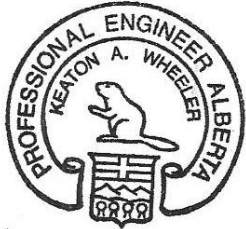
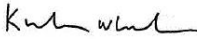



# FortisAlberta – Engineering Study Requirements for DER Interconnections

DER-02A

Version No. 4.0

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This document is not a replacement for electrical codes or other applicable standards.

This document is not intended or provided as a design specification or as an instruction manual.

The DER owner, employees or agents recognize that they are, at all times, solely responsible for the generator plant design, construction and operation.

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## Revision History

Version	Date	Revision Details
4.0	2 January 2025	Additions to short circuit study, Adjustment to Inrush/RVC study
3.0	11 Dec 2023	Transformer inrush study changed to transformer inrush/RVC study
2.0	17 March 2023	Transformer inrush study added
1.0	1 October 2021	New Standard Issued

## PURPOSE

This document is to serve as an aid for completing engineering studies for DER facilities and assess any additional technical requirements required to meet DER-02, including but not limited to grounding transformers, NGR's, and direct transfer trips.

### 1.0 Resources

The following documents should be understood for the purposes of reviewing DER grounding studies.

- DER-02 – FortisAlberta Technical Interconnection Requirements
- DER-02B – FortisAlberta Effective Grounding Study Requirements for DER Interconnections
- AESO DER Roadmap Integration Paper – DER Anti-islanding Screening and Study Guideline

### 2.0 Review Methodology

This section is to serve as a guide to determine anticipated impacts to the distribution system. These impacts are largely driven by the type and size of the DER facility, the minimum load of the feeder or protective segment, and the configuration of the DER interconnection transformer.

The 5 main studies required for DER Interconnections are the following.

- Short Circuit Study
- Effective Grounding Study (See DER-02B)
- Self-Excitation Study (If Applicable)
- Anti-Islanding Study (Transmission, If Applicable)
- Transformer inrush/rapid voltage change (RVC) study

**NOTE:** If the DER system changes control modes at the PCC (e.g. to grid forming, from constant power factor to Volt Var etc.), the studies specified in DER-02A, DER-02B and DER-02C (if applicable) shall be resubmitted along with the updated models.

## SHORT CIRCUIT ANALYSIS

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Short Circuit studies are broken into two submissions and are required to determine the initial equipment requirements of the DER facility and a final study after a project gets accepted.

It is required for all projects with a nameplate rating over 500 kVA.

### **Preliminary Study (Required after the Detailed Level Study (DLS) Application)**

- Short Circuit Study
  - This study shall determine the line to ground (LG), three-phase to ground (LLLG/LLL) short circuit and the zero sequence current ( $3I_0$ ) impacts, and mitigation required to the distribution system.
  - FortisAlberta will provide a system SLD at the detailed level study phase which will be required to complete the study and technical details of the DLS application.
  - [The study shall be conducted with and without the DER connection.](#)
  - Fault detection and performance of the following fault conditions and locations:
    1. LG / LLLG faults at the DER facility (PCC), any upstream protective device on the distribution system, and the substation 25 kV and 138 kV bus. (Further upstream protective zones may be required if determined by the transmission owner)

#### *Requirements for the Study:*

- Demonstrate the DER system shall not exceed the short circuit ratings of 5kA / 8kA on the distribution system (At both the DER facility PCC and Substation Bus)
- Demonstrate any zero-sequence current sourced by the DER facility shall not cause relay desensitization issues for any upstream protective devices by more than 10%. (Required for the effective grounding study; refer to DER-02B for additional details)

### **Final Study (Required to be approved in the 110-day package)**

- Short Circuit Study
  - Complete all requirements listed in the preliminary study requirements with final equipment and DER facility parameters.

## EFFECTIVE GROUNDING STUDY

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This study demonstrates the DER facility is effectively grounded and complies with the performance and power quality requirements outlined in DER-02. A preliminary study is required at the DLS application phase and a complete study in the 110-day package.

It is required for all projects with a nameplate rating over 500 kVA unless otherwise specified by FortisAlberta.

Note: The generation to load ratio of the DER facility will determine the complexity of the study.

**Please refer to the DER-02B document for the complete requirements.**

The preliminary study shall include an outline of the strategy that will be employed by the facility (e.g., supplemental grounding and/or inverter fast trip) to ensure the facility is effectively grounded and does not cause any relay desensitization issues. In addition, any proposed supplemental grounding devices with estimated sizes will be given on a P.Eng. authenticated preliminary single line diagram.

### **SELF-EXCITATION STUDY (INDUCTION GENERATION)**

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DER facilities with induction generators and where a transfer trip is not required shall demonstrate there will be no possibility of self-excitation.

This is required for induction generators [under 4 MVA](#) where a DTT is not required.

### **TRANSMISSION ANTI-ISLANDING STUDY (IF APPLICABLE)**

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An anti-islanding study may be required by AESO or the transmission facility owner to determine if there are any impacts or concerns of islanding to the transmission system.

This study is required for all projects over 5 MW or where there may be generation onto the transmission system. Both the TFO and FortisAlberta will provide required data to complete any study.

**Please refer to the “AESO DER Roadmap Integration Paper –DER Anti-islanding Screening and Study Guideline” document for further guidance.**

### **TRANSFORMER INRUSH/RAPID VOLTAGE CHANGE (RVC) STUDY**

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[DER interconnections](#) shall demonstrate compliance of RVC limits as per DER-02 through a transformer inrush/RVC study. [Whether a study is required shall be determined by FortisAlberta at its sole discretion.](#)

For site that energize interconnection transformers with or without generation a transformer inrush study is required to demonstrate compliance within RVC limits specified by DER-02.

For sites that energize in a composite manner (generation coupled with load) or generation only, a RVC study is required to demonstrate compliance within RVC limits specified by DER-02.

Minimum study requirements:

- Provide a SLD of the system under study, clearly indicate system data, transformer sizes, number of transformers, and any load or other passive devices under consideration.
- Transformer data including excitation curve details.
- Study methodology, assumptions (e.g., residual flux), and summary of study scenarios.
- Provide a typical (most likely) and worst-case scenario of single transformer energization RVC.
- Provide a typical RVC result for energization of all transformers at once.

- Upon receiving the Factory Acceptance Testing (FAT) reports for the transformers, study should be updated with the actual data along with FAT reports as attachments.

For facilities that require mitigation, the study shall include a demonstration of compliance through use of the measures, switching, and actual facility operations philosophies.

## Study Timeframe

Study Timeframe					
Required Stage	Short Circuit	Effective Grounding	Self-Excitation	Anti-Islanding	Transformer Inrush/RVC
DLS Application	Yes (Preliminary)	Yes (Preliminary)	Yes (Preliminary) (If applicable)	Yes  Required during the detailed level study design	Yes (Preliminary)
110-Day Package	Yes (Final)	Yes (Final)	Yes (If applicable)	No	Yes (Final)

Note: The preliminary studies require a FortisAlberta system SLD to be completed. To accommodate this, approximate parameters for supplemental grounding devices will not be required initially. Once the FortisAlberta system SLD has been provided, the DER owner shall update their SLD with approximate parameters following the completion of a preliminary effective grounding study. Once the updated SLD is complete, the FortisAlberta DLS will be completed. The DLS stage will remain on hold until this information is provided.

### 3.0 Approval / Sign-off

All engineering studies shall be submitted to FAI for review and approval within the timeframe in Table 1 and shall be authenticated by a professional engineer accredited to APEGA.