# Monroe County's Path to Solar Energy: Western New York's Largest Municipal Solar Installation

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# Monroe County – 13 MW

- 13 MW
- 45,000 Solar Modules
- Part of System is located on landfill

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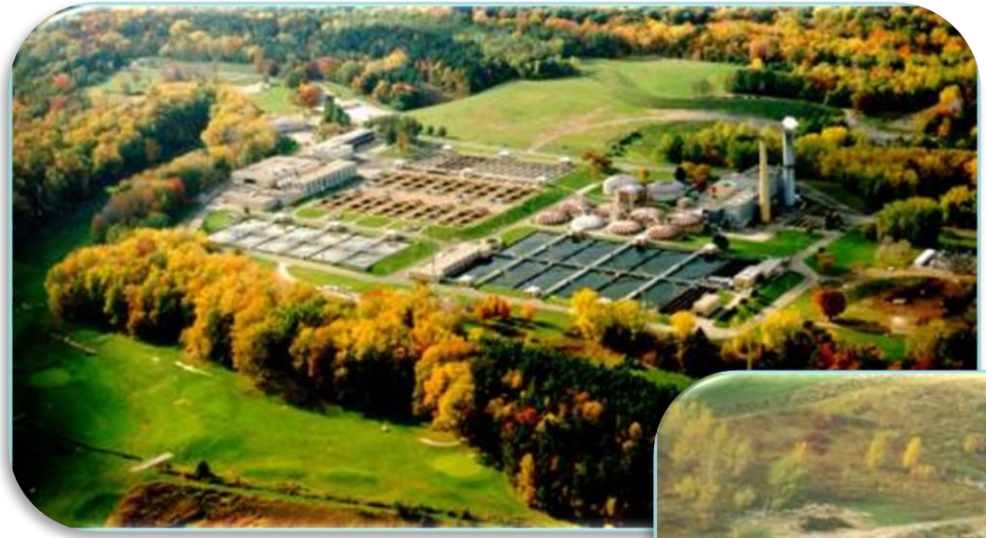
# Pure Waters Wastewater Treatment

- Frank E. Van Lare WWTP
- Northwest Quadrant WWTP



$3.52M
Annual Energy Costs

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# County Facilities

- Hall of Justice
- County Office Building
- Crime Lab
- City Place
- 691 St. Paul

$2.18M
Annual Energy Costs

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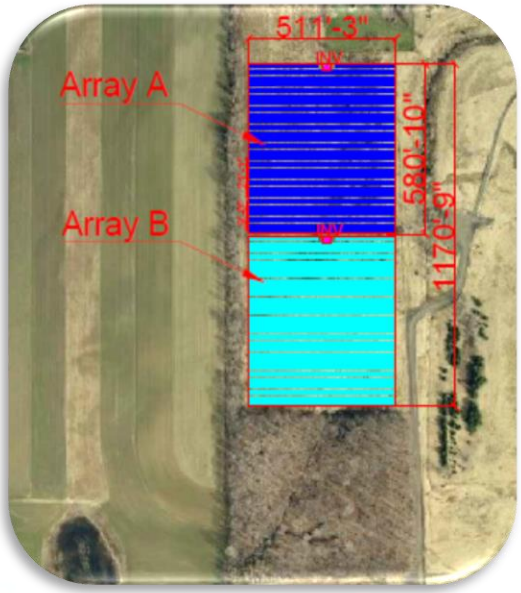
# Gloria Drive Location

- 10 acres, 2 Arrays
- Closed Landfill Adjacent to Arrays

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# Northwest Quadrant WWTP Location

- 20 acres, 3 Arrays
- Closed Landfill within Array C


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# County Responsibilities

- Consultant Selection
- SEQR Action
- Minor Site Preparation
- Subdivision of Array Parcels
- County Legislature Approval
- Execute Power Purchase Agreement and Long Term Lease

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# Power Purchase Agreement

- 20-year agreement
- Identifies seller and purchaser roles and responsibilities
  - Maintenance of system
  - Maintenance of premises
- Contract pricing

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# State Environmental Quality Review

- Type I Action
- Full Environmental Assessment
- Monroe County – Lead Agency
- Negative Declaration – October 2015

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# State Environmental Quality Review

- Concerns:
  - Possible glare from arrays
  - Located on closed landfill
  - Threatened and endangered species
  - Tree clearing
  - Wetlands

