



Wealth Creation in Rural Communities

Financing Renewable Energy Projects: An Overview

by Michael Waldhier
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Wealth Creation in Rural America

This report is part of the Wealth Creation in Rural America initiative, funded by the Ford Foundation. The aim of the initiative is to help low-wealth rural areas overcome their isolation and integrate into regional economies in ways that increase their own-ership and influence over various kinds of wealth. The initiative has produced nine previous papers, which can be found at <http://www.yellowwood.org/wealthcreation.aspx>. The goal of this report is to advance the initiative's broad aim of creating a comprehensive framework of community ownership and wealth control models that enhance the social, ecological, and economic well-being of rural areas.

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Financing Renewable Energy Projects: An Overview

Investment in and use of renewable energy is being encouraged in the U.S. via financing options that include a range of local, state, and federal, and private programs and incentives. Depending on the type of renewable energy and purchaser, federal renewable energy tax credits, renewable portfolio standards and state mandates, green power programs, net metering, private loan/financing programs, state financial incentives, and related options are just several of the financing opportunities available for the purchase and installation of renewable energy technologies.

What is renewable energy? Renewable energy is energy that is replenished by nature and comes from natural resources, including the sun, tides, rain, wind, and geothermal sources. It is “captured” and distributed via a number of technologies, including wind turbines, hydroelectric power stations, photovoltaics and heat engines, ethanol fuel plants, and geothermal heat pumps, among others. Local, state, and federal interest in renewable energy is considerable—in fact, in 2008, annual investment in new renewable energy capacity reached \$120 billion.

While renewable energy and its related technologies offer viable alternatives to fossil fuel reliance, these technologies are often criticized for being unattractive or too distributed, or having negative environmental impacts. On the other hand, climate change concerns, coupled with high fossil fuel prices, peak oil, and increasing government support, are driving renewable energy legislation, incentives, and commercialization. New government spending (including subsidies to users and suppliers), regulation, and policies all helped the industry weather the 2009 economic crisis—in fact, it fared better than many other sectors in the U.S. economy.

A number of methods have been developed at the local, state, and federal levels to finance residential and large-scale renewable energy projects. These methods fall into two categories: developer-owned or privately-owned and government renewable. Each of these categories and their various sub-forms are examined here. In addition, we’ll look at the most common methods for providing financing and break each form down to show the sector in which each is most commonly used: residential, commercial/industrial, or municipal. Where available, an example of a current energy project is provided for each financing method.

DEVELOPER-OWNED RENEWABLE FINANCING METHODS

- **Power Purchase Agreements**
- **Renewable Energy Credits**
- **Greenhouse Gas/Carbon Credits**
- **Energy Performance Contracts**

Climate change concerns, coupled with high fossil fuel prices, peak oil, and increasing government support, are driving renewable energy legislation, incentives, and commercialization. New government spending (including subsidies to users and suppliers), regulation, and policies all helped the industry weather the 2009 economic crisis—in fact, it fared better than many other sectors in the U.S. economy.

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Power Purchase Agreements (PPAs)

The most common form of financing is through a third-party ownership mechanism known as the Independent Power Purchase (IPP)/Power Purchase Agreement (PPA) or energy lease¹. Under a PPA, the customer enters into a long-term power buying agreement with a third-party developer. The developer purchases, installs, and maintains renewable power equipment on the customer's property, effectively leasing the space required for the installation². The customer usually pays nothing for the installation, although some contracts require a small setup fee. The power generated by that equipment is then fed back into the power grid and purchased at a reduced price by whoever owns the property: homeowner for rooftop solar panels, landowner for wind turbines, or township for large-scale renewable energy installations. This arrangement benefits the owner by allowing them to purchase green power at a cost lower than or comparable to grid without spending up-front capital for the equipment³.

