Returns on Renewable Energy Investments

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Florida Small Farms and Alternative Enterprises Conference

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Energy “Crisis” and Renewable Energy Solutions

• “Small family farmers are directly threatened by large-scale mechanization developed in an era of cheap energy…The energy crisis is an economic opportunity for America’s small family farmers.”

• “The small family farmer can make use of renewable energy resources, demonstrating that skill and resourcefulness…is once again at a premium in agriculture.”

What this talk will cover

1. General advice
   • Realism about cost and risks
   • Finding incentives
   • Finding equipment and technical assistance
   • How to work with dealers and installers
   • Renewable energy systems and technologies
Realism about Cost and Risks
Renewable energy reduces many kinds of risk...
But it is not risk-free.
Renewable sources of energy are all around us…

- Sunlight
- Natural fertility of soil
- Steady internal temperature of Earth

10,000X what we use

- Solar
- Wind
- Plant materials

- Heat
- Electricity
- Burning
- Biofuels
- Other processes

“Bioenergy”

- Geothermal heating and cooling
But small-scale renewable energy is (usually) not cheap.

<table>
<thead>
<tr>
<th>Location</th>
<th>Energy cost (cents/kWh)</th>
<th>Solar radiation (kWh/m²/yr)</th>
<th>Energy generated (kWh/yr)</th>
<th>Value of energy generated ($/yr)</th>
<th>System Cost ($4.10/watt) *</th>
<th>Simple Payback (years)</th>
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Source: National Renewable Energy Laboratory

* Average installed cost for residential PV systems in 2009, including incentives

KUA Residential Rate 12.31 cents/KWh up to 1000 KWh, 13.575 cents/KWh over 1000
3 reasons why it’s tough to beat utility and gas station prices

1. Economies of scale
2. Mature vs. Immature Technologies
3. Subsidies – at least $10 billion a year in fossil fuel subsidies in the USA
The *time value of money* also works against you.

RE systems – pay for all the energy production up front.

Electric utility lets you pay as you go.
Four factors that *might* work in your favor

1. Rising cost of energy
2. Incentives
3. Financing
4. Impact on property value

Might not work though, natural gas prices are at a ten year low. April 2012 – 2.00/MCF
Five good reasons to consider a renewable energy project

1. Hedge against energy price increases and supply issues
2. New land management possibilities
3. Environmental benefits
4. Image and marketing
5. Personal satisfaction

Location is Critical!
What it might look like:
Phil Foster Ranches, Hollister, CA
Finding Incentives
Four good places to look

1. DSIRE (www.dsireusa.org)
2. Dealers/installers
3. Your utility
4. Your state energy office
FLORIDA
Incentives/Policies for Renewables & Efficiency

See Federal Incentives
See All Summaries
See Residential Incentives Only

Financial Incentives

Corporate Tax Credit
- Renewable Energy Production Tax Credit

Green Building Incentive
- Miami-Dade County - Expedited Green Buildings Process
- Volusia County - Green Building Program

Industry Recruitment/Support
- Miami-Dade County - Targeted Jobs Incentive Fund

Local Loan Program
- City of Lauderdale - Revolving Loan Program
- St. Lucie County - Solar and Energy Loan Fund (SELF)

Local Rebate Program
- City of Fort Lauderdale - Smart Watts Rebate Program
- City of Longwood - Raising Energy Efficiency Rebate Program
- Miami-Dade County - Commercial Energy Star Appliance Rebate Program
- Miami-Dade County - Residential Energy Star Appliance Rebate Program

Other Incentive
- Lakeland Electric - Solar Water Heating Program
- Progress Energy Florida - SunSense Schools Program
Sweet Deal #1: Business Energy Investment Tax Credit

• Allows businesses to claim a tax credit of 30% of the cost of solar, small wind, and fuel cells.
• No limit.
• 10% credit for geothermal, microturbines and CHP.
• In place since 2005, expanded by the 2009 American Recovery & Reinvestment Act.
• Will last until December 31, 2016.
• Similar 30% tax credit for homeowners.
• Conditions and exclusions apply.
Sweet Deal #2: USDA’s Rural Energy for America Program

- Grants, loans, and loan guarantees for renewable energy and energy efficiency projects.
- Grants up to 25% of eligible project costs.
- Farms and rural small businesses eligible. Nearly 8,000 projects funded from 2003-2010.
- $99 million 2010 → $75 million 2011 → $38.5 million 2012
- Contact your local or state USDA Rural Development office, or your state’s energy coordinator.
- Info at www.farmenergy.org

Anna Ward|Rural Business Cooperative Service|Technician
Rural Development - U.S. Department of Agriculture
4440 NW 25th Place
Gainesville, FL 32606
Phone: 352-338-3496 Fax: 352-338-3450
www.rurdev.usda.gov

8 projects funded this year
Other USDA programs

- EQIP Agricultural Energy Management Plan (NRCS)
- Conservation Stewardship Program (NRCS)
- Conservation Innovation Grant Program (NRCS)
- Value-Added Producer Grant (USDA Rural Development)
- Biomass Crop Assistance Program (Farm Service Agency)
- And many others
Florida Specific Incentives

