

Stakeholder Engagement SE-57

Response to Written Stakeholder Comments on Embedded Generation



On June 5, 2008, the IESO posted an [update](#) on the embedded generation stakeholder engagement initiative. Stakeholders were requested to send in written comments by June 26, 2008.

Four written comments were received, for complete text of Stakeholder comments please refer to:

Canadian Solar Industries Association

<http://www.ieso.ca/imoweb/pubs/consult/se57/se57-20080626-Comments-CanSIA.pdf>

Hydro One Networks Inc.

<http://www.ieso.ca/imoweb/pubs/consult/se57/se57-20080626-Comments-HydroOne.pdf>

OptiSolar Farms Canada

<http://www.ieso.ca/imoweb/pubs/consult/se57/se57-20080626-Comments-OptiSolar.pdf>

SunEdison Canada

<http://www.ieso.ca/imoweb/pubs/consult/se57/se57-20080626-Comments-SunEdison.pdf>

The following is a summary of Stakeholders key comments on each topic followed by the IESO response which has been indented and italicized for ease of reading.

Connection Assessment and Approvals Process (CAA)

Canadian Solar Industries Association

The Association and its members agrees with the IESO recommendations and further recommends that the IESO mandate cycle-time targets for SIA, CIA and Connection Approval by distribution utilities and transmission utilities.

IESO Response

The IESO understands and agrees that a cycle-time targets for connection steps would be beneficial to developers. The IESO already has a process in place for handling system impact assessment (SIA) applications, described in market manual 2.10. Once the stakeholder review has been completed on the new propose SIA trigger point the IESO will initiate the market rule amendment process. Stakeholders will be notified through an update to this SE Plan and through regular communications resulting from Technical Panel meetings. When the rules activity has been started the IESO will be working on updating the existing processes to reflect the new proposed SIA trigger point and expected completion time in assessing embedded generation.

Canadian Solar Industries Association

CanSIA agrees with moving forward on the details as soon as possible to help expedite the significant contribution that solar projects can make to the security of supply for Ontario consumers. We look forward to contributing to these discussions on behalf of our members.

IESO Response

The IESO has recently updated its connection assessment and approvals procedure but has no authority to change the connection processes for other entities such as transmitters and distributors. Via a separate initiative the IESO is working with Hydro One to improve the efficiency of the connection assessment and approvals process, starting with a rationalization of the documents both entities currently use to facilitate their respective processes.

Hydro One Networks Inc.

1. Hydro One is prepared to support the IESO's recommendation that the Local Distribution Company ("LDC") should apply for a System Impact Assessment ("SIA") on behalf of all generators that trigger the 10 MW reverse flow at a Transmission Station. However, this presents several challenges:
 - **Queue Rules and Cost Allocation** – Under existing queuing procedures outlined in the Ontario Energy Board's Distribution System Code ("DSC"), the generator that triggers the additional system upgrades to enable its connection is responsible for the costs of those investments. Since the IESO recommends that the LDC apply for an SIA on behalf of multiple generators, the allocation of costs for conducting the SIA and for implementing the SIA's findings will need to be clarified by the Ontario Energy Board ("OEB"), which has the authority to assign cost responsibilities for required investments.

IESO Response

The IESO agrees that the cost allocation for the system impact assessment (SIA) studies and the implementation of the SIA findings need to be provided by the Ontario Energy Board (OEB). The IESO will undertake to discuss this issue with the Ontario Energy Board and will assist the OEB when it conducts this activity.

- **Losses** – Increased losses result when generation exceeds the load – particularly when reverse flows are introduced at the TS. These losses due to embedded generation may be in contradiction with the OEB's requirement to reduce losses. Further studies and clear rules will be required on how this issue will be addressed by the Ontario Power Authority ("OPA") and the OEB.

IESO Response

The Distributor's studies may indicate the increase of power losses in the distribution system with the addition of embedded generation, under certain conditions. Power losses in distribution systems fall under the purview of the OEB. The IESO will undertake to discuss this issue with the OEB and will assist the OEB when it conducts this activity.

