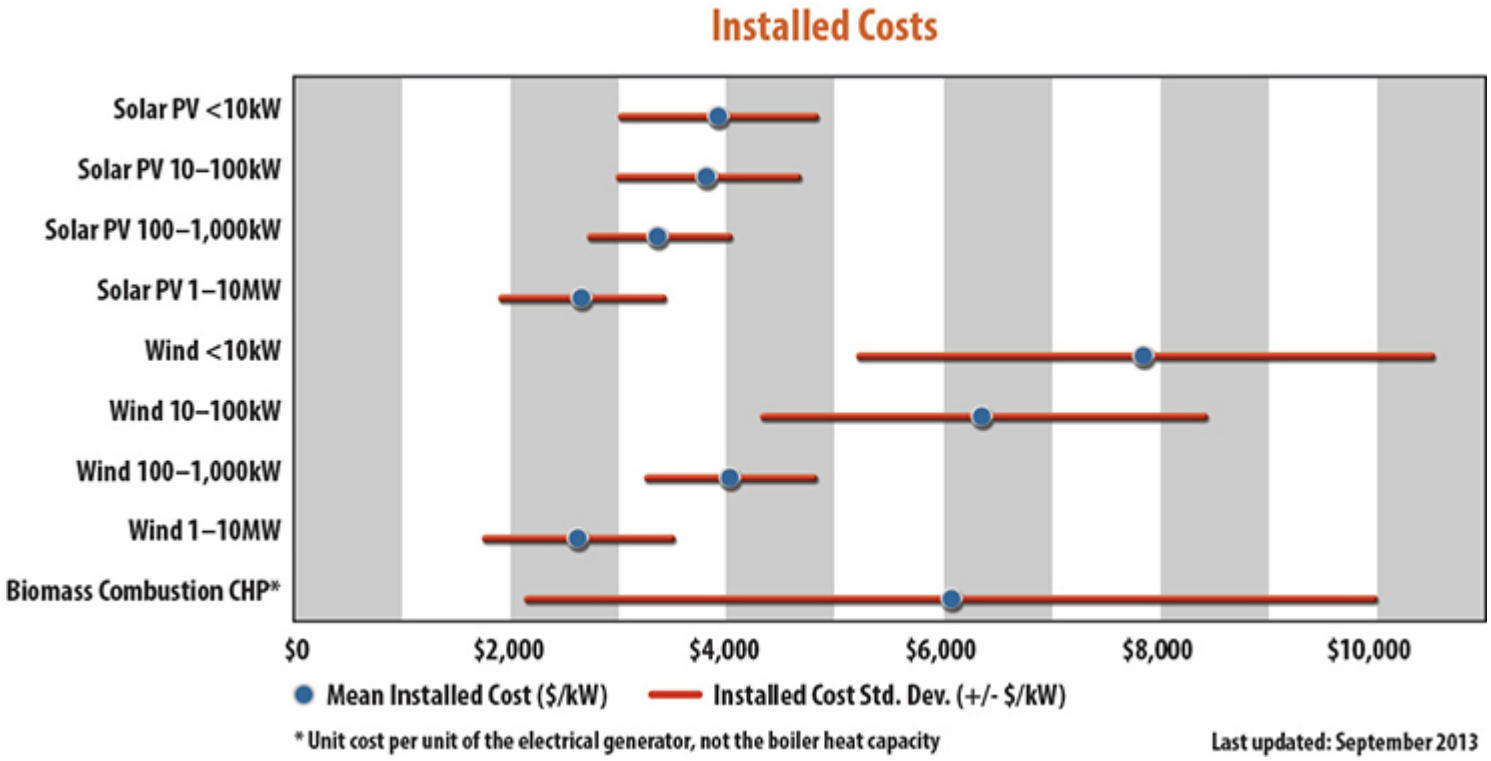
DOE OFFICE OF INDIAN ENERGY

Levelized Cost of Energy (LCOE)

