



RFI_1

IESO Regulation Service Request for Information

Issue 1.0

Release Date: Wednesday, June 22, 2016

Closing Date: Friday, September 30, 2016

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1. Introduction

1.1 About the IESO

- 1 The Independent Electricity System Operator (IESO) works at the heart of Ontario's power system – ensuring there is enough power to meet the province's energy needs in real time while also planning and securing energy for the future. It does this by:
 - balancing the supply of and demand for electricity in Ontario and directing its flow across the province's transmission lines
 - planning for the province's medium- and long-term energy needs and securing clean sources of supply to meet those needs
 - overseeing the electricity wholesale market where the market price of electricity is set
 - fostering the development of a conservation culture in the province through programs such as saveONenergy

The IESO is a not-for-profit corporate entity established under the Electricity Act, 1998. It is governed by an independent board of directors whose chair and directors are appointed by the Government of Ontario.
- 2 Please see the IESO's website at <http://www.ieso.ca> for further information.

1.2 Objective of this RFI

- 3 The IESO has initiated this RFI to assess the capabilities of Respondents with respect to the potential provision of *regulation* services, including through the use of products and technologies not currently supported in Ontario or specified in the *IESO market rules*. .

The IESO is seeking to expand the depth of *regulation* in Ontario and is opening this RFI to both incumbent providers and potential new entrants into the *regulation* service marketplace.
- 4 The IESO is requesting RFI submissions from Respondents provided in the form set out in the “Spreadsheet Information Packages” and containing the following information:
 - data representing a variety of *regulation* services types– new and potential, as well as those which conform to the current requirements of the *IESO market rules*;
 - estimated costs of service using the assumptions set out in Appendix ‘C’, but with the understanding that such estimates will be used for informational purposes only, are non-binding, and will not influence the outcome of any subsequent RFP.
- 5 The requested information will better enable the IESO to:
 - identify types of solutions capable of satisfying both the IESO’s current *regulation* requirements and products not currently stipulated by the *IESO market rules* ;
 - ascertain the levels of market depth for *regulation* products;

- identify areas of focus for potential future Request for Proposals (“RFP’s”)
- 6 This RFI is a precursor to a potential RFP for *regulation* services. The form of any such RFP has not yet been determined, and will be influenced by the aggregate responses to this RFI. It is therefore important for all Respondents to provide full, complete and accurate answers to these RFI questions, to the greatest extent practicable.
 - 7 Respondents should be aware of the following:
 - This RFI does not pre-qualify parties to respond to any subsequent RFP, nor has a date for any such RFP been set.
 - Responses to this RFI will not be used to evaluate any responses to a subsequent RFP.
 - This RFI allows participants to propose various forms of *regulation* products which are not currently defined or supported by the *IESO market rules*.
 - A subsequent RFP may not necessarily target *regulation* products investigated in this RFI.
 - 8 This document addresses timelines, document format, and procurement process relating to this RFI.
 - 9 This RFI is not a request for proposal or a tender call. This RFI is not in any way intended to commit the IESO to select a Respondent or to proceed to negotiate or award a Contract. This RFI is not intended to create, and should not be construed as creating, contractual relations between the IESO and any Respondent.
 - 10 The IESO reserves the right to reject any or all submissions; to amend or terminate this RFI process; and to retain all submissions.

1.3 Conventions

- 11 Terms and acronyms used in this document that are *italicized* have the meanings ascribed thereto in Chapter 11 of the *market rules for the Ontario Electricity Market* (the “*market rules*”).
- 12 Each of the rights and powers reserved by the IESO in this RFI may be acted upon by the IESO in its sole and absolute discretion.

1.4 Definitions

- 13 For convenience:
 - “*ancillary service*” means services necessary to maintain the *reliability* of the *IESO-controlled grid*, including, but not limited to, *regulation*, *black start capability*, *voltage control*, reactive power, *operating reserve* and any other such services established by the *market rules*;
 - “*regulation*” means the service required to control power system frequency and maintain the balance between load and generation.
- 14 In addition to the terms defined elsewhere in this RFI, capitalized terms shall have the meanings given to them below:

- “AGC” is defined in the IESO *market rules* as follows: “automatic generation control” means the process that automatically adjusts the output from a *generation facility* that is providing *regulation*. For the purposes of this RFI, the term AGC is a narrow usage context which will not be used, and instead the broader term “*regulation*” will be used in all instances (see below).
- “Closing Date” means the deadline for submitting an Information Spreadsheet.
- “IESO” has the meaning specified in Section 1.1.
- “Information Spreadsheet” means the Respondent’s formal response to this RFI.
- “Mileage” a term used to describe the difference, in megawatts, between a *regulation* setpoint, and the previous *regulation* set point issued by the IESO, or the cumulative summation of such differences over a specified period of time.
- “NPCC” means **Northeast Power Coordinating Council**
- “NERC” means **North American Electric Reliability Corporation**
- “Ramp Rate” The rate, expressed in megawatts per minute, that a facility changes its energy output or consumption.
- “Respondent” means an entity that submits an Information Package to the IESO in response to this RFI.
- “RFI” means this Request for Information.
- “RFI Coordinator” means the IESO’s authorized representative, and the Respondent’s point of contact, for all purposes relating to this RFI.
- “Timetable” means the schedule of key procedural dates and times relating to this RFI.
- “Toronto Time” means Eastern Standard Time or Daylight Saving Time as provided for in the *Time Act* of Ontario.

– End of Section –

2. Background Information

2.1 Background Information for this RFI

- 15 The IESO is responsible for maintaining power system reliability. It does this in part through contracting for *regulation* to meet applicable reliability standards. *Regulation* acts to match total system generation to total system load (plus transmission losses) minute-by-minute as required on the electricity grid, and acts to help correct variations in power system frequency. This service is currently being provided by generation facilities, , and grid energy storage facilities.
- 16 Generation facilities with Automatic Generation Control (AGC) capability are currently the main providers of *regulation* in Ontario. AGC capability permits a generation facility to vary its output automatically, within a specified range, in response to control signals received from the IESO's AGC controller. Load facilities or alternative technologies capable of varying their power demand in response to control signals received from the IESO's AGC controller may also be able provide *regulation*.
- 17 The IESO's *market rules* require the reliable operation of the Ontario power system which must, at a minimum, meet the reliability standards for the operation of electrical power systems set by the North American Electric Reliability Corporation (NERC) and by the Northeast Power Coordinating Council (NPCC). In addition, to compensate for potential outages at facilities providing *regulation* service, the IESO contracts for amounts of *regulation* capacity and ramp rates in excess of these established amounts. The IESO is responsible for determining the quantities of *regulation* capacity needed in Ontario for all operating timeframes.