- Clarity and Transparency – Hydro One believes it is extremely important to set a clearly defined trigger point for the need for an SIA, and the “10 MW reverse flow” requirement would satisfy this. Generators should be informed of all the technical requirements, costs, and timelines before the project is confirmed.

IESO Response

The IESO recognizes and supports the need for clarity and transparency of the process, and a defined SIA trigger point will support these.

- Confidentiality – The IESO would need modelling data from all earlier applicants and existing generation in order to do its SIA. As such, Hydro One may need to amend confidentiality terms in its agreements with generators, especially those that are already connected, before the information can be given to the IESO.

IESO Response

Protecting customers’ confidentiality is of up most importance to the IESO. The confidential information provided to the IESO will be kept in confidentiality as outlined in the Market Rules Chapter 3, section 5.

- Timelines – The IESO’s recommendation would affect the application process, timelines, and steps prescribed in OEB’s DSC.

IESO Response

The OEB’s DSC already recognizes and includes the SIA step in the connection process for large generators (>10MW). The steps prescribed in the DSC for micro, small and mid-size generators (< 10MW) do not include a reference to the SIA process. The IESO will undertake to discuss this issue with the OEB and will highlight the need for the OEB to consider the impact of the IESO’s proposed changes on the DSC.

2. Resource Mix and Demand Profile – Hydro One submits that once a 10MW criterion, or any other magnitude of reverse flow criteria is established, it will also be extremely important to establish the rules surrounding assumptions for resource mix and demand profile based on conservative assumptions for assessments. Otherwise, implementation could be extremely difficult and be challenged by proponents who may be disadvantaged. We suggest that these assumptions be discussed with stakeholders for wind, solar and other relevant technologies as generation patterns vary widely by technology and location, and this will need to be addressed when developing these rules.
3. Finally, it should be emphasized that clear rules are essential. Any uncertainty would not only delay the generation connection process amid confusion around the need for an SIA but also raise questions by proponents around the fairness of the process.

IESO Response

The IESO agrees that rules should be transparent and clearly defined. The criteria for evaluating the potential reverse power flow into the transmission system will be established after discussions with the stakeholders and will take into account the generation characteristics of the different type of generation technologies. Information in regards to this stakeholder activity will be contained in an updated stakeholder engagement plan which can be found at the following location:

http://www.ieso.ca/imoweb/consult/consult_se57.asp

SunEdison Canada

SunEdison agrees with the IESO recommendations and further recommends that the IESO mandate cycle-time targets for SIA, CIA and Connection Approval by distribution utilities and transmission utilities.

IESO Response

The IESO understands and agrees that a cycle-time targets for connection steps would be beneficial to developers. The IESO already has a process in place for handling system impact assessment (SIA) applications, described in market manual 2.10. Once the stakeholder review has been completed on the new propose SIA trigger point the IESO will initiate the market rule amendment process. Stakeholders will be notified through an update to this SE Plan and through regular communications resulting from Technical Panel meetings. When the rules activity has been started the IESO will be working on updating the existing processes to reflect the new proposed SIA trigger point and expected completion time in assessing embedded generation.

SunEdison Canada

SunEdison agrees with moving forward on the details as soon as possible to help expedite the significant contribution that solar projects can make to the security of supply for Ontario consumers. We look forward to contributing to these discussions.

OptiSolar Farms Canada

OptiSolar Farms Canada has reviewed the discussion paper on embedded generation released June 5, 2008 with particular interest in the Connection Assessment and Approval Process (CAA).

We are in agreement with the IESO recommendation that, **“the characteristics of embedded resources must be accounted for when calculating the reverse power into the grid and determining when to apply to the IESO. For example, when wind resources are predominantly available during the night, solar resources are only available during the day”**.

