DEP Transmission Level Solar PV Plant Data Request

# Purpose

The purpose of this form is for Duke Energy to obtain from the Interconnection Customer the data required to perform the system impact study for transmission level solar PV plant interconnection requests. This form supplements, but does not replace, FERC and state interconnection forms. Any missing data will delay the start of the system impact study.

# Required Data

## General Plant Data

* Customer Name:
* Plant Name:
* Maximum Requested Plant Injection at the POI: MW

## Detail One-Line Diagram of the Proposed Plant Design

The detailed one-line diagram of the proposed plant design should show the topology of the plant which includes inverter connections, inverter transformer connections, electrical wiring from inverter to the point of interconnection (POI) with the correct topology and numbered circuits, plant step-up transformer connections and transmission line between the plant and the POI.

Please see attached example solar PV plant one-line diagram.

Include one-line diagram with this form, and check here when complete: \_\_\_\_\_\_\_\_\_\_\_

## Interconnection Transmission Line

* Line Voltage = \_\_\_\_\_\_kV

If line is greater than 100 feet:

* R = \_\_\_\_\_\_ohm or \_\_\_\_\_\_ p.u. on 100 MVA and line kV base (positive sequence)
* X = \_\_\_\_\_\_ohm or \_\_\_\_\_\_ p.u. on 100 MVA and line kV base (positive sequence)
* C = \_\_\_\_\_\_ μF or B = \_\_\_\_\_\_ p.u. on 100 MVA and line kV base (positive sequence)

## Main Step-Up Transformer

(Note: If there are multiple step-up transformers, data for each transformer should be provided)

* All MVA Ratings: \_\_\_\_\_\_/\_\_\_\_\_\_/\_\_\_\_\_\_/\_\_\_\_\_\_ MVA
* Nominal Voltage for each winding (High /Low /Tertiary): \_\_\_\_\_\_/\_\_\_\_\_\_/\_\_\_\_\_\_ kV
* Available taps: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (indicate fixed or with LTC)
* Positive sequence impedance ZHL \_\_\_\_\_% on transformer self-cooled MVA base,
* \_\_\_\_\_\_ X/R ratio

## Collector System Impedances

For each line/cable section (different size or length) indicated in the one-line diagram, the following data needs to be provided in an attached Excel spreadsheet:

Check here when Excel spreadsheet is complete and attached: \_\_\_\_\_\_\_\_\_\_\_\_

* Collector system voltage = \_\_\_\_\_\_ kV
* R = \_\_\_\_\_\_ ohm or \_\_\_\_\_\_ pu on 100 MVA and collector kV base (positive sequence)
* X = \_\_\_\_\_\_ ohm or \_\_\_\_\_\_ pu on 100 MVA and collector kV base (positive sequence)
* C = \_\_\_\_\_\_ μF or B = \_\_\_\_\_\_ pu on 100 MVA and collector kV base (positive sequence)

## Inverter Step-Up Transformer

For each type of inverter step-up transformer indicated in the one-line diagram, the following data needs to be provided:

* All kVA Ratings: \_\_\_\_\_\_ /\_\_\_\_\_\_ kVA
* Nominal voltage for each winding (High/Low): \_\_\_\_\_\_/\_\_\_\_\_\_kV
* Available taps: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (indicate fixed or with LTC)
* Positive sequence impedance Z1 \_\_\_\_\_\_% on transformer self-cooled MVA base,
* \_\_\_\_\_\_X/R ratio

## Inverter and PV Module Data

* Number of Inverters: \_\_\_\_\_\_\_\_\_\_
* Maximum Nameplate Rating (each Inverter): \_\_\_\_\_\_kW /\_\_\_\_\_\_kVA
* Nameplate Rating @ 95°F (35°C) (each Inverter): \_\_\_\_\_\_kW /\_\_\_\_\_\_kVA

(Note: If the rating at 95°F is not available, a temperature derating factor/curve needs to be provided.)

* Reactive Capability Curve of Inverter (attach and check here when complete) \_\_\_\_\_\_
* Inverter Manufacturer and Model #:
* Number of PV Modules: \_\_\_\_\_\_\_\_\_\_\_
* PV Module Manufacturer and Model #:
* Total rated kW of all PV Modules: \_\_\_\_\_\_\_\_\_\_\_\_\_\_kW
* If the dynamic stability study is required for the project, completed PSS/E data sheets for the generic PV library model(s) or user written model needs to be provided.

## Plant Reactive Power Compensation

Describe which devices (e.g. inverters, capacitors, SVC) will supply reactive power (Mvar) to allow the plant to meet the 0.95 lagging power factor requirement at the Point of Interconnection (transmission HV bus) when the plant is simultaneously injecting full requested MW \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

In addition to the inverters, if a plant reactive power compensation device is part of the plant design, the following data needs to be provided:

* Shunt capacitors: \_\_\_\_\_(count), \_\_\_\_\_\_Mvar each, \_\_\_\_\_\_\_\_ Mvar total
* Shunt reactors: \_\_\_\_\_(count), \_\_\_\_\_\_Mvar each, \_\_\_\_\_\_\_\_ Mvar total
* Dynamic reactive control device type, (SVC, STATCOM): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Control range \_\_\_\_\_\_\_\_\_\_\_\_ Mvar (capacitive), \_\_\_\_\_\_\_\_\_\_\_ Mvar ( inductive)
  + Control mode (e.g., voltage, power factor, reactive power): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Regulation set point \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (kV, power factor, or Mvar)
  + Describe the overall reactive power control strategy: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + If the dynamic stability study is required for the specific project, completed PSS/E data sheets and model for the dynamic reactive control device need to be provided.