2.2 Regulation – Current requirements

- 18 Regulation services are subject to the following governing rules:

Governance Level	References
Standards applicable to the IESO	North American Electric Reliability Corporation (NERC) Standard: <i>Standard BAL-005 Automatic Generation Control</i> ¹
Licensing of market participants	Ontario Energy Board (OEB) licence conditions enabling participation in IESO Administered Markets
Market participant obligations	IESO participation agreement
IESO market rules	Chapter 4, Appendices 4.2, 4.8, 4.15 and 4.19 Chapter 5, Sections 4.4, 4.9, 4.10; Section 12; and Appendix 5.1, Section 1.1 Chapter 7, Section 9
IESO Market Manuals	Market Manual 6: <i>Participant Technical Reference Manual</i> ,

¹ Conveys obligations for the IESO in regards to *regulation* service.

and technical requirements	section 4.2: AGC Operational RTU Specifications
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2.2.1 Current *regulation* arrangements in the IESO-administered markets:

- 19 Since the IESO must constantly match area supply with area demand, rapid responses to *regulation* stimuli are more desirable than slower responses. To satisfy the IESO's aggregate minimum ramp rate requirement of 50 MW/ minute, a portion of the total hourly *regulation* capacity required by the IESO has historically been taken from more agile, quick-response generation facilities, load facilities, or grid energy storage facilities. The current IESO *market rules* require market participants to be able to receive a *regulation* signal every two seconds.
- 20 *Regulation* is generally supplied by individual facilities however consideration may be given to proposals offering the provision of this service by a portfolio of facilities, provided that the reliability of the operation of the *IESO-controlled grid* is not diminished. Facilities wishing to provide *regulation* must have in place control equipment, communication links, and equipment necessary for status monitoring by the IESO. The IESO must be able to send control signals from its Energy Management System (**EMS**) controllers to these *regulation* facilities directly or indirectly through an aggregator.
- 21 The IESO will forecast its hourly *regulation* requirements for the following day. The IESO will generally select *regulation* providers, day-ahead, in accordance with:
- 22 a) hourly forecast of the *regulation* requirements (both capacity and responsiveness (ramp rate));
- 23 b) demonstrated performance of facilities providing *regulation* in following *regulation* signals; and
- 24 c) hourly prices for delivery of *regulation* service stipulated in the contracts between the *regulation* service providers and the IESO.
- 25 The IESO may call on any facility with which it has a contract to provide available *regulation* at any time, subject to any limitations described in the contract.
- 26 The current IESO *market rules* require market participants to be able to receive a *regulation* signal every two seconds.
- 27 There is no guarantee that the *market participant* will be called upon for any minimum amount of *regulation* over the term of the Contract. Determinations as to which service providers will be called upon to provide *regulation* for a dispatch day is made day-ahead based on an economic analysis of submitted costs and quantities, conducted by the IESO.
- 28 If insufficient *regulation* capacity was scheduled day-ahead, or scheduled *regulation* service providers are unable to meet their schedule, the IESO may call on or activate additional capacity as required on the dispatch day.

2.2.2 Use of new technologies in the *regulation* service market

- 29 In 2012, the IESO took a first step towards increasing the participation of alternative technologies such as aggregated loads, flywheels and battery storage in the electricity market by selecting new suppliers of *regulation*, traditionally provided by generators – a first for

Ontario. This project was known as the Alternative Technologies for Regulation (ATR) project, and a further description may be found on the IESO website at the following location:

<http://www.ieso.ca/Pages/Ontario%27s-Power-System/Smart-Grid/Energy-Storage.aspx>

2.2.3 Growing needs for *regulation* capacity

30 The IESO schedules up to ± 100 MW of *regulation* range on a day-to-day basis. Like many jurisdictions across North America, we are monitoring several factors driving the need to expand the *regulation* market in Ontario including:

- The uncertainty in variable generation forecasts related to the predictability of their fuel source (sun and wind)
- The autonomous behavior of embedded distributed energy resources, such as controllable loads, embedded generation, and storage that are not subject to IESO dispatch instructions.
- The increasingly non-linear behavior of demand patterns between 5-minute dispatch intervals

31 As noted in the March 22, 2016 issue of the IESO *18-Month Outlook*, the IESO is seeking to expand the depth of the *regulation* service market in Ontario. This Request for Information (RFI) is a major first step towards that goal.

2.2.4 Regulation Data recently published by the IESO may be used to prepare for this RFI

32 On May 24, 2016 in the lead-up to this RFI, the IESO posted a sample of its *regulation* signal data. This data is intended to assist potential new entrants into the *regulation* market to assess, test, and simulate various scenarios with an actual sample of the IESO's *regulation* signal data. The *regulation* sample data file provides interested parties with an opportunity to analyze various characteristics of the *regulation* signal such as upward/downward bias, volatility, correlations with other datasets, etc. The data can also be mathematically scaled to fit the range of a prospective facility for testing and evaluation purposes.

33 The data sample may be found on the IESO website at the following location:

<http://www.ieso.ca/Pages/Participate/Markets-and-Programs/Ancillary-Services-Market.aspx>

34 The current IESO *market rules* require market participants to be able to receive a *regulation* signal every two seconds.

35 RFI respondents may, at their choosing, analyze and utilize this data in order to estimate the performance characteristics of their proposed facility(ies) when formulating responses to this RFI (see also, **Appendix 'C'** for further details)

2.2.5 Developments outside of Ontario

36 Over the past decade, various developments in other jurisdictions have shaped the broader market for regulation services. The IESO is cognizant of these developments and will use this RFI to test various emerging concepts from other jurisdictions, including:

- **Segmentation of *regulation* markets** into different types of *regulation* products, including *regulation* signals that only move facility output in the upward or downward direction. Other delineations the rate at which different types of assets that can adjust their energy output or consumption ("ramp rate).

- **Standardized representation of *regulation* costs:** In 2011 the United States Federal Energy Regulatory Commission (FERC) issued FERC Order 755² which was aimed at recognizing the value of different types of *regulation* resources and removing structural barriers against the entry of emerging technologies. This ruling continues to shape the evolving *regulation* market in various U.S. jurisdictions. The IESO does not currently integrate *regulation* services in a manner as to allow the full implementation of FERC order 755. However, this RFI will allow participants to break-out their cost functions in a categorization similar to that which is now commonly used in the most prominent *regulation* markets in North America.
- **Standardized, formulaic approach to quality assessment:** As a consequence of FERC Order 755, various U.S. jurisdictions now regularly assess how well facilities respond to *regulation* signals and factor that into their payment process. This RFI will allow respondents to self-assess how their facilities would be expected to perform against such measures, given the data pertaining to their facilities, in the proposals submitted by them.

