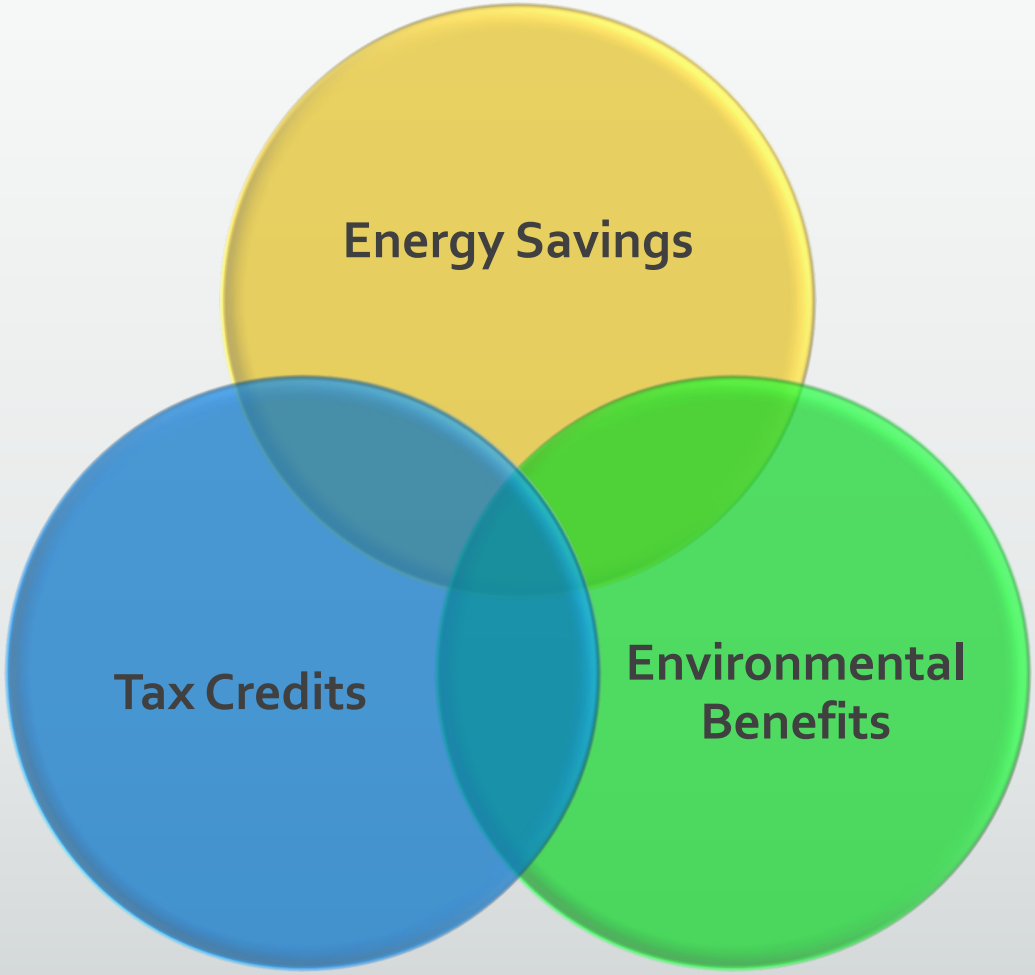
Harvest Solar Energy LLC

John Miggins | President
www.harvestsolar.net

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

HARVEST SOLAR ENERGY

SEIA Solar Energy Industries Association®

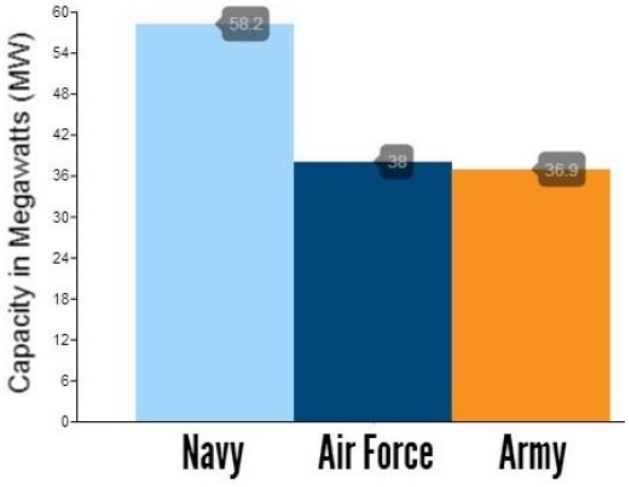
Background

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.

Installed Solar Capacity by Branch



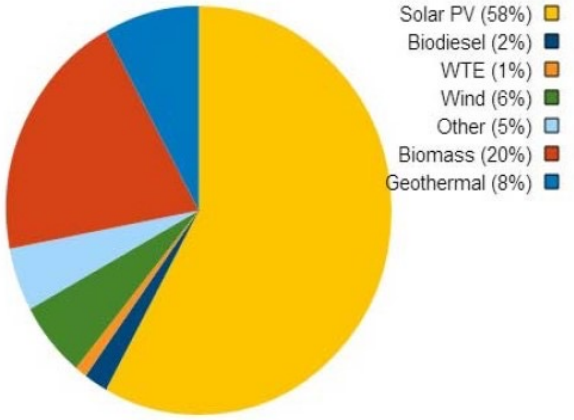
HARVEST SOLAR ENERGY

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]

Planned DOD-Wide Renewable Energy Capacity Additions 2012-2017



Source: FY2011 DOD Annual Energy Management Report

---

[1] 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.