U.S. DEPARTMENT OF ENERGY | Office of Indian Energy

Upfront Capital Costs for Renewables

Upfront costs do not paint a complete picture

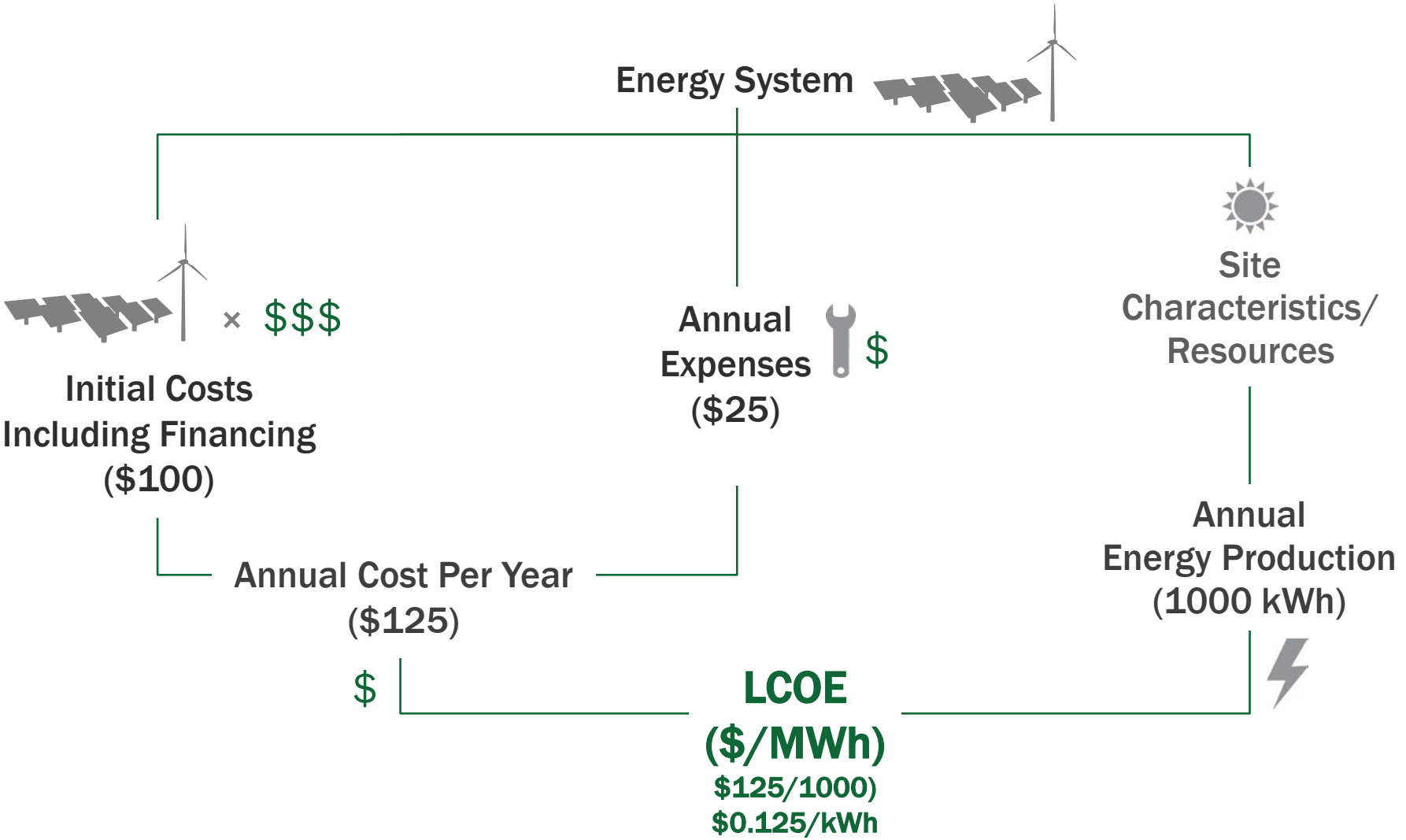


Key Concept: Levelized Cost of Energy (LCOE)

- Measures lifetime costs divided by energy production
- Calculates present value of the total cost of building and operating a power plant over an assumed lifetime.
- Allows the comparison of different technologies (e.g., wind, solar, natural gas) of unequal life spans, project size, different capital cost, risk, return, and capacities

Critical to making an informed decision to proceed with development of a facility, community or commercial-scale project

Simple LCOE Concept



Adapted from European Wind Energy Association, "Economics of Wind Energy,"
http://www.ewea.org/fileadmin/ewea_documents/documents/00_POLICY_document/Economics_of_Wind_Energy__March_2009_.pdf

Simplified LCOE Calculation

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

I_t = Investment expenditures in year t (including financing)

