



**BIOMASS**



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**WIND**

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This fact sheet presents some of the risks and opportunities associated with investing in commercial renewable energy projects. It also identifies the information needed for an investment analysis, outlines various investment decisions and suggests appropriate analysis tools.

## WHAT ARE THE MAJOR RISKS AND OPPORTUNITIES IN RENEWABLE ENERGY DEVELOPMENT?

The decision-making process for renewable projects continues to center on certain specific risk issues:

- High front-end costs or financing requirements** present additional cost-recovery risks for which capital markets demand either higher equity or a premium.
- The ratio of development costs to project investment is higher** for renewable projects, which tend to be smaller and less familiar to developers than conventional energy projects.
- Difficulty in guaranteeing cash flow** may inhibit investment. Surety bonds for performance and operational "all risk" insurance coverage may be expensive for smaller projects.
- Combined tax laws at all levels of government do not favor renewable energy technologies because of their high initial costs and minimal fuel costs.** In addition, renewable energy projects are not eligible for tax incentives that apply to fossil fuel development.<sup>1</sup>
- Small or newly established renewable energy developers may not have the strong track record necessary** for non-recourse financing and may face more difficulty attracting equity investors or securing debt financing for what are regarded as higher risk, emerging technologies.
- Utility power purchase agreements offering higher standard rates for renewable energy<sup>2</sup> and the possibility of regulatory requirements for renewable energy tariffs.
- More flexible markets for renewable energy from increased utility renewable portfolio standards and tradable renewable credits and credit tracking systems.
- Extensive income tax incentives for both residential and business renewable energy generators in the current proposed federal energy bill.
- Accelerated five-year depreciation for businesses that employ solar and wind technologies and increased level of Section 179 cost recovery.
- Solar and wind generators are not subject to property tax in Wisconsin unless they exceed an ownership aggregate of 50 MW in size.
- Capital financing becomes easier as a growing number of projects substantiate viability and performance factors for emerging renewable technologies.



PHOTO COURTESY OF MICK SAGRILLO

## WHAT ANALYSIS TOOLS ARE MOST APPROPRIATE FOR DIFFERENT INVESTMENT SCENARIOS?

The tools appropriate for assessing the financial realities of a particular investment can vary considerably, because the same investment opportunity may present different kinds of risks to different entities, and may involve factors that are not financial in nature.

In making a decision on whether to go forward with a renewable energy project, the economic decisions that are made usually fall into one of three categories:

However, while these challenges exist, there are continual and changing opportunities that may mitigate financial risks:

- Low interest loans or loan guarantees from a wide variety of state and federal sources.
- Grants from federal and state sources, such as the 2002 Farm Bill and Wisconsin's Focus on Energy Renewable Energy Program.

<sup>1</sup> Examples include the write-off period for exploration and development costs, and percentage depletion allowances.

<sup>2</sup> To date in Wisconsin, Alliant Energy's biogas rate and MGE's renewable rate are approximately 6 cents per kilowatt hour.

## PROJECT INFORMATION REQUIRED FOR AN INVESTMENT ANALYSIS

Several economic measures should be used to evaluate an investment. In order to compare options, the following categories of information typically are needed:

### General Project Information

- Rated capacity
- Capacity factor
- Inflation
- Start year
- Project lifetime

### Revenue—Cash Inflows

#### Energy sales income<sup>3</sup>

- Fuel or energy displacement savings
- Ancillary products or benefits
- Cost recovery—depreciation or expensing
- Cost recovery—tax credits
- Tradable renewable credits
- Grants and incentives
- Interest earned on debt service reserves

### Costs—Cash Outflows

#### Equipment and project development

- Equipment costs including installation and site preparation
- Balance of system (BOS) costs including all non-equipment capital costs such as interconnection and civil works
- Developer soft costs such as developer planning, environmental studies, licensing and permitting and negotiation of power purchase agreements

