Energy Storage Procurement Framework

Prepared for the Minister of Energy by the Independent Electricity System Operator and the Ontario Power Authority
January 31, 2014
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Executive Summary

The proposed energy storage procurement framework specifies that 50 MW of energy storage will be included in procurement processes by the end of 2014 using a phased approach. Final MW procurement totals for each phase may change as a result of the response to the Phase I RFP. The OPA and IESO will work closely together throughout the procurement phases to maximize learning about energy storage services in the Ontario context.

Approximately 25-30 MW of energy storage services will be procured by the IESO during Phase I which builds upon the Alternate Technologies for Regulation (“ATR”) framework that the IESO used recently to contract with battery and flywheel vendors to supply regulation service. Contracts under Phase I would be executed by the end of June 2014. While this phase of competitive procurements would focus on reliability services, it is expected that many energy storage solutions selected will provide additional end-use services beyond the primary focus identified in the procurement – this will enhance the learning expected from these solutions.

Phase II of the energy storage procurements will be designed to address the emerging issues of the evolving electricity system as described in the Long Term Energy Plan (“LTEP”). It will focus on areas that can provide the best long-term benefit to the ratepayer while allowing maximum opportunities for storage suppliers to demonstrate their technologies. To do this, input from stakeholders will be required to develop the appropriate framework for achieving these goals and will include input on potential sites and alternate contractual arrangements. The timing will be designed to complement the Phase I process and to leverage learnings from that phase. The OPA will follow a multi-stage procurement process based on input from stakeholders, with it being initiated in Q1/Q2. The OPA will procure the remainder of the 50MW, which may include some consideration for remote communities.

The proposed framework also includes a plan to review the regulatory barriers to storage’s participation in Ontario’s electricity market and identify options for addressing these barriers. This effort will be carried out by the IESO and OPA in partnership with the Ontario Energy Board’s Smart Grid Advisory Committee - Storage Working Group.
Introduction

This report has been submitted by the OPA and the IESO in response to Section 3 of the Minister’s December 16, 2013 Directive to the OPA and letter to the IESO to jointly report back with a proposed design and outline for an energy procurement framework that includes IESO-led procurements and possible OPA-led procurements (see Appendix A – Directive to OPA, Appendix B – Letter to IESO).

As per the 2013 Long Term Energy Plan Achieving Balance, the government included 50 MW of energy storage to be procured by the end of 2014. The OPA and IESO have worked collaboratively to develop an energy storage procurement framework that is able to address the unique system characteristics of energy storage and take into account the main system benefits. The joint framework is structured to facilitate competitive energy storage procurement processes which will test different end-uses for storage solutions and help drive insights into the evolution and integration of energy storage applications in the Ontario market. The proposed energy storage procurement framework also includes a plan to review the regulatory barriers to storage’s participation in Ontario’s electricity market and identify options for addressing these barriers.

The services that can be provided by storage technologies have been reviewed for their use in providing balancing services short-term in nature, such as frequency regulation, and their use in longer term balancing services, such as storing excess production when it cannot be used immediately. A qualifying energy storage system will be one that operates for the primary purpose of absorbing energy and either redelivering or substituting for its use at a future period.

In developing the framework, the OPA and IESO engaged representatives in the storage industry to solicit views on the uses of storage facilities, procurement methods and commercial arrangements. The input received helped inform the structure and content of this framework.

The framework proposes a phased approach for procurements. The Phase I procurement will be led by the IESO and is proposed to conclude before the end of the second quarter of 2014. Phase II will be led by the OPA and will be timed to complement the IESO process. The OPA and IESO will work closely together throughout these procurements.

In addition, the OPA has been directed to work with remote First Nation communities where transmission connection has been identified as uneconomic and explore solutions which must demonstrate the ability to increase a community’s use of on-site renewable energy sources and reduce their dependency on diesel fuel. There may be opportunities to employ storage technologies in these communities as a means of further reducing their reliance on diesel generation. This framework allows for the consideration of energy storage as a way to integrate and increase such renewable generation opportunities in a cost effective manner.
Storage Services

Energy storage systems have the ability to provide multiple services along the entire value chain of the electrical system. This range of services is based on the fundamental attribute of storage; that is its ability to move energy from one time period to another. In doing so, it can increase the value of the energy produced by other sources and adds capacity value to the system. It can act as a load and as a generator and provide a range of balancing services both short-term and long-term such as:

- Capacity and congestion management
- Ancillary services
- Allowing for the deferral of transmission and distribution infrastructure investments
- End use customer energy management, including distribution level services

This procurement will allow emerging storage technologies to demonstrate their value to the system overall by providing services such as:

- Shifting energy from low demand periods to high demand
- Adding MW capacity to the system
- Aiding in electricity ramp (up or down)
- Aiding in utilizing Surplus Baseload Generation more effectively
- Aiding in managing transmission constraints
- Providing contingency response and energy reserves
- Smoothing/firming out the output of intermittent generation resources

A wide range of aspects need to be considered in deciding the best match between storage technologies and system needs. For instance, energy storage services can be of value at the bulk system, LDC, or customer level. Some technologies could be placed at any of these locations while others can only be located where the geography allows. Other technical considerations for the services include the physical size of the facility, its power rating, ramping capability, discharge times and whether it is located on the transmission or distribution system.

There are additional considerations needed in structuring the commercial mechanisms to maximize the value received by these facilities. One such consideration is how to test market mechanisms that may allow storage to compete on a level playing field with other generation resources. Another is the structure of the commercial mechanisms used to incent the facility to provide maximum value to the rate payer.
Industry Engagement

The IESO and OPA jointly hosted an information session for representatives from the storage industry and other interested parties on January 17, 2014. Attendees included representatives of the Ontario Energy Storage Alliance (OESA), Ontario Energy Board (OEB), Ontario Ministry of Energy (ENERGY), Association of Major Power Consumers in Ontario (AMPCO), Association of Power Producers of Ontario (APPrO), and the Building Owners and Managers Association (BOMA). The purpose of the information session was to bring together the IESO, OPA, OEB and storage industry representatives to gather input to inform the development of an energy storage procurement framework, including objectives and scope of an energy storage procurement, to assess storage industry readiness and how to address the main regulatory barriers preventing energy storage technologies from competing in the energy market (see Appendix C for the materials provided by the IESO and OPA for this session).

In advance of the session, the OESA provided the IESO, OPA, ENERGY and OEB a document representing the Alliance’s views on an energy storage procurement framework, including proposed Principles for a procurement in Q1-Q2 2014 and Indicative Contract Terms (see Appendix D).

Consistent with this written submission, critical themes and conclusions drawn from the information session include:

- Agreement that the core objective of an energy storage procurement is to maximize learning such as operating characteristics, system benefits, system and market integration, valuation of the variety of services storage solutions can provide, and commercialization or procurement opportunities
- The storage industry states that they are ready to move quickly and proposes to apply, with minimal refinements, the existing IESO framework used for procurement of Alternative Technologies for Regulation (ATR), to a procurement process to start in February 2014
- Use past experience from procurements to identify contracting mechanisms that minimize both ratepayer and proponent risks
- Some regulatory barriers could be managed in the near term through contracting mechanisms. Applied learning from the operation of the procured storage services and solutions will be used to develop and implement enduring solutions to the regulatory barriers
- A wide range of applications should be considered, including opportunities related to thermal energy storage.
Proposed Procurement Framework

Procurement Principles
The procurements that will take place under this storage initiative should adhere to some guiding principles. These principles lay the groundwork for robust processes that consider the interests of all parties. The following principles will guide both the Phase I and II procurements.

Open, Fair and Transparent Procurements
The procurement and contracting processes are designed to ensure an open, fair and transparent outcome. This includes clear, understandable and publicly available procurement documents and processes, and sample contracts. All participants have equal access to relevant information in a timely manner with no potential proponents having an advantage over others.

Furthermore, a Fairness Advisor will be retained for the procurements to provide interested parties and proponents with the confidence that the procurements are conducted in a fair and open manner that is consistent with defined principles and good procurement practices. A Fairness Advisor acts as an independent and objective monitor of the procurement process. The Fairness Advisor will issue an assessment on the conduct of the process which will be publicly available to all interested parties, subject to appropriate commercial sensitivities.

Value to Ratepayer
The competitive procurements will be designed to maximize value to ratepayers and system operation. The potential value provided by storage solutions is defined by the cost of the specific technology, and the services that the technology provides to the system.

To ensure a diverse portfolio of services and technologies are procured, the assessment criteria will include elements in addition to cost to ensure a diverse portfolio of services and technologies are procured. This will allow as many solutions as possible the ability to demonstrate the ratepayer value they can provide.

Contract structures will also be an important consideration in optimizing the value received by the ratepayer over the useful life of the project, which needs to be reflected in the commercial arrangements. To help protect ratepayers from undue risk, contracts will be structured to ensure the party who has the most control over a risk is the party that bears that risk.