The benefits to the developer depend largely on size, since greater benefits may be derived from aggregating large numbers of installations. For utility-based PPAs, the developer not only guarantees a long-term customer and revenue stream through the purchase contract (which generally runs 10–20 years), but is also able to sell additional power generated to the grid or through the spot market to other customers or states that require renewable energy. The developer also gains immediate tax and renewable credit benefits for meeting state and federal standards. Pennsylvania, for example, passed the Alternative Energy Portfolio Standard in November 2004 which requires that by 2020, electric generation utilities supply 18% of the state's electricity by using alternative energy sources⁴.

By entering into large-scale PPA agreements with commercial and municipal customers, utilities can take advantage of tax credits offered to meet these standards. Additionally, developers that are aggregating many small renewable power sources (i.e., solar panels on residential rooftops) can frequently finance the equipment at much better rates than can individuals and can depreciate leased assets at an accelerated rate (MACRS), allowing them to write down debt more rapidly and gain further tax benefits in the years following the equipment purchase⁵.

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1. Cory, K., J. Coughlin, T. Jenkin, J. Pater, & B. Swezey (2008), *Innovations in Wind and Solar PV Financing*. Washington, DC: National Renewable Energy Laboratory.
 2. Smith, R. (2008, October 8), Lightening the Load: Solar-energy advocates look for innovative ways to reduce the upfront installation costs. *The Wall Street Journal*, p. R7.
 3. Maloney, P. (2008a, March 13). Project finance finds a new niche, aggregating small photovoltaic solar power installations. *Platts Global Power Report*.
 4. Susman, G. (2008). Federal, state, and local incentives and policies for renewable energy and efficiencies. Presentation at the Northeast Renewable Energy Conference.
 5. Cory, K. (2008), *Renewable energy financing: The role of policy and economics*. National Renewable Energy Laboratory.

On the other hand, PPAs have certain drawbacks, the greatest of which is the long-term contractual nature of the agreement. Because power is being purchased from the utility at a fixed rate, the customer is assuming a degree of risk relating to price fluctuations in conventional energy prices—that is, if those prices drop significantly, the customer may have to pay much higher prices for renewable energy. This is why these agreements are most frequently seen in areas with historically high electricity costs, such as California and New Jersey. Similarly, contracts are set for relatively long periods of time. Since installed equipment cannot be removed from a property without incurring significant costs, a contract must be transferred to new owners if the property changes hands. Finally, the customer loses all of the tax benefits gained from installing renewable energy equipment (although the lack of up-front fixed costs greatly offsets this point).

CURRENT EXAMPLES OF POWER PURCHASE AGREEMENTS

- **Helio Green Energy Plan**
- **SunEdison**
- **Tennessee Valley Authority**

Helio Green Energy Plan

Website: <http://www.heliomu.com>

The Helio Green Energy Plan, a residential PPA located in California, follows the standard PPA model in that solar PV panels are installed under a power purchase contract. The panels, installation, and maintenance are covered by the company, which then takes advantage of rebates and tax incentives to lower the initial installed cost of each unit. All generated power is then sold by Helio Green Energy to the grid at premium rates; the company in turn provides power back to the homeowner at a discounted rate. Where the Helio plan differs from traditional PPA agreements is in allowing the homeowner to purchase the panels after six years of service for approximately 50% of the initial cost⁶.

SunEdison

Website: <http://www.sunedison.com/>

SunEdison is a PPA provider that focuses on commercial, government, and utility applications. In all other respects this company follows a typical PPA model by installing the equipment and selling power to the organization at reduced rates. Whole Foods, Staples, and Kohls are three examples of companies that are working with SunEdison to provide renewable power at their commercial locations, although installations remain focused in those areas with the greatest tax benefits, namely California, New Jersey, and Oregon.

On November 30, 2004, Governor Edward Rendell signed Act 213 into law. Generally, Act 213 requires that electric distribution companies and electric generation suppliers include a specific percentage of electricity from alternative resources in the generation that they sell to Pennsylvania customers. The level of alternative energy required gradually increases according to a fifteen-year schedule found in Act 213.

