DG AMP Marshallville Solar Project

Welcome to the DG AMP Marshallville Solar Plant

1,013 Kilo Watt DC, 700 Kilo Watt AC

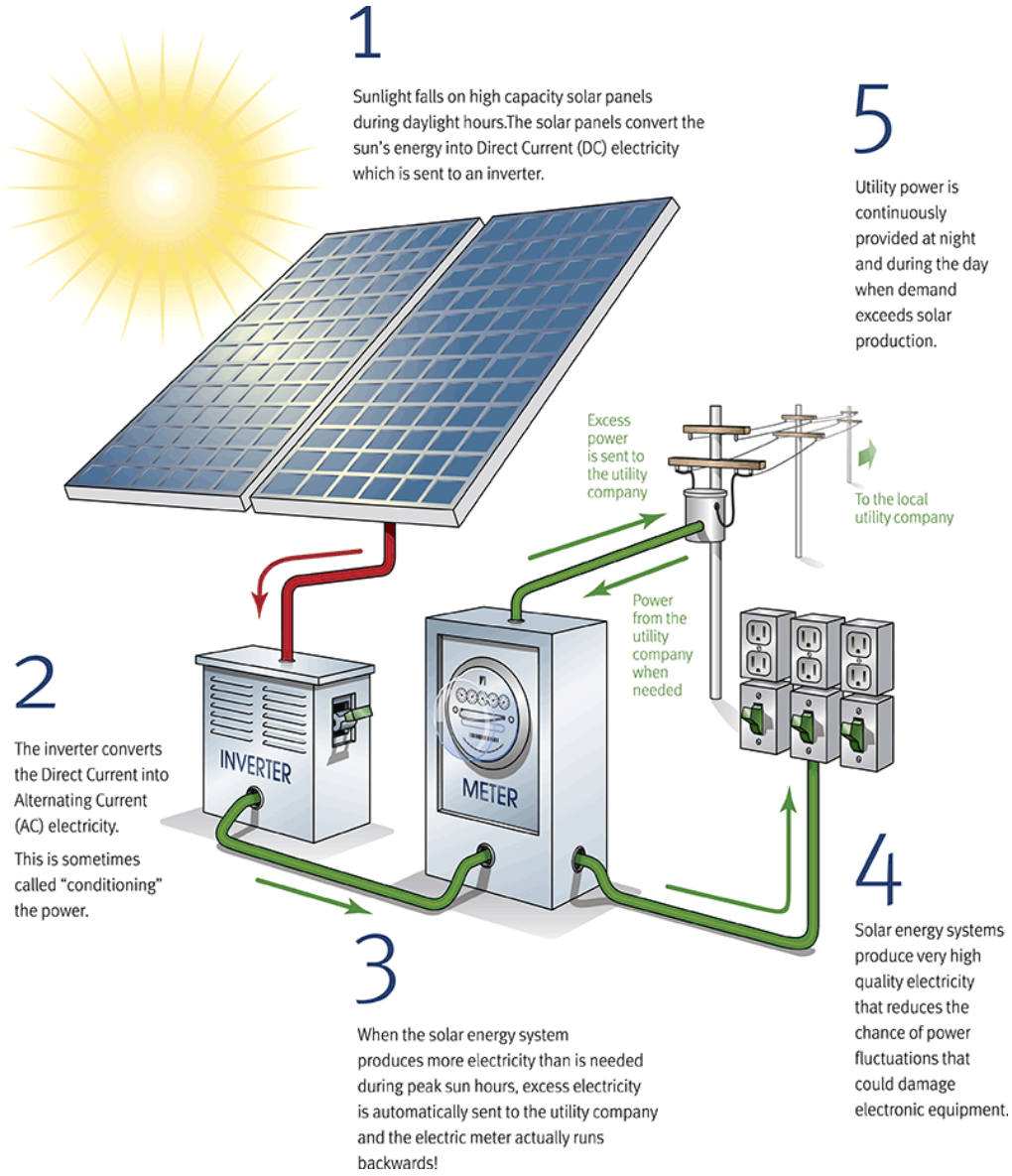
Safety

- Required PPE at our sites:
    - Closed-toe shoes
    - Work clothes (No shorts, tank tops, etc.)
    - High visibility Safety vest
  - First aid kit in site tour lead's vehicle
  - Visitors do NOT open or touch wiring, modules, electrical equipment.
  - Site visitors stay together as a group and do not walk outside of the range of the voice of site tour lead.
  - Site visitors take ALL trash away with them – there is no trash pick-up at site.
  - REPORT EMERGENCIES IMMEDIATELY

    CALL 911 DIRECTLY then notify Bay4 at 1-800-801-9912.

- If a member of the media or the visitor will publish, or post in any way information or comment regarding the site visit - prior to releasing any comment or information they are to contact Corporate Communications for NEER.
    - Media line: 561-694-4442
- This project has two partners:
    - The project was developed, built, and is owned by a subsidiary of NextEra Energy Resources---a Florida-based company that is the largest generator of renewable energy from the wind and sun in the world.
    - American Municipal Power (AMP) is a Columbus, OH based company that assisted DG AMP Solar in site development activities and communication and coordination with the town of Marshallville and other AMP utility members hosting this project
    - The power generated is being sold to AMP under a multiple-year contract
    - AMP offers the energy to the Town of Marshallville and other participating member utilities.

How Solar Energy works



Why solar energy in Ohio?

- The sun is abundant and free.
- Costs of solar power are coming down making it increasingly competitive with other forms of power generation.
- This project will not create any greenhouse gases (pollution) or use any foreign-oil to generate electricity.