– End of Section –

² FERC, *Frequency Regulation Compensation in the Organized Wholesale Power Markets* AD10-11-000 Docket Nos. RM11-7-000, Issued October 20, 2011)

3. Communicating with the IESO

3.1 RFI Coordinator

37 The IESO has appointed the following person as its RFI Coordinator:

Kathie Callan CSCMP, (CPP), CPM, CPSM
Procurement Specialist
Independent Electricity System Operator
Telephone: (905) 855-6192

E-mail: Kathie.callan@ieso.ca and rfi.info@ieso.ca

3.2 General Communications

38 Unless specifically stated otherwise elsewhere in this RFI, all communications relating to this RFI shall be addressed to the RFI Coordinator in writing by e-mail.

3.3 Submitting an Information Package

39 A party wishing to submit an Information Package shall do so, in accordance with this RFI, by email to the IESO's RFI Coordinator prior to the Closing Date as set out in Section 3.5.

40 The Information Package must be clearly marked as "**RFI-1 IESO Regulation Service Information Package – Private & Confidential**".

41 The Information Package must contain the Respondent's full legal name and return address, and must provide the main contact information of the Respondent.

3.4 Questions, Clarification and Discrepancies

42 The Respondent may direct questions or seek additional information in writing by e-mail prior to the deadline for submitting questions to the RFI Coordinator.

43 To ensure consistency and quality of information provided to Respondents, all significant interpretations, responses, and supplemental information and instruction provided by the IESO shall be posted to Merx and our External Website, without revealing the sources of the inquiries.

44 Notwithstanding the foregoing, the IESO is under no obligation to provide additional information or clarification.

3.5 Timetable for RFI

45 The following Timetable lists the key dates and times (Toronto Time) in this RFI process.

RFI release date	Wednesday, June 22, 2016
Respondent’s deadline for submitting questions that specifically pertain to the completion of the RFI Spreadsheet Information Package	Friday, August 5, 2016
IESO deadline for issuing addenda	Thursday, September 1, 2016
RFI Closing Date (Respondent’s deadline for submitting an Information Package)	September 30, 2016, 3:00 p.m.

46 The IESO may amend the Timetable from time to time without penalty.

- End of Section -

4. Submission Requirements

Spreadsheet Information Package Format

- 47 The Respondent shall provide a Spreadsheet Information Package “**Attachment A**” in electronic form using the Microsoft Excel file format. The spreadsheet should be completed in accordance with the instructions set out in **APPENDIX ‘C’** to this RFI.
- 48 The spreadsheet shall be submitted by an authorized representative of the Respondent organization.
- 49 The spreadsheet shall be in English only.
- 50 Further instructions regarding the proper completion of the Spreadsheet Information Package may be found in **APPENDIX ‘C’**.
- 51 The Spreadsheet Information Package to be used for inputting your response to this RFI is Attachment A to this RFI.

– End of Section –

5. General RFI Terms and Conditions

5.1 No Contract

- 52 This RFI neither expresses nor implies any obligation on the part of the IESO to enter into a contract with any Respondent submitting an Information Package. By submitting an Information Package and participating in the process as outlined in this RFI, the Respondent expressly agrees that no contract or agreement of any kind is perceived or formed under, or arises from, a response to this RFI.
- 53 This RFI is not a request for proposal or a tender call. This RFI is not intended to commit the IESO in any way to select a Respondent or intended to create, and should not be construed as creating, any contractual relations between the IESO and any Respondent.
- 54 The IESO shall not be liable for any costs incurred in association with the preparation for or response to this RFI.
- 55 This RFI does not commit the IESO to Contract A or Contract B as recognized in the procurement process.

5.2 Confidentiality

- 56 The Respondent shall enter into the Non-Disclosure Agreement attached to this RFI as Appendix 'A'
- 57 Notwithstanding the terms of the NDA, the Spreadsheet Information Package submitted by the Respondent shall become the property of the IESO and shall not be returned.

5.3 Due Diligence

- 58 The Respondent shall be responsible for obtaining its own independent financial, legal, accounting, and technical advice with respect to this RFI and the RFI process and any information included in this RFI and in any addenda, attachments, appendices, data, materials, or documents made available, provided or required pursuant to this RFI. The IESO will not be liable under any circumstances for any information or advice or any errors and omissions that may be contained in this RFI or in the addenda, attachments, appendices, data, materials, or documents made available, disclosed or provided to the Respondent pursuant to this RFI. The IESO makes no representation or warranty, either express or implied, in fact or in law, with respect to the accuracy or completeness of this RFI or such addenda, attachments, appendices, data, materials, or documents. The IESO will not be responsible or liable under any circumstances for any claim, action, cost, loss, damage, or liability whatsoever arising from the Respondent's reliance on or use of this RFI or any other technical or historical addenda, attachments, appendices, data, materials, or documents provided by the IESO.

5.4 FIPPA Compliance

- 59 The *Freedom of Information and Protection of Privacy Act*, R.S.O. 1990, c.F.31 (“FIPPA”), as amended, applies to information provided to the IESO by a Respondent. In providing its Information Package, the Respondent acknowledges that the terms and conditions of any pre-qualification of the Respondent may be disclosed by the IESO where the IESO is obligated to do so under FIPPA, by an order of a court or tribunal or pursuant to a legal proceeding.
- 60 By submitting any personal information requested in this RFI, the Respondent confirms that it has acquired all necessary consents and agrees to the use of such information as part of the evaluation process, for any audit of this procurement process and for contract management purposes.

5.5 Governing Law

- 61 This RFI shall be governed by the laws of the Province of Ontario and the laws of Canada applicable therein. Each RFI applicant submits to the exclusive jurisdiction of the Courts of the Province of Ontario situated in Toronto.

