GENERATION CONNECTION

INFORMATION PACKAGE

Date: October 1, 2022

Revision: 0

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Introduction

In accordance with OEB Requirements Festival Hydro Inc. is providing a Generator Connection Information Package to provide customers with the information needed to connect a distributed energy resource to Festival Hydro's distribution system.

This package will provide you with the steps, containing all the required information and links to forms, to provide consistency when planning your generation project.

For any inquiries regarding this document or generation projects in general please contact Festival Hydro's Generation team.

Email: DER@festivalhydro.com

Phone: 519-271-4700 ext. 303

Preliminary Consultation

To begin the process of connecting, complete a Preliminary Consultation Information Request (PCIR) form and submit to der@festivalhydro.com

Festival Hydro, within 15 days of receipt of complete PCIR form will respond to the request with the following high-level information in a Preliminary Consultation Report (PCR):

a. Confirm if there is connection capacity at the location, subject to the completion of a Connection Impact Assessment (CIA)
b. Any conditions on capacity and likelihood of Transfer Trip being a requirement
c. What connection studies will be required for CIA (e.g. distributor and host distributor)

CIA studies are required based on the DER Classifications below, with the CIA form completed for Small, Mid-Sized and Large applications (attach link):

DER Classification	**Rating**	**Sample List of Studies**
Micro	≤ 10 kW	None
Small and Mid-Sized	>10kW but ≤10MW	1. Distributor (or Embedded Distributor) 2. Host Distributor (if applicable)
Large	> 10 MW	1. Distributor (or Embedded Distributor) 2. Host Distributor (if applicable) 3. Transmitter 4. IESO System Impact Assessment

Table 1: DER Classification Sizes

If the proposed connection is for a Micro generation facility (≤ 10 kW) and Festival Hydro's Preliminary Consultation Report indicates there is capacity to accommodate the request, a CIA is not required and you can proceed straight to the Build and Energization section of this document for next steps.

Connection Impact Assessment

For all projects >10kW a CIA is required to complete a technical review of the proposed installation.

A CIA application form needs to be completed by the customer and submitted to der@festivalhydro.com along with a cheque for the proper amount based on size of connection and number of studies required. The amount for the CIA will be indicated in Festival Hydro's Preliminary Consultation Report.

Once the CIA application form has been received, Festival Hydro will screen for completeness using the process outlined below.