Responsive to Storage Industry Readiness
The OPA and IESO have well defined and successful competitive procurement processes and contracting mechanisms. The OPA and IESO have relevant procurement experience with processes and materials that can be readily adapted for this procurement.
Integration of Storage into the IESO Administered Markets

The contracting structure used for storage resources under this procurement should aim to effectively integrate these resources into the market. Contract structures should not distort the effective integration of storage resources into the market and should permit participation in new and/or revised market mechanisms. Where facilities earn market revenue, the contracts need to take these into account.
**Procurement Objectives**

The Directive to the OPA and the letter to the IESO to prepare a framework provides an opportunity to increase the knowledge of how to integrate emerging technologies into the market. The following objectives will help ensure that the most can be made from this opportunity:

**Maximize learning about the various end-use services that energy storage solutions can provide.** Storage solutions can provide multiple services for system operation. Indeed, the same storage solution may provide multiple benefits. The procurements will strive to maximize learning opportunities from a diverse services portfolio and through robust information and data gathering and sharing processes. This is consistent with the storage sector’s objective for a ‘learning by doing’ approach.

**Explore potential frameworks for competitive procurements, market mechanisms, and the commercial arrangements for energy storage solutions.** Energy storage solutions can serve as both a load and in some cases a supply for the grid. This procurement provides an opportunity to provide insight into the cost structures of storage facilities. This can help assess the value energy storage solutions provide and inform the development both of the technology itself and the commercial arrangements needed to support it.

**Learn how to effectively and efficiently integrate energy storage resources into the Ontario electricity market, understand its potential roles in the sector and meet system operator needs.** Storage solutions provide grid operators with additional tools to manage the electricity grid. It is also recognized that these resources may be used most efficiently when integrated effectively with electricity market mechanisms.

**Identify the main regulatory and other barriers preventing energy storage technologies from competing in the energy market.** Working through the OEB, the operation and integration of the procured resources into the Ontario electricity market will allow for identification of these barriers and for implementation of enduring solutions.
Procurement Design

Phase I – Ancillary Services Stream

The IESO would competitively procure a number of energy storage solutions that would focus upon end-uses – specifically, providing reliability services (also called ‘ancillary services’) to help address issues observed on the power system.

These expected solutions will be:

- small enough to support many different projects to maximize learnings from different end-uses, technologies, locations, and length of time energy is stored; and
- large enough so that we can observe their operational characteristics and that it can directionally contribute to reliable power system operation.

The IESO expects to procure 5-8 different solutions ranging in size from 2-8 MW each, for a total of approximately 25-30 MW. It is expected that many energy storage solutions selected will provide additional end-use services beyond the primary focus identified in the procurement – this will enhance the learning expected from these solutions.

This stream will build naturally upon the Alternate Technologies for Regulation (“ATR”) framework that the IESO used recently to contract with battery and flywheel vendors to supply regulation service. This framework allows the IESO to contract simply and quickly with energy storage vendors, allow these vendors to arrange financing quickly and facilitate the rapid start of construction so that we can place these devices in-service and begin to learn about their operation. We expect that the contract terms for these vendors will be relatively short minimizing the contractual commitment and freeing these devices for participation in new and/or revised market mechanisms that the IESO desires to implement to support storage on an enduring basis.

Ancillary Services - What are they?

Ancillary services are services necessary to maintain the reliability of the IESO-controlled grid, including but not limited to:

- balancing services (e.g. operating reserve and regulation)
- emergency response services (e.g. black start capability)
- power system operation services (e.g. reactive support and voltage control), and
- any other such services established by the market rules.

The proposed procurement would also afford the opportunity to test other ways in which storage could help meet system operator needs in real-time and day-ahead time frames such as:

- aiding in electricity ramp (up or down);
- aiding in surplus baseload generation management;
- addressing short-duration transmission or distribution congestion; or
- smoothing the output of variable generation resources.
**How will these ancillary services be procured?**

The IESO has the authority to procure contracted ancillary services including any new ancillary services that may be set forth in the market rules. The IESO will use the ancillary service framework as the means to integrate energy storage services into the IESO-administered markets to maintain system reliability in accordance with the IESO’s market objective.

The procurement framework will consist of a competitive RFP for storage solutions to address specific system needs (e.g., SBG management, thermal limits, power quality, Loss of Load Expectation) as defined by IESO and informed by existing and anticipated operational issues. The IESO will also identify locations within Ontario (e.g., southwest GTA, north of Dryden, etc.) with key restrictions impacting potential connection identified.

Participation will be open to existing or new market participants with electrical energy storage technologies not currently under contract with IESO for other purposes. The contracted facilities will be under the direct dispatch control of the IESO for the entirety of the contract term.

The evaluation criteria will be specified within RFP including categories and weightings, including but not limited to: facility location, availability, ability to satisfy the identified reliability service, ability to provide additional end-use reliability services, contract term, and price.

At identified locations within the electricity system the IESO can identify these ancillary service needs and are anticipating utilizing electricity storage facilities in a number of ways in order to help address observed power system issues and enhance system reliability. This is important with the changing generation fleet in Ontario and in particular the increased penetration of renewable, intermittent forms of electricity generation. The IESO resolved a number of operational issues associated with these forms of renewable energy via the Renewable Integration Initiative project work including the creation of new market rule obligations, permissions, and authorities. However, there still remains work to be done to maximize the contributions these forms of electricity generation can provide to the IESO-controlled grid.

As this intermittent generation penetration increases the IESO will need more flexible tools in its operating tool box to maintain system reliability and it is expected that the role of electricity storage to manage the system needs will only increase as time progresses. Procuring up to 30 MW of electricity storage as a set of ancillary service products in 2014 will help the IESO prepare for even greater changes to the electricity system in future.
**Contract Structure – Key Elements**

The new storage services contracts will be based on the existing ATR Regulation Service Agreements contracts. This contract structure can be easily adapted to permit a single electricity storage facility to provide a broad range of ancillary services.

Key elements of these contracts include:

- Fixed (capital costs) and operating (variable costs) paid by IESO-administered markets and recovered via uplift
- Targeted 5 year term
- Ability to substitute contract service payment streams to new/evolving ancillary services or markets that may be developed by IESO during the term of the contract
- Ability to consider other public funding revenue streams (e.g. Smart Grid funding) to prevent duplication of payments for same services
- Requirement for data sharing among IESO, OPA, OEB and ancillary service providers to ensure cooperative learning provide opportunity to improve facility performance, validate contribution to reliable operation of the IESO-controlled grid during contract term, development of enduring solutions to address regulatory barriers, and publication of performance and benefits analyses.

Through the ATR RFP contracting process which culminated in three new ancillary service agreements being executed in April 2013, the IESO learned how to evolve regulation service agreements to meet the needs of alternative providers of this service. The IESO is confident it can build on this experience to craft an ancillary service agreement that meets the needs of energy storage sources of ancillary services.

The ATR RFP process proved to be an open, fair, transparent and competitive process. Building on this base the IESO is confident it can move quickly to execute agreements with electricity storage facility providers to maximize both the flexibility of the use of these facilities and to provide appropriate contract certainty to enable the financing and development of new electricity storage technologies in Ontario.
**Proposed Timelines**

The IESO is committed to releasing and executing an RFP procurement process for electricity storage ancillary services, including the execution of agreements before the close of the second quarter of 2014. The proposed timeline is as follows:

- **RFP release:** 3rd week of February
- **Question Submittal Deadline:** First week of March
- **Proposal Submittal Deadline:** 2nd week of April
- **Proposal Selections Announced:** end of April
- **Contract execution:** May – mid-June

The IESO is aware of the impact time has in respect of evolving technologies and their associated business model requirements. As noted by the Ontario Energy Storage Alliance, time is of the essence as they build their technologies and business models not only to serve the needs of the Ontario electricity system but also to develop their products and expertise to meet the growing export opportunities in other jurisdictions such as California and New York.

The IESO believes the requirements for disclosure and transparency as set forth in the Market Rules provide the solid foundations of an objective, fair, competitive, and open RFP process that can be used to maximize the benefits from electricity storage facilities providing ancillary services for Ontario electricity ratepayers. The IESO can see the immediate value these devices could provide but it is only with their actual use in real-time operations that we can potentially quantify and qualify these benefits with a view to future market evolution.
Phase II- Capacity Services Stream and Remote Communities

This initiative will explore the maximum range of potential benefits to the ratepayer in the future. Phase II is designed to follow through from Phase I and develop those areas that are emerging as the Ontario electricity system develops as described in the LTEP. This stream will focus on how storage can best meet the future capacity needs of the system, allow for the deferral of transmission investments, and enhance the value of renewable generation. These may also be capable of delivering ancillary services. It will be used to test alternative commercial arrangements for storage solutions, including behind the meter or LDC located storage projects.

