

SOLAR ELECTRIC INVESTMENT ANALYSIS SERIES

Conducting a Financial Analysis

Agricultural Energy Efficiency Initiative of
Virginia Cooperative Extension / Virginia Tech
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DISCLAIMER:

This presentation and/or the information provided is not meant and should not serve as financial or legal advice and should only be used as an educational resource. Be sure and **consult with your financial advisor, tax accountant, utility provider, and/or attorney** before signing an agreement.

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Program Learning Objectives

- Examine Why Farmers are Considering PV Solar
- Recognize Common Challenges with Solar Proposals
- Identify Key Cash Flow Mechanics of Investing in PV Solar
- Understand Benefits and Challenges of Financial Metrics
- Additional Resources
- Closing thoughts



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Why Farmers are Considering PV Solar?



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Why Install a Solar PV System

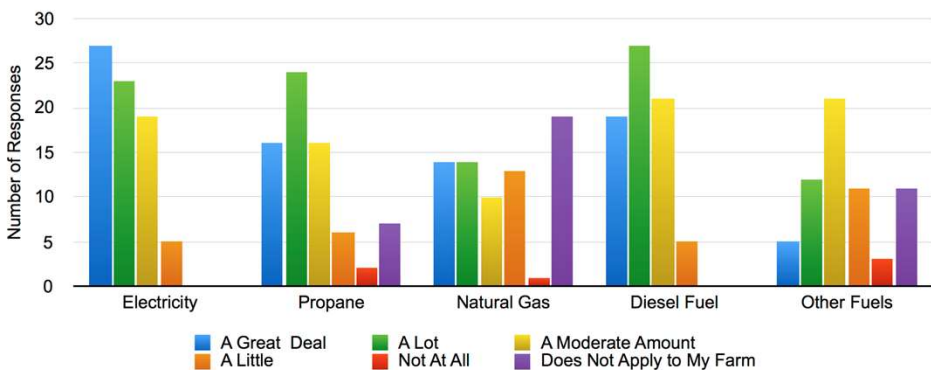
- I want renewable
- I want to produce my own
- I need the electricity
 - Remote system
- Marketing
 - Needs to been seen by customers?
- Investment

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Why Install a Solar PV System

Question: Please indicate your level of concern regarding current or future energy prices for the following energy sources on your farm.



Energy Source	A Great Deal	A Little	A Lot	Not At All	A Moderate Amount	Does Not Apply to My Farm
Electricity	27	5	23	0	19	0
Propane	16	6	24	2	16	7
Natural Gas	14	13	14	1	10	19
Diesel Fuel	19	5	27	0	21	0
Other Fuels	5	11	12	3	21	11

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Common Challenges with Solar Proposals



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“I received a proposal for a 50 kW roof top PV solar system that will payoff in less than 3 years and provide nearly \$350,000 in energy savings over the life of the project. What do you think?”


- What is a Solar Renewable Energy Credit Rebate?
- The REAP Grant is listed as “probable”, what happens if it is not funded?
- Why is the Federal Investment Tax Credit significantly higher than 30%?
- When is the last time you experienced a 10% energy escalation?
- How much do you have to write a check for and why is the analysis focusing on on the net system cost?
- Was simple payback the only financial metric used to measure success?




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Key Cash Flow Mechanics of Investing in PV Solar

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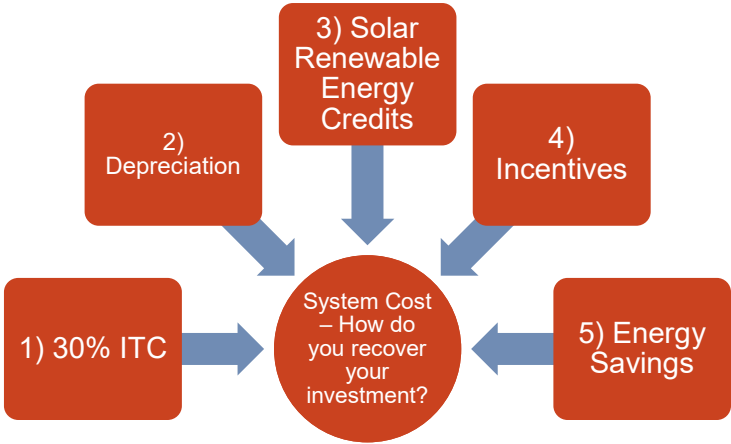
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Project Overview

How will you get your money back and what are the assumptions?



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graph TD; A[1) 30% ITC] --> C((System Cost - How do you recover your investment?)); B[2) Depreciation] --> C; D[3) Solar Renewable Energy Credits] --> C; E[4) Incentives] --> C; F[5) Energy Savings] --> C;
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Federal Business Energy Investment Tax Credit (ITC)

- ITC program offers a 30% tax credit of the eligible construction and equipment costs.
- In general, the original use of the equipment must begin with the taxpayer, or the system must be constructed by the taxpayer.
- The energy property must be operational in the year in which the credit is first taken.
- Businesses that receive other incentives are advised to consult with a tax professional regarding how to calculate this federal tax credit.