[2] http://www.defense.gov/news/newsarticle.aspx?id=117084

[3] These solar totals do not include installations at bases abroad, on the battlefield or at any classified locations.

[4] Annual Energy Management Report www.acq.osd.mil/ie/energy/library/FY.2011.AEMR.PDF

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

System Size	38 kW
Panels	(192) Sanyo 195-watt
Roof Type and Mounting	Integrated into the canopy shade structure
Annual Production	54,925 kWh
Approximate Value of Rebates and Tax Credits	30% / $105,000
Completed Date	2014

HARVEST SOLAR ENERGY

PSO Headquarters
25.6 kW Solar PV System
Tulsa, Oklahoma

System Size	25.6 kW
Panels	(80) Solarworld 320-watt
Roof Type and Mounting	Ballasted non-penetrating roof mount
Annual Production	35,848 kWh
Approximate Value of Rebates and Tax Credits	30% / $21,000
Completed Date	October 2015

HARVEST SOLAR ENERGY

Department of Environmental Quality Field Office

10.8 kW Solar PV System

Edmond, Oklahoma

System Size	10.8 kW
Panels	(35) LG 310-watt
Roof Type and Mounting	Ground mount
Annual Production	16,280 kWh
Completed Date	2013

HARVEST SOLAR ENERGY

Veterans Administration Medical Center
413 kW Solar PV System
Muskogee, Oklahoma

System Size	413 kW
Roof Type and Mounting	Carport
Expected Savings	$50,000
Completed Date	2013

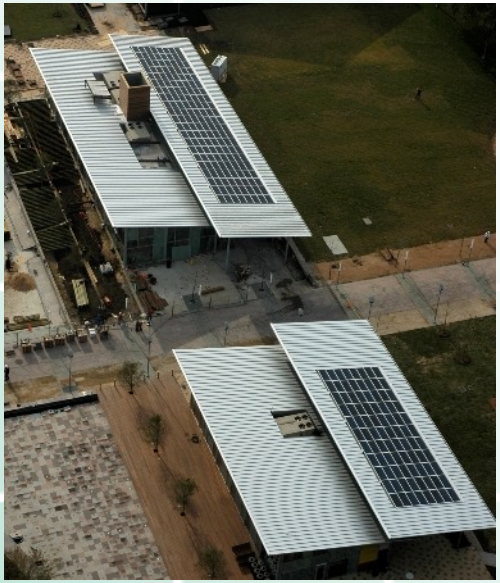
HARVEST SOLAR ENERGY

George R. Brown Convention Center
51.7 kW Solar PV System
Houston, TX

System Size	51.7 kW
Roof Type and Mounting	Flat and tilted
Annual Production	79,079 kWh
Approximate Value of Rebates and Tax Credits	NA
Completed Date	2009

HARVEST SOLAR ENERGY

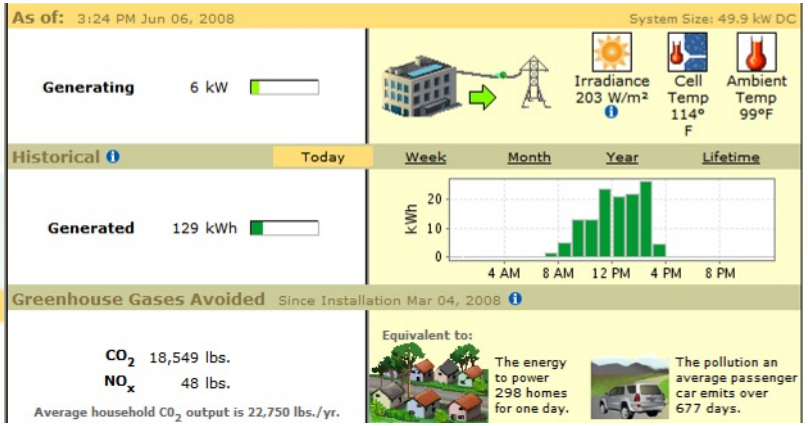
Discovery Green
49.92 kW Solar PV System
Houston, Texas



System Size	49.92 kW
Panels	(256) BP SX195
Inverter	SatCon 50kW
Annual Production	62,000 kWh
Annual CO_2 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.

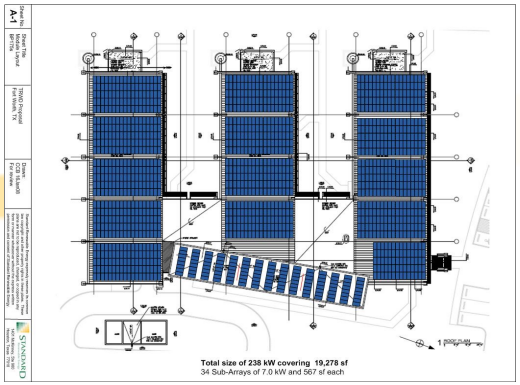


HARVEST SOLAR ENERGY

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 CO_2 Emissions Prevented	244 Metric tons
Approximate Value of Rebates and Tax Credits	???
Completed Date	????

Panel Configuration



HARVEST SOLAR ENERGY

Personal Residence
Houston, Texas
23 kW

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.

System Size	23 kW
Roof and Mounting	Flush mount system on a metal roof
Annual Production	27,600 kWh
Annual CO_2 Emissions Prevented	52,700 lbs

HARVEST SOLAR ENERGY

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 Solar Energy Industries Association
- www.solarpowerworldonline.com
- www.energyresearchucf.edu
- www.duke-energy.com
- 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.