cleanenergy.org
Southern Alliance for Clean Energy

An Introduction to Solar Technology

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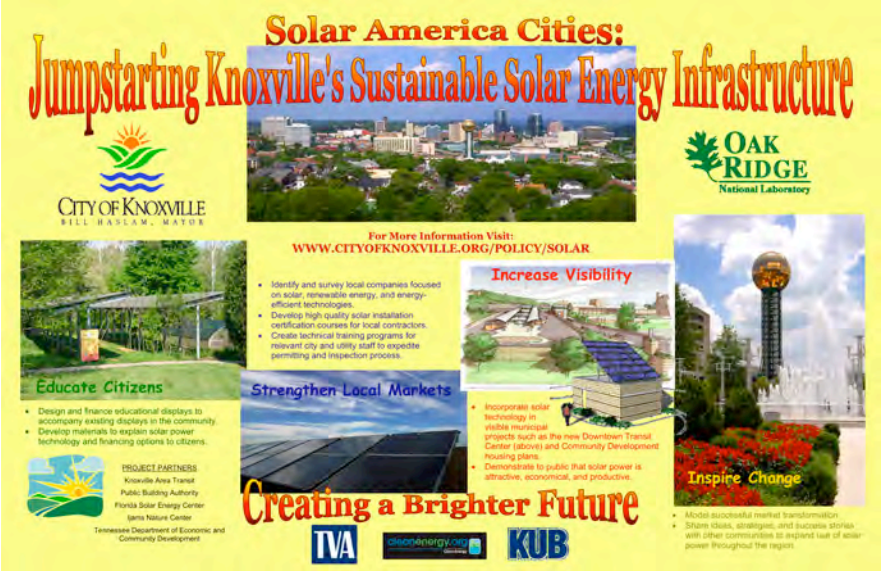
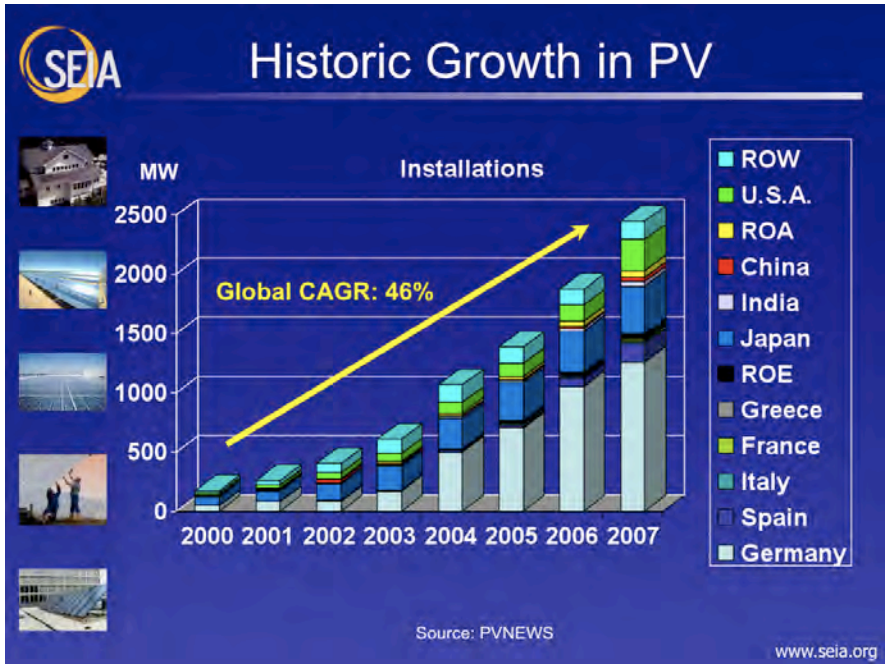
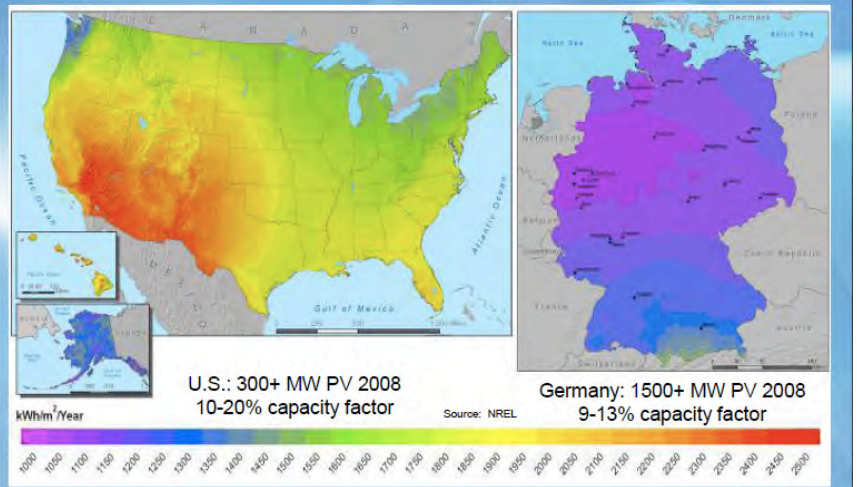