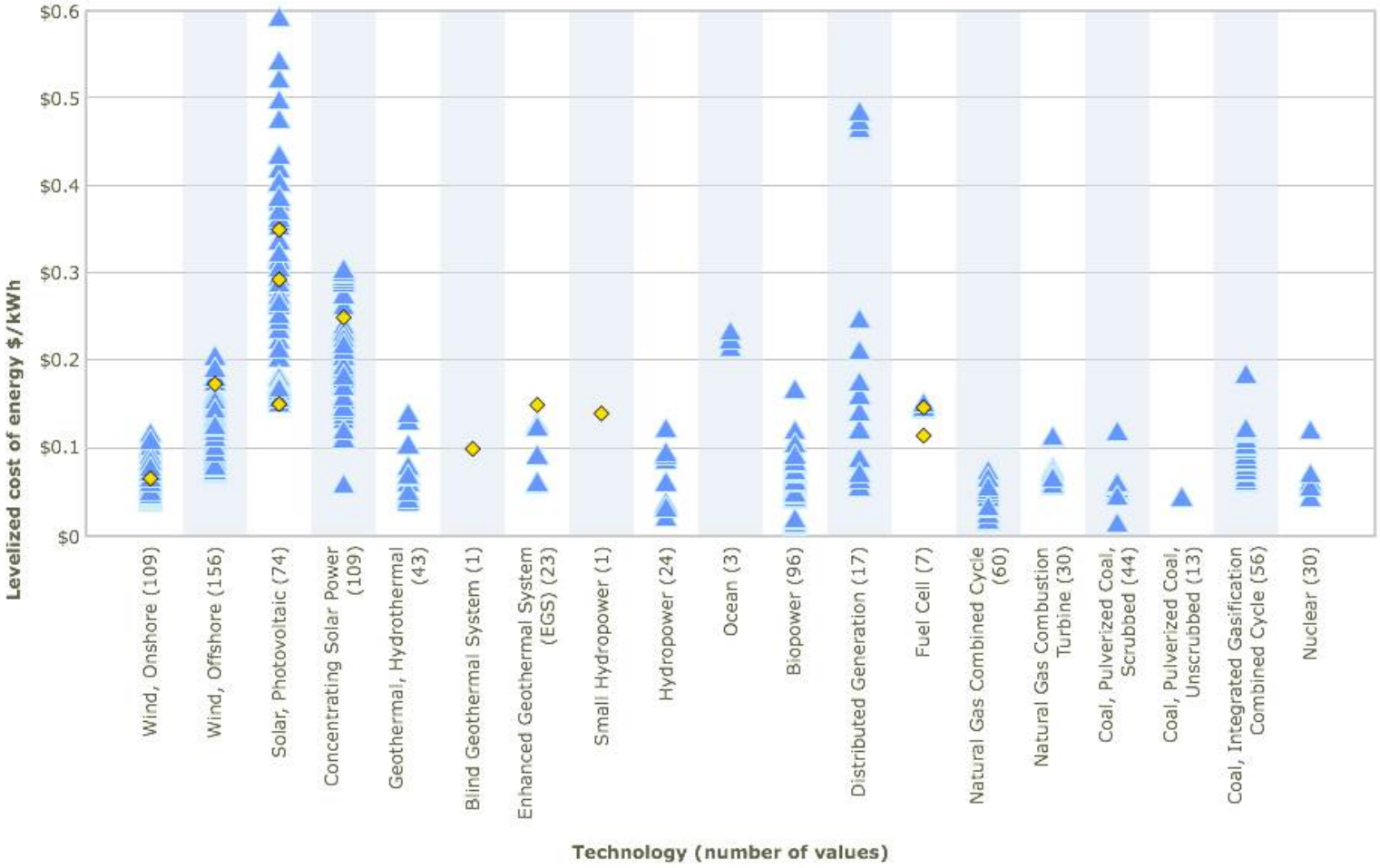
M_t = Operations and maintenance expenditures in year t