Connection Impact Assessment: Screening Process

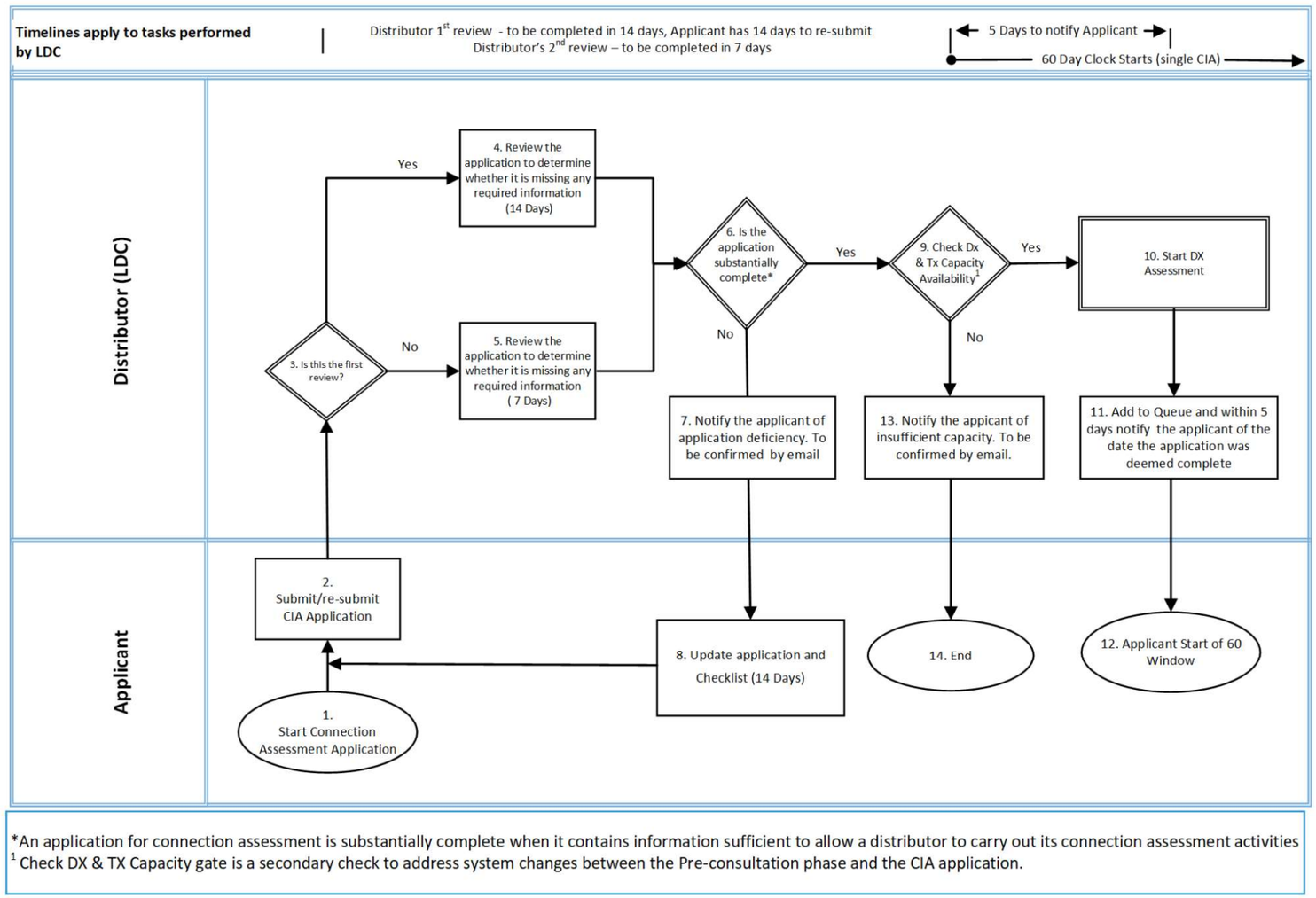


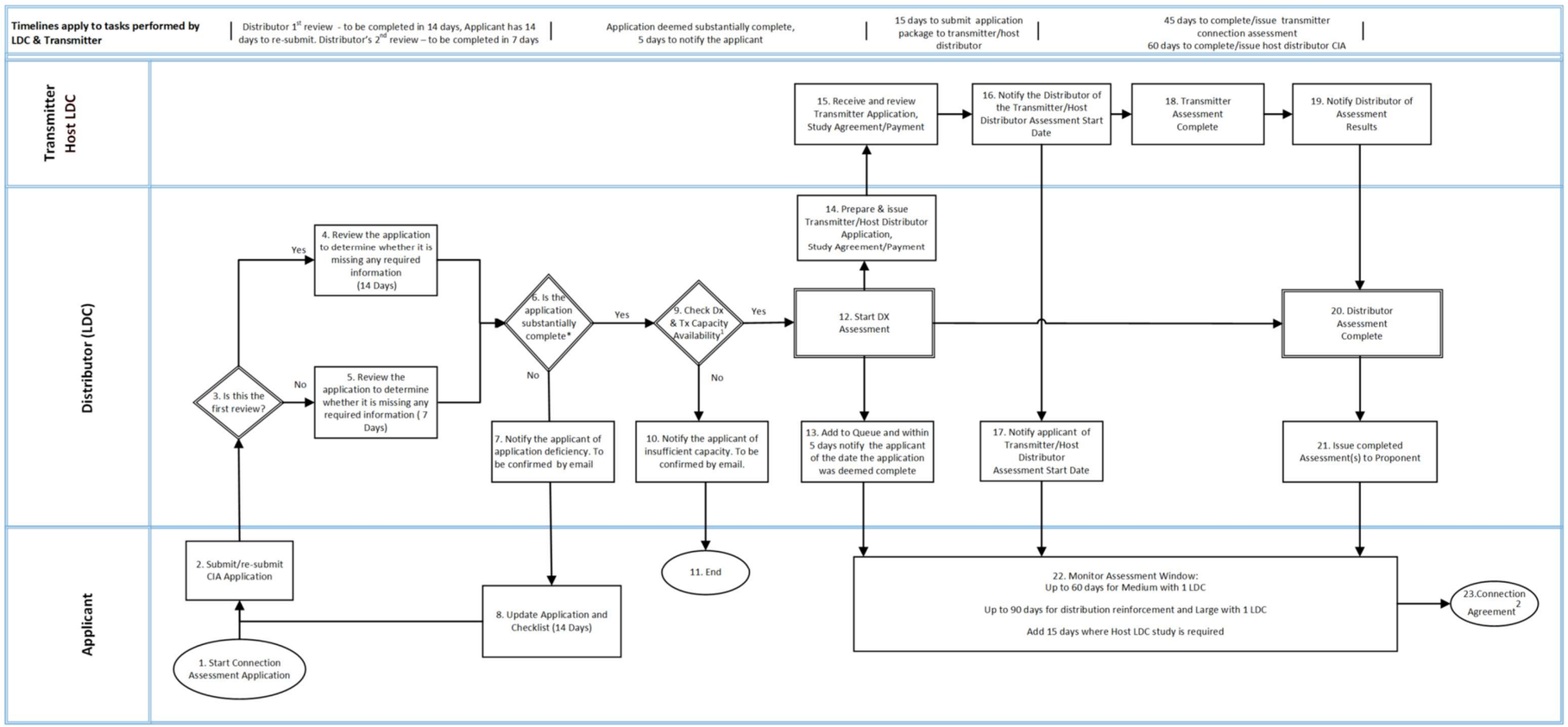
Figure 1: Connection Impact Assessment Screening Process Flowchart (Distributed Energy Resources Connection Procedures Ver. 1, March 2022, https://www.oeb.ca/consultations-and-projects/policy-initiatives-and-consultations/distributed-energy-resources-der)