Grid-scale storage provides longer term storage services that can firm up the output of wind facilities for example, and maximise the value of energy provided by wind resources. It can also address surplus baseload generation by storing electricity during periods of low cost generation and then provide electricity when demand and prices are the highest. It can help defer transmission or distribution investments that may be needed in congested areas. Larger storage facilities also have the potential to provide ramping services that will assist the IESO in the integration of renewable resources and reduce GHG emissions by decreasing the reliance on gas generators. These end-use services associated with capacity are generally provided by larger facilities that require contracts of sufficient length for developers to secure financing or by aggregated resources that require certainty of terms in order to enroll customers. Consideration will also be given in this phase to how storage can optimize the alternatives being considered for remote communities to further reduce their reliance on diesel generation.

In this phase, the OPA will procure the remainder of the 50 MW that was not subscribed in Phase I, which may include some consideration for remote communities. Most of this procurement will be for capacity services. It is expected that two to three projects will be procured, to ensure sufficient size to demonstrate how this resource can help in the management of the grid as it is evolving. The size of storage solution procured for remote communities will largely depend on the community’s needs.

There are many considerations in developing a good site in terms of system consideration and the needs of both the developer and the host communities. For example one major consideration for the location of a pilot storage device is whether it should be distribution connected or transmission connected. An advantage of connecting a device on the distribution system is that it would have the potential to address needs of the distribution system, the transmission system that feeds it as well as the system as a whole. A distribution connected storage device could be used to demonstrate whether storage can provide reliable supply capacity at the local level. This could be beneficial as an alternative means of addressing the need for additional supply capacity, such as distributed generation, or transmission alternatives. If located at a station with a significant amount of intermittent generation, the storage device could demonstrate whether storage can ‘firm’ renewable generation within the nearby area, increasing its effective capacity.
**Capacity Services Procurement Process**

The procurement for capacity services will be administered through a competitive RFP led by the OPA which will be targeted to satisfying the primary end service uses and system locational requirements. The process will follow previous OPA procurements, initiating a multi-stage competitive procurement process. The IESO will support the OPA in this phase, bringing any lessons learnt from Phase I, including the mitigation of regulatory barriers.

The procurement will have clear, definable criteria to which each energy storage device will be graded against previously stated objectives and conducted in a transparent manner. The OPA has taken a number of steps across our many energy procurements which will be used again in this procurement. Prior and during the procurement, the OPA will undertake a variety of stakeholder consultations and communications to all interested proponents. Regular communication and reaching out will ensure that all participants in the procurement process are kept informed on developments and provides for constructive input. At any time during the procurement, in order to undertake such stakeholder activities, the OPA will use some of the following methods:

- Workshops/information sessions/meetings
- Individual information sessions
- Internet tools for Q and As and comments.

These stakeholder activities can be used to both gather input to help shape the procurement and as a way for the OPA to give progress updates on the development of the procurement. Specifically they will be used to help shape the requirements and evaluation criteria for the RFP as has been done in previous OPA procurements. There may be multiple phases of stakeholder engagement in the development of RFP documents before they are considered final.
**Proposed Timelines**

Timelines will be established that allow for participation from stakeholders in the design of both the procurement process and the contracting structure. To allow for lessons learned in the Phase I process to be reflected in Phase II, the release of the RFP for Phase II will be timed to coincide with the conclusion of Phase I. However, the procurement process will be initiated in Q1/Q2 to reflect the readiness expressed by the storage community.

The procurement will be initiated through a pre-selection process to help narrow the number of proponents. This pre-qualification process can be structured to narrow proponents based on experience and financial capacity, and/or by projects. The intent of this pre-qualification will be to reduce the field to high quality projects/proponents thereby minimizing any attrition that could take place during the development and execution of the project.

The timing of Phase II activities undertaken by the OPA would be sequenced to complement the activities and milestones associated with those undertaken by the IESO under Phase I. As such, the timing outlined is intended to be flexible to accommodate this. With this under consideration, the OPA expects following activities to take place:

- Q1/Q2: Public release of pre-qualification process
- Q2: Consultation on RFP, contract design and incorporation of lesson’s from Phase I
- On Finalization of Phase I process: Release of RFP

**Publicly Posted Information**

All procurement documents associated with the OPA’s storage procurement will be posted on the OPA website including; procurement documents, contract structure, contract and application instructions, and Q and As. This is important for all stakeholders including the general public, to ensure information is accessible and presented in a transparent manner where possible. Previous OPA procurement documents are archived on the OPA website.
**Contract Structure for Capacity Services – Key Elements**

To leverage the experience from previous contracts and to move to a point where storage can potentially be expected to compete with other system resources, the base commercial structure for a contract will be an existing OPA contract. Using an existing supplier contract is an approach that is similar to what is being pursued in other jurisdictions\(^1\). Modifications to these contracts to make them more appropriate for storage will be developed with the participation of proponents. The contract structure will follow an existing OPA contract, which are generally Contracts for Differences that incent effective risk sharing. Key elements of these contracts will be as follows:

- **Integrating storage into the IESO market:** Facilities are incented to being active participants in the IESO market, submitting offers and receiving dispatch instructions from the market according to these offers where appropriate. Market revenues obtained through the market will be factored into determining contract payments.

- **Contracts will be structured to allow for projects to obtain financing.** Larger scale storage projects are expected to require significant up-front capital costs. Longer term contracts (10 to 20 years) allow facilities to obtain financing at reasonable terms thus minimizing costs for the ratepayer. Contracts of these terms also typically match the economic lifespan of the project. Shorter duration contract terms have been used in the past to support pilot projects, and could also be considered for this procurement.

- **Future additional revenue streams to be shared.** As is common in existing OPA contracts, future additional sources of revenue will be shared between the supplier and the OPA ensuring that future ratepayer savings may be realized with the introduction of any new services.

- **Flexible structures built into the contract.** Terms will be included into the contract structure providing flexibility should a capacity market, locational pricing or some other market rules are implemented. These terms will allow for the contract to be dynamically adjusted as the market evolves.

- **Any Environmental Attributes are proposed to accrue to the OPA:** As with OPA renewable energy contracts, any Environmental Attributes that can be accrued under the contracts are proposed to be property of the OPA.

Procurement processes and the contract structures used for the remote communities will be determined as required for each community. It is expected that no one solution or approach will fit all the remote communities.

\(^1\) The Long Island Power Authority released an RFP in October for storage resources that provides as a preferred Form of contract, a 20 year gas generation contract. The RFP process closes in March. Storage respondents are to modify the contract as they deem necessary.
Identifying Regulatory Barriers and Possible Solutions

The proposed energy storage procurement framework includes a plan to review the regulatory barriers to storage’s participation in Ontario’s electricity market and identify options for addressing these barriers. This effort will be carried out by the IESO and OPA in partnership with the Ontario Energy Board’s Storage Working Group. The mandate of the Storage Working Group, which is a subcommittee of the OEB’s Smart Grid Advisory Committee, is to provide technical solutions and recommendations to the Committee on the regulatory issues associated with storage and any other areas that may require attention (see Appendix E for the Working Group’s Terms of Reference).

The Storage Working Group has put considerable effort into identifying the regulatory and other barriers under various scenarios of storage applications. At a high level, the main categories of regulatory barriers identified at this stage include:

- Applicability of certain rates and charges (e.g. Demand, Debt Retirement Charge, Uplift)
- Licencing requirements
- Gaps in application of Safety Codes under certain conditions (Electrical Safety Authority)

Some of these barriers can be addressed in the immediate term through contracting mechanisms. However, it is the OEB’s expectation that the work of the Storage Working Group coupled with the lessons learned from this procurement will provide opportunities to identify longer-term solutions for addressing barriers.

It is expected that the OEB’s Smart Grid Advisory Committee will provide the OEB with a comprehensive report on the regulatory barriers and potential solutions by the end of June 2014. The OEB will share the report with the IESO, OPA, and Ministry of Energy as a number of the possible solutions may require action by involving these other parties. At that time, the IESO and OPA would complement that report with any initial learnings about regulatory barriers from Phase I of the procurement. Once the OEB has received the report from the Committee and the information from the IESO and OPA long-term solutions could then be prioritised and passed to the authority responsible for implementation.

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2 The Board formed the Smart Grid Advisory Committee in response recommendations in the Supplemental Report on Smart Grid, February 11, 2013. The main objective of the Committee is to provide information and advice to the Board on issues related to the modernization of the network.
Appendix A - Directive to OPA
Mr. Colin Andersen  
Chief Executive Officer  
Ontario Power Authority  
1600–120 Adelaide Street West  
Toronto ON M5H 1T1  

Dear Mr. Andersen:  

RE: Moving Forward with Large Renewable Energy Projects, Renewable Energy Projects in Remote First Nation Communities and Energy Storage  

Our government has made significant progress transforming our electricity system into one that Ontarians can count on. Over the past 10 years, Ontario has brought more than 3,700 megawatts (MW) of wind, solar, hydroelectric and bioenergy capacity online. This capacity is the result of a variety of initiatives, including competitive procurements, the Feed-In Tariff (FIT) Program, other standard offer programs, projects undertaken by Ontario Power Generation and technology specific Ontario Power Authority (OPA) procurements.  