The Federal Business Energy Investment Tax Credit (ITC) Schedule for Photovoltaic Solar


12/31/16	30%
12/31/17	30%
12/31/18	30%
12/31/19	30%
12/31/20	26%
12/31/21	22%
12/31/22	10%
Future Years	10%

Source: IRS Instruction Form 3468
www.DSIRE.org



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Federal Business Energy Investment Tax Credit (ITC)


What is an eligible construction and equipment costs?


- Eligible property is property that is necessary for the production of property described in section 48C(c)(1)(A)(i), for which depreciation or amortization is available and is tangible personal property or other tangible property (**not including a building or its structural components**), but only if the property is used as an integral part of the qualifying advanced energy project.
- IRS Instructions for Form 3468 available for download at:
www.irs.gov/pub/irs-pdf/i3468.pdf

Source: <http://www.irs.gov/pub/irs-pdf/i3468.pdf>
<https://www.irs.gov/pub/irs-pdf/i5695.pdf> (residential)



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Project Depreciation

- For equipment on which an Investment Tax Credit (ITC) is claimed, the owner must reduce the project's depreciable basis by one-half the value of the ITC.
- MACRS property life - Qualifying solar energy equipment is eligible for a cost recovery period of five years.
- Equipment placed in service before **January 1, 2018** can qualify for 50% bonus depreciation.

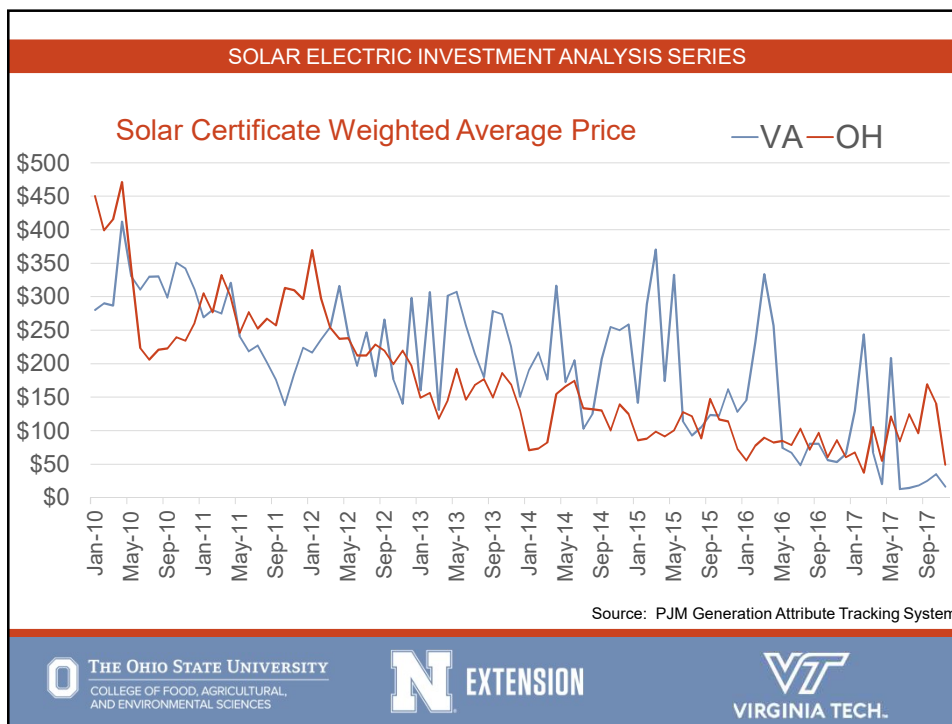


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Solar Renewable Energy Credits (SRECs)

- SREC's represent the generation environmental attributes of solar energy systems and can be traded separately from commodity electricity.
- In Ohio an SREC is equal to one-megawatt hour, which is 1,000 kWh's.
- Many, SREC's have a lifetime or expiration period 5 years following acquisition.
- System owners can sell their credits as they are generated, or in advance of being generated in the futures' market.
- Taxable? - IRS Private Letter Ruling 201035003 (which cannot be cited as precedent) the upfront **sale of SRECs was deemed to be a taxable transaction.**







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Other Incentives?

- Despite rapidly declining costs for PV solar, incentives are still important to the cost-effectiveness of a project.
- Incentives come from four primary sources – federal, state and local government, and utility companies.
- Incentives typically target specific sectors, so different incentives exist for residences, businesses, and agricultural producers.
- In most cases, grant funding is.....
 - **TAXABLE INCOME**
 - **NOT GUARANTEED**


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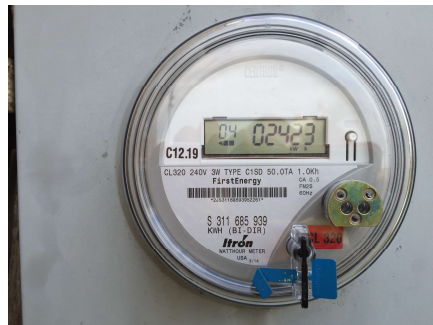

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Value of Energy Savings

Key considerations for estimating the value of energy savings

- System production
- Rate structure
- Net metering agreement
- Energy escalation