OptiSolar Farms Canada would respectfully request that recommendation be further augmented to indicate that **feeder loading characteristics which exist at the time when the embedded generator will be generating electricity** should be utilized in modeling the system impact of connecting the generator. It has been our experience that minimum load feeder characteristics are utilized in simulating the impact of the connection of the solar farm even though the minimum load occurs in the middle of the night when the solar farm is switched off and not generating any electricity. The result has been that the system impacts are unnecessarily exaggerated and generate capital costs which are absorbed by the embedded generator proponent.

OptiSolar has received notice that two of its Connection Impact Assessments will require System impact studies to be carried out by the IESO since more than 10 MW of reverse electricity flow will be sent back on to the transmission grid. I have attached a copy of the wording in the CIA for your information.

“Even though the proposed EG size is 10 MW or less, the Connection Impact Assessment for the proposed project shows that the impacts of the proposed connection on the Transmission system may need to be reviewed by the Independent Electricity System Operator (IESO) and Hydro One Transmission given it would result in a net injection into the Transmission system of over 10 MW under minimum load conditions and with existing generation and other generation ahead of it in the queue as applicable. Hydro One will request the IESO for such a review. If an SIA is required, it will be done by the IESO and Hydro One will do a corresponding Customer Impact Assessment. The SIA or Customer Impact Assessment may result in the need to put in place additional Transmission system facilities or Distribution system facilities that directly interface with the transmission system in order to reliably connect this proposed generator or in an inability to connect the generator.” Given that the above conclusion is again based on system loading data that does not accurately reflect actual system loading conditions, the SIA requirement is unwarranted and contributes to the elimination of potential generation capacity, delays in generator connections, increased workload for the LDC which already has scarce technical resources, and the creation of unnecessary costs to the developer and electricity energy consumer in the Province of Ontario.

IESO Response

In identifying the need for a SIA assessment, the IESO will take into account the generation characteristics of the different type of generation technologies. The IESO recognizes the need for a careful review of all the available information in making the decision to conduct an SIA, which includes the loading profile at the station and the forecast output from different types of embedded generation connected behind the transformer station.

The IESO will not use the feeder load profile in its decision, as the feeder assessment is done by the Distributor.

Performance Standards

Canadian Solar Industries Association

We agree with these next steps and would like to participate in the technical conference. We hope that once the technical conference is over, the Association, in consultation with our members, would still like to be engaged on providing comments to proposed recommendations before they are final.

CanSIA welcomes any changes to the connection process and rules that would help remove the roadblocks currently impairing Ontario's ability to meet or even exceed its renewable energy objectives. In addition, the cost to our members that have resulted due to the current lack of clarity and overall confusion in the connection process makes it more challenging to improve the value proposition of renewable energy for Ontario consumers.

IESO Response

The changes proposed were presented and discussed at the Stakeholder Engagement session this past winter. Not many comments have been received related to the proposed changes to performance standards as in most cases the changes reflect a relaxation from existing standards that are designed to remove barriers to market entry. The IESO is currently assessing the most efficient means for stakeholders to review and comment on the proposed modifications to performance standards and will be communicating that mechanism later in the Autumn of 2008.

Hydro One Networks Inc.

1. Low Voltage Ride Through (“LVRT”) – Hydro One supports the need for LVRT, but cautions that the exact requirement should be in accordance with existing cease to energize requirements. (e.g., IEEE 1547 Clause 4.2.3, DSC Appendix F.2 Section 6.5)

IESO Response

The voltage provisions from IEEE 1547 Clause 4.2.3 are listed for easy reference below. This “clearing” time will be inconsistent with transmission security in many locations. For example, with 3 cycle transmission breakers (50ms) and 5 cycle DG breakers (83ms), the 160ms clearing time would leave insufficient allowance for fault detection, auxiliary relaying and communicating times.

% of Base Voltage	Clearing Time
V<50	0.16
50≤V<88	2.00
110<V<120	1.00
V≥120	0.16

The need to clear the DG quickly for faults on its connection to the distribution system must be reconciled with the need to maintain security for transmission system faults.