As outlined in Achieving Balance: Ontario’s Long-Term Energy Plan (Achieving Balance), the government would like to provide the renewable sector with a predictable procurement schedule. The government is extending the existing target of 10,700 MW for wind, solar and bioenergy to 2021, and expanding the existing hydro target of 9,000 MW to 9,300 MW by 2025. By 2025, 20,000 MW of renewable energy will be online, representing about half of Ontario’s installed capacity.  

As set out in Achieving Balance, the procurement targets for the Competitive Process will be up to 300 MW of wind, 140 MW of solar, 50 MW of bioenergy and 50 MW of hydroelectricity in the first round of large renewable procurement to commence in 2014. The targets will be up to 300 MW of wind, 140 MW of solar, 50 MW of bioenergy and 45 MW of hydroelectricity in the large renewable procurement anticipated to commence in 2015. These procurements shall be made according to the Competitive Process described in section 1 of this direction. Any capacity referred to in this paragraph that is left un-procured is to be made available for procurement of large renewable projects in 2016, along with any capacity from large renewable energy contracts that expire or terminate prior to the commencement of the procurement in 2016.  

.../cont’d
This direction seeks to outline the implementation of the following three initiatives identified in the Achieving Balance released by the government on December 2, 2013:
- Competitive Procurement Process for Large Renewable Energy Projects;
- Renewable Energy Projects in Remote First Nation Communities; and
- Energy Storage.

Direction

Pursuant to the authority I have, as Minister of Energy, under the Electricity Act, 1998, I hereby request under section 25.26 that the OPA submit the following reports and direct under 25.32 that the OPA undertake the following initiatives:


On August 30, 2013, the OPA provided a report entitled "Development of a New Large Renewable Procurement Process: Initial Engagement Feedback and Interim Recommendations" (Report). The Report provides a useful foundation for the development of a new competitive process for large (generally over 500 kW) renewable energy projects (the "Competitive Process").

Pursuant to my authority under section 25.32 of the Electricity Act, I direct the OPA to design and develop the Competitive Process based on the principles articulated in Achieving Balance and to conduct further outreach with the public, municipalities, the renewable energy sector, the Association of Municipalities of Ontario, other stakeholders and First Nation and Métis communities in early 2014 on the following elements:

- Key factors to be used in evaluating proposals, including but not limited to bid price, proponent experience, financial capability and site due diligence;
- Options for how to address local considerations and interests in the siting of projects;
- Potential minimum community acceptance criteria;
- Options for providing proponents with timely connection information and connection costs for proposal purposes;
- Mechanisms to encourage participation by cooperatives, municipalities and public sector entities;
- Mechanisms to encourage First Nation and Métis community participation in a way that reflects their unique circumstances and the time needed for them to build meaningful partnerships and community support.

The OPA shall review and report back with mechanisms to encourage innovative technologies and approaches, including consideration of proposals that integrate energy storage with renewable energy generation for upcoming procurement cycles.

The OPA shall review and report back with options to enable hydroelectric projects located outside of Ontario that are or will be connected to the Ontario transmission system or an Ontario distribution system to participate in this competitive procurement process.

.../cont'd
Pursuant to s.25.26, the OPA shall report back to the Minister of Energy with a proposed design for the Competitive Process by March 1, 2014 and subject to a further direction, plan to post the draft Request for Qualification for comment for the Competitive Process before the end of the first quarter of 2014.

2. **Renewable Energy Projects in Remote First Nation Communities**

The government recognizes the unique challenges faced by the 25 remote First Nation communities in northwestern Ontario. Their electricity is supplied by on-site diesel generators, a non-renewable fuel source that is increasingly expensive and poses health and environmental risks through emissions and fuel storage.

As you are aware, the OPA's 2012 draft "Remote Community Connection Plan" indicated there is a strong economic case to connect up to 20 of the remote First Nations to the provincial electricity grid. Subsequent analysis in the OPA's August 2013 draft "North of Dryden Reference Integrated Regional Resource Plan" identified another community for connection, revising the economic case to connect up to 21 communities. The analysis indicates that over the next 40 years, connection of these communities to the grid could be 30% to 40% less expensive than the continued use of diesel, resulting in about $700M in avoided costs. The potential savings, as well as social, environmental and health benefits make connection of these communities to the transmission system a priority for Ontario identified in Achieving Balance. In addition, there may be cost-effective alternatives to reduce diesel use in the remaining remote First Nation communities in northwestern Ontario, including renewable generation opportunities, which can also support the Government's goal of promoting the use of cleaner and renewable energy sources as well as having the added benefits of stemming community economic development.

Pursuant to my authority under section 25.32, I hereby direct the OPA to work with those remote First Nation communities where transmission connection is not identified as economic in the OPA's plans, and other appropriate parties, in order to develop and implement solutions for on-site renewable generation projects that reduce their dependency on diesel fuel and which promote the use of renewable energy sources. The OPA shall take into consideration the following principles:

- Proposed solutions must demonstrate the ability to increase the community's use of renewable energy sources;
- Communities must have completed implementation plans that demonstrate the cost effectiveness of the proposed solution in comparison to continued diesel use, any community economic development interests, as well as the opportunities for federal and provincial funding that may be used to offset costs which would otherwise be borne by Ontario ratepayers. Where plans are not already in place, the OPA shall work with these remote communities to analyze options and develop plans by the end of 2014.

.../cont'd
3. Energy Storage

Achieving Balance stated the government’s intention to include 50 MW of energy storage into energy storage procurement processes by the end of 2014 and review the regulatory barriers to storage’s participation in Ontario’s electricity market. The government will also commission an independent study assessing the value of energy storage for Ontario.

To address these commitments, I request pursuant to my authority under section 25.26 that the OPA work closely with the Independent Electricity System Operator and jointly report back to the Minister with a proposed design and outline for an energy storage procurement framework by January 31, 2014. For greater clarity, the proposed procurement framework will include IESO-led procurements and possible OPA-led procurements.

The framework shall address the main regulatory barriers preventing energy storage technologies from competing in the energy market on an equal footing and the options for addressing these barriers. The framework shall also include a proposed work plan that would enable new competitive energy storage procurement processes as early as possible.

The Ministry will work with applicable stakeholders to direct the development of the independent study to assess the value of energy storage for Ontario, such study taking into consideration those projects that are brought on line through these new procurement processes as well as existing storage initiatives.

General

This direction supplemenets or amends previous directions only to the extent that a particular provision of this direction is inconsistent with the provisions of a previous direction. All other terms of any previous direction remain in full force and effect.

This direction takes effect on the date it is issued.

Sincerely,

Bob Chiarelli
Minister
Appendix B - Letter to IESO
Mr. Bruce Campbell  
President and Chief Executive Officer  
Independent Electricity System Operator  
410–655 Bay Street  
Toronto ON M5G 2K4

Dear Mr. Campbell:

As you know, *Achieving Balance* stated the government’s intention to include 50 MW of energy storage into an energy storage procurement process by the end of 2014, conduct an independent study assessing the value of energy storage for Ontario, and review the regulatory barriers to storage’s participation in Ontario’s electricity market.

This letter is to ask that, as part of the implementation of these commitments, the Independent Electricity System Operator (IESO), jointly with the Ontario Power Authority (OPA), report back on the development of an energy storage procurement process. Consistent with this request, I have directed the OPA to report back by January 31, 2014 with a proposed design and outline for an energy storage procurement framework. I trust that the IESO and the OPA will work collaboratively to ensure that the proposed framework is able to address the unique system characteristics of energy storage and fully take into account system benefits. The proposed procurement framework should include IESO-led procurements and possible OPA-led procurements. Such a process will naturally build on recent efforts by the IESO to enable opportunities for energy storage to participate in Ontario’s electricity market. I would encourage the IESO to work with the OPA and consult with appropriate stakeholders on the development of this procurement process with the intent of initiating it as early as possible.

In consideration of the need to review regulatory barriers to storage’s participation in Ontario’s electricity market, I would also ask the IESO and OPA to consider working being carried out by the Ontario Energy Board on this matter and use the development of this new procurement process as an opportunity to identify any options for addressing such barriers.

In addition, I would like to note that the Ministry will work with applicable stakeholders to direct the development of the independent study to assess the value of energy storage for Ontario. The study will consider those projects that are brought on line through these new procurement processes as well as existing storage initiatives.