While Act 213 does not mandate exactly which resources must be utilized and in what quantities, certain minimum thresholds must be met for the use of renewable energy resources. Act 213 includes demand-side management, energy efficiency, and load management programs and technologies among the resources eligible for participation in Pennsylvania's alternative energy market.

For more information on Pennsylvania's Alternative Energy Portfolio Standard Program, visit its website at http://www.puc.state.pa.us/electric/electric_alt_energy.aspx

6. Helio Green Energy Plan FAQ (n.d.), retrieved December 1, 2008, from [HeliomU.com](http://www.heliomu.com).

Tennessee Valley Authority

Website: <http://www.tva.gov>

The Tennessee Valley Authority (TVA) has a PPA program in place to support government and municipal installations within the TVA coverage area (most of Tennessee, parts of Alabama, Mississippi, and Kentucky, and small slices of Georgia, North Carolina, South Carolina, West Virginia, Indiana, and Virginia). Power is added to the TVA grid and the municipalities pay a reduced rate for their energy requirements. In addition, the TVA offers residential and commercial customers a Green Power Switch option. By paying a small monthly premium for their energy, customers can purchase power provided via the PPA and thereby switch to all renewable energy without entering a PPA contract or purchasing their own equipment.

Renewable Energy Credits (RECs)

Typically used by commercial or utility customers, renewable energy credits are another method used to generate revenue from renewable energy systems. RECs are essentially certificates that are given to a renewable generation facility, which can then be sold on the open market either to other energy producers that are required to meet certain renewable portfolio standards (RPS) or to commercial entities that are looking to voluntarily offset a percentage of their electricity use with renewable power. For example, the owner of a wind farm would receive 1 REC for every 1MWh of renewable power produced. In states with an active RPS, utilities must show that they are generating enough renewable power to comply with the standard. Utilities that do not generate any power via renewable sources can purchase RECs and renewable power from other producers as a way of meeting their requirements. Unfortunately, the REC market is relatively new, and prices for REC certificates vary widely depending on purpose (voluntary vs. compliance with RPS). Prices for general renewable RECs ranged from \$1 to \$56 per MWh in 2008, with a median price of around \$20. Solar RECs hold higher value, ranging from \$18 to upwards of \$260 per MWh in states with RPS requirements specifically for solar power^{7 8}.

7. Cory, K., J. Coughlin, & C. Coggs (2008), *Solar photovoltaic financing: Deployment on public property by state and local governments*. National Renewable Energy Laboratory.

8. Cory, Coughlin, Jenkin, Pater, & Swezey (2008).

WHAT IS GREEN POWER SWITCH?

The idea behind Green Power Switch is simple: harness the natural power of the wind, the sun, and the earth to create an energy source that's usable in our everyday lives. TVA and local public power companies, working in cooperation with the environmental community, developed Green Power Switch as a way to bring green power — electricity that's generated by renewable resources such as solar, wind, and methane gas — to Valley consumers.

HOW MUCH DOES GREEN POWER SWITCH COST?

Green Power Switch is sold to residential consumers in 150-kilowatt-hour blocks (about 12 percent of a typical household's monthly energy use). Each block adds \$4 to the customer's monthly power bills. Consumers may buy as many blocks as they like. In other parts of the country, residential consumers who participate in green power programs pay an extra \$2 to \$10 per month for green power. Green Power Switch is also marketed to commercial and industrial consumers, who are asked to buy blocks based on the amount of energy they use.

Source: Green Power Switch website, <http://www.tva.com/greenpowerswitch/>

thereby aggregating residential power needs and maximizing the purchasing power of the entire community¹⁰. In terms of renewable power, some of these towns are attempting to simultaneously reduce their carbon footprint by purchasing only renewable power from local generation facilities in a manner similar to a Power Purchase Agreement.