• Corporate Tax Credit ($0.01/KWh)
• Feed-in tariff – Gainesville – $0.24/KWh for <10KW systems
• Orlando production incentive - $0.05/ KWh REC
• Sales tax Exemption - Statewide
• Low interest loans
  • Tallahassee, 5% for 10 years
  • Clay (solar heating) 8-11%
  • Orlando PV and SHW 2-5.5%, 10 years
• Rebates – a TON of stuff there, check dsireusa.org
Finding Equipment and Technical Assistance
ATTRA Resources

www.attra.org
NCAT’s Small-Scale Intensive Farm Training (SIFT) Program
What if every community—even those in food deserts—could increase their food security by producing their own healthy food? NCAT believes they can. And through our Small-Scale Intensive Farm Training (SIFT) program, we are setting out to show them how. » Learn more.

New Small-Scale Agriculture Publications
Are you interested in small-scale, intensive food production but don't know where to get started? NSAP has made a CD available that contains a series of new publications that can help. Season extension, successful composting and the equipment you will need are all covered. Have a copy of the eight PDFs sent right to your door. » Learn More.

Directory of Energy Alternatives
Looking for energy-related equipment, funding, or a local business with the right expertise? Try the Directory of Energy Alternatives.

Ecological Pest Management
The NCAT Sustainable Ag Project offers an online pest management tool for farmers. This database highlights reduced-risk materials that can be integrated with ecological pest management strategies.

Quick Links
- Avian Influenza in Free-Range and Organic Poultry Production
- Organic Seed Suppliers
- Organic Livestock Feed Suppliers
- Disaster Assistance
- Sustainable Poultry
- ATTRA Newsletters
- Cosecha Mensual (Spanish-language e-newsletter)

Find us on Facebook

www.attra.org/dea

access or low-income farmer and find that one of our publications is just not in your budget, please call 800-346-9140.
Directory of Energy Alternatives

Click to search by state

Add your listing to our directory.
(Or update an existing listing)

Energy-related businesses, organizations, and institutions that are focused on the development and support of sustainable agriculture and rural people are welcome to submit or update listings, or if you would like it removed, click here.

www.attra.org/dea
Dealer Websites

For Example (Not an Advertisement)
Welcome To Build-It-Solar

Plans, tools and information to help you build renewable energy and conservation projects.

Hundreds of projects -- from changing a light bulb to building a solar home.

Design information and tools for building renewable energy projects.

An Experimental section for backyard inventors.

Nothing For Sale here -- just free ideas, plans, and information.

A Few Example Projects (from a thousand or so)

New Content
Last update January 17, 2012
An easy/cool DIY LED can light retrofit...
Extensive R Values table...
Using stored solar heat to cook after sunset...

www.builditsolar.com
Working with Dealers and Installers
Some questions to ask

• What is your experience designing/building this type of system? How many years? How many projects?

• Can you provide references—past clients that I can talk to?

• Are you certified by NABCEP (North American Board of Certified Energy Practitioners)?

• Is a site assessment part of the bid? If so, what is included?

• What incentives are available? Who handles the paperwork?

• Do you provide a maintenance or service warranty?

• Does your bid reflect total costs?

• Are there interconnection costs? Do you work with my utility to complete grid interconnection?
Get bids.
Grid-Tied Solar-Electric (Photovoltaics)
Average-sized grid-tied system

$26,173 for 4,700 watts @ $5.56/watt
< $7,851 > for 30% fed tax credit
< $9,400 > for FPL rebate

$8,922 final system cost

System should produce 6,410 kWh per year.

11.3 year payback
$79,252 for 19,200 watts @ $4.12 / watt
< $23,776 > for 30% fed tax credit

$55,476 final system cost

System should produce 25,728 kWh per year.

Feed- in tariff = 0.22/KWh, $5,660/yr revenue, 9.8 year payback
Ballpark Costs & Risks

✓ Expect to pay $3-$9 per watt, including incentives.
✓ Among the least risky renewable energy projects; a fairly “mature” technology.
✓ Low maintenance requirements
✓ Typical warranties of > 20 years on panels
✓ Experienced installers can be found in most locations
✓ Rapidly dropping prices on panels

Common problems/concerns
✓ Disappointing energy output
✓ Interconnection complications
Off-Grid / Remote Solar-Electric
Agricultural Uses

**Common**
- Electric fence chargers
- Pumping
- Lighting
- Small motors, e.g. fans
- Crop drying
- Irrigation system surge valves

**Less common**
- Side roll sprinkler mover
- Solar tractors

New management possibilities
How a solar pumping system works

- PV Array
- Motor/Power Controller
- Storage Tank
- Pump/Motor
Small pumping system with tracking rack

- 25 cow-calf pairs; 2-3 miles from power
- Two 120-Watt solar panels
- Submersible diaphragm pump delivers 1 GPM from 160’ well or 900 GPD
- Cost of solar components: $3,200
Trailer mounted system

- 150 cow-calf pairs; over a mile from power
- Seven 60-Watt solar panels (trailer-mounted)
- Submersible centrifugal pump delivers 6.5 GPM from 60’ well or 3,600-4,000 GPD.
- Cost of solar components: $10,650
Very large system

- 350 cow-calf pairs; >5 miles from power
- 24 120-Watt solar panels on two tracking racks
- Surface piston pump delivers 11 GPM or 7,500 GPD.
- Cost of solar components $24,500
• Pumps surface water over two miles to the top of a ridge, against over 400 feet of head.

