

# User Guide for

## SPV Design & Simulation Tool

- Off grid (Type I)
- Off grid (Type II)
- Grid Tie

**(Design limit - 0.3KWp to 100KWp)**

### Disclaimer

- This solar system design & simulation tool has been developed only for the guidance of Installers and Contractors. The tool is supplied in good faith and without warranty of any kind by Tamil Nadu Energy Development Agency (TEDA).
- TEDA does not represent that the tool or any information or calculations or design derived from the tool is accurate or complete or applicable to your circumstances and application and accepts no liability thereto.
- Installers and Contractors shall make their own independent design calculations to arrive at system configurations. TEDA will not be liable to any person in relation to the contents of, or use of, or otherwise in connection with this calculation tool for any direct, indirect, special or consequential loss or for any business losses, loss of revenue, income, profits or anticipated savings, loss of contracts or business relationships or loss of reputation or goodwill

## Contents

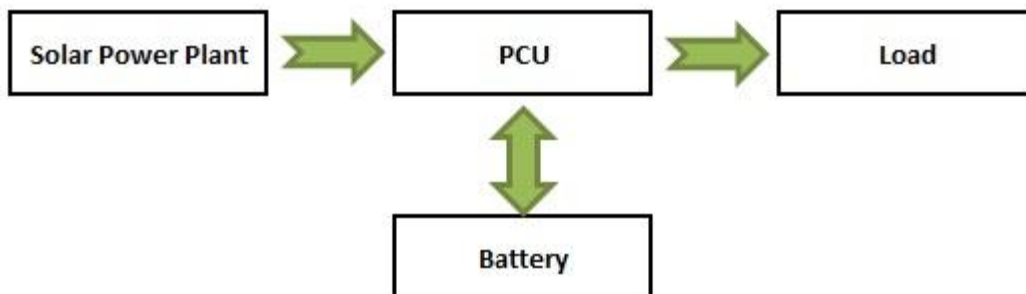
<b>Off grid (Type I)</b>	<b>Off grid (Type II)</b>	<b>Grid Tie</b>
SPV Plant Capacity Sizing	SPV Plant Capacity Sizing	SPV Plant Capacity Sizing
SPV panel selection and Generation Simulation @ various Irradiance and Temp.	SPV panel selection and Generation Simulation @ various Irradiance and Temp.	SPV panel selection and Generation Simulation @ various Irradiance and Temp.
N/A	Charge Controller & Solar String Sizing	N/A
PCU (Charge Controller + Inverter) & Solar String Sizing	Inverter	Grid tie Inverter & Solar String Sizing
Battery Bank Sizing for PCU/ Inverter	Battery Bank Sizing for PCU/ Inverter	N/A
Result – SPV Plant Design	Result – SPV Plant Design	Result – SPV Plant Design

## General Instruction

- Tool Design range from **0.3KWp** upto **100KWp**
- Please enter details ONLY in **YELLOW COLORED TEXT BOX**.
- **Do Not SKIP** any **YELLOW COLORED TEXT BOX**, Else your design will be Incomplete & may project FALSE Design.
- **Do Not SKIP** any of the SHEETS in the TOOL, Else your design will be Incomplete & may project FALSE Design.
- Please Re-Check the Details entered in the TOOL.

## Off grid (Type I)

### SPV Off Grid - With Battery Design & Simulation Tool (Type - I)



## **SPV Plant Capacity Sizing (Sheet No – 2):**

Please enter details as per the Steps mention below: **(DO NOT SKIP ANY STEPS)**

1. Total available Shadow free area (Terrace/Ground/others)
2. Total Electrical Load
  - a. Description
  - b. Load
  - c. Nos
  - d. Hrs of Operation per day
3. % of Total Electrical Load to be powered by Solar
4. Solar Power plant Capacity (You are willing to install)
5. Solar Panel Watt peak (Select as per market availability)