– End of Section –

Appendix A: Non-Disclosure Agreement

PROJECT: IESO Regulation Service Request for Information, 2016

WHEREAS the undersigned company or individual (as applicable, the “Independent Contractor”) and the Independent Electricity System Operator (“IESO”) wish to exchange information and enter into discussions on a confidential basis with respect to the above referenced project (the “Project”);

AND WHEREAS in the course of discussing or evaluating the Project, it may become necessary for the IESO and the Independent Contractor to provide each other with information and/or documentation that each party considers to be of a confidential nature;

NOW THEREFORE in consideration of each party being provided with such Confidential Information (as hereinafter defined), the parties agree:

1. Confidential Information. “Confidential Information” means all data and information, in any form, related to the Project and the business and operations of either party including, without limitation, any and all corporate, financial, economic, legal and customer information, proprietary and trade secrets, technology, accounting records and confidential information of third parties, that has been or will be provided by either party (the “Disclosing Party”) to the other party (“the “Receiving Party”).

Confidential Information does not include information which: (a) is already in the public domain or becomes available to the public other than through an act or omission of the Receiving Party; (b) must be disclosed pursuant to a legal compulsion; (c) is acquired without obligation of confidence from a source, other than the Disclosing Party, that has a legal right to disclose such information; (d) is previously known by the Receiving Party at the time of disclosure or is independently developed by the Receiving Party without violating the obligations of confidentiality in this agreement; or (e) the Disclosing Party has consented in writing to the Receiving Party's disclosure of such information.

A party claiming any of the foregoing exceptions shall have the burden of proof to establish such applicability.

2. Representatives. “Representatives” means directors, officers, employees, contractors, agents, lawyers, advisors and consultants of a party to this agreement, and includes any Representatives of an affiliate of a party.

3. Restricted Use of Confidential Information. The Receiving Party shall keep the Confidential Information confidential and shall use at least the same degree of care in safeguarding Confidential Information as it uses for its own information of like importance, but in no event less than a reasonable standard of care. Notwithstanding the foregoing, the Receiving Party may disclose the Confidential Information to those of its Representatives who require such information for the purposes of the Project, provided that such Representatives are made aware of and required to comply with the obligations of confidentiality contained in this agreement. The Receiving Part shall comply with other reasonable security measures regarding the Confidential Information requested in writing by the Disclosing Party.

4. Term and Survival. This agreement takes effect on the date it is executed by the Independent Contractor. Notwithstanding the return or destruction of all or any part of the Confidential Information, the terms of this Agreement shall nevertheless remain in full force and effect until seven (7) years from the date hereof.

5. Return or Destruction of Confidential Information. All Confidential Information and any reproductions thereof (both written and electronic) which are in possession of the Receiving Party and its Representatives shall be destroyed or returned to the Disclosing Party immediately following the Disclosing Party's request.

6. Compelled Disclosure. Where the Receiving Party is compelled by law to disclose any Confidential Information, it shall provide the Disclosing Party with prompt written notice and co-operate in good faith with the Disclosing Party in any reasonable, lawful action that the Disclosing Party takes to resist such disclosure.

7. No Representations or Warranties. No representations or warranties, express or implied, are made as to the quality, accuracy, completeness or reliability of either party's Confidential Information. The Disclosing Party shall have no liability whatsoever with respect to the use of or reliance upon the Confidential Information by the Receiving Party.

8. Title. The Disclosing Party retains all title to its Confidential Information and all reproductions thereof. This agreement shall not be construed as granting or conferring any rights to the Receiving Party by license or otherwise in any Confidential Information (including any patent, patent application, trademark, copyright or trade secret) disclosed under this agreement.

9. Remedies. Any violation or threatened violation of this agreement by the Receiving Party will cause irreparable injury to the Disclosing Party, entitling the Disclosing Party to equitable relief, including injunctive relief and specific performance in addition to all other remedies available at law or equity.

10. Indemnity. The Receiving Party shall be responsible for any disclosure of Confidential Information by any of the Receiving Party's Representatives that is not permitted by this agreement and for any failure by any of the Receiving Party's Representatives to comply fully with the terms of this agreement. The Receiving Party shall defend, indemnify and hold harmless the Disclosing Party from and against all actions, damages, claims, and costs arising out of any breach of this agreement by the Receiving Party or its Representatives.

11. Miscellaneous. This agreement shall not be amended, assigned, nor shall any obligation be waived, except in writing signed by each party. This agreement benefits and binds the parties and their respective successors and permitted assigns. If any part of this agreement is deemed invalid or unenforceable, the balance of this agreement shall remain valid and in

full force and effect. This agreement represents the complete agreement between the parties with respect to the subject matter hereof.

12. Execution via Fax or Email. This agreement may be signed in counterparts and delivered by mail, fax or email, each of which shall be deemed an original and all of which shall constitute one agreement.

13. Governing Law. This agreement is subject to Ontario law. The parties hereby irrevocably attorn to the exclusive jurisdiction of the Courts of Ontario for any legal proceedings arising out of this agreement.

Agreed to this __ day of _____, 2010 by,

Independent Contractor - Full Legal Name

Address

Authorized Signature

Print Name and Title

- and -

Independent Electricity System Operator
2635 Lakeshore Road West, Mississauga, ON, L5J 4R9

Tina Oswald

Tina Oswald, Procurement Specialist

Once completed and signed, please return this non-disclosure agreement to:

Kathie Callan, Procurement Specialist

Telephone: (905) 855-6192

By Email: Kathie.callan@ieso.ca and
rfi.info@ieso.ca

Appendix B: (Not Required)

(intentionally left blank)

Appendix C: Instructions for completing the Spreadsheet Information Package

C.1 Submission requirements

This section sets out the requirements for submitting the Spreadsheet Information Package as part of this RFI. The Spreadsheet Information Package is provided as a separate Microsoft Excel File. **Do NOT complete the tables in this Appendix 'C' – use the spreadsheet to do this.**

Minimum requirement per Respondent:

At a minimum, a Respondent must submit one, fully-completed Product Proposal Tab in the spreadsheet in accordance with this Appendix. That tab must contain, at a minimum, complete information for one facility and at least one *regulation* product pertaining to that facility (**Example 1 illustrated on next page**).

Maximum limit per Respondent:

At a maximum, each respondent entity may submit up to twenty (20) Product Proposal Tabs.

A facility may have more than one product proposal (**Example 2 illustrated on next page**) or product proposals may pertain to several individual facilities (**Example 3 illustrated on next page**). In any submission where the maximum of 20 Product Proposal Tabs is exceeded, any Product Proposal Tabs beyond Product Proposal Tab number 20 will be disregarded. (**Example 4 illustrated on next page**).

