Who is Harvest Solar Energy?

- Family-owned business
- Serving customers for 20+ years
- Experienced in residential and commercial solar installations
- More than 400 solar installations
- Local company headquartered in Tulsa, OK

Changing the world one house at a time!

www.harvestsolar.net
The World is going solar!

“BloombergNEF estimated that by 2050, 56% of the world's electricity would be produced by wind and solar power.”

Source: New York Times April 29, 2021
Background
In recent years, the Navy, Army and Air Force have outlined ambitious renewable energy targets that will drive 3 gigawatts (GW) of renewable energy installations by 2025.¹

These aggressive renewable energy targets respond to rising energy costs, potential energy supply disruptions and the need for more secure and clean energy generation and distribution. In the past year alone, the DOD spent more than $20 billion on energy and consumed over five billion gallons of oil.² An aging national transmission network, global fuel price market volatility and a dependence on foreign oil continue to put mission-critical energy supply at risk.

The military has increasingly turned to solar energy to meet its renewables targets. Solar has proven an effective alternative to traditional energy sources in a variety of roles for the DOD.
Solar Is Growing in the Navy, Army and Air Force

There are more than 130 megawatts (MW) of solar photovoltaic (PV) energy systems powering Navy, Army and Air Force bases in at least 31 states and the District of Columbia. Combined, these installations provide enough clean energy to power 22,000 American homes.\(^3\)

In addition, PV is 58 percent of the 1.9 GW of identified DOD renewable energy capacity additions from 2012 to 2017. This amounts to approximately 1.1 GW of new PV projects, roughly equal to the amount of installed global solar capacity in 2000.\(^4\)

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1. [http://www.whitehouse.gov/the-press-office/2012/04/11/fact-sheet-obama-administration-announces-additional-steps-increase-ener](http://www.whitehouse.gov/the-press-office/2012/04/11/fact-sheet-obama-administration-announces-additional-steps-increase-ener). These targets are designed to help meet a wider DOD mandate, which requires 25 percent of total facility energy consumption to come from renewable energy sources by 2025. See 10 U.S.C. Section 2911.
3. These solar totals do not include installations at bases abroad, on the battlefield or at any classified locations.
Going Green – Benefits for Businesses

- **Economic Benefits**
  - Lower operating costs
  - Hedge against rising electric rates
  - Financial incentives

- **Environmental Benefits**
  - Doing the right thing to help protect our environment
  - Establishing your business as leader in the communities that it serves

- **Marketing / Public Relations Benefits**
  - Capitalizing on marketing and public relations benefits
  - Generating exposure of your commitments to environmentally friendly sources of power, generating customer goodwill, loyalty, and additional customer traffic
Anatomy of Solar Project Ground mount

- **Site plan evaluation**
  - Topography - soil stability, environmental impact
  - Proximity to transmission lines - cost of interconnect
  - Ability to handle offset energy
  - Financial aspects i.e., lease land, buy, weather issues

- **Racking**
  - Pile drive ground mount racking is most popular
  - Single leg with integrated grounding
  - Satellite mapped; most are single axis tilting for increased efficiency

- **Panels**
  - Large mono or poly 500 watt or higher 1500 volt long strings
  - Grouped in strings of 15 to 20 DC fused in combine

- **Inverters**
  - Most large installs have multiple distributed inverters, 60 kW redundancy
  - Highly efficient and overloaded 20% for earlier sunshine
Solar Examples

- **Rooftop**
  - Ballasted racking non penetrating
  - Structural integrity
  - Wire management- inverter inside
  - Shading impact

- **Carport**
  - Carport solar is very popular for the shade impact
  - Uses smaller panels with off the shelf infrastructure
  - Inverter under canopy

- **Monitoring**
  - Online apps display production, individual string production
  - System energy offset, sometimes consumption as well
  - $ impact and environmental benefits

- **Third party ownership**
  - Tax credits can be sold to third party ownership for limited time
  - System can be leased, PPA or other financing tools
Financial Vehicles for Solar

- **Purchase**
  - Most popular
  - 26% federal tax credit going to 30%
  - Maintenance and warranty period
  - Energy savings ongoing

- **Lease**
  - Third party ownership for tax benefits lease for 20 years
  - No out of pocket but less savings
  - Fixed energy costs but ownership/ insurance issues
  - Stability of the company important

- **PPA**
  - Power purchase agreement similar to lease
  - Agreement to buy the power at a certain kW rate for a fixed period

- **Inverters**
  - Most large installs have multiple distributed inverters, 60 kW redundancy
  - Highly efficient and overloaded 20% for earlier sunshine
Guthrie Green  
38 kW Solar PV System  
Tulsa, Oklahoma

