Financing options, benefits, and cost analysis
Agenda

1. Benefits of solar PV
2. Financing options and incentives
3. Cost analysis
4. Case studies
Benefits of solar PV
Practice benefits

- Allows firms to be more competitive with other practices by providing additional services
- Offer clients lower operating costs
Property owner benefits

Lower and stable electricity prices over the life of the system
Property owner benefits

Increased property value
Property owner benefits

Estimated premiums based on an average-sized 3.6kW system

“Selling Into the Sun: Price Premium Analysis of a Multi-State Dataset of Solar Homes” by Lawrence Berkley National Laboratory, 2015
Property owner benefits

Renewable energy LEED points
• Projects can receive up to seven LEED points for including on-site renewable energy
Community benefits

• Cleaner air
  – Lower greenhouse had emissions
  – Other health and safety benefits
Community benefits

- Lower grid usage
  - Helps avoid peak power days
  - Reduces stress on aging grids
Community benefits

Diffusion of solar puts pressure on non-adopters to conform
Community benefits

Increase in jobs

- In 2016, there were over 260,000 solar workers, a 25% increase over 2015.
Community benefits

Decreased fracking

• Using solar instead of traditional fossil fuels reduces the impacts that practices such as mining and fracking have on individuals and communities
Community benefits

Energy independence

• Renewable energy sources such as solar PV reduce U.S. dependence on foreign energy sources
What is the energy payback for solar PV?

• Consider this in terms of carbon emission reductions

• How long does a PV system have to operate to recover the energy—and associated generation of pollution and CO2—that went into making the system, in the first place?
Energy payback for rooftop PV systems

Reaping the environmental benefits of solar energy requires spending energy to make the PV system. But as this graphic shows, the investment is small. Assuming 30-year system life, PV systems will provide a net gain of 26 to 29 years of pollution-free and greenhouse-gas-free electrical generation.

Photo credit: NREL
Financing options and incentives
Financing options

Two avenues for financing

<table>
<thead>
<tr>
<th>Purchased</th>
<th>Third Party Owned</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Cash</td>
<td>• Lease</td>
</tr>
<tr>
<td>• Loan</td>
<td>• Power Purchase Agreement (PPA)</td>
</tr>
</tbody>
</table>

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U.S. Department of Energy
## Financing options

### What are you buying?

<table>
<thead>
<tr>
<th>Purchased</th>
<th>Third Party Owned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buying an asset</td>
<td>Buying a service, usually with a purchase option</td>
</tr>
</tbody>
</table>
## Financing options

### What is included in the purchase?

<table>
<thead>
<tr>
<th>Purchased</th>
<th>Third Party Owned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generally will not include:</td>
<td>Generally includes:</td>
</tr>
<tr>
<td>• Inverter replacement</td>
<td>• Inverter replacement</td>
</tr>
<tr>
<td>• Operations &amp; Maintenance</td>
<td>• Operations &amp; Maintenance</td>
</tr>
<tr>
<td>• Insurance</td>
<td>• Insurance</td>
</tr>
<tr>
<td>May include:</td>
<td>• Monitoring</td>
</tr>
<tr>
<td>• Monitoring</td>
<td></td>
</tr>
</tbody>
</table>

*Powered by SunShot, U.S. Department of Energy*
## Financing options

### What are the tax implications?

<table>
<thead>
<tr>
<th>Purchased</th>
<th>Third Party Owned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Need to have the tax liability to make use of the federal investment tax credit (ITC) and the commercial tax depreciation</td>
<td>Solar services provider has the tax liability for the federal investment tax credit (ITC) and the commercial tax depreciation</td>
</tr>
</tbody>
</table>
## Financing options

### What are the risks?

<table>
<thead>
<tr>
<th>Purchased</th>
<th>Third Party Owned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building owner responsible for operation and maintenance</td>
<td>Longevity of the solar services provider</td>
</tr>
</tbody>
</table>
## Financing options

**What are the financial benefits?**

<table>
<thead>
<tr>
<th>Purchased</th>
<th>Third Party Owned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return on investment in the form of lower electricity bills</td>
<td>Little or no upfront cost, usually cash positive or neutral in the first year</td>
</tr>
</tbody>
</table>
Solar PV loans

U.S. DEPARTMENT OF ENERGY

Energy Efficiency & Renewable Energy
Solar PV loans

HomeStyle Energy mortgage
• Offered by Fannie Mae
• Loan for up to 15% of the as-completed appraised property value
• Must show positive ROI
Solar PV loans

• **Home Equity Loan**
  – Bank loan secured with equity from the house (if available)

• **Energy Efficient / Solar Loan**
  – Low APR, offered by large banks and local credit unions