Examples of types of Solar



Solar Resource & Market Comparison

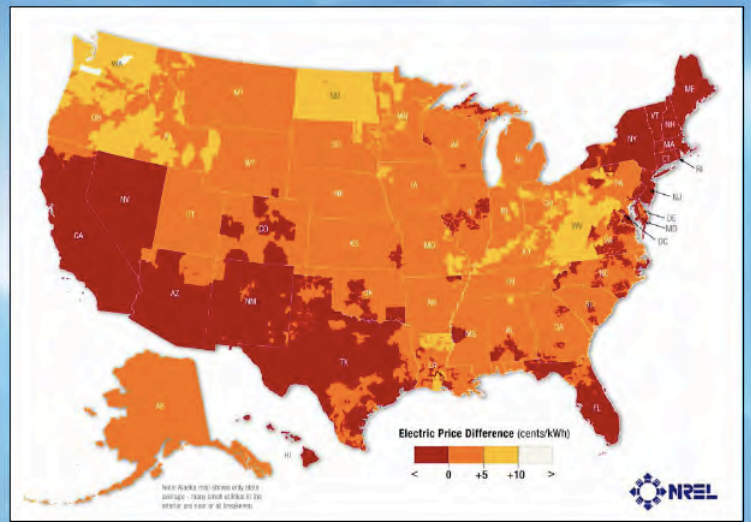
SEPA solar electric power association



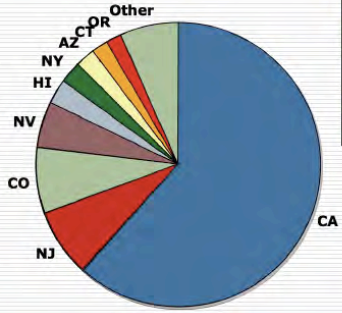
CONFIDENTIAL

Photovoltaic vs. Grid Prices 2015

SEPA solar electric power association

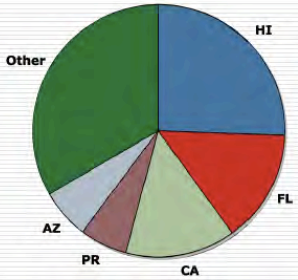


2008 Grid-Tied PV Installations by State



IREC INTERSTATE RENEWABLE ENERGY COUNCIL

Solar Hot Water+ Capacity by State



Based on analysis of EIA Data for 2006-2007

IREC INTERSTATE RENEWABLE ENERGY COUNCIL

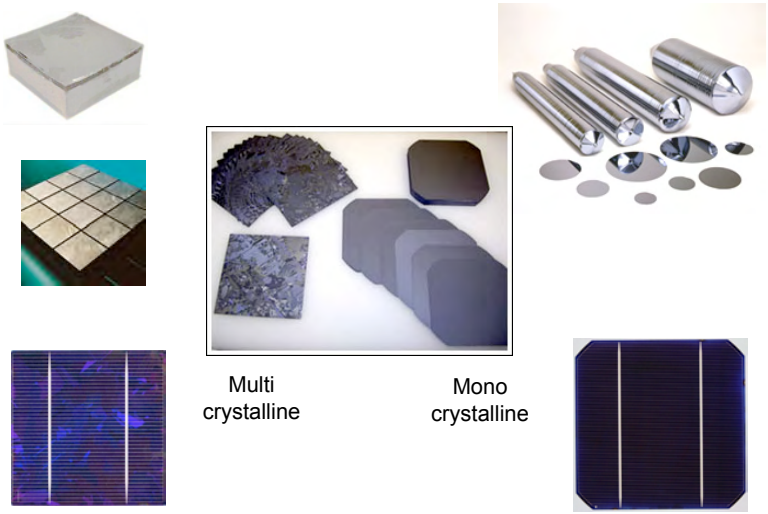
Solar Technology includes:

Photovoltaics

Solar Hot Water

Solar Lighting and Heating

Crystalline Silicon Cell Types



Crystalline Module Evolution

BIPV Evolution – Crystalline Silicon

BIPV - Flat Tile

BIPV - Spanish Tile

PV Thin Film Installations

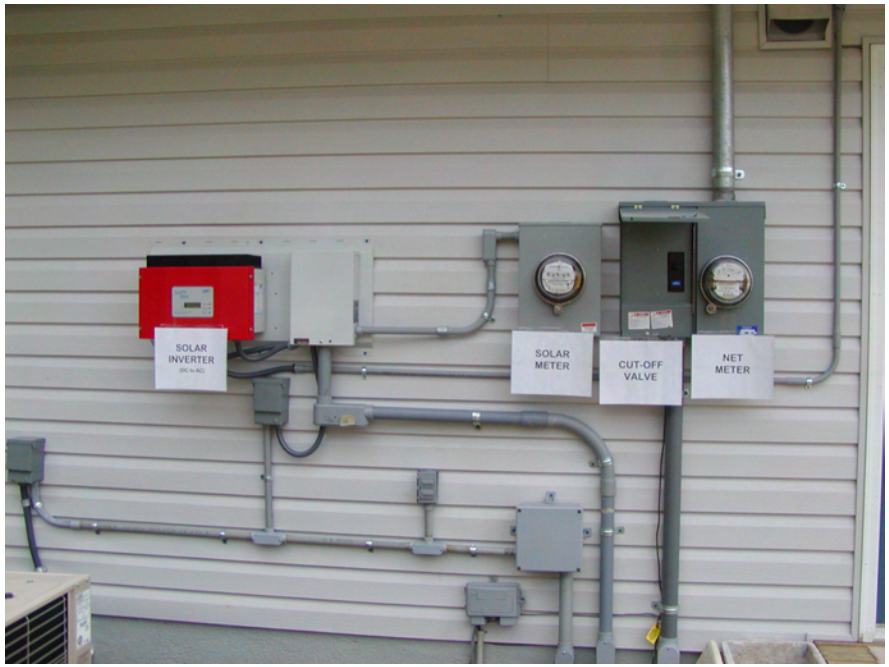
Thin film Cadmium Telluride (CdTe)

The most aggressive leader in the thin film PV industry is FirstSolar, which manufactures a Cadmium Telluride (CdTe) thin film module. They claim a production cost approaching $1/watt, compared to a production cost of about $1.70/watt for typical PV

Rigorous recycling program required due to toxicity of Cadmium

First Solar
CdTe module
(efficiency 10%?)

