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Fueling Your Future with Renewables: Where to Begin?

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In this issue:

Fueling Your Future with Renewables: Where to Begin?

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Generating onsite electricity to power your municipal water/wastewater facility, using alternative energy technologies including wind, geothermal, solar, microbial fuel cells and biogas is the green thing to do, but minimizing the impact to your bottom line is an equally important consideration for your organization and stakeholders. It is critical that the following factors are investigated and included in an evaluation to make sure you achieve your financial objectives.

To start off in the right direction, it is essential to perform a Leveled Cost of Energy (LCOE) evaluation on your facility to enable you to assess each alternative energy technology in terms of what it truly costs you to generate electricity. Many energy assessments for water and wastewater facilities don't take into account the cost of capital and the life of an asset when determining whether or not to invest in onsite electricity generation so make sure this element is addressed in the evaluation equation.

As detailed in the Figure 1 (right), biogas and solar can be some of the more costly options depending on your specific situation. There is such a plethora of information available that it is relatively easy to get the base information you need to perform a leveled cost assessment. In fact, almost all the information you see in the chart below, except for biogas and fuel cell technologies, was gathered from the US Energy Information Administration website (*www.eia.gov*).

The following is an outline of what needs to be considered in building a financial feasibility model for your project.

First, start with the following simplified formula:

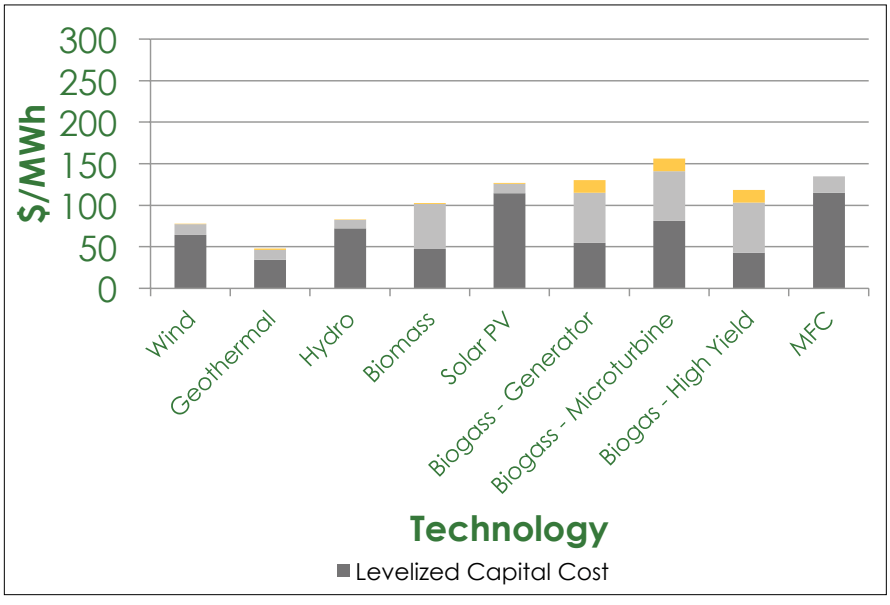
$$LCOE = \frac{\sum_{t=1}^{n} \frac{I_t + M_t + F_t}{(1+r)^t}}{\sum_{t=1}^{n} \frac{E_t}{(1+r)^t}}$$

Where:

I_t = Capital Expenditure in Year t
M_t = O&M Expenditures in Year t
F_t = Fuel Expenditures in Year t
E_t = Electricity Generation in Year t
r = Discount Rate
t = Expected Life of Asset

The above LCOE formula is predicated on determining the Net Present Value over the life of the asset. In most situations you can assume a discount rate of 3% or something close to that of a 30-year Treasury note (or a Treasury note with a term close to the expected life of the asset). If you have equity shares and a mixed portfolio of debt you may need to consider using a more complicated method of determining the discount rate. Talk to your Chief Financial Offer to determine what discount rate most accurately represents your organization's cost of capital.

FIGURE 1: LEVELED COST OF ALTERNATIVE ENERGY



"Be wary of incentives with limited durations such as Renewable Energy Credits (RECs) or Solar Renewable Energy Credits (SRECs) which are traded on open markets and tied to state energy mix goals."