Sincerely,

Bob Chiarelli
Minister
Appendix C - Industry Engagement Presentation Materials
Energy Storage Procurement Framework
For Discussion with Storage Community
January 17, 2014
Agenda

• Procurement Objectives
• Potential Storage Services Bundles
• Existing procurement processes and contract structures
• Storage Community Readiness
• Update on OEB Storage Working Group
• What’s Next
Objectives

• Maximize learning about the various services that energy storage solutions can provide
• Explore potential frameworks for competitive procurement, market mechanisms, and the commercial arrangements for energy storage solutions
• Learn how to effectively and efficiently integrate energy storage resources into the Ontario electricity market, meet system operator needs, and understand their potential roles in the sector
• Identify the main regulatory and other barriers preventing energy storage technologies from competing in the energy market on an equal footing
Question 1

What additional objectives should be considered in procuring energy storage in Ontario?

What does success look like?
Potentially Storage Services Bundles

- Multiple storage solutions available to provide a number of services to the system (see handout).
  - Capacity /Congestion Management
  - Ancillary Services (regulation/operating reserve)
  - Infrastructure upgrade deferral (transmission/distribution)
  - Customer Energy Management (load shifting, power quality)

- A single storage solution can provide multiple benefits.
Question 2

Are there additional services not captured by the IESO/OPA energy storage services bundles?
Existing procurement process: IESO Ancillary Services

- Operating Reserve – competitive market, value driven by market prices
- Ancillary Services (Black Start, Reactive Support and Voltage Control (RSVC), Regulation Service) are procured either through a competitive RFP for Black Start and Regulation Service or through contracts requested by a Market Participant for RSVC
- Procured ancillary service payments ensure that the provider is not out of pocket for the provision of service including fixed and/or variable payment streams depending upon the nature of the service
Existing IESO contract structures: Alternate Technologies for Regulation (ATR)

- An RFP was used to procure 10 MW of alternate sources of regulation (aggregated load, flywheel, battery)
- Contracted parties are compensated for capital costs (fixed payments) and operating costs (variable payments) or for services provided (variable payments)
- Energy storage projects that can provide ancillary services (existing and any new services developed in the IESO-administered markets) are eligible for an ancillary service agreement
Existing IESO contract structures: Alternate Technologies for Regulation (ATR)

Continued ...

• ATR work is being used by the IESO to assess technological capabilities, develop market mechanisms to facilitate competition, and metering, verification and settlement for alternative sources of regulation in future years

• ATR framework also includes performance assessment metrics to assist in value determination

• Agreements are clear, concise, self-containing in nature and readily adaptable to other procurements

• Framework can be used for energy storage projects in Ontario
Existing OPA contract structures: Deemed Dispatch

- Deemed Dispatch Contract is based on a ‘Contract for Difference’ approach
  - Financial backstop bridging the gap between market revenues and total required costs
  - Incents facility to operate when it is economic to do so, effectively integrating facility into the current market

- Pays facility for capacity (MW) on a monthly basis and ensures market revenues are offset from the monthly fixed capacity payment
  - Contract calculates on a daily basis whether facility was economic to operate in the market and what revenues they are deemed to have earned operating under model conditions (Actual and deemed production are not identical
  - Where the market revenues (Imputed Net Revenues) are less than the monthly fixed costs, OPA Contracts pay the difference (Contingent Support Payment)
  - Where the market revenues (Imputed Net Revenues) are more than the monthly fixed costs, the generator makes a Revenue Sharing Payment to the OPA

- Generally 10-20 year contract terms and can be adapted to needs of energy storage

- Example: Clean Energy Supply Contracts
Existing OPA contract structures: Power Purchase Agreement (PPA)

- Pays facility for production (MWh) net of any revenues earned in the market.
  - Contract outlines fixed price per MWh that facility is guaranteed to earn for its production
    - Facility receives revenues from market for its operation
    - Contract for Difference as OPA makes up difference when the market price is less than fixed contract price
    - If facility earns more market revenues than its contract price, generator pays difference to OPA

- Contract incents facility to maximize its production
  - Other incentives can be built in to incent facility to shift production to peak periods, if possible, or avoid/curtail production during surplus periods

- Generally 10-20 year contract terms and can be adapted to needs of energy storage

- Example: Bruce Power Agreement, FIT Contracts
Existing OPA contract structures: Demand Response

- Customer commits to curtail load when called upon by IESO
  - Limited number of events per year of specified duration
- Aggregation of load permitted
  - Aggregator has a ramping window to build their portfolio of customers
- Contract payments include an *availability* payment ($/MW/annual hours of availability) plus a *utilization* payment when activated ($/MWh)
- Performance in events measured against baseline with penalties for non-performance
- Contract term typically 5 years
Existing OPA contract structures: Energy Efficiency Projects

• Contribution to customer’s capital investment that delivers behind-the-meter energy savings or load displacement (70% of capital for EE or 40% for CHP projects)

• Customer commits to maintain project in service for 10 years (reporting obligation with clawback provisions)
• Competitive procurement processes generally result in Request for Proposal process
  – Open, fair and transparent
  – Contractual and commercial arrangements
  – Transparency to the evaluation methodology and approach
  – Technology neutral

• Option to include a prequalification process (RFQ) can narrow field to projects and/or developers
Question 3

What elements of these procurement and contract structures works well for storage services?

What wouldn’t work?
The OPA/IESO have been asked to initiate energy storage procurements by the end of 2014.

What are your timing needs to participate in a procurement process?
OEB Storage Working Group

- Ongoing work of the Smart Grid Advisory Committee and the Storage Working Group
- Overview of regulatory and other barriers identified
  - Licencing requirements
  - Rates and Charges (e.g. Demand, Debt Retirement Charge, Uplift)
  - Net metering
  - Safety Codes (Electrical Safety Authority)
- Next steps and expected timelines
Next Steps and Timelines

• January 31 deliverable to Ministry of Energy:
  – Proposed design and outline for an Energy Storage Procurement Framework
• Additional opportunities for consultation after January 31 (e.g. Procurement Design)
Closing remarks
<table>
<thead>
<tr>
<th>Electric Area</th>
<th>Description of the problem</th>
<th>Capacity/Concurrent Management</th>
<th>Ancillary</th>
<th>Infrastructure (transmission and/or distribution)</th>
<th>Customer Energy Management</th>
<th>Receive market revenues?</th>
<th>Total Initial Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW-GTA</td>
<td>Locate project capable of overnight electricity storage on the load side of a congested (thermally limited) interface to supply peak load and improve voltage profile.</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>S</td>
<td>TBD</td>
<td>TBD up to 25MW</td>
</tr>
<tr>
<td>Toronto</td>
<td>Locate project capable of overnight electricity storage on the load side of a congested (thermally limited - example 115 kV Leaside area) interface to supply peak load and improve voltage profile or in a non-congested load area (example: 220 kV Pickering area) for SBG and peak demand management.</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>S</td>
<td>TBD</td>
<td>TBD up to 25MW</td>
</tr>
<tr>
<td>West of MacKenzie (NW)</td>
<td>Locate project capable of overnight electricity storage on the load side of a congested (thermally limited) interface or transmission circuit to supply local peak load, shift energy and improve voltage profile.</td>
<td>P</td>
<td>S</td>
<td>P</td>
<td>P</td>
<td>TBD</td>
<td>TBD up to 25MW</td>
</tr>
<tr>
<td>Ottawa 115 kV</td>
<td>Locate project capable of overnight storage on the load side of a congested interface or transmission circuit to supply peak load, shift energy and improve voltage profile.</td>
<td>P</td>
<td>S</td>
<td>P</td>
<td>P</td>
<td>TBD</td>
<td>TBD up to 25MW</td>
</tr>
<tr>
<td>Eastern Ontario 115 kV</td>
<td>Locate project capable of overnight storage on the load side of a congested interface or transmission circuit to supply peak load, shift energy and improve voltage profile.</td>
<td>P</td>
<td>S</td>
<td>P</td>
<td>P</td>
<td>TBD</td>
<td>TBD up to 25MW</td>
</tr>
<tr>
<td>Northeastern Ontario 115 kV</td>
<td>Locate project capable of overnight storage on the load side of a congested interface or transmission circuit to supply peak load, shift energy, smooth out active power flows and improve voltage profile.</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>S</td>
<td>TBD</td>
<td>TBD up to 25MW</td>
</tr>
<tr>
<td>Lakehead area</td>
<td>Locate project capable of overnight or short term storage on the load side of a congested interface or within an area with rapidly changing transmission flows to supply peak load, shift energy, smooth out active power flows and improve voltage profile.</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>TBD</td>
<td>TBD up to 25MW</td>
</tr>
<tr>
<td>KCGW 115 kV area</td>
<td>Locate project capable of overnight storage on the load side of a congested interface or transmission circuit to supply peak load, shift energy and improve voltage profile.</td>
<td>P</td>
<td>S</td>
<td>P</td>
<td>P</td>
<td>TBD</td>
<td>TBD up to 25MW</td>
</tr>
<tr>
<td>Western Ontario</td>
<td>Locate project capable of overnight or short term storage on the generation side of a congested interface or within an area with rapidly changing generation output to shift energy, smooth out active power and improve power quality and voltage profile.</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>TBD</td>
<td>TBD up to 25MW</td>
</tr>
</tbody>
</table>