- Construction loan interest
- Recurrent costs such as equipment replacement

#### Other recurrent expenses

- Operation and maintenance (fixed, variable, or a combination of the two)
- Site owner rent or royalties
- Property tax
- Project insurance
- Production insurance
- Income tax on revenue

### Financing Costs—Debt and Equity

- Loan debt<sup>4</sup>
- Debt percentage (the percentage of capital costs being covered by a loan)
- Loan interest rate
- Loan term
- Equity
- Equity financing fees<sup>5</sup>
- Initial working capital
- Debt financing fees<sup>6</sup>
- Debt service reserve fund<sup>7</sup> and other debt covenants
- Discount rate that is used to calculate the net present value (NPV) of the project by discounting future cash flows to the start year

## 1. Accepting, rejecting or deferring the project

**Scenario:** A single investment opportunity is under consideration to be accepted or rejected. It might also be deferred to a later time. The financial analysis helps determine the project's associated costs, the owner's ability to withstand the financial risk and whether the project meets investment goals. Also, there is a question of the investment's appropriateness, based on both economic circumstances and personal values.

### Most common economic measure used: Internal Rate of Return (IRR)

IRR allows a quick comparison of acceptable costs and benefits with a minimum acceptable rate of return.

**Note:** IRR may not be recommended when additional investment is required after the return on an investment, such as periodic equipment replacement, or in comparing investments with dissimilar investments and returns.

**Others used:** NPV, LCOE, MIRR, SPB, DPB, SIR (see table, page 3)

## 2. Choosing from completely different alternatives

**Scenario:** Only one project will be selected from a set of alternatives that are different in approach, size or design. Analysis may be complicated by different investment amounts, project parameters or expected benefits and outcomes.

### Most common economic measure used: Net Present Value (NPV)

NPV can account for costs (cash outflows) and revenues (cash inflows) together. It can also account for different sizes of investments, discount rates and social costs.

**Not recommended:** LCOE, IRR, MIRR, SPB, DPB, SIR do not account for the difference in size of investments (see table, page 3).

## 3. Choosing from similar alternatives within a budget limit

**Scenario:** A choice must be made from similar alternatives that meet certain project constraints. These may be limited budget, a cash flow requirement, or limits imposed by the natural resource. This implies a set of possible options, with overall project risk not being a determinant in the evaluation. The economic measure should help determine the best alternative or combination of alternatives to yield the greatest return on the investment.

### Most common economic measure used: Levelized Cost Of Energy (LCOE), Modified Internal Rate of Return (MIRR), or Savings to Investment Ratio (SIR)

These three economic measures are best for easily ranking projects where risk is not the major consideration.

<sup>3</sup> Calculation should factor for an energy payment escalation rate. This number can vary depending on the agreement between the power purchaser and the power seller. For a given rate of return, the higher the escalation rate, the lower the first year purchase price of energy.

<sup>4</sup> Loan debt may be repaid using one of three schedules: level mortgage, level premium, or a custom schedule.

<sup>5</sup> Equity financing fees typically run from 3 percent to 10 percent of the equity. Smaller projects will pay a larger percentage than larger projects.

<sup>6</sup> Debt financing fees typically run from 2 percent to 5 percent of the loan amount. Smaller loans typically pay a higher percentage than larger loans.

<sup>7</sup> This fund may be required by a lender to help meet loan payments in case the project experiences cash flow problems. If necessary, a typical fund size is six months of payments.

**Not recommended:** IRR assumes all returns are reinvested at the IRR and it may overvalue projects with early returns and neglect overall higher profitability. SPB and DPB do not count returns after payback. NPV is acceptable, but more time intensive because it requires evaluation of each project permutation.