## **SPV panel selection and Generation Simulation @ various Irradiance and Temp (Sheet No – 3):**

Please enter details as per the Steps mention below: **(DO NOT SKIP ANY STEPS)**

1. Solar Panels Details
  - a. Module Make
  - b. Module Type
  - c. No of Cell
  - d. Single - Cell area (Length x Breadth)
  - e. Module area (Length x Breadth)
  - f. temperature coefficient - open-circuit voltage
  - g. temperature coefficient - short-circuit current
  - h. temperature coefficient - rated power
  - i. Maximum System Voltage
  - j. Module Efficiency
2. STC - 1 - (NOCT - 25C, Irradiance - 1000W/m<sup>2</sup>)
  - a. Voltage @ Maximum Power
  - b. Current @ Maximum Power
  - c. Open Circuit Voltage
  - d. Short Circuit Current
3. STC - 2 - (NOCT - 47C, Irradiance - 800W/m<sup>2</sup>)

- a. Rated Power
  - b. Voltage @ Maximum Power
  - c. Current @ Maximum Power
  - d. Open Circuit Voltage
  - e. Short Circuit Current
4. SPV Panel - Generation Simulator (South Orientation)
    - a. Cell Temperature @ operating condition
    - b. Irradiance @ operating condition
    - c. Hours of Operation of the plant per day

#### **PCU (Charge Controller + Inverter) & Solar String Sizing (Sheet – 4)**


Please enter details as per the Steps mention below: **(DO NOT SKIP ANY STEPS)**

1. PCU - Surge Voltage Compensation
2. PCU - Surge Current Compensation
3. PCU Details
  - a. Make
  - b. PCU - Capacity
  - c. Total No of PCU - required
  - d. Output - Phase
  - e. No of DC inputs per PCU
  - f. Input – Voc (Min & Max)
  - g. Input – Vmp (Min & Max)
  - h. Input – Isc (Min & Max)
  - i. Battery Voltage
  - j. Efficiency
  - k. Power Factor
4. SPV String - Capacity Simulator
  - a. No of SPV String
  - b. No of Panel in Series

#### **Battery Bank Sizing for PCU/ Inverter (Sheet – 5)**

Please enter details as per the Steps mention below: **(DO NOT SKIP ANY STEPS)**

1. Autonomy

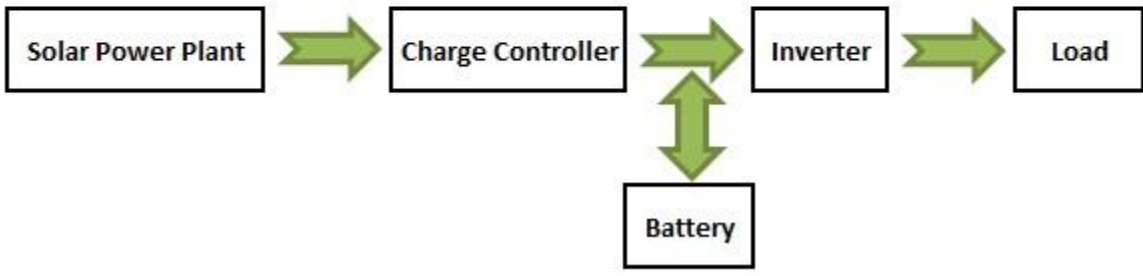
- 
2. Battery Details
    - a. Make
    - b. Type
    - c. Battery Voltage
    - d. Hour Rate (C-Rating)
    - e. Rated Capacity
    - f. Rated Discharge
  3. C- Rating Data @ 24C /25C /26C /27C
    - a. Hour Rate (C-Rating)
    - b. Capacity
    - c. Hour Rate (C-Rating)
    - d. Capacity
  4. Battery/Cycle Life @ Various DOD's
    - a. Cycles @80% / 100%DOD
    - b. Cycles @50% DOD
    - c. Cycles @30% DOD
  5. Depth of Discharge (DOD)

**Result – SPV Plant Design (Sheet – 6)**

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Off grid (Type II)