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# Project Communication

- Towns of Greece and Penfield
- NYSDEC
- Adjacent Property Owners

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# Project Timeline

- Request for Proposals — Nov. 2014
- County Legislature Action — Sept. 2015
- Execute Power Purchase Agreement — Dec. 2015
- Begin Construction — July 2017
- Begin Remote Net Metering — Dec. 2017

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# Solar Project Benefits

- 20-year Power Purchase Agreement
- No Capital Costs for Monroe County
- Power Generated $1.22M/year
- Credits Sold $1.59M/year
- Annual Savings $366,000
- Total Savings $7.3M

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# Project Specifications

| | | |
|---|---|---|
| Array A | 2.4 MW | 7,236 modules |
| Array B | 2.4 MW | 7,236 modules |
| Array C | 2.9 MW | 9,505 modules |
| Array D | 2.9 MW | 8,532 modules |
| Array E | 2.8 MW | 8,533 modules |
| | ***13.4 MW*** | |

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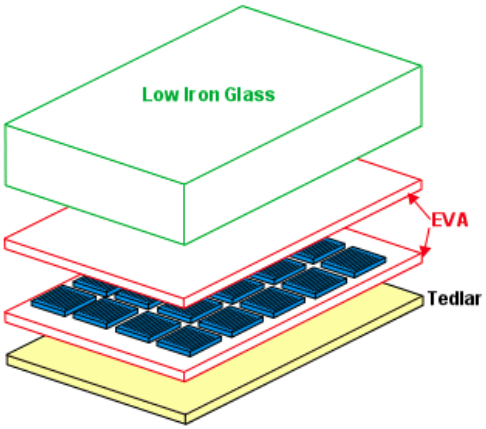
# Cells, Modules/ Panels

- The **solar cell** is the fundamental voltage/current producing element. Using silicon as the base element, cells directly convert incident solar radiation into electricity with no noise, pollution, or moving parts by raising electrons to a higher state that flows into an external circuit.

PV Cell

- A **module** is a serial/parallel combination of cells that produces a desired output voltage and current. Components include…
  - The first layer is durable low-iron glass- impervious to water, good impact resistance with low thermal resistivity
  - Next, an ethyl vinyl acetate encapsulates the solar cells. EVA is optically transparent with low thermal resistance, which fosters stability at high temperatures and extended UV exposure.
  - The rear layer is a thin polymer sheet; commonly Tedlar (DuPont). This prevents the ingress of water while promoting low thermal resistance.

  Finally, the framing is typically made of a robust aluminum.




PV Module

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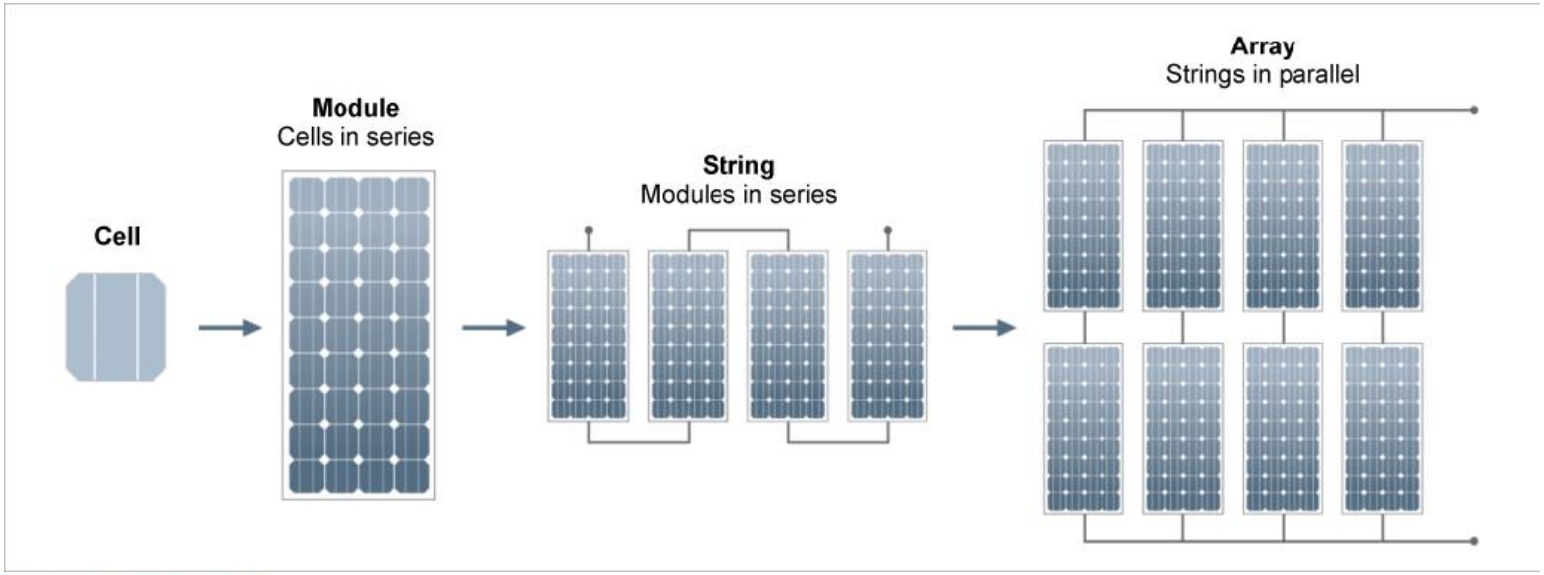
# Strings and Arrays