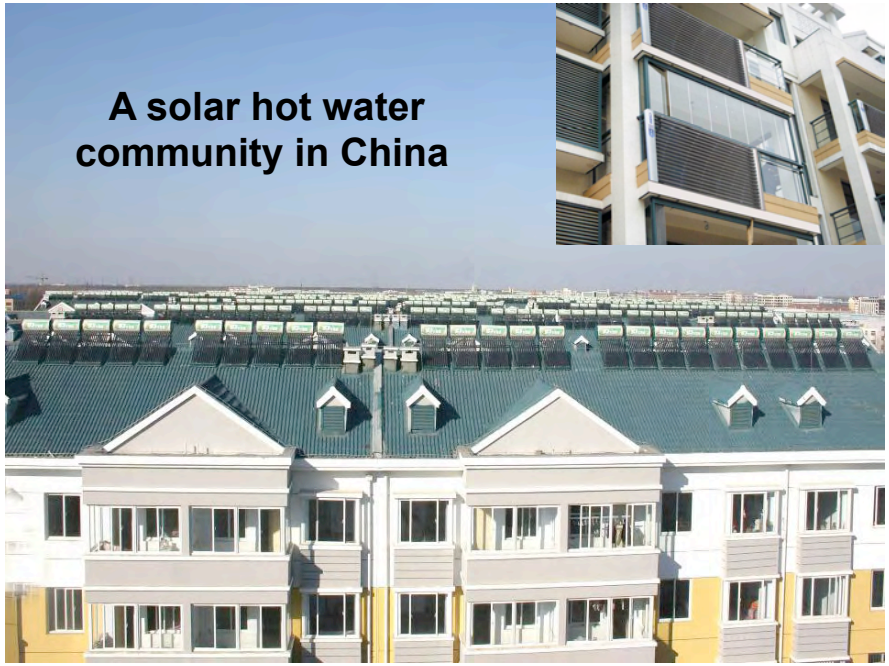
Credit Curt Maxey, ORNL



Solar Water Heating (SWH)

SWH GUIDELINES

Only install systems that are Solar Rating and Certification Corporation (SRCC) certified (www.solarrating.org). The SRCC provides independent certification of solar water and swimming pool heating collectors and systems. Some states (Florida, for example) require their own certification. Install the simplest system that will work in your climate. In most areas of the United States, SWH must incorporate freeze protection.



Solar Heating options:

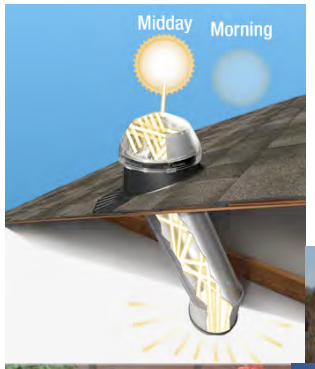
Solar Pool Heating

Solar water heating can be used to heat swimming pools and spas. This works by the existing pool filtration system pumping pool Water through the solar collector and the heated water.

Radiant Floor Heating (RFH)

Also known as 'hydronic in-floor' heating. Hot water is run through tubing that is either attached under the floor or embedded in the concrete slab. The hot water running through the tubing warms the floor and radiates heat into the structure. By heating the floor, a thermal inversion is created that traps cool air at the ceiling and circulates warm air where you are.

This pool, located in a condominium complex in Oregon, is heated by solar thermal collectors.



Examples of Solar lighting:

DSIRE SOLAR

Database of State Incentives for Renewables & Efficiency

Energy Efficiency and Renewable Energy

North Carolina Solar Center

IREC

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DSIRE HOME

DSIRE SOLAR is a comprehensive source of information on state, local, utility, and federal incentives and policies that promote the adoption of solar technologies. Funded by the U.S. Department of Energy's Solar Energy Technology Program, *DSIRE SOLAR* is a new component of the DSIRE project that provides solar-specific policy information to consumers, policy makers, program administrators, the solar industry and other stakeholders.

Search for incentives for one or both technologies:

☑ Solar Electric ☑ Solar Thermal

Federal Solar Incentives

Resources

- Solar Policy Guide
- Summary Maps
- Policy Comparisons
- Library
- Search
- What's New?

www.dsireusa.org/solar/

DSIRE HOME

GEORGIA

Incentives/Policies for Solar

Printable Version

- See Federal Incentives
- See All Summaries
- See Residential Incentives Only

Resources

- Solar Policy Guide
- Summary Maps
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- Library
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- What's New?