#### RESOURCES

##### A Manual for the Economic Evaluation of Energy Efficiency and Renewable Energy Technologies

Walter Shor, Daniel J. Packey and Thomas Holt. March 1995  
NREL/TP-462-5173, [www.nrel.gov/](http://www.nrel.gov/)

Table of Past Years Discount Rates from Appendix C of OMB Circular No. A-94, [www.whitehouse.gov/omb/circulars/index.html](http://www.whitehouse.gov/omb/circulars/index.html)

##### Tax Barriers to Four Renewable Electric Generation Technologies

California Energy Commission, Sacramento, California  
[www.energy.ca.gov/development/tax\\_neutrality\\_study/index.html](http://www.energy.ca.gov/development/tax_neutrality_study/index.html)

#### Guides and software tools

##### A Borrower's Guide to Financing Solar Energy Systems

[www.eere.energy.gov/financing/homeowners.html](http://www.eere.energy.gov/financing/homeowners.html)

##### Solar Hot Water

[www.theenergyguy.com/lifecyclecost.html](http://www.theenergyguy.com/lifecyclecost.html)

#### Wind Energy

Windustry web site calculator and evaluation tools:

[www.windustry.com/calculator/default.htm](http://www.windustry.com/calculator/default.htm), or the NREL Wind Finance web page at <http://analysis.nrel.gov/windfinance/login.asp>

##### Structuring Community Wind Projects for Success, Jeffrey

C. Paulson and Associates, Ltd. April 13, 2004

[www.state.co.us/oemc/events/cwade/2004/presentations/Paulson.pdf](http://www.state.co.us/oemc/events/cwade/2004/presentations/Paulson.pdf)

##### RETScreen—Renewable Energy Technology Screen

[www.retscreen.net/](http://www.retscreen.net/)

Developed by Natural Resources Canada (NRCan), and available for free, this software can be used to evaluate the annual energy production, costs and financial viability of wind energy, small hydro, photovoltaics, solar air heating, biomass heating, solar water heating, passive solar heating and ground source heat pumps.

##### Proform Version 3.2

For both renewable energy and energy efficiency projects, ProForm calculates the Net Present Value (NPV), the Internal Rate of Return (IRR), the Debt Service Coverage Ratio (DSCR), and the Annual Cash Flow of a project from the investor's perspective. Users must register to use the free-of-charge spreadsheet tool.

<http://poet.lbl.gov/>

ECONOMIC MEASUREMENT TOOLS USEFUL FOR ANALYZING A RENEWABLE ENERGY INVESTMENT OPPORTUNITY		
ACRONYM	FULL NAME	QUESTIONS ANSWERED
NPV	Net present value	How much income will this project generate over its useful life, less operation and financing costs, stated in today's dollars?
LCOE	Levelized cost of energy	What is the cost per kWh if all capital, fuel and O&M costs are calculated in current dollars and divided by the estimated output in kWh over the lifetime of the project?
IRR	Internal rate of return	What percentage of the initial project investment will be returned annually and be available for internal reinvestment?
MIRR	Modified internal rate of return	What percentage of the initial project investment will be returned and available annually, adjusted for potential negative cash flow?
SPB	Simple payback period	How long will it take for project income to exceed the initial capital investment?
DPB	Discounted payback period	How long will it take for project income to exceed the initial capital investment, accounting for inflation?
DSCR	Debt Service Coverage Ratio	If the net operating income of the project is divided by the total debt service, is the ratio greater than 1.0? For example, will the project provide sufficient cash flow to cover debt payments?
SIR	Savings to Investment Ratio	Will the savings offer significant economic value? What is the ratio of the discounted savings to discounted capital costs ?