Step 1. The applicant initiates the CIA Application and gathers the current application form and Distributor's application requirements.
Step 2. The applicant submits the completed CIA Application package, including completed application form, payment for required studies, attachments, and application checklist.
Step 3. The distributor determines if this is the initial submission or a revised application submission.
Step 4. For initial submissions, the Distributor reviews the application for completeness within 14 calendar days.
Step 5. For revised application submissions, the Distributor reviews the application for completeness within 7 calendar days.
Step 6. For the completeness check outlined in steps 4 and 5 above, the distributor will review the application to determine if there is sufficient information provided by the applicant to process the submission. Once the distributor determines that the submission provides the necessary information to commence a CIA study, the application is deemed substantially completed.
Step 7. For submissions that are not substantially complete, the distributor will notify the applicant of the application deficiencies via email or letter if the applicant's email is not provided. The deficiency notification shall identify any errors and omissions in the application that would prevent the distributor from proceeding with the CIA. The notification shall outline the available remedies required to have the application deemed substantially complete.
Step 8. On receipt of a deficiency notification, an applicant should review and revise the application to address the deficiencies and resubmit the application. The process allows 14 days for the applicant to resubmit a revised application. If the applicant does not return the revised application within 14 days, the distributor may remove the application from the processing queue. If the application is removed from the queue, it may be treated as a new application once it is resubmitted.
Step 9. For submissions that are deemed substantially complete, the distributor will reconfirm[4] transmission and distribution capacity availability.
Step 10. If capacity is confirmed to be available, the distributor proceeds with the assessment.
Step 11. The distributor will add the application to the processing queue in the order in which they are deemed substantially complete and within 5 days notify the applicant of the date the application was deemed substantially complete.
Step 12. The date the submission is deemed substantially complete starts the timed-day window for the distributor to send the completed connection impact assessment to the applicant and proceed with the connection agreement.
Step 13. If available capacity is not confirmed, the distributor will notify the applicant via email that capacity is not available to support the connection
Step 14. If there is no capacity available, the process concludes.

The screening process will then end once the application is deemed to be substantially complete and the CIA can be started.

The CIA flowchart, with detailed steps can be found below.

Connection Impact Assessment Process for Mid-sized or Large Embedded Generation Facility



*An application for connection assessment is substantially complete when it contains information sufficient to allow a distributor to carry out its connection assessment activities
1. Check DX & TX Capacity gate is a secondary check to address system changes between the Pre-consultation phase and the CIA application.
2. After receiving capacity allocation CCA signed within (i) 17 months for large embedded generation facility if transmission upgrades are required, (ii) 9 months for large embedded generation facility if transmission system impact assessment required (iii) 6 months for all other embedded generation facilities (reference DSC 6.2.4.1)

Figure 2: Connection Impact Assessment Process for Small to Large Size Facilities (Distributed Energy Resources Connection Procedures Ver. 1, March 2022, https://www.oeb.ca/consultations-and-projects/policy-initiatives-and-consultations/distributed-energy-resources-der)

Step 1. The applicant initiates the CIA process and gathers the current CIA application form and distributor's application requirements from the distributor.
Step 2. The applicant submits the completed CIA Application package, including completed application form, payment for required studies, attachments, and application checklist.
Step 3. The distributor determines if this is the first submission or a revised application submission.
Step 4. For initial submissions, the distributor reviews the application for completeness within 14 calendar days.
Step 5. For revised application submissions, the distributor reviews the application for completeness within 7 calendar days.
Step 6. For the completeness check outlined in Steps 4 and Steps 5 above, the distributor will review the application to determine if there is sufficient information provided by the applicant to process the submission. Once the distributor determines that the submission provides the necessary information to commence a CIA study, the application is deemed substantially completed.
Step 7. For submissions that are not substantially complete, the distributor will notify the applicant of the application deficiencies via email or letter if the applicant's email is not provided. The deficiency notification shall identify any errors and omissions in the application that would prevent the distributor from proceeding with the CIA. The notification shall outline the available remedies required to have the application deemed substantially complete.
Step 8. On receipt of a deficiency notification, the applicant should review and revise the application to address the deficiencies and resubmit the application. The process allows 14 days for the applicant to resubmit a revised application. If the applicant does not return the revised application within 14 days, the distributor may remove the application from the processing queue. If the application is removed from the queue, it may be treated as a new application once it is resubmitted.
Step 9. For submissions that are deemed substantially complete, the distributor reconfirms[6] transmission and distribution capacity availability. Capacity is not reserved for the project until the CIA has been completed.
Step 10. The distributor notifies the applicant via email if there is no capacity availability to support the connection.
Step 11. If there is no capacity available, the process concludes.
Step 12. If capacity is confirmed to be available, the distributor proceeds with the assessment.
Step 13. The distributor adds the application to the processing queue and within 5 days notifies the DER applicant of the date the application was deemed substantially complete. The date the submission is deemed substantially complete starts the timed window for the distributor to return the completed CIA.
Step 14. The distributor prepares and issues an application to the transmitter for a CIA, a Study Agreement, and payment within 15 days of starting the assessment.
Step 15. The transmitter receives the application from the distributor along with the Study Agreement and payment. The Transmitter has 15 days to review the submission and notify the distributor
Step 16. The transmitter notifies the distributor of the Transmitter Assessment start date
Step 17. Distributor notifies the applicant of the Transmitter Assessment start date.
Step 18. The transmitter executes and completes the assessment within 45 days. Where possible the transmitter completes this study concurrently with the distributor Assessment.
Step 19. The transmitter notifies the distributor on the results of the assessment
Step 20. The distributor also completes its CIA
Step 21. The distributor will provide the completed CIA to the applicant within:
i. 60 days of the receipt of the substantially complete application in the case of a proposal to connect a mid-sized DER; and
ii. 90 days of the receipt of the substantially complete application in the case of a large DER.
The applicant can use the assessment start date notification to monitor the distributor's and transmitter's assessment progress against the applicable 60-day or 90-day assessment window. The assessment period is increased by 15 days where a host distributor assessment is also required.
Step 22. The process moves on to the connection agreement phase.