<table>
<thead>
<tr>
<th>System Size</th>
<th>38 kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panels</td>
<td>(192) Sanyo 195-watt</td>
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<tr>
<td>Roof Type and Mounting</td>
<td>Integrated into the canopy shade structure</td>
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<tr>
<td>Annual Production</td>
<td>54,925 kWh</td>
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<td>Approximate Value of Rebates and Tax Credits</td>
<td>30% / $105,000</td>
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<tr>
<td>Completed Date</td>
<td>2014</td>
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<tr>
<td>System Size</td>
<td>25.6 kW</td>
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<tr>
<td>-----------------------</td>
<td>----------------------------------</td>
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<tr>
<td>Panels</td>
<td>(80) Solarworld 320-watt</td>
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<tr>
<td>Roof Type and Mounting</td>
<td>Ballasted non-penetrating roof mount</td>
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<tr>
<td>Annual Production</td>
<td>35,848 kWh</td>
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<tr>
<td>Approximate Value of Rebates and Tax Credits</td>
<td>30% / $21,000</td>
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<tr>
<td>Completed Date</td>
<td>October 2015</td>
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### 10.8 kW Solar PV System
Edmond, Oklahoma

<table>
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<tr>
<th>Description</th>
<th>Details</th>
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<tbody>
<tr>
<td>System Size</td>
<td>10.8 kW</td>
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<tr>
<td>Panels</td>
<td>(35) LG 310-watt</td>
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<td>Roof Type and Mounting</td>
<td>Ground mount</td>
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<td>Annual Production</td>
<td>16,280 kWh</td>
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Veterans Administration Medical Center  
413 kW Solar PV System  
Muskogee, Oklahoma

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<th>System Size</th>
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<tr>
<td>Roof Type and Mounting</td>
<td>Carport</td>
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<td>Expected Savings</td>
<td>$50,000</td>
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George R. Brown Convention Center
51.7 kW Solar PV System
Houston, TX

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<th>System Size</th>
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<tbody>
<tr>
<td>Roof Type and Mounting</td>
<td>Flat and tilted</td>
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<td>Annual Production</td>
<td>79,079 kWh</td>
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<td>Approximate Value of Rebates and Tax Credits</td>
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<tr>
<td>Completed Date</td>
<td>2009</td>
</tr>
</tbody>
</table>
Discovery Green
49.92 kW Solar PV System
Houston, Texas

System Size
49.92 kW

Panels
(256) BP SX195

Inverter
SatCon 50kW

Annual Production
62,000 kWh

Annual CO₂ Emissions Prevented
100,000 lbs

Approximate Value of Rebates and Tax Credits
$120,000

Installed Date
February 2008

The system was designed in 3 sub-arrays on 2 different building structures. The engineers worked with the architects to optimize the building orientation and the pitch of the veranda to gain the best production from the system.

The system includes a display monitor that provides real-time production, consumption, and savings information for park patrons.
Tarrant County Water District
238 kW Solar PV System
Ft. Worth, Texas

System Size: 238 kW
Panels: 132 BP SX170W
Inverter: 3 SMA 7000US
Roof Type and Mounting: Non-penetrating ballasted design
Annual Production: 315,000 kWh
Annual CO₂ Emissions Prevented: 244 Metric tons
Approximate Value of Rebates and Tax Credits: ???
Completed Date: ???
This home will be the first residential LEED Platinum certified home in Houston, Texas. It’s 23 kW solar electric system will cover all of the home’s electrical needs and export additional power back to the grid.
Solar Increases Home Value

- The National Renewable Energy Laboratory (NREL) found that every dollar saved on energy through solar increases home value by $20. That's a return on investment of 20 to 1.

- According to Zillow, homes with solar panels sell for approximately 4 percent higher on average than homes without solar energy.

- In 2014, the Lawrence Berkeley National Laboratory, with funding from the United States Department of Energy, reviewed the sales of 22,822 in California, Connecticut, Florida, Massachusetts, Maryland, North Carolina, New York, and Pennsylvania. They found that ‘Home buyers consistently have been willing to pay more for a property with PV across a variety of states, housing and PV markets, and home types.’ The amount that a solar system added to a home’s sale price across all homes is approximately $15,000.
Resources

- The National Renewable Energy Laboratory (NREL) PV watts is solar estimating tool with 30 years of weather data for projections

- [www.seia.org](http://www.seia.org) Solar Energy Industries Association

- [www.solarpowerworldonline.com](http://www.solarpowerworldonline.com)

- [www.energyresearchucf.edu](http://www.energyresearchucf.edu)

- [www.duke-energy.com](http://www.duke-energy.com)

- [www.harvestsolar.net](http://www.harvestsolar.net)

- Contact: John Miggins
  - john@harvestsolar.net
  - 918-521-6223
John Miggins, President

- Proud member of the American Solar Energy Society
- Work to promote awareness of solar and renewable energy locally and nationally
- Respected expert in the solar industry
- Has been a featured speaker at the Sierra Club, Texas Solar Energy Society, University of Houston, Oklahoma State University, and numerous architectural committee/organization events

Guthrie Green pavilion having 192 solar panels installed by Harvest Solar Energy providing power for park concessions, lights and stage.