|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Project Name** |  | | | | | | | |
| **Queue #** |  | | | | | | | |
| **Developer** |  | | | | | | | |
| **Technical Contact Info** | **Name** | | |  | | | | |
| **Phone #** | | |  | | | | |
| **Cell #** | | |  | | | | |
| **Email** | | |  | | | | |
| **Project Type/Size** | **Type:** | *<wind, biogas, solar, energy storage, etc.>* | | | | **Size:** | |  |
| **Project**  **Address** |  | | | | | | | |
| **POI** | *<Point of Interconnection (POI): (include voltage, line name and number, and/or station name)* | | | | | | | |
| **ISD/COD** | **ISD:** | |  | | **COD:** | |  | |

## Diagrams/Drawings

Provide **current** conceptual, simplified breaker one-line diagram (i.e., operating diagram, switching diagram) (legible electronic file), to show the Point of Interconnection (POI) and remote ends (identified by name and kV). The diagram must contain all elements starting from the generators, including, but not limited to, generator step up transformer (GSU), feeder(s) and their length(s), developer-owned collector station (Collector Station), line(s) from Collector Station to POI and associated length(s), the POI and its relation (distances) with remote ends or existing substation (as the case may be), the Point of Change of Ownership (PCO) (if known), metering points (if known), station load, and proposed reactive compensation devices. The diagram should include information like kV levels, circuit distances, transformer MVA ratings and impedances (Z and X/R), total plant MW, number of units per feeder, unit MW and MVA at power factor, unit type, etc.

|  |  |
| --- | --- |
|  | OPERATING/SWITCHING DIAGRAM ATTACHED |

***[NOTE: FOR EXISTING FACILITIES, CHANGES (I.E., REPLACEMENTS, ADDITIONS, ETC) SHALL BE CLOUDED ON THE DIAGRAM.]***

Provide **conceptual relay one-line diagram for the Collector Station**. (Requirements are outlined in the Company’s Electric System Bulletins which are located at:

<https://www.nationalgridus.com/ProNet/Technical-Resources/Electric-Specifications>

***[NOTE: FOR EXISTING FACILITIES, CHANGES (I.E., REPLACEMENTS, ADDITIONS, ETC) SHALL BE CLOUDED ON THE DIAGRAM.]***

|  |  |
| --- | --- |
|  | RELAY ONE LINE/SINGLE LINE ATTACHED |

# Provide **Overall Project Preliminary Site/Plot Plan** that must include: *(i) the generation facility, (ii) Collector Station with coordinates for the termination structure(s), (iii) proposed POI with coordinates and* *the transmission/distribution line structure numbers in the vicinity of the POI, (iv) collection system feeders, and (v) generator tie line(s).*

|  |  |
| --- | --- |
|  | OVERALL PROJECT PRELIMINARY SITE/PLOT PLAN ATTACHED |

# Provide **Collector Station Preliminary Site/Plot Plan** that must include: *(i) the proposed layout of the Collector Station in relation to the POI and transmission/distribution corridor(s), (ii) POI (with coordinates the transmission/distribution line structure numbers in the vicinity), (iii) coordinates for the Collector Station termination structure(s), (iv) tie line between POI and Collector Station with distance to the POI, and (v)generator tie line(s) (i.e., lines between the Collector Station and PCO).*

|  |  |
| --- | --- |
|  | COLLECTOR STATION PRELIMINARY SITE/PLOT PLAN ATTACHED |

**If a new POI Station (i.e., ring bus station)** is required for interconnection of the project, a preliminary site plan must be provided and shall include (at a minimum): *(i) the proposed orientation of the POI Station in relation to the Collector Station, (ii) the transmission/distribution corridor and POI, and (iii) coordinates for proposed location of the POI Station and/or termination structures.*

|  |  |
| --- | --- |
|  | POI STATION PRELIMINARY SITE PLAN ATTACHED |

## DESCRIPTION

## Project

Provide a written description of the proposed project, including an element-by-element description of the one-line diagram, from generators, GSU, feeders, Collector Station PSUs, lines, up to and including the POI and its relation (distances) with remote ends or existing substation (as the case may be).