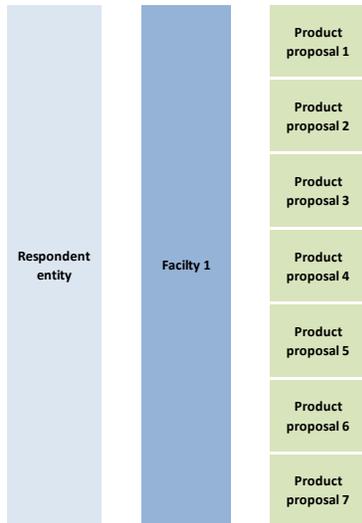
Figure – Examples of allowable and inadmissible RFI submissions for each Respondent entity

ALLOWABLE RFI Submission Examples 1, 2 and 3

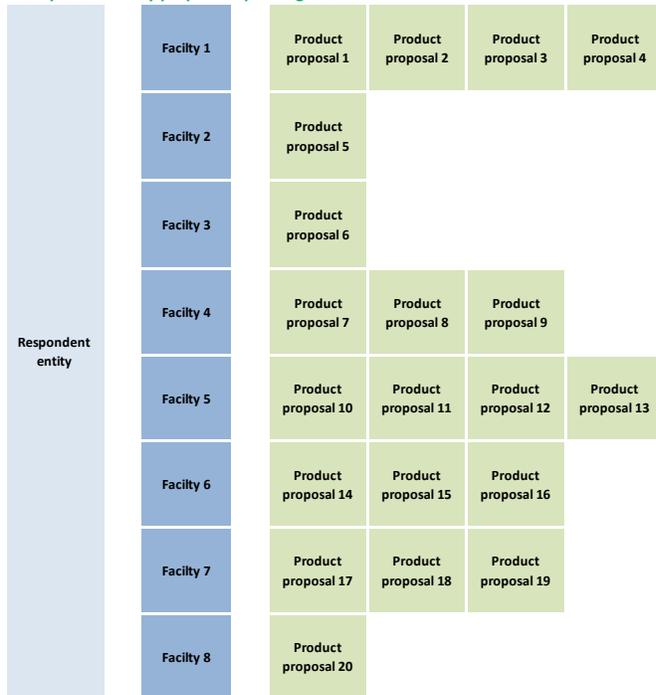
Example 1: Minimum proposal allowed in this RFI



Example 2: A single facility will multiple proposals

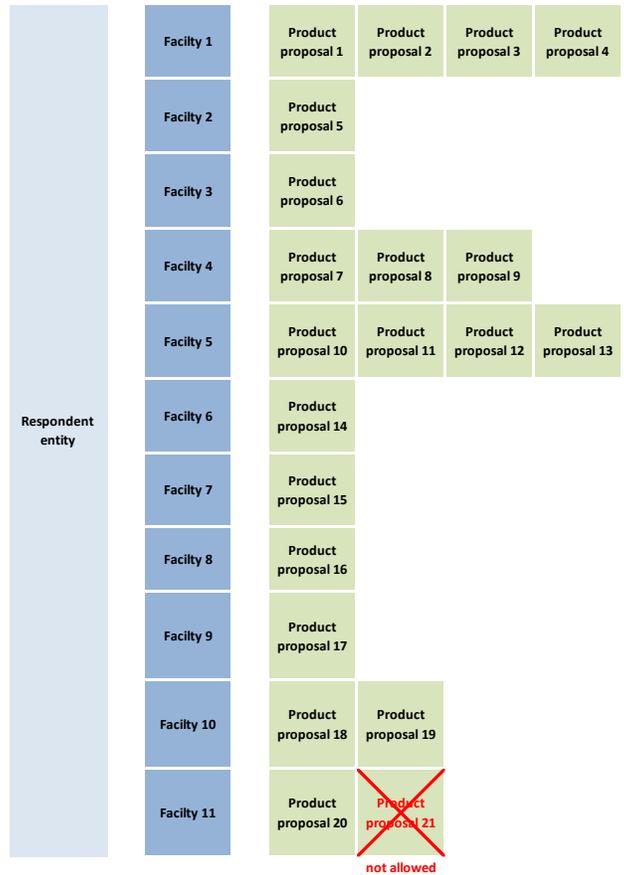


Example 3: Twenty proposals spanning 8 facilities



INADMISSABLE RFI Submission Example 4

Example 4: Inadmissible proposal because maximum of twenty product proposals is exceeded



C.2 Spreadsheet Information Package sections:

C.3 General Instructions Tab:

Overview: This section contains general instructions for filling out the spreadsheet as follows:

2	Submit a maximum of ONE spreadsheet per respondent organization
3	Complete a MINIMUM of ONE and a MAXIMUM of TWENTY Product Tab in this spreadsheets.
4	Each Product Tab shall pertain to ONE facility only.
5	Fill in GREEN-SHADED areas only: The spreadsheet information package is designed to collect specific information in the fields given. Any additional information provided outside of these designated cells will be disregarded by the IESO.
6	Do NOT override cells that limit a specific type of input
7	Use the units of measurement required for each data field. The IESO will assume that you have followed the prescribed units of measurement when evaluating all answers given in this spreadsheet.
8	For each PROPOSAL TAB submitted, the following sections MUST be completed: 1) Section 1 - RFI Respondent Entity Information 2) ONE sub-section of Section 2 - Facility Characteristics 3) Section 3 Product Proposal
9	Submit completed spreadsheet to: SEE SECTION 3
10	Submit completed spreadsheet by: September 30th, 2016, 3:00 p.m. Eastern Time

C.4 Product Proposal Tab: Section 1 - RFI Respondent Entity Information

~~Overview: Provide information regarding the Respondent entity and its representatives, in a manner consistent with information provided in Appendix B: Intent to Participate Form~~

Spreadsheet Data field	Instructions
Name of Respondent organization	Complete data field as indicated. This should correspond with the same legal entity listed in Appendix 'B' (Appendix B: Intent to Participate Form)
Market Participant ID of Respondent organization (if applicable)	-If the Respondent entity is currently registered in the IESO Administered markets, then the Market Participant ID of that organization should be provided. Otherwise, leave blank. It is not necessary for the Respondent entity to be registered in the IESO Administered markets.
Name of individual completing this form	-The individual completing and submitting this spreadsheet shall be assumed to be duly authorized to represent the Respondent in this RFI.
Title of individual completing this form	Complete data field as indicated.
Contact phone number	Complete data field as indicated.
Contact e-mail address	Complete data field as indicated.