- Solar panels can generate power for several decades and require very little maintenance.

Why build a solar project at this location?

- Proximity to Marshallville customers.
- The land is relatively flat.
- In addition, it is close to existing electrical infrastructure
- The site is also somewhat remote and not near existing homes

About the solar site

- The project is on about 7 + acres on land owned by the town of Marshallville
  - 1 Acre is slightly less than the size of an American football field
- The project is comprised of about 3,024 “335 Watt” individual solar panels
- There are 84 racks of panels, an average row contains 36 panels in each row.
- There is about 16 ft. between the rows. This is primarily to allow for access to provide maintenance. Adequate spacing also ensures the rows do not shade each other which could result in lost generation.
- There are driven piles (heavy stakes support the racks) these have been driven into the ground to support the racks which support the solar modules.
- When operating at its peak, this project can generate 700 Kilowatts of power or enough for about 109 average homes
- This project will avoid more than 786 tons of carbon dioxide per year that would have been produced if fossil fuels generated the same electricity.
- You would have to take nearly 173 cars off the road to achieve the same carbon dioxide reduction.
- The 25-degree fixed tilt helps achieve max Solar production and engineered to withstand wind shear issues. Also, this allows any snow accumulation to typically melt off the Solar modules quickly.

- **What makes up a typical photovoltaic solar project?**
  - ***As previously mentioned, there are 3,024 "335 Watt" individual modules on this site. Each module is 65 inches long and 40 inches in width. Each module is made up 72 solar cells.***
  - ***Individual solar cells are connected into what is called a module.***