The LVRT settings must allow for unrelated transmission contingencies to be cleared where this does not conflict with the clearing of faults on the associated distribution system to strike a reasonable balance between these conflicting needs. The voltage thresholds nearest nominal should reflect the present requirement for transmitters under the TSC. By using the CSA-235 emergency requirements for the tripping ranges closest to nominal.

% of Typical Voltage	Clearing Time
V<50	> transmission system fault clearing time plus local breaker operating time
50≤V<88	2.00
112<V<120	1.00
V≥120	0.16

A difficulty particular to Ontario is the large discrepancy between “base” voltage and typical operating voltage. Tripping voltages should reflect a percentage of the typical operating voltage at the DG as shown in the table above.

2. Automatic Reconnection – Hydro One agrees with this proposal.
3. Power Factor Regulation – Clarification on this item is requested. Hydro One can support the IESO’s removal of the requirement with respect to the Distribution System, however, the change in power factor at the TS due to embedded generation warrants further discussion so that transmitters are not held responsible for low power factor.

IESO Response

There is no intention on the part of the IESO to change the Market Rules to make Transmitters responsible for the power factor of Distributors or wholesale consumers.

4. Reactive Power, Voltage Variations and Automatic Voltage Regulation – Clarification on this item is requested. While these may have limited effects on the IESO-controlled grid, they could have significant impacts on the safe and reliable operation of the distribution system. A uniform approach could be challenging because of innate site-specific and technological differences. (e.g., solar technologies cannot provide reactive power.)

IESO Response

The proposed removal of IESO requirements to have power factor regulation capability is intended to avoid the installation of equipment that may conflict with a distributor’s requirement.

5. Under Frequency Load Shedding (“UFLS”) – Hydro One supports the need for UFLS, but cautions that the exact requirement should be in accordance with existing cease to energize requirements. (e.g., IEEE 1547 Clause 4.2.4, DSC Appendix F.2 Section 6.5)

IESO Response

The provisions of IEEE 1547 Clause 4.2.4 are listed below for convenience. These settings conflict with existing NPCC and IESO requirements.

DR Size	Frequency Range (Hz)	Clearing Time
≤ 30 kW	60.5	0.16
	<59.3	0.16
≥ 30 kW	>60.5	0.16
	< 59.8 – 57) adjustable setpoint	Adjustable 0.16 to 300
	< 57.0	0.16

IEEE 1547 requirement would have generators trip above the frequency-time curve in NPCC’ Emergency Operations Criteria and therefore would require a compensating amount of load to armed for automatic under-frequency load shedding. The proposed market rule changes will clarify the responsibility of distributors in this regard and provide the latitude for distributors to compensate for any generation facility that trips too early by arming additional load. Tabulated below are existing Market Rule requirements that are not proposed to be changed.

Frequency Range (Hz)	Frequency Trip Time
> 60.6	Undelayed tripping permitted
59.4≤Hz≤60.6	Tripping not allowed
57.0<Hz≤59.0	Not less than NPCC A-3 criteria
≤ 57.0	Undelayed tripping permitted

6. Load Power Factor – Clarification on this item is requested.

IESO Response

The proposed changes are intended to make it clear that the power factor compliance will be calculated on the distributors demand (e.g. load + losses) to avoid unfairly penalizing them for incorporating DG. An example provided below illustrates the point of the change.

	At the Defined Point of Sale		
	Active Power (MW)	Reactive Power (Mvar)	Power Factor
Before DG	90	45	~0.90
After 30MW of DG	60	45	~0.80

Without changing the Market Rules, the distributor would become non-compliant due to the incorporation of DG.

7. Excitation and Speed Governing Systems – Clarification on this item is requested.

IESO Response

The proposed changes are intended to organize the existing rules in a format that is more user friendly. The IESO has received numerous queries since market opening in regards to making this portion of the market rules simpler and clearer.