Detailed Cost Estimate

The CIA will include an estimate of the anticipated connection costs.
Upon receipt of the CIA, an applicant for a mid-sized or large generation facility (see Table 1) has the option to request a detailed cost estimate from the distributor prior to entering into a Connection Cost Agreement.
To obtain a detailed estimate, the applicant must make a written request for the estimate (add link to form); the distributor and applicant may enter into a study agreement for the preparation of the cost estimate, if required; the applicant would pay the distributor's fee for preparation of the detailed cost estimate; and the distributor would proceed with preparing the detailed cost estimate. The detailed cost estimate would be provided to the applicant before the applicant signs the Connection Cost Agreement.

Construction and Energization

Micro Generation Facility

For a Micro Embedded Generation Facility (≤ 10 kW), no CIA is required and a completed Connection Form, along with a cheque for the appropriate amount is to be submitted.

The detailed connection process can be found below.

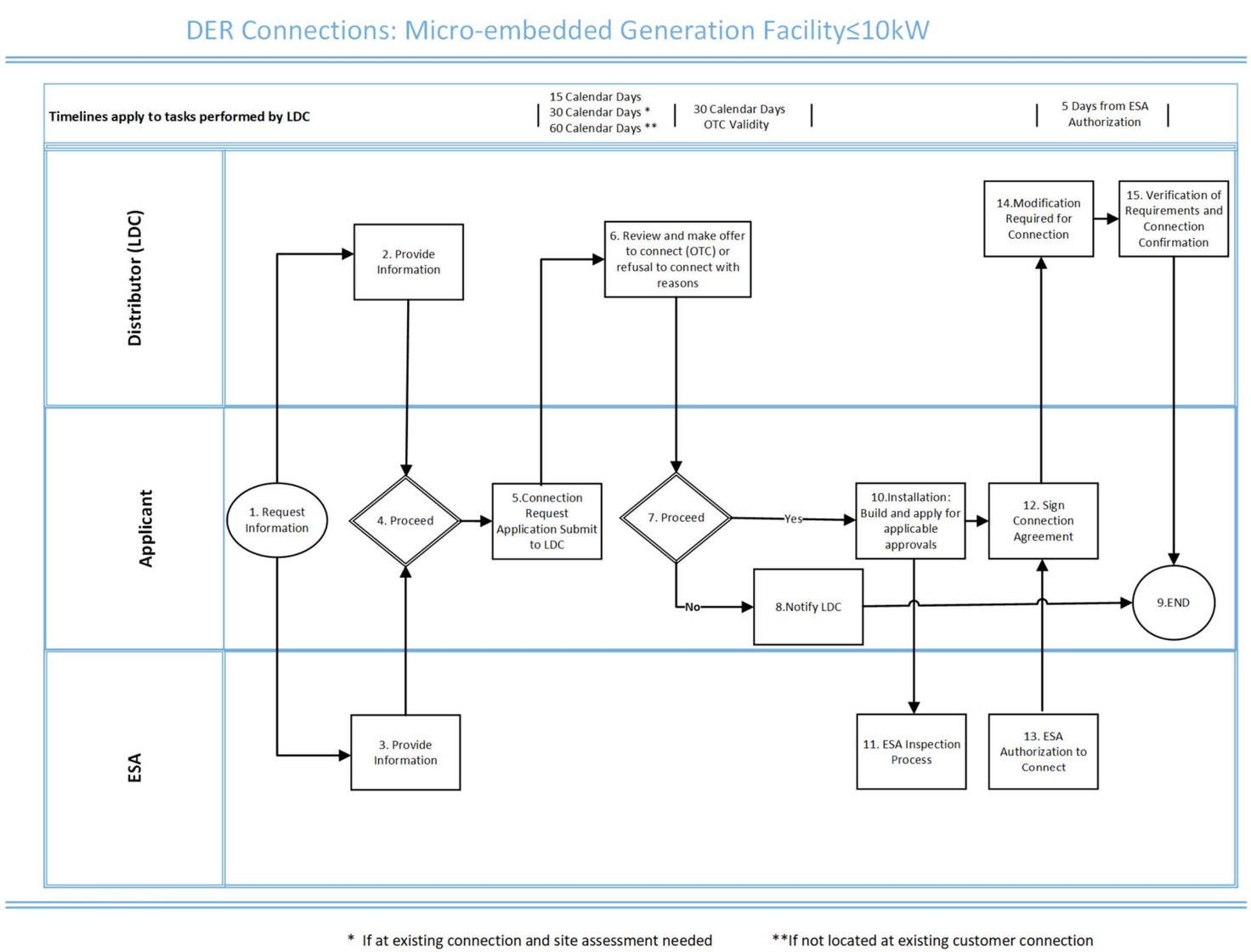


Figure 3: Timeline/Responsibilities for Micro Generation Facilities (Distributed Energy Resources Connection Procedures Ver. 1, March 2022, https://www.oeb.ca/consultations-and-projects/policy-initiatives-and-consultations/distributed-energy-resources-der)