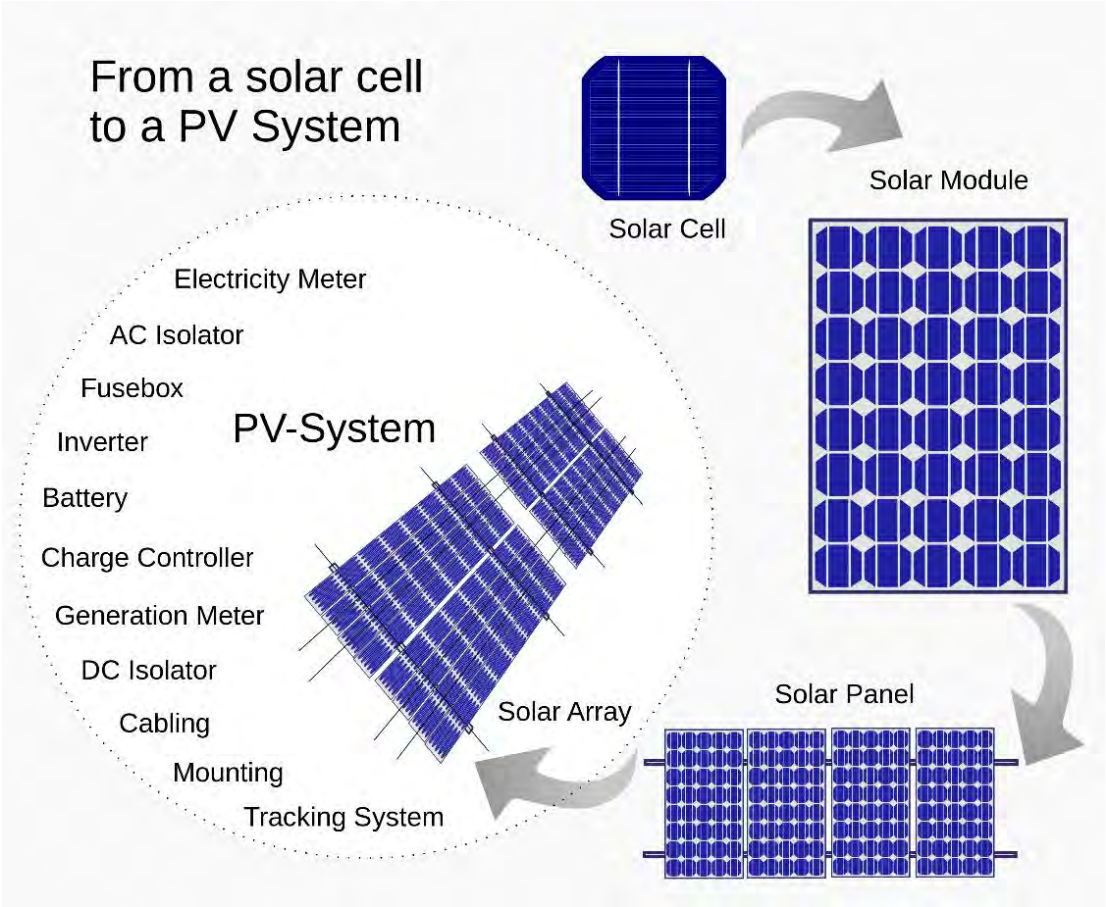
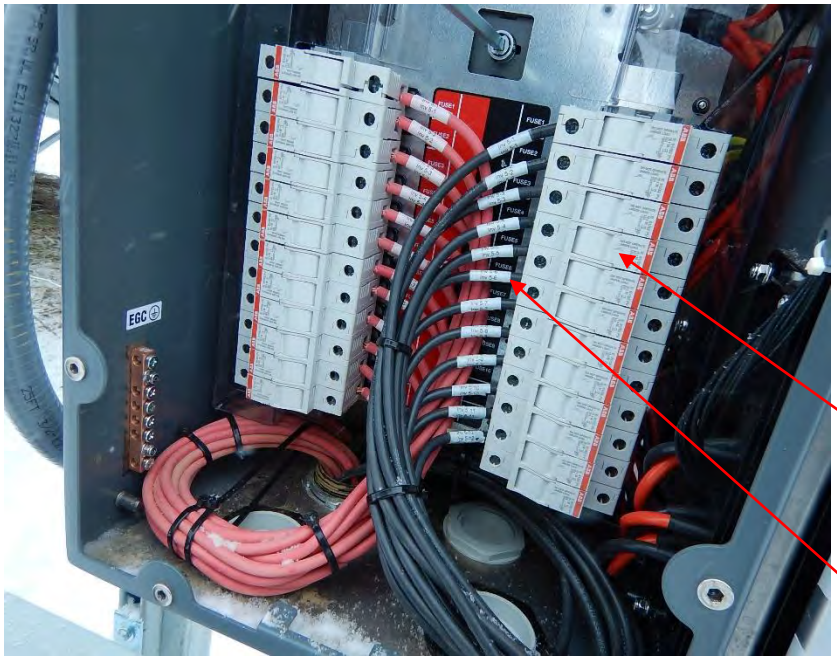