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Benefits and Challenges of Financial Metrics



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Common Project Budgeting Tools

- Simple Payback Period
- Rate of Return
- Net Present Value
- Profitability Index
- Levelized Cost of Electricity



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Critical Investment Characteristics to Consider

- Time value of money
- All variable and ongoing cash flows
- Energy price escalation
- Variable rate electricity pricing
- Alternative investment options
- What happens after payback



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Simple Payback Period

- Period of time required to recoup the funds expended in an investment, or to reach the break-even point.

$$\text{Payback (years)} = \frac{\text{Initial Cost (\$)}}{\text{Annual Production (kWh/year)*Value (\$/kWh) - O\&M (\$/year)}}$$

\$19,000 (system cost after incentives) / \$6,000 (Year 1 Energy Savings) = 3.1 years

OR

\$212,500 (total system cost) / \$6,000 (Year 1 Energy Savings) = 35.4 years

Note: SAM uses the values from the cash flow described below to calculate the payback period.



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Internal Rate of Return (IRR)

- The gain or loss of an investment over a specified period expressed as a percentage increase over the initial investment cost.
- The IRR is equal to the discount rate that makes the NPV equal zero.
- Calculating the IRR is difficult and is basically done through trial and error.
- NOTE: always pick the project with the highest NPV, not necessarily the highest IRR.



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Net Present Value (NPV)

- How much money the system will generate (save) above the costs
- Yet ... Money **Now** is more valuable than money **Later**
- So a discount is applied
 - Discount rate should estimate the risk or uncertainty of future cash flows.
- Net Present Value (NPV) is a formula used to determine the present value of an investment by the discounted sum of all cash flows received from the project.
- **Positive is good, Negative is bad**



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Levelized Cost of Electricity (LCOE)

- The LCOE represents the per-kilowatt hour cost of building and operating a power plant over an assumed financial life and duty cycle.
- $LCOE = \text{Total Life Cycle Cost} / \text{Total Lifetime Energy Production}$
- Real (Constant) LCOE is a constant dollar, inflation-adjusted value.
- Nominal (Current) LCOE is a current value.
- Be cautious when using LCOE to compare different types of generation for example Dispatchable vs Nondispatchable dollar value.



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Comparison of Financial Metrics		
Metric	Strengths	Weaknesses
Simple Payback	<ul style="list-style-type: none"> • Easy to calculate and understand 	<ul style="list-style-type: none"> • Overlooks time value of money • Variable and ongoing cash flows • Alternative investment options • What happens after payback? • not recommended when evaluating alternatives involving financing and tax features
Levelized Cost of Energy	<ul style="list-style-type: none"> • Combines fixed costs and variable costs into a single measure (Kwh) • Easy to understand 	<ul style="list-style-type: none"> • Cannot estimate the changes in variable costs • Cannot compare different types of generation
Internal Rate of Return	<ul style="list-style-type: none"> • Easy to illustrate project value • Accounts for all cash flows • Considers time value of money 	<ul style="list-style-type: none"> • IRR is also not recommended when ranking projects • Assumes you can always continue to reinvest returns at the same rate
Net Present Value	<ul style="list-style-type: none"> • Accounts for all cash flows • Considers time value of money • Adjust for risk • Can rank projects 	<ul style="list-style-type: none"> • No major weaknesses

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2015 Proposal for a 50 kW Roof Top PV Solar System	
Simple Payback Calculation from Farmers Proposal	
Net System Cost	\$19,000
Year 1 Electricity Savings	\$6,600
Payback Period	2.8 Years
Additional Financial Metrics from SAM	
Levelized Cost of Energy (Nominal)	16.46 ¢/kWh
Levelized Cost of Energy (Real)	13.01 ¢/kWh
Cash Flow Payback Calculation	greater than analysis period
Internal Rate of Return	-2.84%
Net Present Value	-\$67,827

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Additional Resources (Tools such as System advisory model)



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National Renewable Energy Laboratory System Advisory Model (SAM)

- SAM estimate both system production and the financial impacts of renewable energy projects.
- Simulates a detailed cash flow analysis, payback period, net present value, levelized cost of energy and electricity savings.
- The SAM Model is available for download at www.sam.nrel.gov
- PV Watts – www.pvwatts.nrel.gov
- <http://www.solarprojectbuilder.org>



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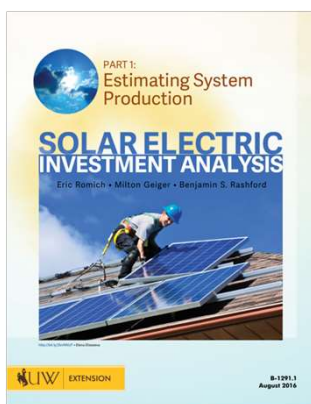
Lessons Learned

- Get multiple quotes
- Simple payback calculation is not the correct tool to evaluate projects
- Don't mix pre-tax and post-tax numbers
- Focus on the system cost, excluding incentives and assumptions
- Every farm and solar proposal is unique
- Accurately evaluate the value of energy savings (net excess generation)
- Review project with utility representative, accountant, and attorney



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Additional Resources



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Thank You!

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