**Expected Services (P - Primary, S - Secondary)**

- Bulk Storage/Congestion Management (SBG Management/Ramping)
- Ancillary Services (operating reserve, regulation, Reactive Support Voltage Control)
- Infrastructure (Deferring Capital Investment)
- Customer Energy Management (Improve electricity consumption/time shifting consumption)
Appendix D - Copy of OESA Submission to IESO and OPA
Ontario Energy Storage Alliance Advocacy Council (OESAAC)

Proposed Principles and Indicative Terms for:

**Ontario’s 50 MW Energy Storage Service: 2014 Request for Proposals**

**Principles:**

- Facilitate prompt implementation and release of the 50 MW Energy Storage RFP outlined in the LTEP by end of Q1 2014, in accordance with the LTEP and related Ministerial Directions and requests.
- Leverage the existing IESO RFP for Ancillary Services to the maximum extent possible in order to facilitate efficiency and prompt implementation of the RFP.
- Ensure that the RFP Rules and draft contract terms facilitate:
  - multiple storage technologies and projects at ideal locations (locations to be specified in advance)
  - multiple bidders
  - finance-ability/bankability of projects and financially sound proponents
  - site access, security and application fee requirements that are not unduly onerous and are commensurate with the “pilot” nature of this small 50 MW
  - a “learn by doing” approach to this early 50 MW of energy storage in the province
  - the requisite information and data gathering that the government intended to result from the RFP and the projects
  - a fair return for proponents and the requisite flexibility required by the Ontario electricity system
  - consistency with the Market Rules
  - removal of the regulatory barriers and associated uncertainties and inefficiencies that are currently faced by energy storage projects in Ontario.
- Note: while a fixed and variable payment mechanism is appropriate for this preliminary 50MW RFP, alternate payment and contracting mechanisms (including contract for difference/clean energy supply type mechanisms may be appropriate for future energy storage procurement initiatives.

**Definitions:**

- "Contract" means a written binding agreement between the IESO and a Preferred Respondent for the provision of the Deliverables, consisting of the RFP, the Proposal and the Agreement substantially in the form attached hereto as Appendix __ (provided as a separate document with indicative terms).
- "Closing Date" means the deadline for submitting a proposal as set out in the Timetable.
Ontario Energy Storage Alliance Advocacy Council (OESAAC)

Proposed Principles and Indicative Terms for:

- **“Deliverables”** means the storage related services and other obligations to be provided by a Preferred Respondent to the IESO as stipulated in its Contract.
- **“Energy Storage”** means a system that is developed and operates for the purpose of absorbing, supplying, and redelivering energy through technologies including, but not limited to, flywheels, compressed air, batteries, power-to-gas, hydro-storage, and pumped hydro.
- **“Energy Storage Service(s)”** includes the services and benefits provided by an Energy Storage Service Provider in accordance with the obligations and performance specifications as outlined in their Contract.
- **“Energy Storage Service Provider”** means a Preferred Respondent who has been selected to enter into a Contract with the IESO.
- **“IESO”** has the meaning specified in Section 1.1 and the Market Rules.
- **“Project”** means the Energy Storage project and related Energy Storage Services as outlined by a Respondent in its Proposal.
- **“Proposal”** means the Respondent’s formal response to this RFP.
- **“Respondent”** means an entity that submits a Proposal.
- **“Preferred Respondent”** means a Respondent selected by the IESO to enter into negotiations for a Contract based on the indicative terms set out in Appendix *.
- **“RFP”** means this Request for Proposal.

<table>
<thead>
<tr>
<th>Item</th>
<th>Sub-Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>Objectives</td>
<td>Issued by the IESO as an invitation to qualified interested parties to submit Proposals for the provision of the Deliverables, within the scope set out herein. The RFP describes the process by which the IESO intends to select one or more Preferred Respondents to enter into a Contract with the IESO for the provision of the Deliverables. The purpose of the RFP is to ensure that the IESO contracts for the Deliverables in an economical, timely and efficient manner through a process that is fair, transparent and accessible to qualified Respondents.</td>
</tr>
<tr>
<td>Overview</td>
<td>Scope</td>
<td>The document covers the intended scope of services and benefits,, Energy Storage Services, Deliverables, schedules and applicable payment mechanism(s), as well as the requisite communication processes, timelines, document format, and legal issues relating to the RFP process.</td>
</tr>
<tr>
<td>Overview</td>
<td>Total Procurement</td>
<td>50 MW from an assortment of Energy Storage technologies. Demand response submissions are not covered within the scope of this dedicated, preliminary 50 MW RFP for Energy Storage Services . This RFP meets the Government procurement objectives as set out in the 2013 Ontario Long Term Energy Plan. The purpose of the RFP is to identify interested parties who can provide Energy Storage solutions to</td>
</tr>
</tbody>
</table>
**Ontario Energy Storage Alliance Advocacy Council (OESAAC)**

Proposed Principles and Indicative Terms for:

| **Location** | All facilities must be located in Ontario at or around the locations and included connection points identified in Appendix. |
| **Services** | Respondents must be capable of providing Energy Storage Services to the Ontario IESO-controlled grid. Each Respondent must identify the Energy Storage Services and benefits to be delivered. |

**Timeline**

<table>
<thead>
<tr>
<th><strong>ACTIVITY</strong></th>
<th><strong>DATE</strong></th>
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</thead>
<tbody>
<tr>
<td>Release of RFP</td>
<td>February 17, 2014</td>
</tr>
<tr>
<td>Question Submittal Deadline</td>
<td>February 28, 2014</td>
</tr>
<tr>
<td>Proposal Submittal Deadline</td>
<td>March 31, 2014</td>
</tr>
<tr>
<td>Proposal Selections Announced</td>
<td>April 30, 2014</td>
</tr>
</tbody>
</table>

**Availability**

The IESO may call on any Energy Storage Service Provider with whom it has a Contract to provide available Energy Storage Services, subject to any limitations described in the Contract. If there is insufficient capacity to deliver the required Energy Storage Services, the Energy Storage Service Provider will be notified immediately if they have not already notified the IESO. The IESO may also call on the Energy Storage Service Provider for additional capacity as required. Even though a Preferred Respondent may be selected as an Energy Storage Service Provider and enter into a Contract, there is no guarantee the Energy Storage Service Provider will be called on for any minimum amount of Energy Storage Services over the term of the Contract. A Respondent may submit a Proposal and/or the IESO may enter into a Contract with a Preferred Respondent for the full capacity or a portion of capacity of a Project. Any non-Contracted capacity of a Project may be used for other operations or services at the discretion of the Project owner. [Energy Service Storage Providers can elect to operate outside the time periods prescribed by IESO signals providing this does not limit the availability to meet IESO needs. Revenue and regulatory treatment for operation outside of the IESO contracted services will be defined in the Contract terms and conditions.]
**Ontario Energy Storage Alliance Advocacy Council (OESAAC)**

Proposed Principles and Indicative Terms for:

| **Interconnection Points** | The IESO should work with the OPA and HONI to suggest preferred interconnection points and substations that may require significant upgrades. For example, the IESO/OPA/HONI should suggest substations that are transmission constrained, have new or forecasted renewable generation growth, are coping with peak load growth, and experiencing power outages, grid instability or other power quality issues. Interconnection costs should be capped at an amount TBD and/or incorporated into the fixed price arrangement. |
| **Dispatch Rights** | The IESO will require priority control of any Energy Storage Service and dispatch rights throughout the term of the Contract. The IESO has the right to provide dispatch instructions to the Energy Storage Service Provider for any of the IESO markets as long as the Projects capable of meeting the operational requirements as specified under the applicable Contract. |
| **Response Time** | Since the IESO must constantly match area supply with area demand, rapid response capabilities are generally preferred over slower response capabilities. |
| **Market Rules** | If Respondents identify a need for an exemption from any of the applicable market rules this should be identified specifically in their Proposal. |
| **Controls** | Respondents must have in place control equipment, communication links and the 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 Energy Storage Service facilities. [NTD: Does this make sense for an Energy Storage Services Contract as we are describing it in this draft? Discuss whether all energy storage under this RFP can be dispatched directly by the IESO via an AGC signal, dispatch instructions, and/or whether the Project itself is intended to be responding to price signals (or some combination thereof)] |
| **Government Funding** | Respondents must disclose any sources of funding from a public body (i.e. municipal, provincial, or federal government) that they have received. |

**Scope**

| **General** | All Preferred Respondents must meet the stipulated performance standards outlined in the RFP as particularized in the Contract. |
| **Monitoring & Control** | All Preferred Respondents shall submit to the IESO the monitoring and control information required pursuant to Chapter 4 of the market rules. |
| **Communications** | Communication services approved by the IESO must be in place between the |
### Proposed Principles and Indicative Terms for:

