF

NEXTERA ENERGY CANADA

I. INTRODUCTION

NextEra Energy Canada, LP (Nextera Energy Canada)¹ respectfully submits these comments on IESO Market Rule Submission MR-00415 titled “Generation Facility Requirements-Voltage Ride Through and Reactive Power”. We understand that these market rule changes are intended to address an error or inconsistency within the market rules and remove an unwarranted barrier to market entry for some generating facilities.

NextEra Energy Canada is a wholly-owned subsidiary of [NextEra Energy Resources, LLC](#). NextEra Energy Resources is the largest generator of wind energy in North America with more than 100 wind projects in 19 U.S. states and four provinces, operating more than 9,600 wind turbines. These projects are capable of generating over 11,000 MW of energy.

NextEra Energy Canada began to actively develop wind projects in Canada in 2006, and located our Canadian headquarters to Burlington, Ontario in March 2007. In 2012, NextEra Energy Canada relocated its headquarters to Toronto, Ontario. NextEra Energy Canada is focused on developing wind and solar projects in Ontario and other provinces. In Ontario, NextEra Energy Canada currently has two operating solar facilities – Moore Solar and Sombra Solar- and seven operating wind facilities - Conestogo Wind Energy Centre, Summerhaven Wind Energy Centre, Bluewater Wind Energy Centre, Adelaide Wind Energy Centre, Bornish Wind Energy Centre, Jericho Wind Energy Centre, and Goshen Wind Energy Centre - providing over 600 MW of capacity.

NextEra Energy Resources is in the competitive energy business. We develop, construct and operate power plants to produce electricity. We market electricity to wholesale customers and develop the critical infrastructure for power delivery. We also market a variety of energy-related products and services to customers across North America. Equally important, we are dedicated to quality, and we care about the communities where we have facilities and intend to be long term partners in Ontario.

NextEra Energy Resources has a great deal of practical experience in the integration of wind

¹ <http://www.nexteraenergycanada.com/>

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energy in Ontario and other jurisdictions and is strongly motivated to see connection requirements which ensure system reliability while being cost effective to implement, as this contributes to continued success of our business.

II. COMMENTS

NextEra Energy Canada understands that reactive power is critical to the reliable operation of power systems. From an operational perspective, having adequate reactive capability in appropriate locations is essential to mitigating the potential for voltage concerns, including voltage collapse that could lead to an undesired regional or system-wide blackout. In the past, electric supply was generally provided by traditional generation resources (*e.g.* nuclear and fossil fueled) that provided adequate reactive support over the entire operational range of the units. Where additional reactive support was needed, appropriate devices were added to the transmission system. Recently, the amount of wind generation on the grid has increased, and although it still represents a minority of supply, we realize that it is no longer a trivial consideration from either an operational or planning perspective. Initially, the technology of these resources did not provide the same level of reactive power as traditional generation, and displacement of traditional generating capacity with renewables had the potential to result in a net decrease in a system's reactive capability. To forestall this possibility, the IESO specified requirements for static and dynamic reactive capability. In general, the IESO's approach has been to require that renewable facilities "exhibit connection point performance comparable to an equivalent synchronous generation unit"².

Market Rule submission MR-00415 is intended to address an error or inconsistency within the market rules and remove an unwarranted barrier to market entry for some generating facilities³⁴. Specifically;

- It is proposed to remove the word "low" from the Category 3 requirement not to "trip-off" during switching events on the IESO controlled grid that resulted in high and low voltages⁵,
- It is proposed to remove the word "continually" from the Category 5 requirement that

² http://www.ieso.ca/Documents/marketRules/mr_chapter4appx.pdf, Appendix 4.2 – Generation Facility Requirements

³

http://www.ieso.ca/Documents/icms/tp/2015/01/IESOTP_286_4b_MR_00415_Amendment_Submission.doc

⁴ http://www.ieso.ca/Documents/Amend/mr2015/MR-00415-R00_v2.0.pdf

⁵ "Ride through routine switching events and design criteria contingencies assuming standard fault detection, auxiliary relaying, communication, and rated breaker interrupting times unless disconnected by configuration"

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requires the injection or withdrawal of reactive power up to 33% of the rated active power at all levels of active power⁶.

In the first instance, the need for wind farms to ride through normal switching voltage variations, comprising both low and high variations, is understood. For the most part, new wind plants use doubly fed asynchronous generators or full-conversion machines with self-commutated electronic interfaces that have considerable dynamic reactive and voltage regulation capability. We support the proposed change to the Category 3 requirement.

In the second instance, the IESO has recognized that, while the general intent is to require connection point performance comparable to an equivalent synchronous generation unit, there are inherent differences between a synchronous generator and the wind turbine technology. This is especially true in the case of reactive power control, as described in the IESO presentation made to the IESO Technical panel on January 20th, 2015 in support of the aforementioned market rule changes⁷. It is made clear on slide 6 that the reactive capability curve for a synchronous generator is different than a typical wind facility, especially at high levels of real power output.