Last Updated: 06/25/2009

Financial Incentives

Corporate Tax Credit
- Clean Energy Tax Credit (Corporate)

Personal Tax Credit
- Clean Energy Tax Credit (Personal)

Production Incentive
- TVA - Green Power Switch Generation Partners Program

Utility Rebate Program
- Central Georgia EMC - Photovoltaic Rebate Program
- Georgia Power - Solar Buyback Program
- GreyStone Power - Photovoltaic Rebate Program
- GreyStone Power - Sun Rays Power Program
- Jackson EMC - Right Choice Sun Power Rebate Program
- Sawnee EMC - Solar Photovoltaic Rebate Program
- Walton EMC - Residential Solar and Efficiency Rebate Programs

Rules, Regulations & Policies

Interconnection
- Interconnection Standards

Net Metering
- Georgia - Net Metering

Solar Access Law/Guideline
- Solar Easements

www.dsireusa.org/solar/

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Incentives/Policies for Solar

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Business Energy Investment Tax Credit (ITC)

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Last DSIRE Review: 06/10/2009

Incentive Type: Corporate Tax Credit

Eligible Renewable/Other Technologies: Solar Water Heat, Solar Space Heat, Solar Thermal Electric, Solar Thermal Process Heat, Photovoltaics, Wind, Biomass, Geothermal Electric, Fuel Cells, Geothermal Heat Pumps, CHP/Cogeneration, Solar Hybrid Lighting, Direct Use Geothermal, Microturbines

Applicable Sectors: Commercial, Industrial, Utility

Amount: 30% for solar, fuel cells and small wind; 10% for geothermal, microturbines and CH

Maximum Incentive: Fuel cells: $1,500 per 0.5 kW
Microturbines: $200 per kW
Small wind turbines placed in service 10/4
Small wind turbines placed in service after
All other eligible technologies: no limit

Eligible System Size: Small wind turbines: 100 kW or less
Fuel cells: 0.5 kW or greater
Microturbines: 2 MW or less
CHP: 50 MW or less

Equipment/Installation Requirements: Fuel cells, microturbines and CHP systems

Authority 1: 26 USC § 48

Summary:
Note: The American Recovery and Reinvestment Act of 2009 (H.R. 1, electricity production tax credit (PTC) to take the federal business en grant from the U.S. Treasury Department instead of taking the PTC fo taxpayers eligible for the business ITC to receive a grant from the U.S business ITC for new installations. The Treasury Department issued guidance on how to take the federal business energy investment tax production tax credit. The Treasury Department will issue more exte

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Incentives/Policies for Solar

Residential Renewable Energy Tax Credit

Last DSIRE Review: 02/19/2009

Incentive Type: Personal Tax Credit

Eligible Renewable/Other Technologies: Solar Water Heat, Photovoltaics, Wind, Fuel Cells, Geothermal Heat Pumps, Other Solar Electric Technologies

Applicable Sectors: Residential

Amount: 30%

Maximum Incentive: Solar-electric systems placed in service before 2009: $2,000
Solar-electric systems placed in service after 2008: no maximum
Solar water heaters placed in service before 2009: $2,000
Solar water heaters placed in service after 2008: no maximum
Wind turbines placed in service in 2008: $4,000
Wind turbines placed in service after 2008: no maximum
Geothermal heat pumps placed in service in 2008: $2,000
Geothermal heat pumps placed in service after 2008: no maximum
Fuel cells: $500 per 0.5 kW

Carryover Provisions: Excess credit may be carried forward to succeeding tax year

Eligible System Size: Fuel cells: 0.5 kW minimum

Equipment/Installation Requirements: Solar water heating property must be certified by SRCC or by comparable entity endorsed by the state in which the system is installed. At least half the energy used to heat the dwelling's water must be from solar. Geothermal heat pumps must meet federal Energy Star requirements. Fuel cells must have electricity-only generation efficiency greater than 30%.

Authority 1: 26 USC § 25D

Date Enacted: 8/8/2005 (subsequently amended)

Date Effective: 1/1/2006

Expiration Date: 12/31/2016

Authority 2: IRS Form 5695 & Instructions: Residential Energy Credits

Summary:
Note: The American Recovery and Reinvestment Act of 2009 does not allow taxpayers eligible for the residential

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Incentives/Policies for Solar

Printable Version

Modified Accelerated Cost-Recovery System (MACRS) + Bonus Depreciation (2008-2009)

Back

Last DSIRE Review: 02/19/2009

Incentive Type: Corporate Depreciation

Eligible Renewable/Other Technologies: Solar Water Heat, Solar Space Heat, Solar Thermal Electric, Solar Thermal Process Heat, Photovoltaics, Landfill Gas, Wind, Biomass, Renewable Transportation Fuels, Geothermal Electric, Fuel Cells, Geothermal Heat Pumps, Municipal Solid Waste, CHP/Cogeneration, Solar Hybrid Lighting, Direct Use Geothermal, Anaerobic Digestion, Microturbines