Step 1 The applicant proposing the installation of a micro-embedded generation facility with a non-exporting connection contacts the distributor and the Electrical Safety Authority (ESA) to gather connection and process information.
Step 2 The distributor makes the information available to the applicant in a timely manner. The information package will include the description of the connection process approvals needed by the distributor for connection; technical requirements including metering; contractual requirements (Micro-Embedded Generation Facility Connection Agreement); and application forms.
Step 3 ESA provides information on Electrical Safety Requirements
Step 4 The applicant reviews relevant information from the distributor and the ESA on the project, and prepares:
• an installation plan, including the size/type of generation facility (i. e. load displacement/net metering/isolated from distribution system/grid connection); and
• a project plan.
Step 5 The applicant submits application to the distributor to review
Step 6 The distributor makes an offer to connect the approved DER or provides its refusal to connect with reasons within 15 calendar days
The distributor's review of an Application submitted for the connection of a micro-embedded generation facility at the existing customer connection will include:
• typical requirement for new meter only;
• check for service upgrade requirement;
• check for significant amount of other generation on feeder;
• response to the applicant with an offer to connect or refusal
• response to applicant with requirements specific to the connection (typically requirements for metering) and costs, timing to implement, etc.
Step 7 The applicant decides whether to proceed with the connection process.
Step 8. The applicant notifies the distributor that it has decided not to proceed with the connection application.
Step 9. The applicant ends the process.
Step 10 The applicant must indicate its intention to connect within the 30-day validity period of the offer to connect. The applicant must work closely with the distributor, the ESA and any other organizations from which work, inspections, approvals, or licenses are required to prevent delays.
The activities will be planned in coordination with project milestones, and it is up to the applicant to initiate actions at the required times.
Step 11 Where required by the ESA, the applicant must file a notification to receive an ESA Authorization to Connect
Step 12 The applicant reviews and signs the Connection Agreement
Step 13 ESA provides an Authorization to Connect when the installation meets all the applicable requirements of the Ontario Electrical Safety Code as determined by ESA.
Step 14 The distributor completes any work required to facilitate the connection to the distribution system
Step 15 The distributor works with the applicant to complete the connection including any testing and verification requirements

Small/Mid-Size/Large Generation Facility

For facilities larger than 10kW a Connection Cost Agreement is completed to set out the scope of work and associated cost for the Distributor to connect the project to the distribution system.

Below outlines the process steps for this.

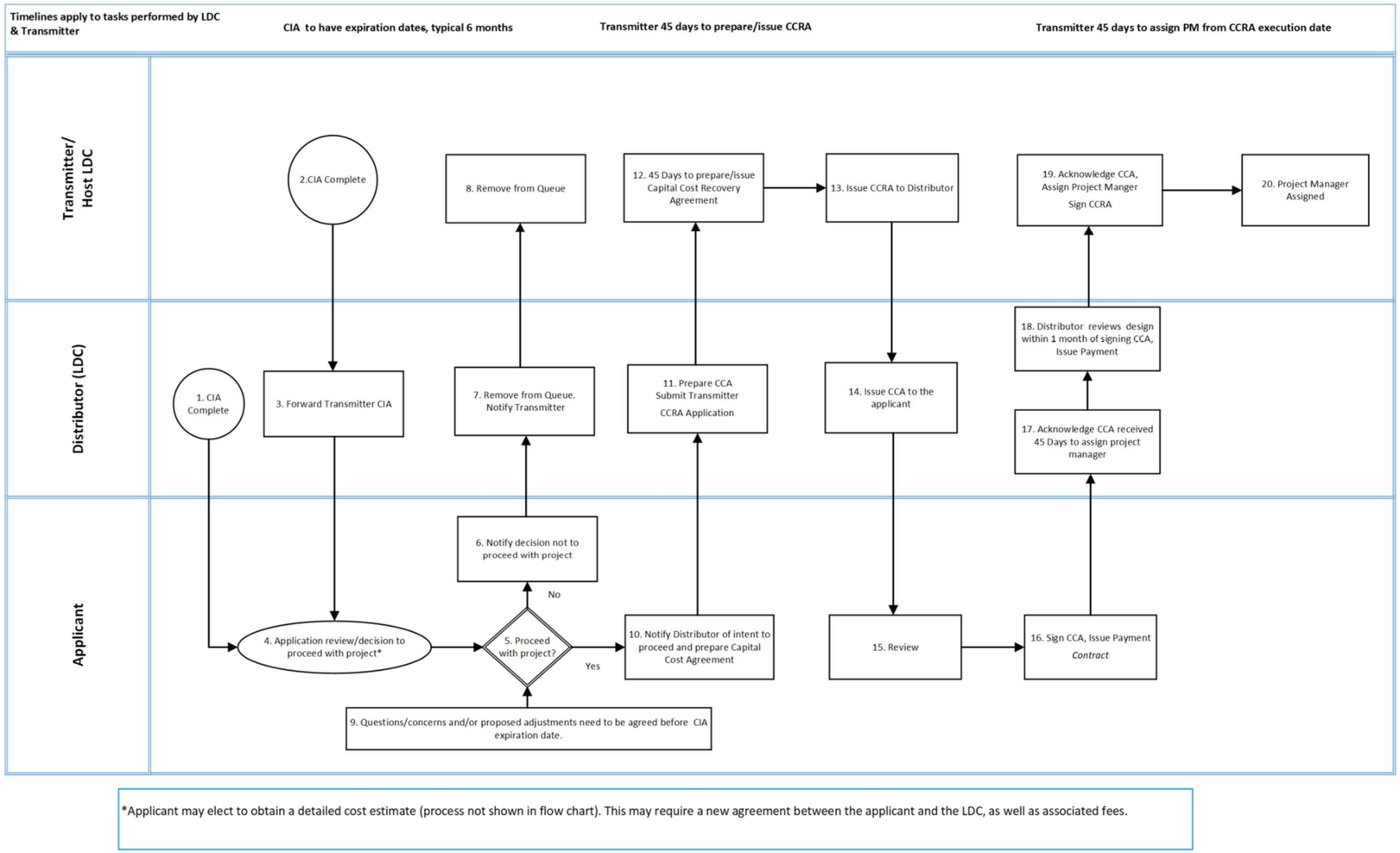


Figure 4: Timeline/Responsibilities for Small to Large Generation Facilities (Distributed Energy Resources Connection Procedures Ver. 1, March 2022, https://www.oeb.ca/consultations-and-projects/policy-initiatives-and-consultations/distributed-energy-resources-der)