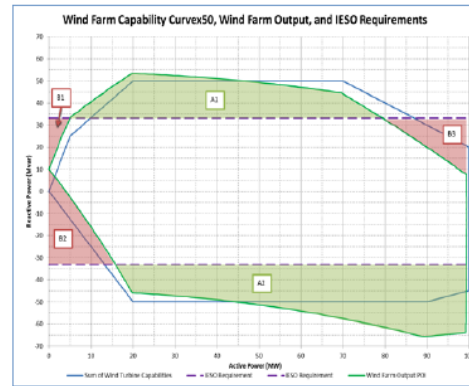
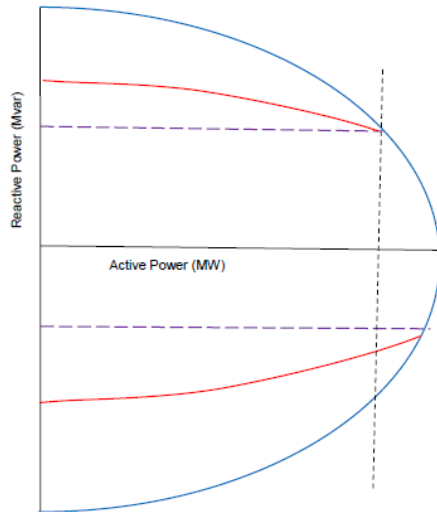
⁶ “Inject or withdraw reactive power continuously (i.e. dynamically) at a *connection point* up to 33% of its rated active power at all levels of active power output except where a lesser continually available capability is permitted by the *IESO*. A conventional synchronous unit with a power factor range of 0.90 lagging and 0.95 leading at rated active power connected via a main output transformer impedance not greater than 13% based on generator rated apparent power is acceptable.”

The IESO proposes to remove the word “continually” from the phrase “except where a lesser continually available capability is permitted by the IESO,” which would give the IESO latitude to remove unwarranted barriers for entry and allow participation of these types of generation, in cases where the IESO has assessed that a lesser requirement is acceptable while maintaining reliability.

⁷ http://www.ieso.ca/Documents/icms/tp/2015/01/IESOTP_286_4d_MR_00415_Presentation.pdf

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Conventional vs Non-Conventional



This difference is a result of the inherent differences in power production of the wind technology as compared to a synchronous generator and could be very costly to address, requiring additional wind farm voltage control facilities beyond that typically provided. On slide 7 the IESO assesses that removing the word “continually”, thus relaxing the reactive requirement from wind facilities at high levels of active power will;

- Not result in a material change from past practice,
- Not shift the burden to other market participants,
- Provide latitude to avoid substantial costs and time delays to overcome inconsequential shortcomings,
- Will remove barriers to market entry

NextEra Energy Canada fully supports the intent and implementation of this change to the Category 5 requirement and commends the IESO for taking this action in support of wind facilities.

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However, we are concerned that the proposed change is insufficient to fully meet the IESO's stated goals. A second important reactive capability requirement is dynamic capability. This capability pertains to the speed at which a generating facility can change its reactive output in response to a monitored system voltage. This requirement is governed by generator connection requirement Category 6 – Automatic Voltage Regulator (AVR)⁸.

Dynamic reactive capability is another area where wind facilities differ from a large centralized synchronous generator that the IESO uses as an equivalent facility from a performance perspective. Wind facilities are made up of large numbers of individual wind turbines, each of which must be given control instruction to provide dynamic reactive response. In addition, the voltage is typically controlled at the point of interconnection with the IESO controlled grid, which may encompass several wind farms that may be located many kilometers from the point of interconnection. This coordination of response across multiple wind turbines and sometimes multiple wind farms is far more complex than is the case for a single large synchronous generator and requires careful management. This management may introduce small time delays to ensure acceptable performance response of the multiple turbines and wind farms. It is important to recognize that this coordination does not degrade the overall reactive performance of the facilities as seen by the system, but it is challenging for wind facilities to meet the dynamic response of a single large synchronous generator where adjustment of a single exciter is all that is required.

It is important to note that the North American Electric Reliability Corporation (NERC), the international regulatory authority whose mission is to assure the reliability of the bulk power system of North America, recognizes the differences between static and dynamic response of renewable facilities and suggests alternatives for the management of these differences.⁹

NextEra Energy Canada encourages the IESO to adopt a similar approach to dynamic reactive response as it is proposing for static response in the aforementioned rule changes. Likewise, NextEra Energy Canada requests that IESO modify the connection requirements with respect to dynamic reactive capability to provide wind facilities the time necessary to coordinate multiple facilities in real-time to achieve the desired dynamic speed of response. We believe this is consistent with the proposed change to MR-00415 where the IESO has assessed that a lesser requirement is acceptable without jeopardizing reliability.

Again, NextEra Energy Canada thanks the IESO for this opportunity to comment. We would be pleased, as this process moves forward, to provide additional information or technical support.

⁸ "Regulate automatically voltage within $\pm 0.5\%$ of any set point within $\pm 5\%$ of rated voltage at a point whose impedance (based on rated apparent power and rated voltage) is not more than 13% from the highest voltage terminal. If the AVR target voltage is a function of reactive output, the slope $\Delta V / \Delta Q_{\max}$ shall be adjustable to 0.5%. The equivalent time constants shall not be longer than 20 ms for voltage sensing and 10 ms for the forward path to the exciter output. AVR reference compensation shall be adjustable to within 10% of the unsaturated direct axis reactance on the unit side from a bus common to multiple units."

⁹ NERC 2012 Special Assessment – Interconnection Requirements for Variable Generation, 2012 www.nerc.com/files/2012_IVGTF_Task_1-3.pdf, Section 2. Reactive Power and Voltage

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PART 4 – EXTERNAL CONSULTATION MEETING

If you believe that a special meeting of stakeholders would be necessary/desirable to discuss the issues raised by the rule amendment, please complete the following information:

External Stakeholding meeting necessary/desirable (please indicate with x):

Reason(s) why you believe a meeting is necessary/desirable:

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