C.5 Product Proposal Tab: Section 2 Facility characteristics

The Respondent shall Complete ONE of these sub-sections to Section 2 for each Product Proposal Tab in the spreadsheet:

- 2 a. Existing Facility currently registered with the IESO
- 2 b. Near-term Contracted Facility listed in current IESO 18-Month Outlook
- 2 c. Longer-term Contracted (IESO contracted build queue)
- 2 d. Speculative Segment 'A' Energy Storage facilities, single load facilities > 1 MW, and generation facilities > 1 MW~~Not yet built, but technology proven to be able to provide regulation~~
- 2 e. Speculative Segment 'B': Aggregated/virtual facilities and other technologies not listed in Speculative Segment 'A' > 1 MW~~Not yet built, but technology may be able to provide regulation capacity~~

C.5.1 Sub-section 2 a. Existing Facility currently registered with the IESO > 1 MW

Overview: This sub-section should only be completed if the facility is currently registered in one or more of the IESO-administered markets.

The facility must be greater than one megawatt in capacity.

Instructions for completing spreadsheet information fields in this section:

Spreadsheet Data field	Instructions
Facility-level information	
Facility Name	Complete as per most current IESO registration data for this facility (see also, IESO Form 1181)
Facility ID no.	
Registered Market Participant (RMP) ID no.	
Metered Market Participant ID no.	
Facility Type	
Fuel Type	
Connection Type	
Capacity (MW) (capacity for the entire facility).	

Spreadsheet Data field	Instructions
Regulation capacity to be provided in Section 3)	
Facility bid type	
IESO delivery points	
IESO program list - please indicate markets/programs applicable to this facility	
Facility currently participates in real-time energy market?	SELECT 'YES' or 'NO'
Facility currently participates in operating reserve market?	SELECT 'YES' or 'NO'
Facility currently provides <i>regulation capacity</i> ?	SELECT 'YES' or 'NO'
Facility currently provides Black Start capability?	SELECT 'YES' or 'NO'
Other contractual arrangements with the IESO	SELECT FROM LIST IN SPREADSHEET

C.5.2 Sub-section 2 b. - Near-term Contracted Facility listed in current IESO 18-Month Outlook

Overview: This sub-section should only be completed if the facility is currently contracted with the IESO and is listed in the *IESO 18-Month Outlook*, published on March 22nd 2016 (or subsequent version) and listed as being expected to be in service during the 18-month planning period to which it pertains.

The facility must be greater than one megawatt in capacity.

Instructions for completing spreadsheet information fields in this section:

Spreadsheet Data field	Instructions
Facility-level information	
Facility Name	Complete as per most current IESO registration data for this facility (see also, IESO Form 1181)
Facility ID no.	
Registered Market Participant (RMP) ID no.	
Metered Market Participant ID no.	
Facility Type	

Spreadsheet Data field	Instructions
Fuel Type	
Connection Type	
Capacity (MW) (Capacity for the entire facility. Regulation capacity to be provided in Section 3)	
Facility bid type	
IESO delivery points	
IESO program list - please indicate markets/programs applicable to this facility	
Facility will participate in real-time energy market?	SELECT 'YES' or 'NO'
Facility will participate in operating reserve market?	SELECT 'YES' or 'NO'
Facility will provide <i>regulation</i> capacity?	SELECT 'YES' or 'NO'
Facility will provide Black Start capability?	SELECT 'YES' or 'NO'
Other contractual arrangements with the IESO	SELECT FROM LIST IN SPREADSHEET

C.5.3 Sub-section 2 c. - Longer-term Contracted facilities (IESO contracted build queue) > 1 MW

Overview: This sub-section should only be completed if the facility is:

- currently contracted with the IESO;
- not listed in the *IESO 18-Month Outlook*, published on March 22nd 2016 as being expected to be in service during the 18-month planning period to which it pertains; and
- expected to come into service during a 30-month time period extending from the first quarter of 2017.

The facility must be greater than one megawatt in capacity.

Instructions for completing spreadsheet information fields in this section:

Spreadsheet Data field	Instructions
Facility-level information	
Facility Name	Complete as per most current IESO registration data for this facility (see also, IESO Form 1181)
Facility ID no.	
Registered Market Participant (RMP) ID no.	
Metered Market Participant ID no.	
Facility Type	
Fuel Type	
Connection Type	
Capacity (MW) (Capacity for the entire facility. Regulation capacity to be provided in Section 3)	
Facility bid type	
IESO delivery points	
IESO program list - please indicate markets/programs applicable to this facility	
Facility will participate in real-time energy market?	SELECT 'YES' or 'NO'
Facility will participate in operating reserve market?	SELECT 'YES' or 'NO'
Facility will provide <i>regulation</i> capacity?	SELECT 'YES' or 'NO'

Spreadsheet Data field	Instructions
Facility will provide Black Start capability?	SELECT 'YES' or 'NO'
Other contractual arrangements with the IESO	SELECT FROM LIST IN SPREADSHEET

C.5.4 Sub-section 2 d. Speculative Segment 'A': Energy Storage facilities, single load facilities > 1 MW, and generation facilities > 1 MW

Overview: This sub-section should only be completed by Energy Storage facilities, single load facilities > 1 MW, and generation facilities > 1 MW and:

- not listed in the *IESO 18-Month Outlook*, published on March 22nd 2016; AND
- not expected to come into service over the next 18 months.

The facility must be greater than one megawatt in capacity.

Instructions for completing spreadsheet information fields in this section:

Spreadsheet Data field	Instructions
Facility-level information	
Facility Name	
Resource-Facility Type	SELECT FROM LIST IN SPREADSHEET IN SPREADSHEET
Technology Type	Please summarize in one sentence.
Prospective Transmission Zone	SELECT FROM LIST IN SPREADSHEET
Prospective location	Please summarize in one sentence to the greatest detail currently known.
Prospective Capacity (MW)	Must be great than one megawatt Rounded to the nearest tenth of a megawatt
Prospective Connection Type	SELECT FROM LIST IN SPREADSHEET
Prospective Resource bid type	SELECT FROM LIST IN SPREADSHEET

Spreadsheet Data field	Instructions
Energy Storage-specific information (to be completed only if the facility is an Energy Storage facility)	
Energy Storage Capacity of the Facility (MWh)	Specify MWh to the nearest tenth of a megawatt hour.
Response Time for variation of energy input and output (seconds)	To the nearest second.
Conversion losses (% of total energy stored)	To the nearest tenth of a percent.
Storage losses over 2 hours (% of total energy stored)	To the nearest tenth of a percent.
Storage losses over 12 hours (% of total energy stored)	To the nearest tenth of a percent.
Storage losses over 16 hours (% of total energy stored)	To the nearest tenth of a percent.
Minimum Full Charge Cycle Duration (hours)	The “full charge cycle duration“ is the time required by the grid energy storage facility to charge from its minimum loading point to its maximum loading point. “Minimum full charge cycle duration” is the shortest time the grid energy storage facility can achieve (“fast charge”), while “maximum full charge cycle duration” is the longest acceptable time (trying to charge slower than this would most likely result in unacceptable losses or damage the equipment).
Maximum Full Charge Cycle Duration (hours)	
Power Storage Capacity of the Facility (MW)	Specify MW to the nearest tenth of a megawatt
Energy Storage Capacity of the Facility (MWh)	Specify MW to the nearest tenth of a megawatt hour
Response Time for variation of energy input and output (seconds)	To the nearest millisecond.