Steps 1-3. The process starts with the applicant reviewing the completed CIA (s) from the distributor, the host distributor and if applicable, the transmitter.
Step 4. The applicant decides whether to cancel or proceed with the connection of the project
Step 6. The applicant notifies the distributor in the case of a decision not to proceed with the project.
Step 7. The distributor notifies the host distributor/transmitter that the applicant is not proceeding with the project. The distributor removes the project from the application processing queue and the process concludes for the distributor.
Step 8. The host distributor/transmitter removes the project from the application processing queue and the process concludes for the host distributor/transmitter.
Step 9. The applicant should discuss with the distributor any concerns, questions and/or proposed adjustments that need to be agreed upon before the Connection Assessments expiration date(s). An extension may be granted by distributor if deemed necessary.
Step 10. The applicant must notify the distributor of its intent to proceed with the Project.
Step 11. The distributor prepares the Capital Cost Agreement (CCA) and submits a Transmitter Capital Cost Recovery Agreement (CCRA) Application to the transmitter.
Step 12. The transmitter prepares the CCRA within 45 days.
Step 13. The transmitter issues this CCRA to the distributor.
Step 14. The distributor reviews the CCRA and issues the distributor's CCA to the applicant.
Step 15. The applicant is expected to review the CCA and seek any clarification from the distributor if required.
Step 16. If the applicant agrees with the terms of the CCA, the applicant sign and issues payment to the distributor.
Step 17. The distributor acknowledges receipt of the CCA, assigns a Project Manager within 45 days, issues payment to the transmitter, and executes the CCRA and any other required agreements.
Step 18. The distributor shall review the detailed design within 1 month of signing the CCA
Step 19. The transmitter acknowledges receipt of the CCRA and assigns a project manager within 45 days.
Step 20. The process moves onto the build phase after assignment of the Project Manager for the distributor and transmitter.

After the CCA is executed, the construction drawings are finalized, and the applicant can proceed to construction. A kick-off meeting is scheduled with an assigned project manager within 45 days of the CCA being signed. The Build and Energization process flowchart starts with the assignment of the distributor project manager at the end of the CCA phase. The full process flowchart is outlined in Figure 7. The corresponding process steps for the distributor, transmitter and Applicant follow thereafter.