SPV Off Grid - With Battery  
Design & Simulation Tool  
(Type - II)



## **SPV Plant Capacity Sizing (Sheet No – 2):**

Please enter details as per the Steps mention below: **(DO NOT SKIP ANY STEPS)**

1. Total available Shadow free area (Terrace/Ground/others)
2. Total Electrical Load
  - a. Description
  - b. Load
  - c. Nos
  - d. Hrs of Operation per day
3. % of Total Electrical Load to be powered by Solar
4. Solar Power plant Capacity (You are willing to install)
5. Solar Panel Watt peak (Select as per market availability)

## **SPV panel selection and Generation Simulation @ various Irradiance and Temp (Sheet No – 3):**

Please enter details as per the Steps mention below: **(DO NOT SKIP ANY STEPS)**

1. Solar Panels Details
  - a. Module Make
  - b. Module Type
  - c. No of Cell
  - d. Single - Cell area (Length x Breadth)
  - e. Module area (Length x Breadth)
  - f. temperature coefficient - open-circuit voltage
  - g. temperature coefficient - short-circuit current
  - h. temperature coefficient - rated power
  - i. Maximum System Voltage
  - j. Module Efficiency
2. STC - 1 - (NOCT - 25C, Irradiance - 1000W/m<sup>2</sup>)
  - a. Voltage @ Maximum Power
  - b. Current @ Maximum Power
  - c. Open Circuit Voltage
  - d. Short Circuit Current
3. STC - 2 - (NOCT - 47C, Irradiance - 800W/m<sup>2</sup>)



- a. Rated Power
  - b. Voltage @ Maximum Power
  - c. Current @ Maximum Power
  - d. Open Circuit Voltage
  - e. Short Circuit Current
4. SPV Panel - Generation Simulator (South Orientation)
    - a. Cell Temperature @ operating condition
    - b. Irradiance @ operating condition
    - c. Hours of Operation of the plant per day

#### **Charge Controller & Solar String Sizing (Sheet – 4)**

Please enter details as per the Steps mention below: **(DO NOT SKIP ANY STEPS)**

1. CC - Surge Voltage Compensation
2. CC - Surge Current Compensation
3. Battery Bank Voltage – Rating
4. Solar Charge Controller Details
  - a. Make
  - b. Type
  - c. CC - Battery Charging Voltage - Rating
  - d. CC - Current - Rating
  - e. Total No of CC - required
  - f. Input – Voc (Min & Max)
  - g. Input – Vmp (Min & Max)
  - h. Input – Isc (Min & Max)
  - i. Battery Voltage
  - j. Efficiency
  - k. Power Factor
5. SPV String - Capacity Simulator
  - a. No of Panel in Series

#### **Inverter (Sheet – 5)**

Please enter details as per the Steps mention below: **(DO NOT SKIP ANY STEPS)**

1. Inverter Details

- a. Make
- b. Inverter - Capacity
- c. Total No of Inverter - required
- d. Output - Phase
- e. Battery/DC Input (Volt & Amp)
- f. Efficiency
- g. Power Factor