SunEdison Canada

Overall we agree with these recommendations but do have a couple of questions for the IESO’s consideration:

1. Will the anticipated changes to the performance standards and rules be consistent with the IEEE 1547 standards typically at the core of any expedited interconnection rules? These IEEE standards are already adhered to by many renewable technologies, and would likely address the concerns identified by the IESO as adequately as the proposed blanket prohibition on automatic reconnection.

The recommendation refers to changes assisting proponents to “utilize emerging technologies in an economically responsible manner”. For example, a performance standard could be economically responsible from a consumer perspective, but may not be economically responsible for the project investors (which could include community groups). As well, it is unclear how such an assessment would be done and what factors would be considered (i.e. impacts on the environment and human

health). SunEdison believes more clarity in terms of intent and criteria for analysis is required to make sure all proponents and the IESO are working to the same goal during consultations.

SunEdison looks forward to reviewing and commenting on the proposed amendments to market rules and processes required to implement these changes.

IESO Response

The proposed changes to the Market Rules are intended to reduce obstacles to the connection of embedded generation while allowing reliability to be maintained.

Unfortunately some provisions of IEEE 1547 are in conflict with pre-existing NPCC, IESO Market Rule, OEB Transmission System Code and CSA requirements. IEEE 1547 was sponsored by the Standards Coordinating Committee 21 (Fuel Cells, Photovoltaics, Dispersed Generation and Energy Storage). This class of generation is relatively small in Ontario at the present and has not been at the core of most generation connection assessment done by the IESO. The proposed changes to the Market Rules will utilize IEEE 1547 to the extent possible. Differences from this standard to allow reliability to be maintained are discussed below.

Low Voltage Ride Through (“LVRT”) – The voltage provisions from IEEE 1547 Clause 4.2.3 are listed for easy reference below. This “clearing” time will be inconsistent with transmission security in many locations. For example, with 3 cycle transmission breakers (50ms) and 5 cycle DG breakers (83m), the 160ms clearing time would leave insufficient allowance for fault detection, auxiliary relaying and communicating times.

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The need to clear the DG quickly for faults on its connection to the distribution system must be reconciled with the need to maintain security for transmission system faults.

The LVRT settings must allow for unrelated transmission contingencies to be cleared where this does not conflict with the clearing of faults on the associated distribution system to strike a reasonable balance between these conflicting needs. The voltage thresholds nearest nominal should reflect the present requirement for transmitters under the TSC. By using the CSA-235 emergency requirements for the tripping ranges closest to nominal.

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V<50	> transmission system fault clearing time plus local breaker operating time
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A difficulty particular to Ontario is the large discrepancy between “base” voltage and typical operating voltage. Tripping voltages should reflect a percentage of the typical operating voltage at the DG as shown in the table above.

Under Frequency Load Shedding (“UFLS”) – The provisions of IEEE 1547 Clause 4.2.4 are listed below for convenience. These settings conflict with existing NPCC and IESO requirements.

DR Size	Frequency Range (Hz)	Clearing Time
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≥ 30 kW	>60.5	0.16
	< 59.8 – 57) adjustable setpoint	Adjustable 0.16 to 300
	< 57.0	0.16

IEEE 1547 requirement would have generators trip above the frequency-time curve in NPCC’ Emergency Operations Criteria and therefore would require a compensating amount of load to be armed for automatic under-frequency load shedding. The proposed market rule changes will clarify the responsibility of distributors in this regard and provide the latitude for them to compensate for any generation facility that trips too early by arming additional load. Tabulates below are existing Market Rule requirements that are not proposed to be changed.

Frequency Range (Hz)	Frequency Trip Time
> 60.6	Undelayed tripping permitted
59.4≤Hz≤60.6	Tripping not allowed
57.0<Hz≤59.0	Not less than NPCC A-3 criteria
≤ 57.0	Undelayed tripping permitted

SunEdison Canada

SunEdison agrees with these next steps and would like to participate in the technical conference. We hope that once the technical conference is over, proponents will still be engaged on providing comments to proposed recommendations before they are final.