• **Loan provided by the dealer/contractor**
Filter by State: Pennsylvania

<table>
<thead>
<tr>
<th>Company</th>
<th>Service Area</th>
<th>Products</th>
<th>Term</th>
<th>Learn more</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admirals Bank</td>
<td>PA, AK, AL, AR, AZ, CA, CO, CT, DC... More</td>
<td>Mortgage, Equipment</td>
<td>10-20 years</td>
<td>Learn more</td>
</tr>
<tr>
<td>AmeriFirst</td>
<td>PA, AK, AL, AR, AZ, CA, CO, CT, DC... More</td>
<td>Mortgage</td>
<td></td>
<td>Learn more</td>
</tr>
<tr>
<td>Dividend Solar</td>
<td>PA, AK, AL, AR, AZ, CA, CO, CT, DC... More</td>
<td>Equipment</td>
<td>20 years</td>
<td>Learn more</td>
</tr>
</tbody>
</table>
Property Assessed Clean Energy (PACE)

- **Property Owner**
  - No/Low up-front costs
  - Competitive-interest assessment
  - Additional savings from tax-deductible interest

- **City or Local Government**
  - Creates tax assessment district
  - Issues bonds or uses other funding sources
  - Places liens on properties

Photo Credit: NREL
Third party owned options

• **Lease**
  - Fixed $ per month
  - May be pre-paid or monthly

• **Power Purchase Agreement (PPA)**
  - Fixed $ per kWh produced by system
  - Customer buys *all* power produced by system
Local incentives

Database of State Incentives for Renewables & Efficiency®

Find Policies & Incentives Near You

Zip Code

Search

Find Policies & Incentives by State

http://www.dsireusa.org
<table>
<thead>
<tr>
<th>Name</th>
<th>State/Territory</th>
<th>Category</th>
<th>Policy/Incentive Type</th>
<th>Created</th>
<th>Last Updated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Energy Investment Tax Credit (ITC)</td>
<td>US</td>
<td>Financial Incentive</td>
<td>Corporate Tax Credit</td>
<td>03/15/2002</td>
<td>02/20/2017</td>
</tr>
<tr>
<td>Interconnection Standards</td>
<td>PA</td>
<td>Regulatory Policy</td>
<td>Interconnection</td>
<td>12/16/2004</td>
<td>01/24/2017</td>
</tr>
<tr>
<td>Net Metering</td>
<td>PA</td>
<td>Regulatory Policy</td>
<td>Net Metering</td>
<td>01/01/2000</td>
<td>01/23/2017</td>
</tr>
</tbody>
</table>
Solar Renewable Energy Credits (SRECs)

SREC Markets and Solar RPS States in the U.S.
Eligible SREC markets listed in each state

States with SREC markets: RPS, solar requirement and SACP
States eligible to sell into other state SREC markets
States with an RPS solar requirement but no SREC market yet

Photo credit: SREC Trade
Solar Renewable Energy Credits (SRECs)

- 1 SREC = 1 Mwh of solar electricity
- A 10kW facility generates around 12 SRECs annually
- SRECs are sold separately from the electricity
- Value is determined by market supply and demand
Solar Renewable Energy Credits (SRECs)

Pennsylvania SREC market prices

Bid Prices for PA - Last Twelve Months (LTM)

$14.50

$7.00

Photo credit: SREC Trade
Federal Investment Tax Credit (ITC)

Video by Pick My Solar
Federal Investment Tax Credit (ITC)

Everything you need to know about the extension of the ITC

<table>
<thead>
<tr>
<th>Year</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>30%</td>
</tr>
<tr>
<td>2017</td>
<td>30%</td>
</tr>
<tr>
<td>2018</td>
<td>30%</td>
</tr>
<tr>
<td>2019</td>
<td>30%</td>
</tr>
<tr>
<td>2020</td>
<td>26%</td>
</tr>
<tr>
<td>2021</td>
<td>22%</td>
</tr>
<tr>
<td>2022</td>
<td>10%</td>
</tr>
</tbody>
</table>

permanent 10% for commercial credit

Photo credit: EnergySage
Depreciation deductions are available if:

- Taxpayer owns the property
- Solar system is installed for a business, not residential property
Solar cost analysis
Cost analysis factors

- Total system cost
- Available incentives and tax credits
- Financing model (loan, lease, PPA)
- System design
- Utility rates
Calculate your solar panel savings in 3 simple steps

Use this solar panel calculator to quickly estimate your savings with solar. Estimates are based on your roof, electricity bill, and actual offers in your area.

For more precise information, make sure to register your property on EnergySage to receive and compare quotes from pre-screened solar installers.