Energy performance contracts have a few major drawbacks. First, the local energy service becomes responsible for billing, marketing, and management of the contract, which can be complicated, especially if the service is not initially set up to perform these activities. Second, utility companies must be willing to provide discounts based on the number of subscribers/population and the performance of the community energy service. Participation in energy performance contracts is based in large part on discount opportunities for communities/consumers.

PRIVATELY-OWNED & GOVERNMENT RENEWABLE FINANCING METHODS

- **Energy Loan Programs**
- **Feed-in Tariffs**
- **Net Metering**
- **Municipal Property Tax Assessments**

Several privately owned and government renewable financing methods are available for homeowners and communities considering renewable energy options. Private options include second mortgages and home equity loans obtained to purchase and enable the professional installation of single dwelling-appropriate renewable energy technologies, such as solar panels. Government renewable financing may be obtained from federal agencies such as the U.S. Department of Energy, Environmental Protection Agency, and U.S. Department of Agriculture, each of which periodically offers programs designed to encourage the research, development, and deployment of renewable energy technologies.

Energy Loan Programs

For those who wish to own and operate their own equipment, renewable energy projects have traditionally been funded through standard loans with very long repayment terms (10+ years) and low interest rates. Unfortunately, the cost associated with the installation and maintenance of renewable energy equipment is still difficult for most to justify. For example, installed costs for residential solar power systems generally range from \$10,000 per kilowatt for small installations (1–2 kilowatts) to \$7,500 per kilowatt for larger ones (4–6 kilowatts)¹¹. For homeowners, loans have typically been in the form of home equity lines of credit or second mortgages. These traditional loans can be combined with state and

10. Kellett, J. (2007, May), Community-based energy policy: A practical approach to carbon reduction. *Journal of Environmental Planning and Management*, 381–396.

11. Bolinger, M., & K. Porter (2002), *Renewable energy loan programs*. Berkeley, CA: Berkeley Labs.

federal tax credits to further bring down installation costs. Certain states, such as California and New Jersey, have introduced solar incentive programs that offer rebates for new installations. California's program offers up to \$8,000 in rebates for a typical home solar system and aims to create 3,000 MW of solar power by 2017—the equivalent of 750,000 residential rooftop installations¹². New Jersey in particular has seen significant growth in solar installations due to its incentive program, growing from 6 installations in 2001 to 2,712 by the end of 2007¹³. Adding the current 30% (no cap) federal tax credit reduces the costs of installation, but it can still be difficult to find lenders in the current economic market. Still, for individuals who go this route for their renewable energy installations, several methods can be used to repay the loans more quickly.

Two other federal mechanisms have been created to help finance residential and community solar projects: the IRS clean renewable energy bonds (CREBs) and DOE Renewable Energy Production Incentives (REPI). Unfortunately, both of these programs are currently not accepting new proposals and therefore should not be counted on for financing. A third round of CREBs allocations is currently being proposed in Congress¹⁴.

Feed-in Tariffs

In a feed-in tariff model, power is generated by a number of distributed nodes rather than by a single centralized utility. Since many states are adopting renewable portfolio standards (see text box on Pennsylvania's Alternative Energy Portfolio Standard, above), electric utility companies are required to purchase power from all distributed nodes at a higher rate than conventional power to satisfy state requirements. This power is then sold at market rates and a small tariff/tax is levied against all power purchasers in the state to subsidize the higher cost of the renewable energy. This benefits those who own small renewable installations because they are effectively paid for any energy that they do not use, and supply that energy into the grid for use by other customers. Typically, due to renewable portfolio standards, energy utilities must pay a higher-than-market price for renewable energy from community or residential providers, generating a higher return on investment for additional power sold to the grid.