***[NOTE: FOR EXISTING FACILITIES, DESCRIBE BOTH EXISTING AND NEW. IF EQUIPMENT IS BEING REPLACED, DESCRIBE THE EXISTING AND WHAT IT IS BEING REPLACED WITH.]***

## Collection System

Provide written description of collection system, including number of feeders, units per feeder, etc.

***(For multiple feeders, a table containing the length and impedances of each feeder must be included.)***

## Generator Facility Data

### Type/Model/Manufacturer:

|  |  |  |
| --- | --- | --- |
| **Type** | **Model** | **Manufacturer** |
|  |  |  |

*(Note: For wind turbines identify whether it is Type 3 or Type 4.)*

### Rated power of each unit:

|  |  |  |
| --- | --- | --- |
| **MVA** | **MW @ power factor** | **Total Plant** |
|  |  |  |

### For energy storage supply:

|  |  |
| --- | --- |
| **Energy storage capability (MWh)** |  |
| **Duration for full discharge (i.e., injection) (Hours)** |  |
| **Duration for full charge (i.e., withdrawal) (Hours)** |  |
| **Maximum withdrawal from the system (i.e., when charging) (MW)** |  |
| **Primary frequency response operating range for electric storage resource** |  |
| **Minimum State of Charge (%)** |  |
| **Maximum State of Charge (%)** |  |

### Inverter Data

|  |  |  |  |
| --- | --- | --- | --- |
| **Inverter Manufacturer** | **Model Name** | **Model Number** | **Model Version** |
|  |  |  |  |

***(Note: Cut sheets for the inverter(s) must be provided with the completed study data form.)***

### Aspen Modelling Data

***All Generators will be modelled using appropriate type as described in ASPEN Oneliner V15.6***

1. **Converter- Interface Resource Model data for all solar, BESS and Type 4 Wind projects:**

|  |  |
| --- | --- |
| **Number of Units** |  |
| **Unit MVA Rating** |  |
| **Unit MW Generation**  **(>=0) or consumption (<0)** |  |
| **Max current (in multiple of full load)**  **When + seq V (pu) >**  **Max current (pu) =**  **Otherwise reduce current to (pu)** |  |
| **Slope of + seq dynamic reactive current injection characteristic** |  |
| **Slope of - seq dynamic reactive current injection characteristic** |  |
| **Resource shutdown**  **When a phase voltage exceeds (pu)**  **When a phase voltage drops below (pu)** |  |

1. **Type 3 Wind Data for a Type 3 Wind Project:**

|  |  |
| --- | --- |
| **Number of Units** |  |
| **Unit MVA Rating** |  |
| **Unit rated MW** |  |
| **Unit MW generation** |  |
| **Converter current limits:** |  |
| **Rotor side limit (pu)** |  |
| **Grid side limit (pu)** |  |
| **Plant shutdown:** |  |
| **When a phase voltage exceeds (pu)** |  |
| **When a phase voltage drops below (pu)** |  |
| **Rotor R** |  |
| **Rotor Leakage L** |  |
| **Stator R** |  |
| **Stator Leakage L** |  |
| **Mutual L** |  |
| **Slip at rated kW** |  |
| **Filter X** |  |

1. **Generator data for conventional project:**

|  |  |
| --- | --- |
| **Max design fault current contribution in per**  **unit of full load current** |  |
| **X”/unit** |  |
| **X2/unit** |  |
| **X0/unit** |  |

***PSCAD model for each type of inverter used must be provided with completed study data form.***

### Plant Station Load (MW)

|  |  |
| --- | --- |
| **Summer** | **Winter** |
|  |  |

### Proposed power factor capability range that can be achieved at the proposed maximum output (lagging-supply, leading-absorb) and corresponding Qmin and Qmax in MVAR (at the terminals)

|  |  |  |
| --- | --- | --- |
| **Qmin(absorb)** | **Qmax(supply)** | **Power factor** |
|  |  |  |

### Other proposed power factor/voltage compensation devices (e.g., switched or fixed capacitors, SVCs, DVARs, etc.)

### *(Provide location, kV, type (static,dynamic), size (MVAR), nr. Steps, normal operation reaction time, during fault reaction time, etc. If there are none, then state as such.)*