1. Enter your property details
Your address will allow us to determine sun & weather data, applicable rebates and tax credits, and your roof’s suitability to generate your estimate.

https://www.energysage.com/solar/calculator
EnergySage Solar Calculator

**PAY CASH**
- Own the system; maximize savings
- $31,000 20 Year Net Savings
- $17,000 Net Cost
- 8.3 Years Payback
- 3% or more Increase in Property Value

**$0-DOWN LOAN**
- Own the system; no up-front cost
- $21,000 20 Year Net Savings
- $0 Out-of-Pocket Cost
- Immediate Payback
- 3% or more Increase in Property Value

**$0-DOWN LEASE/PPA**
- Rent the system; no up-front cost
- $12,000 20 Year Net Savings
- $0 Out-of-Pocket Cost
- Immediate Payback
- 0% Increase in Property Value
https://www.energysage.com/solar
Welcome to SAM

published by admin on Mon, 2010-04-05 16:58

The System Advisor Model (SAM) is a performance and financial model designed to facilitate decision making for people involved in the renewable energy industry:

- Project managers and engineers
- Policy analysts
- Technology developers
- Researchers

Download a published description of SAM 2014.1.14 (PDF 1.6 MB)

https://sam.nrel.gov/
System Advisor Model (SAM)

**Step 1:** Select technology type

**Step 2:** Select financing model
System Advisor Model (SAM)

Step 3: Select location
Step 4: Select module model
Step 5: Select inverter
System Advisor Model (SAM)

Step 6: Design system
Step 7: Enter system costs, financial parameters, and incentives
Step 8: Enter electricity rates and electric load
System Advisor Model (SAM)

Monthly energy production

[Bar chart showing monthly energy production from January to December.]
System Advisor Model (SAM)

Monthly energy and load

![Bar chart showing monthly energy and load](chart.png)

- **System energy (AC)**
- **Electricity load**
- **Net metering credit in kWh**

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U.S. Department of Energy
Solar case studies
Case Study 1

Vista La Mesa Christian Church
La Mesa, CA

- Annual utility bill before solar: $10,386.40

Photo Credit: CSE
Case Study 1

**Vista La Mesa Christian Church**
La Mesa, CA

- Annual utility bill after solar: $1,573.18
- System size: 18.3 kW
- Designed to cover 85% of historic consumption

Photo Credit: CSE
Case Study 1

Vista La Mesa Christian Church
La Mesa, CA
• System cost: $70,380
• Local incentive: $16,073
• Net system cost: $54,307
• Annual bill before solar: $10,386.40
• Annual bill after solar: $1,573.18
• Annual savings: $8,813.22

Payback period: 6.2 years
Case Study 2

Charleston Regional Center
Charleston, SC
LEED Platinum design included:
• Solar PV
• Wind generation
• Energy efficiency improvements
• Water saving improvements

Photo Credit: Charleston Regional Center
Case Study 2

Charleston Regional Center
Charleston, SC

- System size: 45.7 kW
- Designed to cover 100% of historic consumption combined with wind
- System cost (with wind): $500,000
- Annual energy savings: $9,296
### Case Study 2

**Charleston Regional Center**

Charleston, SC

<table>
<thead>
<tr>
<th><strong>SA 59 - Building 84</strong></th>
<th><strong>Summary Financial Statistics</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment - Renovation</td>
<td>$1,300,000</td>
</tr>
<tr>
<td>Cost avoided - Renovation</td>
<td>$380,000</td>
</tr>
<tr>
<td>Investment - Renewable Energy</td>
<td>$500,000</td>
</tr>
<tr>
<td>Savings - Energy/year</td>
<td>$9,296</td>
</tr>
<tr>
<td>Savings Water/year</td>
<td>$843</td>
</tr>
<tr>
<td>Total Utility Savings/year</td>
<td>$10,139</td>
</tr>
<tr>
<td>Total Utility Cost/year/SQFT</td>
<td>0.30</td>
</tr>
<tr>
<td>Total Utility Cost/SQFT - Private Sector</td>
<td>$1.76</td>
</tr>
<tr>
<td>Total Utility Cost /SQFT - Baseline</td>
<td>$0.41</td>
</tr>
<tr>
<td>ROI percent</td>
<td>8.4%</td>
</tr>
<tr>
<td>Payback in years (Renovation)</td>
<td>12</td>
</tr>
<tr>
<td>NPV including Cost Avoidance in Dollars</td>
<td>$83,119</td>
</tr>
<tr>
<td>NPV of Renewable Energy Investment - Dollars</td>
<td>($313,911)</td>
</tr>
</tbody>
</table>
Summary

• Solar PV provides benefits for both the property owner and the community
• Two avenues for solar financing: purchased and third party owned
• Energy Sage Calculator can provide a quick cost analysis
• System Advisor Model (SAM) can provide a in-depth cost analysis
Which of the following helps home and business owners finance energy efficiency and renewable energy projects for their property?

a) Net energy metering
b) Shared renewables
c) Property assessed clean energy
d) Solar PV payback
Which of the following are key concepts that solar PV advocates should be able to communicate to clients?

a) Community benefits, including energy independence and lower greenhouse gas emissions

b) How including solar can be crucial to avoiding peak power days

c) Financing options and tax incentives

d) Available technologies for calculating estimated solar savings

e) All of the above