## EXAMPLE: ECONOMIC ANALYSIS OF AN ANAEROBIC DIGESTER

This example models a mixed plug flow digester project for a 1,000-head dairy farm, using the following assumptions:

- \$700 per head turnkey construction cost: \$700,000
- 200 kW engine generator (0.2 kW/cow) derated to 180 kW for low Btu gas (.18 kW/cow)
- Gas production equivalent to 4.3 kWh cow/day
- 90 percent capacity factor (1.42 million kWh/yr)
- Effective tax rate  $((1 - \text{state rate}) \times \text{federal rate}) + \text{state rate}$ ,  $((1 - .0675) \times .25) + .0675$ : 30%

**Revenue—Cash Inflows**

- 2003 WI Act 135, dairy modernization income tax credit: **\$50,000 (year one only)**
- Focus on Energy grant: **\$55,000 (year one only)**
- Waste heat value: **\$4,000 per year**
- Value of electricity: 6.0 cents per kWh x 1.42 million kWh/yr: **\$85,200 per year**
- Value of solids as bedding/sale as compost: 3 cu. yds./cow-yr, \$15/yd = **\$45,000 per year**
- Straight line depreciation, 10 yrs @ 30% effective tax rate (basis \$700,000-\$55,000 = \$645,000): **\$19,350 per year**

**Costs—Cash Outflows**

- Equipment and turnkey costs, \$700,000 less year one reductions from Focus grant (\$55,000) and Wisconsin income tax credit (\$50,000): **\$595,000**
- O&M: \$0.0175/kWh x 1,420,000 kWh/yr: **\$24,850 per year**

**Financing Costs—Debt and Equity**

- 30 percent equity (\$178,500) @ 10%: **\$17,850 per year**
- 70 percent (\$416,500) commercial loan @ 8%, 10 years: **\$62,070 per year**

**Project Annual Costs**

Equity: \$178,500 @ 10%	\$17,850
Loan: \$416,500, interest = 8%, 10 yrs	\$62,070
O&M	\$24,850
<b>Total</b>	<b>\$104,770</b>

**Project Annual Revenue**

Electricity	\$85,200
Heat	\$4,000
Digested Solids	\$45,000
Depreciation	\$19,350
<b>Total</b>	<b>\$153,550</b>

**Project Annual Savings**

Annual Revenue	\$153,550
Annual Costs	\$104,770
<b>Total Annual Savings</b>	<b>\$48,780</b>
<b>Savings per kWh</b>	<b>.3.4 cents</b>

**ACCEPT OR REJECT CALCULATIONS****Simple Payback**

Cost of project reduced by year one grant and Wisconsin income tax credit: \$595,000

Annual (non capital) savings: \$128,700 (annual revenue \$153,550 – O&M \$24,850)

Simple Payback: 4.6 years

**Pre-tax Return on Investment**

<b>Equity:</b>	<b>\$178,500</b>
<b>Annual revenue:</b>	<b>\$48,780</b>

**AgSTAR FarmWare 2.0 Handbook and Software**

Available online, FarmWare is intended to help farmers decide whether a methane recovery system can work on their farm. Includes a tutorial guide, and works on Windows 98 and 95.

[www.epa.gov/agstar/resources/handbook.htm](http://www.epa.gov/agstar/resources/handbook.htm)

**WindFinance**

Energy Finance Tool, National Renewable Energy Laboratory (NREL). WindFinance is an on-line levelized cost of energy calculator for wind energy projects. Users must register to use the free-of-charge program.

<http://analysis.nrel.gov/windfinance/login.asp>

**Regulatory links**

<http://psc.wi.gov/general/tarlinks.htm>

The Public Service Commission of Wisconsin web site offers links to utility web sites that describe tariffs and offers information about interconnection rules and procedures.

[www.dnr.state.wi.us/](http://www.dnr.state.wi.us/)

The Wisconsin Department of Natural Resources issues permits for air, waste management, and confined animal feeding operations.

Focus on Energy is a public-private partnership offering energy information and services to energy utility customers throughout Wisconsin. The goals of this program are to encourage energy efficiency and use of renewable energy, enhance the environment, and ensure the future supply of energy for Wisconsin. For information about the Focus on Energy services and programs, call 800.762.7077 or visit [focusonenergy.com](http://focusonenergy.com).