C.5.5 Sub-section 2 e. Speculative Segment 'B': Aggregated/virtual facilities and other technologies not listed in Speculative Segment 'A' > 1 MW

Overview: This sub-section should only be completed by Aggregated/virtual facilities and other technologies not listed in Speculative Segment 'A' that:

- Have an aggregated, expected capacity of at least 1 MW;
- not listed in the IESO 18-Month Outlook, published on March 22nd 2016; and
- not expected to come into service over the next 18 months.

Spreadsheet Data field	Instructions
Facility-level information	
Facility Name	
Resource Type	Please summarize in one sentence.
Technology Type	Please summarize in one sentence.
Prospective Transmission Zone	SELECT FROM LIST IN SPREADSHEET
Prospective location	Please summarize in one sentence to the greatest detail currently known.
Prospective Capacity (MW)	To the nearest tenth of a megawatt.
Prospective Connection Type	SELECT FROM LIST IN SPREADSHEET
Prospective Resource bid type	SELECT FROM LIST IN SPREADSHEET

Spreadsheet Data field	Instructions
Information specific to a facility comprised of aggregated, distributed resources	
% of aggregated facility capacity that is attributable to generation	<ul style="list-style-type: none"> • Percentage (%) rounded to the nearest tenth of one percent • The summation of these three rows should add to 100%
% of aggregated facility capacity that is attributable to controllable loads	
% of aggregated facility capacity that is attributable to energy storage	
Number of individual resources to be aggregated	

C.5.6 Product Proposal Tab: Section 3 - Product Proposal:

Overview: This section must be completed for each facility submitted. As noted at the beginning of this Appendix, the Respondent may provide ONE *regulation* product proposal for each Product Proposal Tab submitted in the spreadsheet (up to a maximum of 20 Product Proposal Tabs per submission).

This section contains Row 'A' through 'T' comprised of the following sub-sections.

Subsection 1 – Product Attributes	ROW 'A' to ROW 'I'
Subsection 2 – Availability Attributes	ROW 'J' to ROW 'N'
Subsection 3 – Cost Data	ROW 'O' to ROW 'S'
Subsection 4 – Delivery Data	ROW 'T'

The description of these subsections and rows are provided in the table that follows.

Row	Instructions	Units of measurement for response	Key Assumptions
<p>Sub-section 1 – Product Attributes ROW ‘A’ to ROW ‘I’</p> <p>Overview: This subsection allows the respondent to provide attributes of the proposed <i>regulation</i> product to be provided by the facility described in Section 2: Facility characteristics</p> <p>As noted at the beginning of this Appendix, the same facility may be associated with more than one product proposal tabs in the spreadsheet.</p>			
ROW A	Average Minimum Regulation Ramp Rate	MW/minute	Current IESO requirement is 50 MW/minute, but Respondents may make proposals for slower or faster MW ramp rates.
ROW B	<p>"Select ONE type of <i>regulation</i> product from the dropdown menu:</p> <p>1) Up Only: A hypothetical <i>regulation</i> signal in which a generation facility is required to respond to a signal within the Response Time by INCREASING output or in the case of a load facility, by DECREASING its consumption.</p> <p>2) Down Only: A hypothetical <i>regulation</i> signal in which a generation facility is required to respond to a signal within the Response Time by DECREASING output or in the case of a load facility, by INCREASING its consumption</p> <p>3) Up and Down: A <i>regulation</i> signal in which a facility is required to respond to a signal within the Response Time by INCREASING OR DECREASING output or consumption"</p>	Select type of signal: Up Only Down Only, Up and Down	Current IESO requirement is an Up and Down signal, but Respondents may make proposals for an Up Only or Down Only signal.

Row	Instructions	Units of measurement for response	Key Assumptions
ROW C	Please indicate if you are assuming that the Up and Down <i>regulation</i> signal is "energy neutral" (i.e. where upward and downward instructions balance to within 1% during a given time period).	YES or NO	Select "YES" or "NO" in the spreadsheet input file. NOTE: the IESO <i>regulation</i> signal is currently NOT energy neutral (please see data sample on the Ancillary Services page of the IESO public website)
ROW D	Regulation Capacity to be offered (\pm MW)	\pm MW range to the nearest 0.1 MW	The total amount of <i>regulation</i> (MW) made available above and below a given basepoint. Example 1: if a storage facility is able to offer a <i>regulation</i> range between 5 MW of consumption and 5 MW of production, then the Regulation Capacity to be offered would be \pm 5 MW Example 2: If a generation facility was able to offer a <i>regulation</i> range of 25 MW above and 25 MW below a given basepoint, then the Regulation Capacity to be offered would be \pm 25 MW
ROW E	Assumed Mileage Multiplier = A quantity reflecting expected mileage from 1 MW of <i>regulation</i> capacity in a given hour where "mileage" = $\sum_{x=2}^X [\text{abs} \text{setpoint}_x - \text{setpoint}_{x-1}]$ where 'X' is the set of all setpoints issued over the course of an hour (Assume 1,800 set points per hour) Note: In some U.S. <i>regulation</i> markets, the mileage multiplier is used as a <i>regulation</i> payment component to recognize the value of fast-acting facilities.	Floating point to two decimal places	Example for mileage for a single two-second interval between setpoint X-1 and setpoint X: Assume: setpoint _x = 23 MW setpoint _{x-1} = 24.5 MW Mileage over 2 seconds = 1.5 MW Note: In some U.S. <i>regulation</i> markets, the mileage multiplier is used as a <i>regulation</i> payment component to recognize the value of fast-acting facilities in their ability to ramp to different <i>regulation</i> levels much faster