ABB 50KW Inverter

<u>14 ABB 50KW inverters receive the</u>



Fuse and fuse holder for 12 individual string circuits

12 String circuits terminate at each of the 14 ABB 50KW Inverters

power generated by the 3,024 Q CELLS Q.PLUS L-G4.2 335 Watt solar modules

produces DC (Direct Current). This is the module nameplate with the output data.

- ***These strings are then connected in Parallel at the 50 KW ABB Inverter to increase amperage.***
- ***The Parallel 12 string circuits connected at each ABB 50KW inverter then convert the Direct Current "DC" voltage to a useable 277/480 Volt Alternating Current "AC"***
- ***The 14 ABB 50 KW inverter's AC output is connected into 1 of 3 AC Combiner Panels and the 3 Combiner Panels are connected to a 1200 Amp AC Switch Gear.***
- ***The 480 Volt AC power leaving the Switch Gear is then connected to an AMP Utility 750 KVA Transformer where the Voltage is then stepped up to 13,200 Volts. The Marshallville Solar site produced power is then distributed throughout the grid where it is utilized throughout the community.***

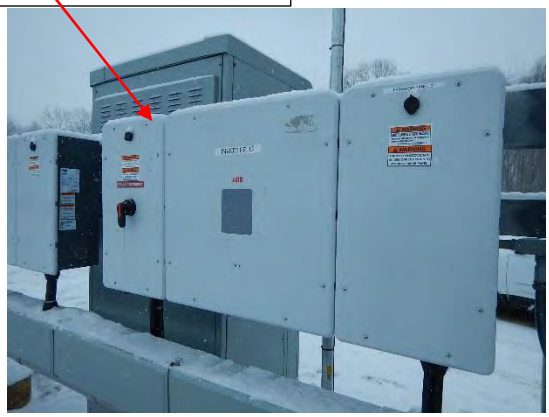
Meteorological Station

- ***We rely on knowing current conditions. By monitoring, we can see expected performance/production. This helps determine when we have a down circuit, Inverter failure, blown fuse, shading issues from vegetation, dirty modules etc.***
- ***Our meteorological station measures wind speed, ambient temperature, module temperature and solar irradiance (strength of the sun through our atmosphere). This allows us and the site owners to review and predict performance expectations.***

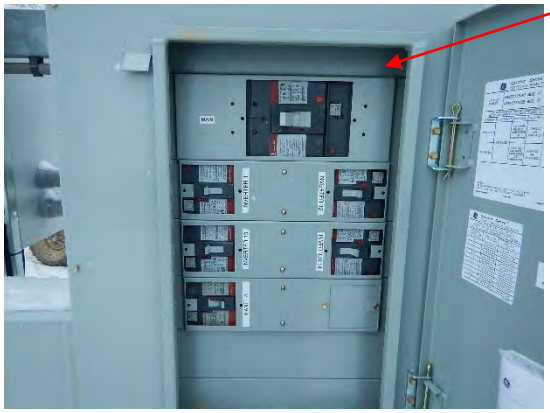
Solar Array field has 168 String circuits which feed the 14 ABB 15 KV Inverters which feed the 3 Combiner Panels that feed the Switch Gear, which feeds the transformer which feeds the grid

Array Field

ABB 50 KW inverters 14 total on site



Combiner Panels 1,2, and 3 typical



SW GEAR (Feeds and receives power to and from Combiner Panels 1, 2, and 3)

AMP Transformer takes the 277/480 solar generation and steps it up to 13,200 Volts

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