- A **string** is a group of modules interconnected.
- An **array** is a collection of panels mounted to a fixture to achieve the desired system specification/ output.
- **Silicon** is an element that will degrade over time. Thus cells lose 15-20% efficiency over their 25 year warranty period.

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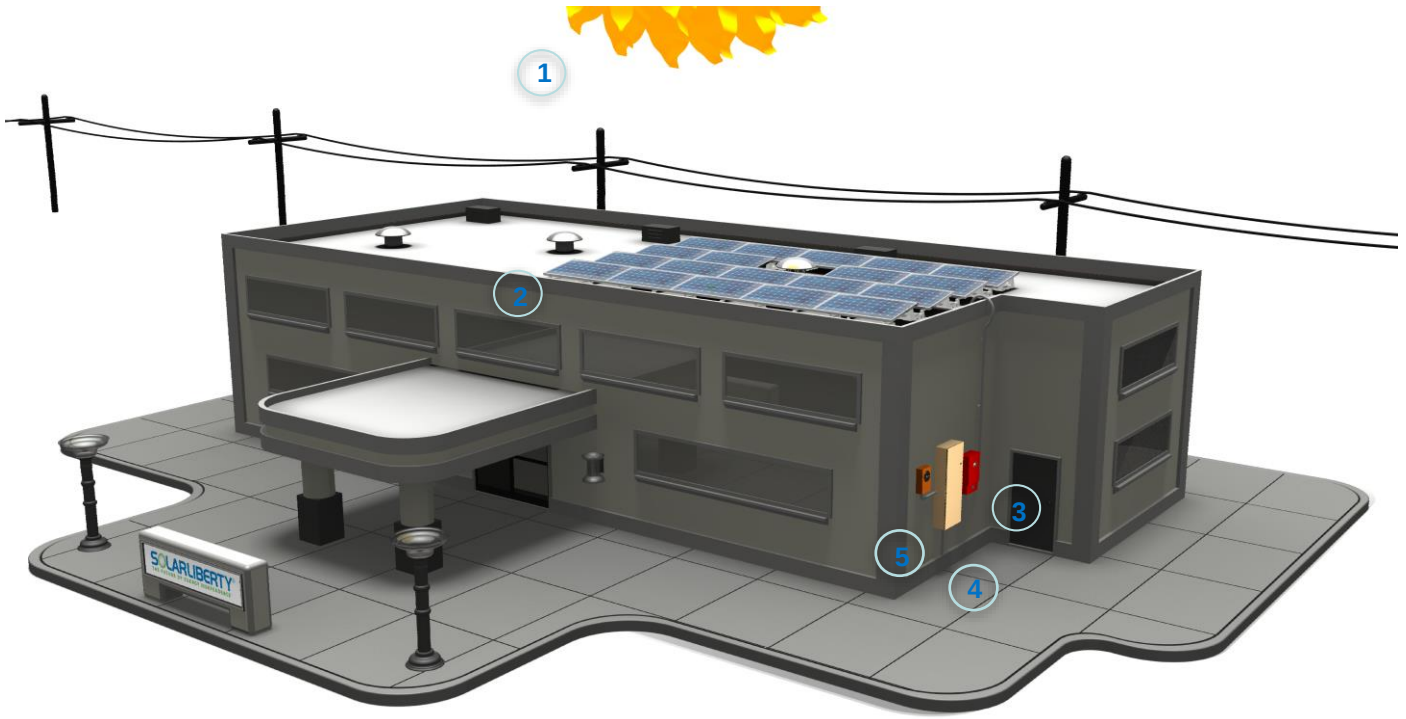
# Grid-Tied PV System- Net Metering