Net Metering

Similarly, some states are using 'net metering' to pay those who own renewable power equipment. In net metering, any power that is unused is fed back into the power grid, thereby reducing the monthly electric bill from the utility provider by in effect "running the power meter backwards." While this is a very simple

SUCCESS STORY: FREIAMT, GERMANY

(<http://www.freiamt.de/index.php>)

Among Western European communities engaging in the search for and installation of sustainable renewable energy sources, the town of Freiamt, Germany, is a well-known example.

Freiamt is a cluster of villages of 4,300 people with an economy dominated by farming, tourism, and small-scale forestry. Five years ago, this community's goal was to achieve total energy self-sufficiency. This goal has been accomplished through the installation of four wind turbines, 800 rooftop photovoltaic systems and solar thermal installations. The community also has several biomass digesters (a holistic solution to the problems of farm waste).

How was this energy self-sufficiency achieved? Economically, the communities employed a form of the feed-in tariff mechanism to support the development of local renewable energy sources. As of August 2008, the town's four wind turbines and other renewable generation projects were supplying 17% more power than the community of 4,300 people required. The extra power was sold to the grid and is generating income for the local investors who helped fund the project¹⁵. Similar projects have been developed in other German and Austrian towns, where coal and gas fired power is very expensive compared to U.S. costs.

12. Maloney (2008a).

13. Maloney, P. (2008b, March 26), Pay for the power, not the panels. *The New York Times*, p. 1.

14. Cory, Coughlin, & Coggsall (2008). CREBs allocations may have changed by the date of publication.

15. Blake, M. (2008, August 21), In Germany, ruddy-cheeked farmers achieve energy independence. *Christian Science Monitor*.

method for reaping the benefits of generating renewable power, it does require special metering equipment that is not available in most states. Additionally, because the customer is using the majority of the power generated, the benefits gained are usually small and frequently capped by the utility, thereby extending the payback period.

Municipal Property Tax Assessments

Another recently developed method for financing renewable energy installations is through an increased property tax assessment levied on the owner's property¹⁷. These increased property tax assessments are typically levied for 20–30 years and are used to repay local and state loans used to purchase, install, and maintain equipment and energy efficiency improvements that are permanently tied to the property (i.e., high efficiency furnaces, solar thermal water heating, HVAC, insulation, etc.)¹⁸. Funding is obtained through local banks and/or investors and is then aggregated to all program participants to achieve lower rates and more favorable terms. Property tax assessments are also very secure, which reduces investor risk and requires a lower rate of return. The energy improvements are attached to the property upon which they are built and can be extended to other improvements that are permanently attached to the property, such as geothermal installations, or in the case of a residential property, insulation, glass, or other energy efficiency improvements¹⁹.

The greatest advantage of this type of financing is that the equipment is purchased by the property owner and all power generated by the facility can be used. Loans taken out for the fixed up-front costs of purchase and installation typically have very good terms and long payback periods because they are tied to the tax capacity of the property and not the credit standing of the property owner. Finally, loan repayment is attached to the property and transfers with its sale, offering greater flexibility to homeowners who are then able to use this type of financing to make renewable energy improvements on their property. Additionally, since the payments are tied to tax assessments, there may be positive implications for federal taxes, allowing the home- or landowner to deduct both principal and interest from their taxes²⁰. One major drawback to this form of financing is the uncertainty about whether federal tax incentives and rebates can apply to the current lien holder on the property since the installation is technically purchased by the local municipality. To overcome this barrier, use

SUCCESS STORY: SMETHPORT, PENNSYLVANIA

(<http://smethportpa.org>)

With Pennsylvania set to further deregulate the utility industry by lifting rate caps for generating electricity, the price consumers pay for natural gas could go much higher. When the caps come off, a spike in consumer prices is expected, as has already occurred in other states when caps were removed. All this lends urgency to pursuing alternative energy sources.

Smethport, Pennsylvania, is taking a proactive approach with its plan to implement a highly efficient, non-polluting, carbon neutral, CHP system that uses low-value wood as the energy source. Any excess electricity will be put up for sale and distributed over the existing power grid, providing a new revenue stream for the Borough. This system would not only lower electricity costs in the area, but also provide additional power that could be sold to the grid at a premium rate, generating revenue for the borough¹⁶.