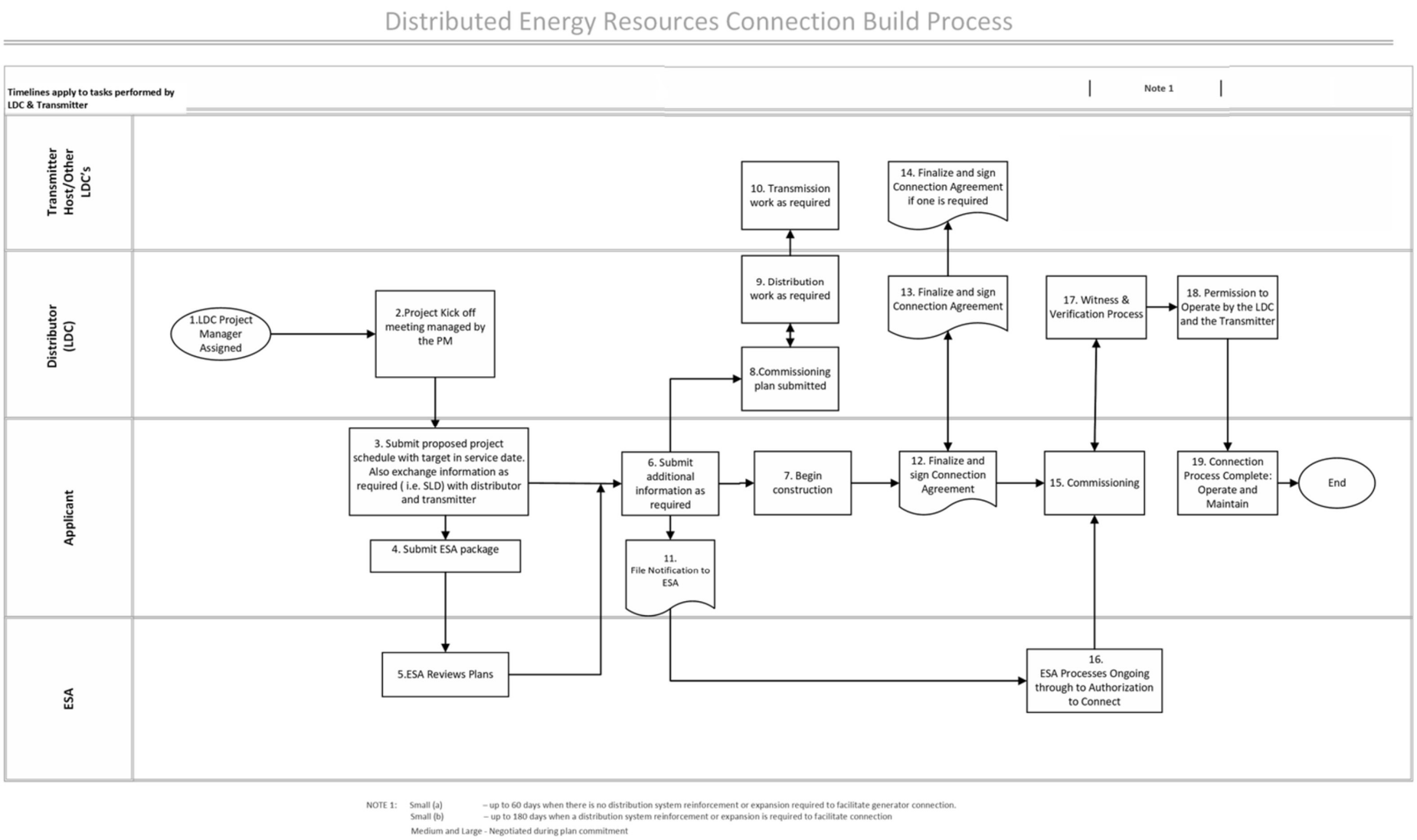


Figure 5: Build Process for Generation Facilities (Distributed Energy Resources Connection Procedures Ver. 1, March 2022, https://www.oeb.ca/consultations-and-projects/policy-initiatives-and-consultations/distributed-energy-resources-der)

Step 1. The distributor assigns a project manager who will coordinate a project kick-off meeting with the applicant and the host distributor/transmitter.
Step 2. The distributor's Project Manager will complete a project kick off meeting with all parties involved to discuss facility design, SLD, protections and controls, cost estimates and the project schedule including target in-service date.
Step 3. Applicant is to provide project design details including single line diagrams (SLDs) and the proposed project schedule including targeted in-service date.
Step 4. The DER Applicant must provide information to the ESA for the Plan Review process.
Step 5. ESA reviews the Plan and provides feedback.
Step 6. The Applicant shall, at transmitter's and distributor's request, provide a summary of testing results, including any certificates of inspection or other applicable authorizations or approvals certifying that any of the applicant's new, modified or replacement facilities have passed the relevant tests and comply with all applicable instruments and CSA C22.3 No 9.
Step 7. The Applicant begins construction of the project.
Step 8. The Applicant submits the Commissioning Plan to the distributor and the transmitter via the distributor.
Step 9. The distributor completes any additional work required.
Step 10. The transmitter completes any additional work required
Step 11. The applicant files a notification with ESA.
Step 12. The Applicant finalizes the terms of the Connection Agreement with the distributor and signs the agreement
Step 13. The distributor finalizes the terms of the Connection Agreement with host distributor/transmitter if required and signs the agreement(s)
Step 14. The host distributor/transmitter finalizes the terms of the Connection Agreement with the distributor and signs the agreement(s)
Step 15. The applicant proceeds with commissioning and testing of the generation facility.
Step 16. The ESA inspections through the construction process up to and including the issuance of an Authorization to Connect.[7]
Step 17. The distributor witnesses and verifies the applicant's commissioning process related to the connection facilities.

Step 18. The distributor (and transmitter where and when applicable) will grant the applicant permission to operator once all the distributor connection requirements have been satisfied and ESA Authorization to Connect have been received by the distributor.
Step 19. The connection process concludes when the DER is fully connected and operational.

Appendices

A. Sample Protection Philosophy

B. Technical Information

I. Technical Requirements to Connect

Appendix A – Sample Protection Philosophy

This document is a summary of a sample protection philosophy for non-exporting, inverter-based (NE/I) connections including storage, solar, and wind. The OEB intends it as a guide for applicants regarding the kinds of protections, and particularly the categories of protections, that distributors will require for connection.

This is one example of a protection philosophy that would meet the requirements for a complete protection philosophy for the purpose of a CIA application[9]. Other philosophies may also meet the standards. It provides guidance to a distributed energy resource (DER) proponent on good utility practice as it relates to protection requirements of non-exporting, inverter-based (NE/I) DERs. To form a protection scheme, all the elements for each category within any given protection philosophy are requirements.

This document is not an approval for connection. This information should help applicants file better and more complete applications for connection. An applicant will need to submit detailed protection settings after the utility has completed the impact assessment of the submitted connection application.

The standards and certification testing referenced in this document should be read as referring to the current versions of these standards at time of reading.

Sample Protection Philosophy for Non-exporting Inverter-based Sources

Project Name:
Project ID#:
Project Type:
Capacity:
Connection feeder (optional):

In compliance with the technical interconnection requirements of the local distribution company for which this project will interconnect ,the protection system of the connection will be designed to:

• Detect internal faults with the generator facility, downstream of the Point of Common Coupling (PCC), and automatically disconnect the NE/I source
• Detect external faults on the utility feeder and automatically disconnect the NE/I source
• Detect islanding conditions and disconnect the NE/I source
• Detect export of power from the NE/I source to the utility feeder and automatically disconnect the NE/I source

Internal Faults Within the Generator Facility

The following protections are in place to protect against internal faults resulting from the NE/I source:

• **Multi-Function Relay-**At the PCC, a multi-function relay will be installed to monitor internal faults resulting from the NE/I source. The 52 Trip Breaker will trip if it detects the following:
• 25 - Synchronization Check
• 27 - Undervoltage
• 59 - Overvoltage
• 81O/U - Under and Over Frequency
• ID -Active Anti-Islanding
• **Inverter Breakers** - Each inverter is equipped with an AC breaker at the output of the inverter providing additional overcurrent protection
• **Facility Overcurrent Protection** - All circuits within the facility are protected from both phase-to-phase and phase-to-ground faults by appropriate overcurrent protection devices. Fuses are sized to clear under fault conditions within the generator facility

External Phase and Ground Faults in the Distribution System

The following protections are in place to protect against external faults resulting from the utility feeder:

• **Multi-Function Relay** - At the main utility service, prior to the first facility load, a multi-function relay will be installed to monitor faults from the utility feeder. The 52 Trip Breaker at the NE/I source PCC will trip under the following faults: • 27 - Undervoltage
• 32R- Reverse Power

• 50/51- Overcurrent
• 59 - Overvoltage
• 81O/U - Under and Over Frequency
• 67 - Directional

• **Inverter Protection:** The inverters proposed for this project are certified to UL 1741, IEEE 1547, CSA C22.2 107.1-01 standards[10] and will behave accordingly.

Anti-Islanding
• The Energy Resource Facility will operate in a grid following mode and will not operate islanded.
• **Anti-Islanding Inverters** -The NE/I source inverters contain both passive and active antiislanding protection as required by IEEE 1547 and UL1741 SA. If the utility normal power supply is interrupted, the inverters detect the loss of power and disconnect.
Reverse Power
• **Reverse Power Protection** - In addition to the multi-function relay at the utility supply monitoring reverse power (32R), the load is continually monitored to ensure the NE/I source discharge is below the consumption of the facility. This additionally protects against power injection to the utility grid.

Directional Overcurrent
• **Directional overcurrent protection** - Directional overcurrent relays are normally used on incoming line circuit breakers on buses which have two or more sources. They are connected to trip an incoming line breaker for fault current flow back into the source, so that a fault on one source is not fed by the other sources.

Special Comment Regarding Inverter Based Generation
The inverters specified for this project have a limited fault current contribution.
• Because inverters are current-limited devices, unlike rotating generators, the fault current is very close to the maximum output current, limiting the fault current in the system to 120% -140% of FLA.

Breaker Failure Scheme (Facilities with an aggregate output > 500kW)
In the event that 52-A fails to open when intertie protection relay calls for a trip, 52-B will instantaneously trip and lock out.
Reconnection
Manual reconnection: There is no automatic reconnection scheme at this facility. A manual reconnection will only be executed when given permission by the respective controlling authority.
OR
Automatic reconnection scheme: Intertie protection relay will initiate automatic reconnection of DER only after a fault event has occurred on the utility feeder and not after a fault event within the DER facility. Stable voltage and frequency measurement within ranges and for time period stipulated in the technical interconnection requirements will be met prior to automatic reconnection. Internal faults will be distinguished from external faults by pickup of directional overcurrent 67/67N protection element looking into DER facility. This will ensure reconnection into facility fault is prohibited by blocking of automatic reconnection scheme for facility faults.
Open Phase Protection
This project consists of multiple 1-phase inverters connecting to a 3-phase service or multiple 3-phase inverters connecting to a 3-phase service; therefore, open phase protection will be provided by 46 and/or 47 element(s) in the intertie protection relay to ensure the BESS maintains a balanced 3-phase output and detects loss of voltage in one or more phases and will trip the entire generating facility upon detection of such.
OR

Attached is a signed letter from the inverter manufacturer stating that a facility comprising of multiple inverters is capable of maintaining a balanced 3-phase output and will detect loss of voltage in one or more phases and will trip the entire generating facility upon detection of such.

Communications and Transfer Trip/DGEO (if applicable)

Summarize communication systems and transfer trip/DGEO timing (if applicable).

Table 1: Protection Summary Matrix

Description	IEEE Device	Internal Faults	External Faults	Anti-Islanding	Reverse Power	Trips 52-A	Trips 52-B	Disables Inverters
Over-Voltage	59	X	X	X		X		X
Under-Voltage	27	X	X	X		X		X
Over-Frequency	81O	X	X	X		X		X
Under-Frequency	81U	X	X	X		X		X
Instantaneous Over-Current Phase	50	X	X			X		X
Timed Over-Current Phase	51	X	X			X		X
Reverse Power	32R			X	X	X		
Breaker Fail	50BF						X	
Active Anti-Islanding	IEEE 1547			X				X

Table 2: Protection Elements

Protection Element Function	Device#	Feeder Protection Relay/Shunt Trip	IEEE 1741 SA Inverter
Over-Voltage	59	X	Y
Under-Voltage	27	X	Y
Over-Frequency	81O	X	Y
Under-Frequency	81U	X	Y
Synchronization Check	25	X	Y
Reverse Power	32R	X	
Overcurrent	50/51	X	Y
Directional	67	X	
Active Anti-islanding	ID		X

X = Primary Y = Secondary

Appendix B – Technical Information

I. Technical Requirements to Connect

Festival Hydro's technical requirements to connect are consistent with Hydro One's Technical Interconnection Requirements. They can be found at:
https://www.hydroone.com/businessservices_/generators_/Documents/Distributed%20Generation%20Technical%20Interconnection%20Requirements.pdf