① Sunlight shines on the modules
② The solar modules produce DC power
③ The inverter changes the DC power into AC power
④ Solar electricity flows through the home or building and is used where needed
The utility owned Net Meter “counts” any excess electricity pushed back onto the grid and “counts” supplemental power drawn from the grid

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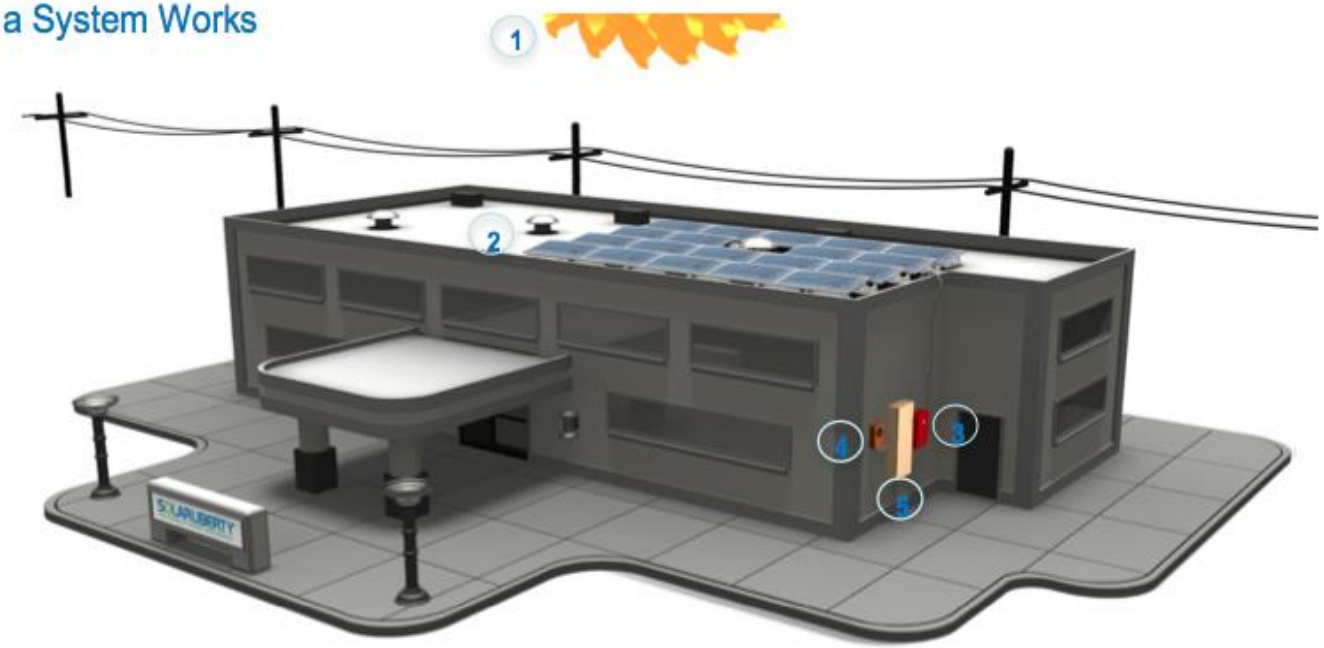
# Grid-Tied PV System- Value Stack

## How a System Works




1 Sunlight shines on the modules

2 The solar modules produce DC power

3 The inverter changes the DC power into AC power

4 The utility owned meter "measures" electricity produced by the solar system

5 Solar production is first utilized by your building

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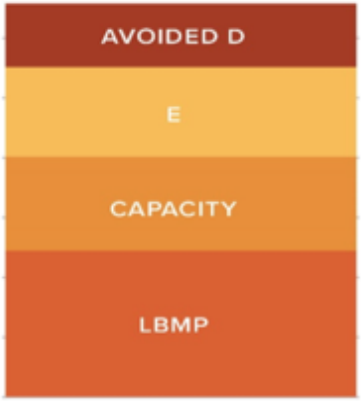
# Grid-Tied PV System- Value Stack

## How Solar is Credited (VDER) or "Value Stack"

1. NY State has created a value for solar energy production called the, "Value Stack"
2. Compensation is based on electricity delivered to the grid on an hourly basis via production of the solar system
3. Every kWh of Solar Production is given a monetary value
4. The monetary value is used as a credit to buy down your current electric bill




Value Stack

- **Avoided D** – Includes demand reduction value (DRV) & locational system relief value (LSRV)
- **E** – environmental benefit
- **Capacity** – ICAP
- **LBMP** – energy commodity