Row	Instructions	Units of measurement for response	Key Assumptions
			than other facilities. Although this method is not currently employed in Ontario, Respondents should derive this multiplier using their facility's <i>regulation</i> capacity, ramp rate and, optionally, by analyzing the <i>regulation</i> signal sample posted on the IESO website (see section 2.2.24).
ROW F	Maximum output for operation under <i>regulation</i> control (MW)	MW to the nearest tenth of a megawatt	The maximum level at which the facility's basepoint may be set.
ROW G	Minimum output for operation under <i>regulation</i> control (MW)	MW to the nearest tenth of a megawatt	The minimum level at which the facility's basepoint may be set.
ROW H	Maximum Number of Starts Per Day	Starts per day	TO BE COMPLETED BY GENERATORS ONLY The number of times a generation unit can be started within a dispatch day
ROW I	Minimum down time Per Day (minutes)	Minutes, to the nearest minute	TO BE COMPLETED BY GENERATORS ONLY The minimum time period for which the facility is unavailable to provide <i>regulation</i> , immediately following a previous <i>regulation</i> event.
<p>Sub-section 2 – Availability Data – ROW ‘J’ to ROW ‘N’</p> <p>Overview: This subsection allows the respondent to provide availability attributes for each product proposal in terms of:</p> <ol style="list-style-type: none"> 1. Availability characteristics over the course of an average year, accounting for normally scheduled outages maintenance and other reasons. 2. Availability characteristics over the course of each quarter of an average calendar year, accounting for seasonal factors. <p>Availability attributes must be provided for each product proposal.</p>			
Row	Instructions	Units of measurement for response	Key Assumptions

Row	Instructions	Units of measurement for response	Key Assumptions
ROW J	Average YEARLY Availability Factor (%) over 7 years: percentage of time the unit is available to offer <i>regulation</i> capacity over the course of a year	Percentage (%) to the nearest tenth of a percent	The average time a facility is available to provide <i>regulation</i> service over a YEAR, INCLUDING expected time for scheduled outages and de-ratings.
ROW K	Seasonal reductions - FIRST Quarter of each year - % reduction in Monthly Availability factor due to seasonal factors	Percentage (%) to the nearest tenth of a percent	The average additional reduction to a unit's average availability over the course of a year, during each quarter of each year due to seasonal factors.
ROW L	Seasonal reductions - SECOND Quarter of each year - % reduction in Monthly Availability factor due to seasonal factors	Percentage (%) to the nearest tenth of a percent	Examples of seasonal factors: <ul style="list-style-type: none"> • Run of river conditions • Temperature
ROW M	Seasonal reductions - THIRD Quarter of each year - % reduction in Monthly Availability factor due to seasonal factors	Percentage (%) to the nearest tenth of a percent	<ul style="list-style-type: none"> • Solar irradiance • Wind speeds
ROW N	Seasonal reductions - FOURTH Quarter of each year - % reduction in Monthly Availability factor due to seasonal factors	Percentage (%) to the nearest tenth of a percent	

Sub-section 3 – Cost Data – ROW ‘O’ to ROW ‘S’

Overview: This section requires each Respondent to express the costs of each product proposal in terms of three separate components:

1. fixed costs (“Availability cost component” ROW O)
2. variable costs (“Performance component” or, “Mileage cost” – ROW P); and,
3. opportunity costs (“Opportunity Cost adder” – ROW Q).

In addition:

- Respondents may optionally complete Row ‘R’ to represent the combined value of ROW ‘P’ and ROW ‘Q’ as a single variable cost in \$/MWh
- Respondents are requested to estimate an Assumed average accuracy for each product proposal (ROW ‘S’).

Cost attributes must be provided for each product proposal provided in each Product Proposal Tab (see also, section 3)

Row	Instructions	Units of measurement for response	Key assumptions
ROW O	Availability cost component (\$/year): A fixed, annual payment to achieve the <i>regulation</i> range indicated in the proposal line, for a period of one year, subject to the availability data provided in Section 34 .	\$ per year	For each <i>regulation</i> product proposal row, assume: <ul style="list-style-type: none"> all fixed costs are recovered through ONE product Assume an amortization period of 10 years
ROW P	Performance Component (Mileage cost) \$ per MW: A \$/MW payment based on the mileage provided during any given time period over the term of an Ancillary Service contract, prior to the application of any performance/accuracy penalties. "mileage" = $\sum_{x=2}^X [\text{abs} \text{setpoint}_x - \text{setpoint}_{x-1}]$ where 'X' is the set of all setpoints 'x' issued over the course of an hour (Assume 1,800 set points per hour)	\$ per MW of mileage to the nearest cent	For each <i>regulation</i> product proposal row, assume: <ul style="list-style-type: none"> The facility is only offering ONE product The <i>regulation</i> product is fully utilized, subject to the availability data provided in Section 34 Example for mileage for a single two-second interval between setpoint X-1 and setpoint X: Assume: setpoint _x = 23 MW setpoint _{x-1} = 24.5 <ul style="list-style-type: none"> Mileage over 2 seconds = 1.5
ROW Q	Opportunity Cost adder as a percentage of the Performance Component (%): Represents the value of lost opportunity costs associated with providing other services as a consequence of providing <i>regulation</i> service.	% of Performance Component to the nearest tenth of a percent	For each <i>regulation</i> product proposal row, assume: <ul style="list-style-type: none"> The facility is only offering ONE product The facility is only offering ONE product
ROW R	OPTIONAL ROW: Respondents may provide a Variable Cost estimate of variable costs in \$/MWh which should reflect the combined value of Row 'P' and ROW 'Q'	\$ per MWh	This should reflect the commensurate value of Mileage Costs (Row 'P') plus Opportunity Costs (Row 'Q') in dollars per megawatt hour
ROWS	Assumed average accuracy (%):	Percentage (%) to	For each <i>regulation</i> product

Row	Instructions	Units of measurement for response	Key Assumptions
	average deviation of output from the setpoint, assuming a setpoint is received every two seconds, which would form the basis of any accuracy payment reductions	the nearest tenth of a percent	proposal row, assume: <ul style="list-style-type: none"> The facility is only offering ONE product
<p>Sub-section 4 – Delivery Data – ROW ‘T’ Each Product Proposal Tab requires each Respondent to make an estimate as to when their facility might be able to provide <i>regulation</i> service under the assumption that a <i>regulation</i> agreement with the IESO is executed during the first quarter of 2017. <u>Facilities that are part of the Speculative Segment A or B can offer to provide service beyond Q3, 2019.</u></p>			
ROW T	Please indicate if it is technically possible for the facility in question to provide frequency <i>regulation</i> services by the BEGINNING of the quarter selected	<u>YES or NO</u> Quarter, year	<u>Facilities should provide a best estimate of when they will be able to provide regulation service by</u> Ensure at least one row in this column is marked as YES
END OF PRODUCT PROPOSAL TAB			

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