### **Battery Bank Sizing for PCU/ Inverter (Sheet – 6)**

Please enter details as per the Steps mention below: **(DO NOT SKIP ANY STEPS)**

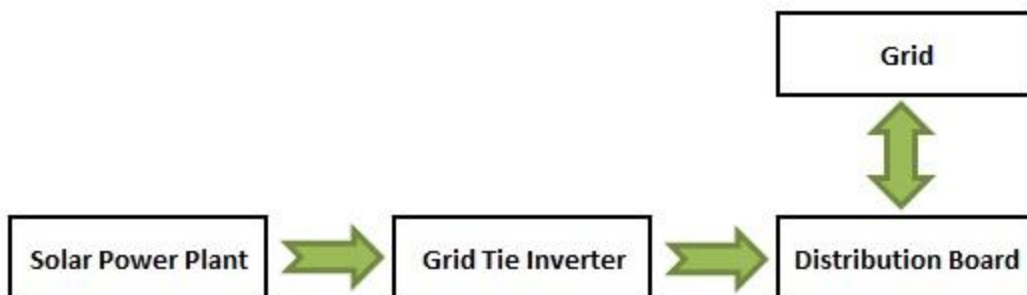
1. Autonomy
2. Battery Details
  - a. Make
  - b. Type
  - c. Battery Voltage
  - d. Hour Rate (C-Rating)
  - e. Rated Capacity
  - f. Rated Discharge
3. C- Rating Data @ 24C /25C /26C /27C
  - a. Hour Rate (C-Rating)
  - b. Capacity
  - c. Hour Rate (C-Rating)
  - d. Capacity
4. Battery/Cycle Life @ Various DOD's
  - a. Cycles @80% / 100%DOD
  - b. Cycles @50% DOD
  - c. Cycles @30% DOD
5. Depth of Discharge (DOD)

### **Result – SPV Plant Design (Sheet – 7)**

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# Grid Tie

## SPV Grid Tie - Without Battery Design & Simulation Tool



## **SPV Plant Capacity Sizing (Sheet No – 2):**

Please enter details as per the Steps mention below: **(DO NOT SKIP ANY STEPS)**

1. Total Electrical Load
  - a. Description
  - b. Load
  - c. Nos
  - d. Hrs of Operation per day
2. Total available Shadow free area (Terrace/Ground/others)
3. Average Annual Energy Consumption
4. % of Max. Installable SPV capacity - allowed by your local DISCOM  
W.R.T your Monthly/Yearly Energy Consumption Sanctioned Load
5. % of Total Electrical Load to be powered by Solar
6. Solar Power plant Capacity (You are willing to install)
7. Solar Panel Watt peak (Select as per market availability)

## **SPV panel selection and Generation Simulation @ various Irradiance and Temp (Sheet No – 3):**

Please enter details as per the Steps mention below: **(DO NOT SKIP ANY STEPS)**

1. Solar Panels Details
  - a. Module Make
  - b. Module Type
  - c. No of Cell
  - d. Single - Cell area (Length x Breadth)
  - e. Module area (Length x Breadth)
  - f. temperature coefficient - open-circuit voltage
  - g. temperature coefficient - short-circuit current
  - h. temperature coefficient - rated power
  - i. Maximum System Voltage
  - j. Module Efficiency
2. STC - 1 - (NOCT - 25C, Irradiance - 1000W/m<sup>2</sup>)
  - a. Voltage @ Maximum Power
  - b. Current @ Maximum Power

- c. Open Circuit Voltage
- d. Short Circuit Current
3. STC -2 - (NOCT - 47C, Irradiance - 800W/m<sup>2</sup>)
  - a. Rated Power
  - b. Voltage @ Maximum Power
  - c. Current @ Maximum Power
  - d. Open Circuit Voltage
  - e. Short Circuit Current
4. SPV Panel - Generation Simulator (South Orientation)
  - a. Cell Temperature @ operating condition
  - b. Irradiance @ operating condition
  - c. Hours of Operation of the plant per day

#### **Grid Tie Inverter & Solar String Sizing (Sheet – 4)**

Please enter details as per the Steps mention below: **(DO NOT SKIP ANY STEPS)**

1. Inverter - Surge Voltage Compensation
2. Inverter - Surge Current Compensation
3. Inverter Details
  - a. Make
  - b. Inverter - Capacity
  - c. Total No of Inverter - required
  - d. Output - Phase
  - e. No of DC inputs per Inverter
  - f. Input – Voc (Min & Max)
  - g. Input – Vmp (Min & Max)
  - h. Input – Isc (Min & Max)
  - i. Efficiency
  - j. Power Factor
4. SPV String - Capacity Simulator
  - a. No of SPV String
  - b. No of Panel in Series

#### **Result – SPV Plant Design (Sheet – 5)**

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