Now you are ready to apply any grants or incentives to your model. I recommend visiting *www.DSIRE.org* where you will find a summary of all alternative energy incentives by state. Be wary of incentives with limited durations such as Renewable Energy Credits (RECs) or Solar Renewable Energy Credits (SRECs) which are traded on open markets and tied to state energy mix goals. This means the credit may only be available for a limited period or may drop in value in that specific REC exchange which makes them difficult to incorporate into an accurate evaluation. Look for guaranteed incentives and see if you can achieve a projected energy generation cost less than your current cost of electricity. If so, you are on the right track and any RECs/SRECs you can attach to the project are a bonus.

FIGURE 3: LOCE/LACE COMPARISON - 2040

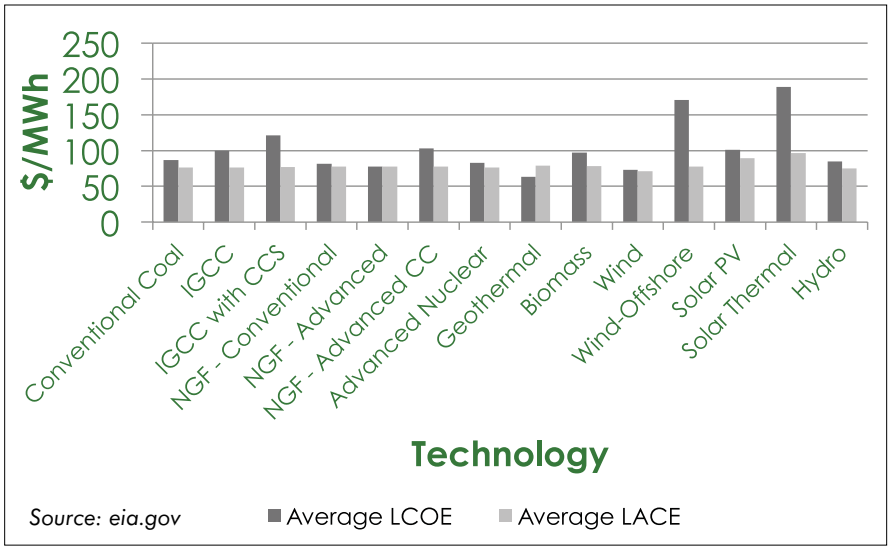
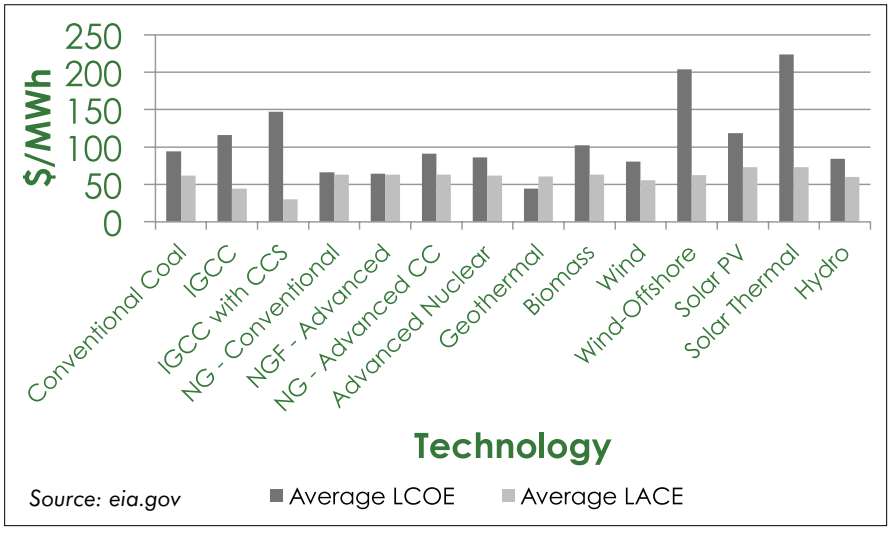