Applicable Sectors: Commercial, Industrial

Authority 1: 26 USC § 168

Date Effective: 1986

Authority 2: 26 USC § 48

Summary:
Under the federal Modified Accelerated Cost-Recovery System (MACRS), businesses may recover investments in certain property through depreciation deductions. The MACRS establishes a set of class lives for various types of property, ranging from three to 50 years, over which the property may be depreciated. A number of renewable energy technologies are classified as five-year property (26 USC § 168(e)(3)(B)(vi)) under the MACRS, which refers to 26 USC § 48(a)(3)(A), often known as the energy investment tax credit or ITC to define eligible property. Such property currently includes:

- a variety of solar electric and solar thermal technologies
- fuel cells and microturbines
- geothermal electric
- direct-use geothermal and geothermal heat pumps
- small wind (100 kW or less)
- combined heat and power (CHP).
- The provision which defines ITC technologies as eligible also adds the general term "wind" as an eligible technology, extending the five-year schedule to large wind facilities as well.

In addition, for certain other biomass property, the MACRS property class life is seven years. Eligible biomass property generally includes assets used in the conversion of biomass to heat or to a solid, liquid or gaseous fuel, and to equipment and structures used to receive, handle, collect and process biomass in a waterwall, combustion system, or refuse-derived fuel system to create hot water, gas, steam and electricity.

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Incentives/Policies for Renewable Energy

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USDA - Rural Energy for America Program (REAP) Loan Guarantees

Back

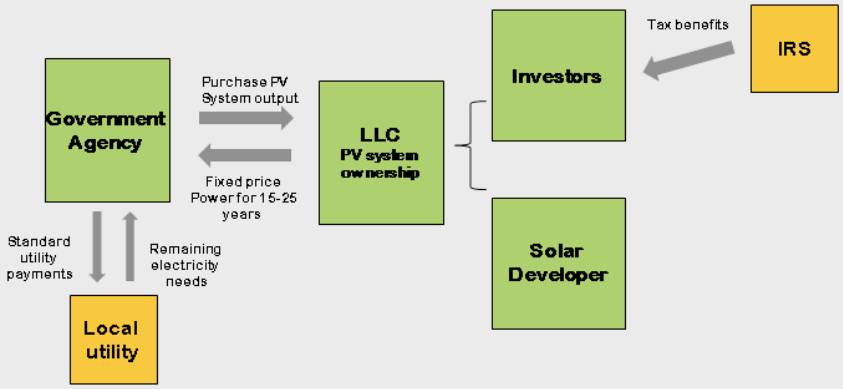
Last DSIRE Review: 05/27/2009

Incentive Type: Federal Loan Program
Eligible Efficiency Technologies: Yes; specific technologies not identified
Eligible Renewable/Other Technologies: Solar Water Heat, Solar Space Heat, Solar Thermal Electric, Photovoltaics, Wind, Biomass, Hydroelectric, Renewable Transportation Fuels, Geothermal Electric, Geothermal Heat Pumps, CHP/Cogeneration, Hydrogen, Direct-Use Geothermal, Anaerobic Digestion, Small Hydroelectric, Tidal Energy, Wave Energy, Ocean Thermal, Renewable Fuels, Fuel Cells using Renewable Fuels, Microturbines
Applicable Sectors: Commercial, Agricultural
Amount: Varies
Max. Limit: $25 million per loan guarantee
Web Site: http://www.rurdev.usda.gov/rbs/busp/bprogs.htm
Authority 1: 7 USC § 8106
Date Enacted: 5/13/2002
Date Effective: FY 2003

Summary:
NOTE: The U.S. Department of Agriculture's Rural Development has issued a Notice of Solicitation of Applications for the Rural Energy for America Program (REAP). The deadline to apply for grants and loan guarantees under this solicitation is July 31, 2009. Grants and loan guarantees will be awarded for investments in renewable energy systems, energy efficiency improvements and renewable energy feasibility studies.