### Inverter Step-up Transformer

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Quantity** |  | **Type** | 1ph | | 3ph |
|  | |  | | | |
| **Size (MVA)** | | **Voltage (kV)** | | | |
| Nameplate self-cooled |  | Low(generator side) | |  | |
| 1st stage cooling |  | High (system side) | |  | |
| 2nd stage cooling |  | Tertiary | |  | |

|  |  |  |  |
| --- | --- | --- | --- |
| Fixed Taps | Non-LTC | LTC | % range: |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Winding Connections** | | | | | | | | |
| **VLOW** | | | **VHIGH** | | | **VTERTIARY** | | |
| delta | wye | wye-grounded | delta | wye | wye-grounded | delta | wye | wye-grounded |

|  |  |  |  |
| --- | --- | --- | --- |
| **Two Winding Transformer Impedance (in pu on self-cooled MVA rating)** | | | |
| **Positive Sequence** | | **Zero Sequence** | |
| Z1 | %, X/R | Z2 | %, X/R |
|  |  |  |  |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Three Winding Transformer Impedance (in pu on self-cooled MVA rating)** | | | | | | | |
| **Positive Sequence** | | | | **Zero Sequence** | | | |
| Z1  (H-L) | %, Z1  (H-T) | %, Z1  (L-T) | %,X/R | Z0  (H-L) | %, Z0  (H-T) | %, Z0  (L-T) | %,X/R |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

|  |  |
| --- | --- |
| **Neutral Grounding Impedances (Ohms)** | |
| **Reactor** | **Resistor** |
|  |  |

### Plant Step-up Transformer

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Quantity** |  | **Type** | 1ph | | 3ph |
|  | |  | | | |
| **Size (MVA)** | | **Voltage (kV)** | | | |
| Nameplate self-cooled |  | Low(generator side) | |  | |
| 1st stage cooling |  | High (system side) | |  | |
| 2nd stage cooling |  | Tertiary | |  | |

|  |  |  |  |
| --- | --- | --- | --- |
| Fixed Taps | Non-LTC | LTC | % range: |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Winding Connections** | | | | | | | | |
| **VLOW** | | | **VHIGH** | | | **VTERTIARY** | | |
| delta | wye | wye-grounded | delta | wye | wye-grounded | delta | wye | wye-grounded |

|  |  |  |  |
| --- | --- | --- | --- |
| **Two Winding Transformer Impedance (in pu on self-cooled MVA rating)** | | | |
| **Positive Sequence** | | **Zero Sequence** | |
| Z1 | %, X/R | Z2 | %, X/R |
|  |  |  |  |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Three Winding Transformer Impedance (in pu on self-cooled MVA rating)** | | | | | | | |
| **Positive Sequence** | | | | **Zero Sequence** | | | |
| Z1  (H-L) | %, Z1  (H-T) | %, Z1  (L-T) | %,X/R | Z0  (H-L) | %, Z0  (H-T) | %, Z0  (L-T) | %,X/R |
|  |  |  |  |  |  |  |  |

|  |  |
| --- | --- |
| **Neutral Grounding Impedances (Ohms)** | |
| **Reactor** | **Resistor** |
|  |  |

### Line Reactor

|  |  |  |
| --- | --- | --- |
| **Voltage** | **Impedance** | |
| **(kV)** | **(mH)** | **Per Unit** |
|  |  |  |

### Generator Lead Line (line between POI and Collector Station)

|  |  |  |  |
| --- | --- | --- | --- |
| **Type** | | | **Cicuit Distance** |
| O/H | U/G | O/H&U/G |  |

|  |  |
| --- | --- |
| **Impedances (pu on 100 MVA base, in components R and X)** | |
| **Positive Sequence (Z1=R1+jX1)** | **Zero Sequence (Z0=R0+jX0)** |
|  |  |

***(NOTE: IF THE GENERATOR LEAD LINE IS COMPRISED OF BOTH UNDERGROUND AND OVERHEAD CONSTRUCTION, THEN THE LINE LENGTHS AND IMPEDANCES FOR EACH SECTION OF OVERHEAD AND UNDERGROUND ARE TO BE PROVIDED.)***