ECONOMICS OF COMMERCIAL PHOTOVOLTAIC AND NET METERING

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Photovoltaic is the technical name of one of the most talked about energy technologies on the market today, solar electricity. Photovoltaic, PV, systems are touted for their ability to provide clean power to homes and businesses. With increasing awareness of problems associated with power generation, such as pollution and reliability, PV systems are becoming more attractive to consumers. However, as with any technology, the costs and benefits must be considered before any final decision is made.

The analyses in this report illustrate the high cost of photovoltaic technology. However, costs are expected to decrease as the technology improves. Also, many benefits of the technology cannot be easily converted into monetary terms. For instance, in places where electric transmission is unavailable or costly, the benefits of the system may justify the cost. Another consideration is utility reliability. If the utility's supply goes down for any reason, a PV system can be used to power critical equipment, such as cash registers, refrigeration units, gas pumps, etc. The economics of PV systems is obviously a concern, but it isn't the only determining factor that must be considered.

Net Metering and What It Means to You

One major problem with PV systems is that the supply of power from the system does not always correspond with the demand for power. If the power supplied is greater than the power required, the excess power may be wasted. There are two common ways to address this problem. First, batteries may be added to the system to save the excess energy for later times when the demand for power exceeds the supply of the system. However, battery systems are large, expensive, and must be regularly maintained. The second way to address the problem is through a solution known as net metering.

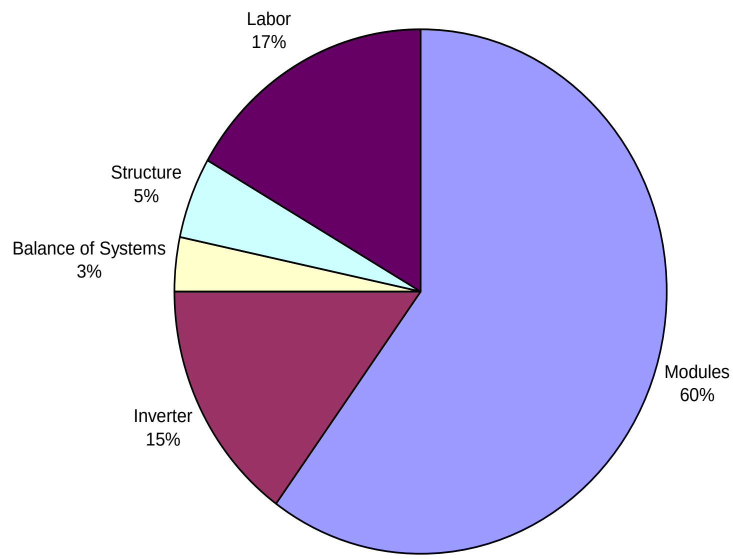
Net metering promotes the use of on-site renewable power by ensuring that the full benefit of the system is realized. Net metering is an important part of Louisiana's initiative to introduce renewable energy into the state. It allows individuals and businesses to be credited a fair value for excess power sent to the utility. When this occurs, the utility meter will reverse, crediting the consumer for the energy that was put onto the grid. This credit will show up on the consumer's bill as a reduction in the energy used. In the event that the monthly power supplied back to the grid exceeds the power taken from the grid, the remaining power will be applied as a credit to the next month's bill. In many cases, the full amount of power supplied by the photovoltaic system will exceed the power requirement of the building. However, during night, low light, or high demand conditions, the power required by the building may exceed the power supplied by the system. Net metering allows excess power to be fed back into the power grid. The maximum amount of power allowed for commercial entities under the current net metering law is 100 kilowatt (kW).

Economics of 100 kW Photovoltaic System

One of the first things to consider before installing a photovoltaic system is the economics of the system. This section will help you understand the costs and benefits of PV systems. Several different analyses were performed. First, the maximum initial costs required for 3 different payback periods, 8, 10, and 25 years, were determined using the expected energy savings. Next, taking the standard cost, the minimum electric rates required to reach the same 3 payback periods were determined. For all analyses, an interest rate of 3% and an annual system degradation of 1% were assumed.

Standard costs of equipment and installation are based on a typical 100 kW system. There are 5 major components considered. Modules refer to solar panels, which absorb sunlight and convert it into electricity in the form of a DC (direct current) voltage. To make this power usable for typical applications, an inverter is used to convert the DC voltage to a 120 volt AC (alternating current) voltage. The inverter also conditions the power to make it acceptable for the electric utility grid. Structure refers to the hardware required to mount the system. Labor costs are included, but will vary considerably depending on the nature of the installation. Finally, balance of system is used to refer to other applicable costs such as permitting and administration.

Figure 1. Cost Breakdown of Grid-Tied PV System



To determine the required minimum electric rates for each payback period, a standard cost per watt of installed power was given to each component. These costs were taken from typical systems of a comparable size, to take the economies of scale into account. For the sake of this analysis, all of these costs will be included in a single figure, referred to as installed cost. An installed cost of $6 per watt was assumed for the system. For a 100 kW system, the cost would be $600,000.

The total energy supplied by the panels annually was found using the U.S. Department of Energy's PV Watts software. The theoretical system was located in Baton Rouge with a fixed tilt of 30.7°, and default derate factor of 0.77 was used. Using this information PV Watts determined that the system should provide approximately 131,455 kilowatt-hours (kWh) annually. The annual savings required to reach the payback periods were then determined. Dividing the annual savings required by the amount of energy supplied by the panels annually, the minimum electric rates needed to make the investment economical were determined.

For the second analysis, the maximum initial costs that can be paid resulting in the selected payback periods were found. The cost of electricity was assumed to stay constant at the current rate of 9.72 cents per kilowatt-hour. The maximum allowable costs of the system were then found for each payback periods. These costs were then divided by the size of the system to determine the allowable cost per watt.

Table 1. Payback Requirements

Payback Period	Required Rate (¢/kWh)	Allowable Cost (Current Energy Rates)	Cost per Watt
25 years	29.2	$199,184.95	$1.99
10 years	56.3	$104,354.74	$1.04
8 years	67.8	$86,693.41	$0.87