16. Muller, N. (2008, September 26), Smethport seeks to be national renewable energy leader. Additional information on Smethport can be retrieved from the Smethport website at <http://smethportpa.org/>

17. Eyzaguirre, C., & A. Charmichael (2008), Municipal property tax assessment financing. Vote Solar Initiative.

18. Bolinger, M. (2008), Property tax assessments as a finance vehicle for residential PV installations. Berkeley Labs.

19. This program was initially established in 2007 in Berkeley, CA. See the Berkeley FIRST Model (Eyzaguirre & Charmichael, 2008) for more information.

20. Bollinger (2008).

of a 30%/70% financing model has been recommended—the homeowner uses traditional financing for 30% of the project to qualify for available tax credits, and funds the remaining 70% through municipal sources²¹.

Conclusion

Over the past few decades, residential, commercial, government, and utility stakeholders have recognized the advantages of readily available, cost-effective sources of clean energy. To enable their use, public and private financial entities have created and continue to support financial programs designed to increase the development and use of clean energy technologies by these stakeholders. Financing mechanisms generally take the form of tax incentives, production incentives, or grants—a handful of these options have been examined here.

The financing options available for the purchase and installation of renewable energy technologies serve many important functions. Those who take advantage of them are accelerating participation in the utilization of these technologies and the de-emphasis on fossil fuels. The options offer consumers the opportunity to garner for home and community use cost-effective, energy-efficient, and stable energy resources. The focus on natural resources may mean that use of these technologies will lessen/have minimal environmental impacts (unlike fossil fuels, e.g.).

As Figure 2 shows, residential and commercial customers, government entities, and utilities are using one or more of the currently available financing options to participate in renewable energy programs, with the majority utilizing Power Purchase Agreements and Energy Loan Programs.

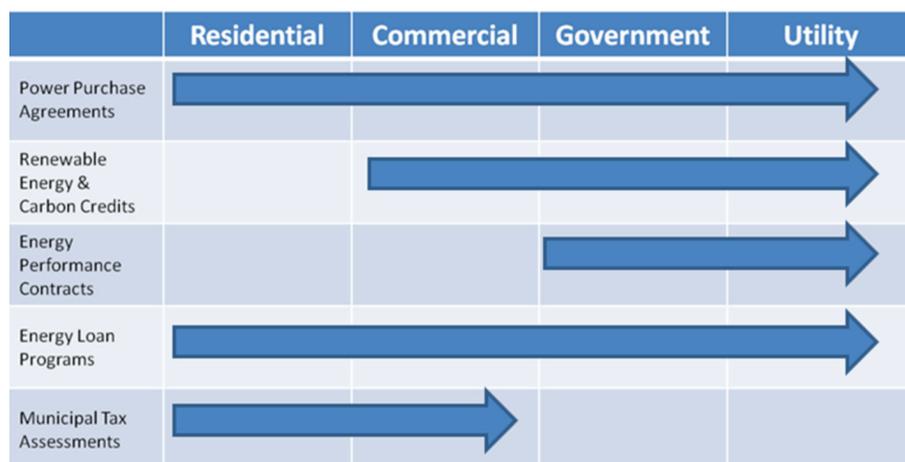


Figure 2. Financing Mechanisms by Sector

21. Bollinger (2008). Current revisions to the U.S Tax Code may limit the ability for homeowners to apply for tax credits under this model.

The need for financing options continues. From 2007 to 2008, new global investments in clean energy technologies expanded by 4.7%—from \$148 billion in 2007 to \$155 billion in 2008. The American Recovery and Reinvestment Act of 2009 includes more than \$70 billion in direct spending and tax credits for clean energy programs. All in all, America benefits from the availability of renewable energy options and the financing programs that make them possible.

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