• Fills 8,000 gallon storage tank and six 1,000+ gallon stock tanks
Ballpark Costs & Risks (Solar Water-Pumping)

✓ Expect to pay $2,000 - $8,000 for installed solar components.
✓ Tracker $750-$2,000, increases power 30-50% in summer.

Common problems/concerns

✓ Best-suited to low-flow, low-pressure, and low-head situations.
✓ Pumping from deep wells (>250 feet) is expensive.
✓ Well-drilling cost and complications.
✓ Complications related to remote locations
✓ Disappointing flow volumes
✓ Vandalism?
✓ Cold weather/freezing issues
Battery-based system instead of utility line extension

$27,509 for 2,820 watts @ $9.75/watt
< $8,253 > for 30% fed tax credit
$19,256 final system cost
$25,000 1 mile Utility line extension avoided

System should produce 3,666 kWh per year.
Instant payback, but.....
Solar Water Heating
(“Solar Thermal”)
Agricultural Applications

• Suitable for any farming operation that uses a lot of hot water.
• Consider as replacement for electric or propane water-heating.
• Dairies should probably do heat recovery on refrigeration system and/or heat exchange on milk first.

From www.builditsolar.com
Heating transplant tables and space-heating

- Cost $8,000; $3,900 after NC and federal incentives.
- 250 gallon “drain down” system
- Cut propane costs from $3,000 to $1,000 per year.
Solar Water Heating for Greenhouses

Design issues

• Freeze protection a must.

• No toxic fluids around crops or leaking into soil.

• Need to dump heat (or disable) in summer months, if sized for winter needs.

• Backup heating system desirable.

• Tubing can be buried or above-ground, depending on use of greenhouse.
Flat plate collectors: simple and durable
Evacuated Tube Collector

- Newer technology; more expensive.
- Highest temperature output.
- Does not shed snow & ice.
Simple Payback for Solar Hot Water Systems (Gas)  
(Not Considering Incentives)

Payback Period  
(Years)

- 0 - 5
- 5 - 10
- 10 - 15
- 15 - 20
- 20 - 30
- 30 - 40
- 40 - 50
- 50 - 60
- > 60

Assumes:
- System cost of $150/ft²
- System efficiency of 40%
- Annual average solar resource for tilt=latitude collector
- Average commercial natural gas rate for 2008 by state

This map was produced by the National Renewable Energy Laboratory for the U.S. Department of Energy. Map created by Donna Heimiller - Oct. 7, 2010
Simple Payback for Solar Hot Water Systems (Elec) (Not Considering Incentives)

Payback Period (Years)

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- 30 - 40
- 40 - 50
- 50 - 60
- > 60

Assumes:
- System cost of $150/ft²
- System efficiency of 40%
- Annual average solar resource for tilt=latitude collector
- Average commercial electricity rate for 2008 by utility/state*

* Source: Ventyx and EIA state average.

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Ballpark Costs & Risks

• Typical residential system $6,000-$10,000 without incentives.
• Collectors usually have 10-20 year warranty and should last 30 years or more.
• Modest maintenance requirements. Transfer fluid normally lasts 10-20 years.

Common problems/concerns

• Lingering image problems from market crash in early 1980s.
• Poor system design, leading to disappointing output or (worse) frozen and bursting pipes, overheated systems
• Reports of gradual loss of vacuum in evacuated tube collectors (which may not be covered by the warranty).
• Degraded performance over time, e.g. from scale buildup.
Some other options
Biodiesel:
Phillip Barker (Oxford, NC): $1.35 per gallon (from waste vegetable oil).
Petroleum diesel cost reduced from $12-$14,000 to zero.
Biodiesel:
Thad Doye (Walters, OK): $4.38 per gallon after 3 years from sunflower seeds grown on the farm

Accounting for everything including labor, growing oilseed, and second year the crop failed
Biodiesel Ballpark Costs & Risks

• Equipment costs range from $500 to tens of thousands.

Common problems/concerns

• Not fully mature; the realm of creative do-it-yourselfers.
• Failed reactions, messy/sticky
• Challenging to make high-quality fuel that is safe, legal, and environmentally benign.
• Engine damage is a possibility, especially from SVO.
• Fires and explosions have happened.
• Permitting problems
• Waste-handling problems
Small biogas: an option on any small farm.
Small scale ethanol
US wind map - Not much wind in South Eastern US

Max elevation in Florida 345 feet - not much potential for hydroelectric
Thank you for your attention!

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