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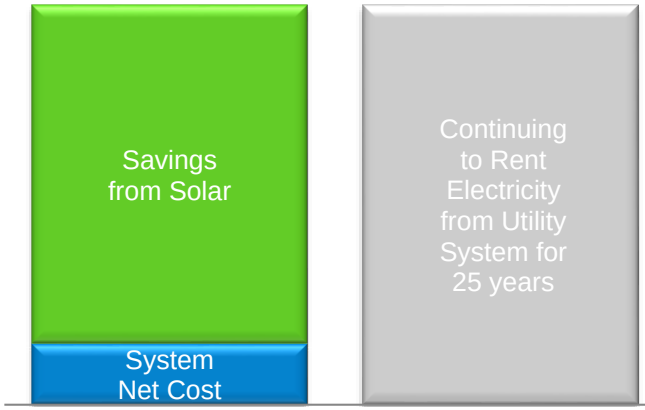
# Solar Incentives

- Purchase
  - Residential
    - NYSERDA Incentive- $0.35/W
    - Federal Tax Credit – 30%
    - NYS Tax Credit – 25%
  - Commercial
    - NYSERDA Incentive
      - Systems 0 < 750 kW DC
        - » $0.45/ W
      - Systems > 750 kW
        - » $.25 / W
        - » Adder $.10/ W for Landfills
    - Federal Tax Credit – 30%
    - MACRS – 5 Year Accelerated Depreciation

- Power Purchase Agreements/ Leases
  - No upfront capital
  - Lease agreement- 20/ 25 year term
  - Commercial- PPAs typically 1 MW+ size system
  - Residential- Leases now available

- Community Distributed Generation Solar
  - Residential/ Commercial/ Non-profits can all participate

Solar Savings vs. Utility Power (25 Years)

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# Types of Mounting Systems

## 4 MAJOR TYPES OF INSTALLATIONS

1.Flat Roof (Ballasted Mounting) - The solar panels are affixed to mounting racks and held down with concrete ballast blocks.  There are no penetrations into the roof.

2.Pitched Roof - The solar panels are mounted onto a racking system that is fastened onto the roof.

3.Pole Mounted - A group of solar panels, typically 8-12 modules, are mounted on a rack that is fixed to the top of a single pole.

4.Ground Mounted - An array is mounted onto a racking system with multiple posts (driven pile/ ground screw/ ballasted).  A good solution for large systems with enough available land. Ideal tilt depends on latitude. In our area we prefer a 30 degree fixed tilt.


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# Mounting Systems Used

## Arrays A, B, D and E

## Array C

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# Sizing a PV System

- Analyze building's annual energy usage (kWh) to calculate system size (utility bill).
- Use satellite imagery to determine usable roof/ground space.
- Generate project specific site plan layout.
- Factor in site parameters – shading, module tilt, azimuth to the sun.
- Using PV Watts via NREL, we calculate the expected power output using 30 years of average sunlight data specific to your area. Other options are PVSyst or PV*SOL Expert.

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# Operations and Maintenance

- Routine Maintenance- by Solar Liberty
  - Solar Panels - Area precipitation (inc. snow) typically helps to keep modules clean.
  - Inverter - Clean accumulated dust from the heat sink or fan screen.
  - Wiring - Check wiring around the inverter.
- Power production - Compare estimated power output (kWh) to the measured values on inverter.
- Snow removal - Not recommended.

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# Warranties and Service

- No moving parts means a long life expectancy
- Panels come with a 25 year power production warranty from the manufacturer
- Inverters include a 10-25 year warranty
- Solar Liberty has a standard comprehensive 5-year service and product warranty on system purchases
- Under a PPA agreement, Solar Liberty will handle all manufacturer warranty c, naintenance required for the system to operate in

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# Field Issues to Avoid

- Roof Mount
  - Roofs with less than 7 years life
  - Penetration of the roof must be done with care to eliminate any leak potential
  - Loading- can't overload the roof. Structural PE analysis performed prior
  - Not void warranty- use slip sheets and coordinate with roof mfr.

- Ground Mount
  - Wetland/ nexus to waterways
  - Contamination
  - Bedrock
  - Slope- 20 degree max
  - Vicinity to power lines/ main panel for resi

# Solar Installations

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# Questions

1. What is the size of the project?

   13 MW

2. What is the duration of the Power Purchase Agreement?

   20 years

3. Who is responsible for maintenance?

   Solar Liberty

4. What type of SEQR Action?

   Type I

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# Thank You!

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