<table>
<thead>
<tr>
<th><strong>Energy Service Provider's/Project's control interface and the IESO's EMS. For the purpose of this RFP, telecommunication technologies that use a Virtual Private Network (VPN) are acceptable.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ramp Rate</strong></td>
</tr>
<tr>
<td><strong>Generation or Applicable OEB License</strong></td>
</tr>
<tr>
<td><strong>Capacity Eligibility</strong></td>
</tr>
<tr>
<td><strong>Existing Resources</strong></td>
</tr>
<tr>
<td><strong>Generation and Load Switching</strong></td>
</tr>
<tr>
<td><strong>Availability</strong></td>
</tr>
</tbody>
</table>
| **Communications Testing** | As required, the communication system must pass qualification tests to demonstrate the overall ability of the system:  
- Confirmation of control communication path performance  
- Confirmation of dispatch messaging system for receipt of dispatch instructions  
- Confirmation of control by the IESO’s EMS over the range of load/generation  
- Verification of the total registered capacity and ramp rate |
| **Performance Testing** | The IESO must carry out a performance test before the Project is commissioned and |
Ontario Energy Storage Alliance Advocacy Council (OESAAC)
Proposed Principles and Indicative Terms for:

<table>
<thead>
<tr>
<th>Services</th>
<th>General</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Respondents</strong></td>
<td>must be capable of providing Energy Storage Services in response to the IESO-controlled signals. The Energy Storage Services for each Project must be described in each Proposal and Proposals can include more than one Energy Storage Service.</td>
</tr>
</tbody>
</table>

This 50 MW RFP will support a variety of needs including the commercial demonstration of different Energy Storage technologies, the performance capabilities of different Energy Storage resources, and providing the industry, system operators and planners with insights on the potential for new Energy Storage Services that may improve system flexibility or offer cost benefits to the market.

The contract structure will have the flexibility for the Respondent and the IESO to establish operating and payment terms that would allow the market to test potentially new and beneficial Energy Storage Services and their associated system benefits. [NTD: Examples of these new Energy Storage Services, which may not currently exist in Ontario, are listed in the Ontario Energy Storage Alliances Advocacy Council (OESAAC) submission into the LTEP (EBR Registry Number 011-9614).]

Some examples an existing service and potentially new services are detailed as follows, but Respondents are not limited to offering just these new services for IESO consideration:

<table>
<thead>
<tr>
<th>EXISTING SERVICES</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fast-Response Regulation Service</td>
<td>Regulation Service acts to match total system generation to total system load (including transmission losses) and helps correct variations in power system frequency. Traditional response times vary from seconds to several minutes while Fast Response Regulation Service offers response times of seconds or less. Facilities responding to this service must have automatic generation control (AGC) capability, which</td>
</tr>
</tbody>
</table>
Ontario Energy Storage Alliance Advocacy Council (OESAAC)
Proposed Principles and Indicative Terms for:

<table>
<thead>
<tr>
<th>NEW SERVICES</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ramping Service</td>
<td>Ramping service acts to provide fast ramping capabilities to match supply and demand on a minute to minute basis when large changes in generation or load occur. This provides additional flexibility to the grid operator while managing the generation fleet. For example, these facilities can store electricity when there is a sharp increase in renewable generation and can generate electricity when renewable generation drops off faster than expected. Response times are not required to be as fast as Fast-Response Regulation Service but are still considered fast when compared to traditional generation. The storage duration minimum is longer to account for specific events such as the longer-lasting periods of intermittency experienced with renewable generation.</td>
</tr>
<tr>
<td>Load Leveling Service</td>
<td>Load leveling service acts to match supply and demand with longer duration on the scale of hours, days, months or seasons. Facilities providing Load Leveling Service can store surplus generation from generation sources such as wind/solar, nuclear or hydro and can provide clean peaking power. Technologies capable of supplying this service include, but are not limited to, compressed air energy storage, long-duration batteries, power-to-gas and pumped hydro.</td>
</tr>
</tbody>
</table>

Project Benefits

Each Respondent must describe the anticipated system and other benefits resulting
Ontario Energy Storage Alliance Advocacy Council (OESAAC)

Proposed Principles and Indicative Terms for:

<table>
<thead>
<tr>
<th>Deliverables</th>
<th>from the Project. The Respondent should indicate which, if any, benefits are mutually exclusive. Benefits should be conceptualized, described and quantified in as much detail as possible. Where no direct information exists, comparable/relevant projects and studies may be used as supporting material.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service(s)</td>
<td>Identification and description of the Energy Storage Service(s)</td>
</tr>
<tr>
<td>Benefits</td>
<td>Identification and description of the anticipated system and other benefits</td>
</tr>
<tr>
<td>Location/Site</td>
<td>The physical location of the Project; must have ownership, lease or associated option/rights to the real property upon which the Project is located</td>
</tr>
<tr>
<td>Access</td>
<td>Capacity that could be available (MW)</td>
</tr>
<tr>
<td>Communications</td>
<td>Communications for status-monitoring and control requirements</td>
</tr>
<tr>
<td>Project</td>
<td></td>
</tr>
<tr>
<td>Specifications</td>
<td>Round Trip Efficiency: Total Project round trip Energy Storage efficiency (Measured as electricity delivered into storage and its redelivery to the end-use energy market, which may involve end-use commodities other than electricity)</td>
</tr>
<tr>
<td></td>
<td>Duration: The total duration (hours) at maximum input and output</td>
</tr>
<tr>
<td></td>
<td>Cycles: Minimum full charge cycles</td>
</tr>
<tr>
<td></td>
<td>Response Times: Response times for variation of energy input and output</td>
</tr>
<tr>
<td></td>
<td>Switching: Response times for switching between input and output and vice versa</td>
</tr>
<tr>
<td></td>
<td>Ramp: Max input and output ramp rates and average ramp achievable 90% of the time</td>
</tr>
<tr>
<td></td>
<td>Parasitic Losses: Stored energy losses when in standby mode (if applicable)</td>
</tr>
<tr>
<td>Schedule</td>
<td>The Contracts will be for a term of 5 to 20 years as specified by each Respondent in its Proposal. The IESO shall have the right to extend the term of a Contract for a term and on terms and conditions to be agreed upon by the parties. Respondents are encouraged to propose Contract lengths with multiple duration and pricing options.</td>
</tr>
<tr>
<td>Payment</td>
<td>Mechanism: Monthly fixed price capacity payment and a variable performance payment or such other innovative payment structure that may be bid in by a Respondent in their proposal.</td>
</tr>
<tr>
<td>Mechanism</td>
<td></td>
</tr>
</tbody>
</table>
### Fixed Payment
Under the terms of the Contract, each operating Energy Storage Service Provider will receive a defined net revenue requirement based fixed monthly payment for the total MW capacity of Energy Storage that is available to the IESO that month.

### Variable Payment
Each Energy Storage Service Provider will receive a monthly variable operating cost payment for each Energy Storage Service(s) that the Project provided through operating that month. We note that certain Preferred Respondents may provide more than one Energy Storage Service. Respondents are also encouraged to propose innovative payment mechanisms for the variable payment as part of their Proposal(s).

### Energy Related Costs and Uplift
The Energy Storage Service Provider shall be made whole by the IESO on all energy related costs. Any and all energy and market related costs shall be the responsibility of the IESO. The Energy Storage Provider shall have the cost responsibility for all station service costs. **[NTD – Station Service Costs should be included in the Variable Payment, and the OESAAC needs to ensure this is not a “net” adjustment on details like GA.]**

### Payment Suspension and Agreement Extension
The monthly fixed payment will be made and all variable charges incurred will be reimbursed as long as the Energy Storage Project is available. Should a capacity de-rating occur that is outside of the availability schedule and is deemed significant, the Energy Storage Provider may request a payment and agreement extension (term to be determined during the Preferred Respondent’s Contract negotiation period), whereby both the payments and contract are extended by the amount of time it takes the Energy Storage Service Provider to return the Project to the Contracted rating. The allowance may be used all at once or in multiple instances over the life of the Contract.

### Proposal Content

<table>
<thead>
<tr>
<th>General Requirements</th>
<th>Administrative information regarding formatting, contact information, correspondence etc. to be addressed.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offer Letter</td>
<td>The Respondent must make/meet a number of mandatory commitments in order to complete the RFP process, including a declaration of acceptance, representative authorization, conflict of interest and disclosure of disputes.</td>
</tr>
<tr>
<td>Technical Proposal</td>
<td>Table of Contents</td>
</tr>
</tbody>
</table>
## Executive Summary
This section should provide a brief profile of the Respondent and overview of the Proposal. It should summarize the Respondent’s qualifications, financial soundness, and relevant experience; comment on the Respondent’s ability to provide, and the methodology to be used in providing, the Deliverables; and, should specify any intended use of sub-contractors or third parties.