SunEdison welcomes any changes to the connection process and rules that would help remove the roadblocks currently impairing Ontario’s ability to meet its renewable energy objectives. As well, the cost to proponents of the current lack of clarity and overall confusion in the connection process makes it more challenging for proponents to improve their value proposition for Ontario consumers.

Visibility/Telemetry

Canadian Solar Industries Association

CanSIA agrees with these recommendations subject to the following concerns: The recommendation directs the various agencies to develop “*an effective and inexpensive means of providing real-time visibility*”. Many renewable generation proponents already have these types of systems in place, so we suggest that the IESO consider including proponent input as well to ensure that the agencies consider the costs and data available from those systems already in operation.

If the IESO is planning to use this information to curtail embedded generation under certain conditions, proponents will need to have a very clear understanding of the criteria to be used to decide who is curtailed. This information will be critical to project economics.

IESO Response

The IESO understands that many proponents already have existing means to providing real-time visibility and will seek proponent input when addressing this recommendation.

The IESO agrees that the proponents will need to have a very clear understanding of the criteria to be used to decide who is curtailed and will work this into the design.

Hydro One Networks Inc.

1. The OPA contract may not be the most suitable place for active monitoring requirements. The OPA’s contract outlines commercial arrangements, but this is a requirement for safe and effective operation of the transmission and distribution systems.

IESO Response

The IESO agrees with this statement. The IESO states that the obligation to provide telemetry within the market rules would fall under the LDC. The recommendation offers another option. The IESO appreciates Hydro One's feedback.

2. Currently, Hydro One has monitoring requirements already in place. Consultation should ensure harmonious integration of the various requirements and needs of the LDC and the IESO. Cost allocation will have to be considered not only from an initial connection perspective, but also when the distribution system configuration changes.

IESO Response

The IESO understands that many proponents already have existing means to providing real-time visibility and will seek proponent input when addressing this recommendation.

3. The IESO should identify their requirements. For example, does the IESO need aggregate generation data at the delivery point (i.e. the TS’s low voltage bus) or at the generator’s connection point within the distribution system?

IESO Response

The IESO agrees with this statement and will stakeholder all requirements identified.

In general, Hydro One is in favour of revising standards to facilitate connections. However, the rationale behind each technical requirement affected should be identified for stakeholder discussion. Although the IESO should propose changes necessary for it to operate and control the IESO-controlled grid, it is also important that due consideration is given to requirements that are in place to ensure the integrity of the distribution system. Hence, it is extremely important to ensure that the IESO requirements are not in conflict with other governing codes, standards, or industry-wide practices. Finally, the implementation of new changes needs to consider the fair treatment of new facilities, the challenges for the LDCs, and generators that are already connected.

IESO Response

The IESO will stakeholder any revisions to the standards, along with the rationale behind the changes. Furthermore, the IESO will ensure that the relevant standard setting authorities are kept engaged during the process.

The IESO agrees that due consideration should be given to the requirements that are currently in place and will ensure that the IESO requirements are not in conflict with other governing codes, standards or industry-wide practices.

SunEdison Canada

SunEdison agrees with these recommendations subject to the following concerns:

1. The recommendation directs the various agencies to develop “*an effective and inexpensive means of providing real-time visibility*”. Many renewable generation proponents already have these types of systems in place, so we suggest that the IESO consider including proponent input as well to ensure that the agencies consider the costs and data available from those systems already in operation.
2. If the IESO is planning to use this information to curtail embedded generation under certain conditions, proponents will need to have a very clear understanding of the criteria to be used to decide who is curtailed. This information will be critical to project economics.
3. Again, SunEdison looks forward to reviewing and commenting on the proposed amendments to market rules and processes required to implement these changes.

IESO Response

The IESO understands that many proponents already have existing means to providing real-time visibility and will seek proponent input when addressing this recommendation.

The IESO agrees that the proponents will need to have a very clear understanding of the criteria to be used to decide who is curtailed and will work this into the design.