Third Party PPA Structure

Instead of purchasing a PV system, a public entity agrees to **host** the system and **purchase** the electricity. The contract to purchase this electricity is often called the Power Purchase Agreement or PPA.



Caveat: This is just an example. Lots of different structures .

3

Case Study provided by

LightWave Solar Electric

Freeman Webb Building in Nashville, TN

- **10.8 kW** system: Generates 12,960 kWh per year ($2,600/yr)
- Initial investment: $90,700 (about 8.5 cents/watt)
  - TN-CET Grant: **$36,280** ($12,698 tax on grant)
  - Federal tax credit: **$27,210**
  - MACRS over 6 years: **$26,983**
  - Net cost after grant, tax credit, and depreciation benefits: **$12,900**

- 50-year system pays for itself in 5 years and generates revenue thereafter—**approx. $2,600 a year**
- 25-year warranty

- Over 25 years, system will offset:
  - 485,190 lbs of CO_2
  - 729 lbs of NO_x,
  - 2,241 lbs of SO_2,
  - Equivalent to planting 68 acres of trees

www.lightwavesolarelectric.com 615-641-4050

Case Study: Dr. Stephen and Libby Smith Residence

a net zero energy home
7.1 kW grid tied PV system consisting of 36 Sharp 198 modules and a SMA SB7000US inverter capable of producing over 700 kilowatt hours a month. Additionally a Schuco Thermal system to produce hot water consisting of 2 collectors and an 80 gallon storage tank.

Design and Installation by Green Earth Services

Case Study: **Dr. Stephen and Libby Smith Residence.**

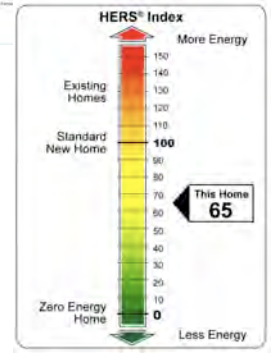
Photovoltaic system cost	**$60,000.00**
Thermal DHW system cost	**$10,000.00**
Total system cost	**$70.000.00**
Less 30% Federal Tax Credit	**($21,000.00)**
Net System Cost	**$49,000.00**

7.128kW system cost is $60,000.00
Less 30% federal tax credit $18,000.00
(less Generation Partners $500.)
Net system cost $41,000.00
7.128 x 1200(estimated annual production /kW) = 8554kWh x $.205 = $1,754.00, $42,000.00/$1,754.00 = maximum 24 years simple pay back.
Less depending on how fast electricity cost rise.
And not looking at the investment in the equity of your home

The First Step

ALWAYS make energy efficiency improvements first.

Energy efficiency is the most cost effective way to reduce utility bills and improve comfort. The less energy a house requires, the smaller and less expensive the solar equipment will be.



FIND A QUALITY INSTALLER

Teaming up with a reliable, experienced solar installer is the single most important strategy for solar success. Choose an experienced local installer.

Ask local solar companies if they have NABCEP-certified installers. **The North American Board of Certified Energy Practitioners (NABCEP)** certifies both SWH and PV installers. Go to www.nabcep.org to find certified installers in your area. The installer should also have a local contractor license.

• **www.findsolar.com** is a National data- base of solar Professionals sponsored by the American Solar Energy Society.

• **The Solar Energy Industries Association (SEIA)** is a national trade association for the solar industry. Check with the local members. www.seia.org

Good links for more information on Solar:

The North American Board of Certified Energy Practitioners (NABCEP) certifies both SWH and PV installers. www.nabcep.org

Interstate Renewable Energy Council (IREC) The Interstate Renewable Energy Council http://www.irecusa.org/

Database of solar and energy efficiency incentives www.dsireusa.org

The U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy - Solar Energy Technologies program http://www.eere.energy.gov/solar/

National Renewable Energy Laboratory - Solar Energy Technologies Program http://www.nrel.gov/solar/

The U.S. Green Building Council has local chapters, and now has a LEED™ (Leadership in Energy and Environmental Design) program for homes. www.usgbc.org

The Solar Energy Industries Association (SEIA) is the national trade association http://www.seia.org/

The Southern Alliance for Clean Energy www.cleanenergy.org

Find Solar www.findsolar.org

For more Information:

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