## Approach, Methodology, Deliverables and Schedule
This section should detail:
- The Respondent’s understanding of the required Deliverables, acceptance of the scope set out in this RFP and the Respondent’s technical plan to fulfill them.
- The details of the Respondent’s plan and schedule of all high-level activities, referencing the Deliverables and their targeted COD dates.

## Other
Any other material, documentation, site access information, supporting schedules, exhibits or supplementary information not specifically addressed elsewhere but which is necessary to demonstrate the Respondent’s credentials, or to provide a complete understanding of its Proposal, which is relevant to this RFP should be contained or referenced in this part of the Proposal. The Proposal shall clearly identify all attachments, each of which shall be considered a part of the Proposal. Any assumptions made by the Respondent, which are not explicitly stated elsewhere in its Proposal, should also be described the response to this section.

## Respondent’s Legal Status, Aboriginal or Community involvement
In setting out the details of the Respondent’s legal status, the Respondent shall specify whether the Respondent is an individual, a sole proprietorship, a corporation, a partnership, a joint venture, an incorporated consortium or a consortium that is a partnership or other legally recognized entity, as well as any aboriginal or community involvement in the Project or the Respondent. If the Respondent is a joint venture or a combination of prime and sub-contractors, the Proposal shall clearly: (a) identify the prime contracting member, as the IESO will only contract with one party for the required Deliverables; (b) include a business profile detailing the principal businesses and corporate directions of the individual members; (c) specify the roles and responsibilities of the individual members; (d) identify the financial and other material relationships between the individual members; and (e) describe how the members of the joint venture – or prime/sub-contractor combination – are organized as a team in responding to this RFP.

## Pricing Proposal
A price sheet should be included for each of the Contract length options provided. The pricing proposal will be an attachment and include the:
- Quantity of Energy Storage Service (+/- MW and MWh capacity) being offered
Ontario Energy Storage Alliance Advocacy Council (OESAAC)

Proposed Principles and Indicative Terms for:

- Net revenue requirement based fixed monthly payment.
- Variable payment(s) cost estimate based on each Energy Storage Services the Respondent can provide from each applicable Project (noting that there may be more than one Energy Storage Service provided by a single Project).
- Respondents are also encouraged to submit innovative payment mechanisms as part of the variable payment for Energy Storage Services.

All parties acknowledge that while a fixed and variable payment mechanism is appropriate for this preliminary 50MW RFP, alternate payment and contracting mechanisms (including contract for difference/clean energy supply type mechanisms) may be appropriate for future energy storage procurement initiatives.

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>The IESO will evaluate each Proposal and shall award 50 MW of Energy Storage Service Contracts in accordance with the terms and timelines outlined in this RFP. Each Proposal will be scored on the following criteria:</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>The Proposal must fully describe the Energy Storage Services and the anticipated system and other benefits of the Project. Short and long-term benefits should be included. Benefits to the flexibility of the operating system and market will be identified for the both the project (specific size) and what the Energy Storage Services and/or the Project may offer in flexibility at future scale. IESO will seek to maximize the storage solution diversity to maximize lessons learned in the 50 MW RFP.</td>
</tr>
<tr>
<td>Services and Benefits</td>
<td>Respondents with Energy Storage experience in Ontario energy markets should provide details of their proven expertise.</td>
</tr>
<tr>
<td>Project Location</td>
<td>Locations will be evaluated based on the Energy Storage Services to which the Project is relevant. Proposals should describe the reasoning behind the selection of that particular location, from a geographical and T&amp;D perspective.</td>
</tr>
<tr>
<td>Operational Characteristics</td>
<td>Flexibility of the technology providing the Energy Storage Services to respond to dispatch instructions. [NTD: clarity around responding to price signals required]</td>
</tr>
</tbody>
</table>
| Availability        | Availability of the Project to provide a continuous reliable service. Reliability is a priority of the IESO. E.g. Provision of Regulation Service 24/7, seasonally (months),
Ontario Energy Storage Alliance Advocacy Council (OESAA)
Proposed Principles and Indicative Terms for:

<table>
<thead>
<tr>
<th></th>
<th>off-peak/on-peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic Potential</td>
<td>Job creation (direct/indirect; temporary/permanent) and investment impact. Future project potential and relevant job creation. Local manufacturing opportunities. Export opportunities. <em>(Any access to Government or Ministry tools that could help Respondents estimate the economic impact of their project would be beneficial to include in this RFP. Links should be provided by the appropriate contacts if available.)</em></td>
</tr>
<tr>
<td>Price</td>
<td>Total costs of each applicable Energy Storage Service and the fixed monthly payment identified in each Proposal. IESO to use fixed monthly payment plus variable payment to evaluate each Proposal.</td>
</tr>
<tr>
<td>Timeline and Schedule</td>
<td>Project timeline and COD date(s) that meets the needs of the IESO.</td>
</tr>
<tr>
<td>Other Relevant Attributes</td>
<td>The IESO will take into account:</td>
</tr>
<tr>
<td></td>
<td>• Community engagement and integration</td>
</tr>
<tr>
<td></td>
<td>• Sustainability of the Project and/or the Respondent</td>
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<td></td>
<td>• First Nations and Metis engagement</td>
</tr>
<tr>
<td></td>
<td>• [Other]</td>
</tr>
<tr>
<td>Debriefing of Unsuccessful Respondents</td>
<td>Upon written request to the designated contact stated in the RFP, an unsuccessful Respondent may request a debriefing, by phone or in-person, with IESO staff. Debriefings will be scheduled after notice of selection has been made to the successful Respondents. Discussions will be limited to the analysis of the evaluation process. Comparisons of other technologies will not be discussed.</td>
</tr>
</tbody>
</table>
Appendix E - OEB Smart Grid Advisory Committee Storage Working Group Terms of Reference
Storage Working Group

Background

In its Supplemental Report on Smart Grid the Board stated that “regulated entities must demonstrate in their investment plans how they have incorporated necessary investments to facilitate the integration of distributed generation and more complex loads (e.g. customers with self-generation and/or storage capability).” The Smart Grid Advisory Committee has established a working group to address issues related to storage so that it may provide advice to the Board as to how the Board might address any barriers to storage integration.

Scope

The Storage Working Group (the “Working Group”) is expected to provide technical solutions and recommendations to the Smart Grid Advisory Committee (the “Committee”) on the regulatory issues associated with storage. The Working Group will focus on the initial questions identified by the Committee, but they may also self-identify other areas that require attention. The Working Group will also be guided by the Board’s Supplemental Report on Smart Grid.

Deliverables

The Working Group is expected to deliver a final report and presentation to the Committee that outline their solutions and recommendations for the Board.

Work Plan

The Working Group is expected to organize their meeting structure and frequency based on their needs. Board Staff will lead the Working Group meetings and support progress by providing questions that require solutions and background material as needed.

Timelines

It is tentatively expected that the Committee will be able to provide preliminary recommendations to the Board by March 2014. In order to facilitate this timing, the Working Group will be asked to provide an update on its discussions at the November Committee meeting.

It is still expected that the Working Group sets goals that outline when specific tasks are expected to be completed.
Questions

1. What types of services can storage provide for the Ontario electricity system?
2. Can storage provide multiple services to the electricity system simultaneously?
3. How should the costs and benefits of storage be assessed?
4. What are the primary barriers (e.g., economic, regulatory) to the incorporation of storage into the Ontario electricity system?
5. What are the demarcation points (e.g., customer-owned and operated storage facilities vs. distributor-owned and operated) with respect to what safety guidelines apply in what application setting?
6. Are changes to the Board’s regulatory instruments needed to account for storage in Ontario? Why?
   a. Licences
   b. Rate classification
   c. Connection costs
   d. Codes and rules
   e. Other

Member List

1. BOMA – Scott Rouse
2. ESA – Nancy Hanna
3. IESO – Dave Barrett
4. Hydro One – Ravi Seethapathy
5. MaRS – John Dogterom
6. OESA – Cam Carver
7. OESAAC – Lisa DeMarco
8. OPA – George Pessione
9. Power Stream – Martin Rovers
10. Toronto Hydro – Aisha Bukhari

Observer: Ministry of Energy – Usman Syed

Reference Documents

1. Electrical Energy Storage – Technologies, Services, and Barriers – David Wilson
   a. In folder
2. DOE/EPRI - 2013 Electricity Storage Handbook in Collaboration with NRECA
   a. Chapters of interest:
      i. Chapter 1: Electricity Storage Services and Benefits
      ii. Chapter 3: Methods and Tools for Evaluating Electricity Storage
iii. Chapter 4: Storage Systems Procurement and Installation
iv. Appendix E: Regulations
3. OESA Document
   a. To be circulated
4. RES Canada Energy Storage LP Electricity Generation Licence
5. National Regulatory Research Institute - Electricity Storage: Technologies and Regulation