FIGURE 2: LOCE/LACE COMPARISON - 2019



Lastly, choose the alternative energy technology that makes the most sense for you and minimizes risk. Perform a sensitivity analysis to consider potential additional Operations and Management (O&M) and regulatory compliance costs in order to understand their risk. In a sensitivity analysis, any potential additional O&M costs are relatively straight forward to model. The safest way to account for worst-case regulatory compliance costs is to assume the world adopts a Carbon Economy and include the potential Social Costs of Carbon (SCC). Right now, the Environmental Defense Fund (EDF) projects the SCC to be approximately $35 per ton of CO_2 emitted. CO_2 emissions for various conventional energy technologies are readily available. So are those for most alternative energy technologies. No biogas emissions data is available but it is safe to assume that it is equivalent to that of natural gas. In a way, it's a wash since the biogas would be flared anyway but the potential costs are the potential costs no matter which way you slice it.

Figure 1 shows the Leveled Cost of Electricity (LCOE) evaluation for alternative energy with the SCC lumped on top (please note this is not the sensitivity analysis). The SCC has very little effect on solar, wind, geothermal and microbial fuel cells, but a relatively significant potential impact on the unit production cost for biogas.

Enhanced biogas (improved with food waste, manure, fats, oils, grease and other organic wastes), in combination with municipal biosolids to greatly increase the amount of generated biogas through anaerobic digestion, is the most cost effective biogas solution. There are two drivers that increase the economic viability of this option which are: 1) The increase biogas allows smaller facilities (i.e., a facility between 3 to 10 million gallons per day) to be able to supply the total amount of electricity needed to meet the facilities energy needs; and 2) Additional revenue from biomass tipping fees (associated with waste disposal), that significantly offset operational costs. Usually the tipping fees are shared with a biomass management service provider, but the benefit is still a net positive in terms of reducing a facility's total energy cost.

- A municipality needs to know what their cost of energy is, especially if they are considering selling the generated power back to the grid. Under the *Power Utility Regulatory Policy Act* of 1978 as amended by the *Energy Policy Act* of 2005, power utilities are only obligated to buy electricity from a Qualifying Facility (QF) at a rate equal to their avoided cost of electricity. A QF is a generator that meets one of the two criteria:

- A small power production facility generating 80 MW or less whose primary energy source is renewable (hydro, wind or solar), biomass, waste, or geothermal resources; or
- A cogeneration facility of any size that sequentially produces electricity and another form of useful thermal energy (such as heat or steam) in a way that is more efficient than the separate production of both forms of energy.

The Leveled Avoided Cost of Electricity (LACE) is essentially a power company's marginal cost to generate an additional megawatt of electricity. Some of the models that utilities use to estimate their LACE are extremely thorough. They take into account all of their regulatory costs, fuel, O&M, transmission, transmission losses, etc. to try to minimize its fees due to QFs. What is interesting is the spread between the LCOE and LACE over the next 30 years is projected to dwindle significantly (see Figures 2 and 3 below). This makes sense from an economic perspective since entrants will compete and drive the price down until there is zero economic benefit left.

If your facility's projected LCOE is greater than the LACE rate you will receive from the power company then you will be essentially paying the power company to take your electricity because it costs you more to generate it than you receive in terms of economic benefit. The worst case is to come to find out that it is actually costing you more to generate electricity than the commercial rate of electricity you were paying your power company before you got into all of this in the first place! You may be paying them even more than you know if you didn't account for potential interconnection fees or tariffs due to the power company.

In conclusion, here are a few tips:

- Perform an LCOE evaluation before making any final alternative energy decisions in conjunction with a payback scenario evaluation and sensitivity analysis.
- Make sure you understand the incentives and credits afforded to each alternative energy technology at the state and federal level before shortlisting any specific technology under consideration.
- Know the dollars and cents of it all to make sure you are prepared to negotiate the most favorable terms with vendors and your power utility (if you are selling back to the grid) to ensure you have a fighting chance of staying in the black.

Decreasing alternative energy technology costs are making it more economically viable to generate electricity at wastewater treatment plants. Incentives at the state and federal levels are making electricity generation using biogas viable even for smaller facilities (around 10 MGD).

If you have any questions with your alternative energy projects or need assistance performing an LCOE evaluation, please feel free to contact me at: *spierini@maserconsulting.com* P: 877-627-3772.

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