F_t = Fuel expenditures in year t

E_t = Electricity generation in year t

r = Discount rate

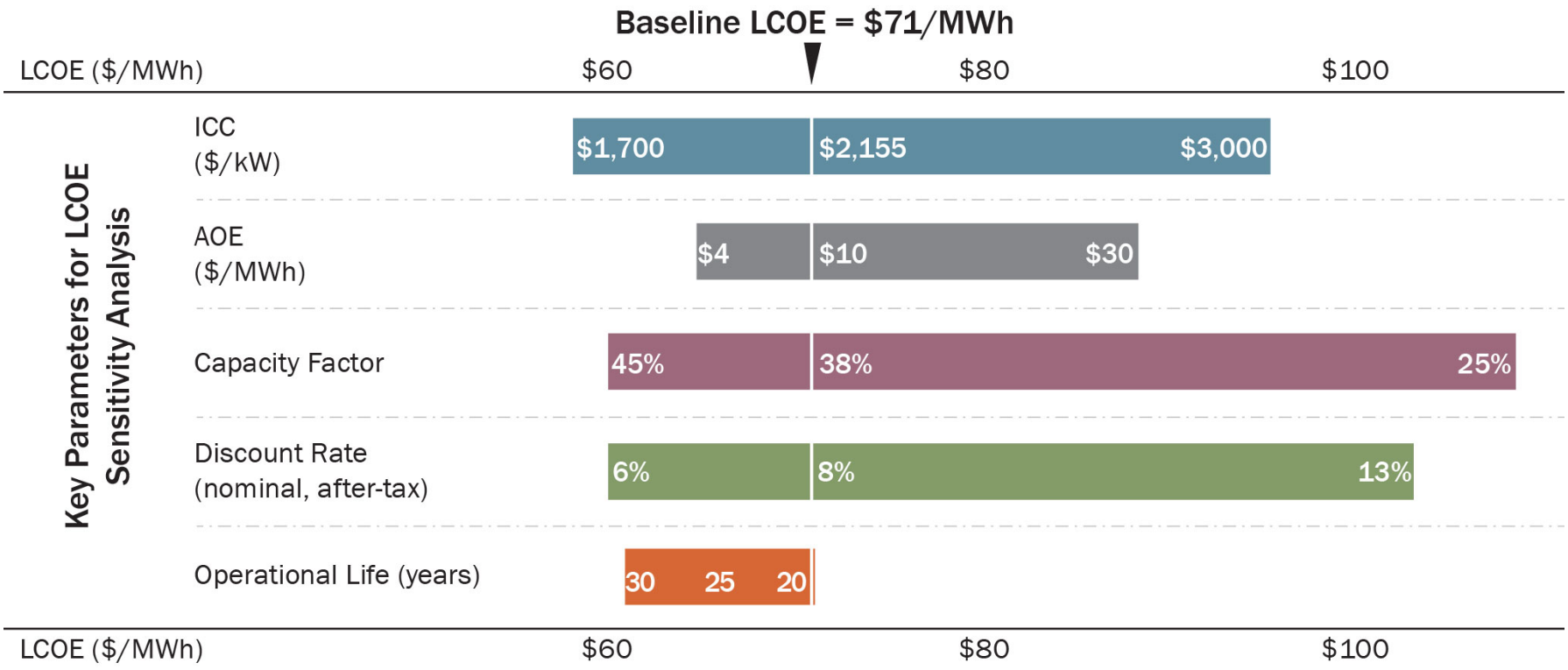
n = Life of the system



http://en.openei.org/wiki/Transparent_Cost_Database

Wind LCOE Sensitivity: What Are the Big Drivers?

Initial capital cost (ICC) and capacity factor are two critical drivers, but discount rate (financing costs) and annual operating expenses (AOE) are non-trivial. Wind LCOE example shown below:

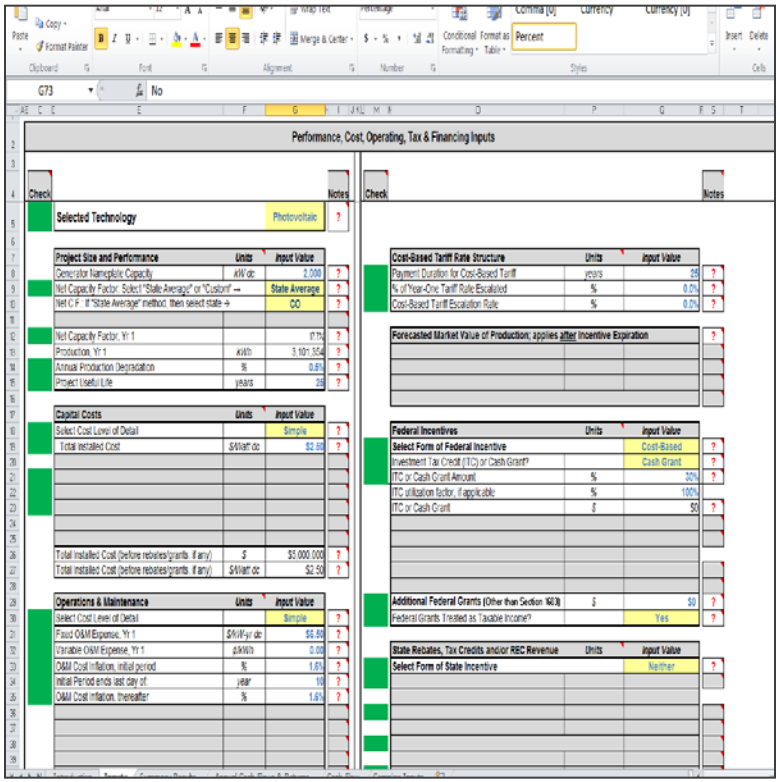


Source: Tegen et al. 2012

LCOE Models

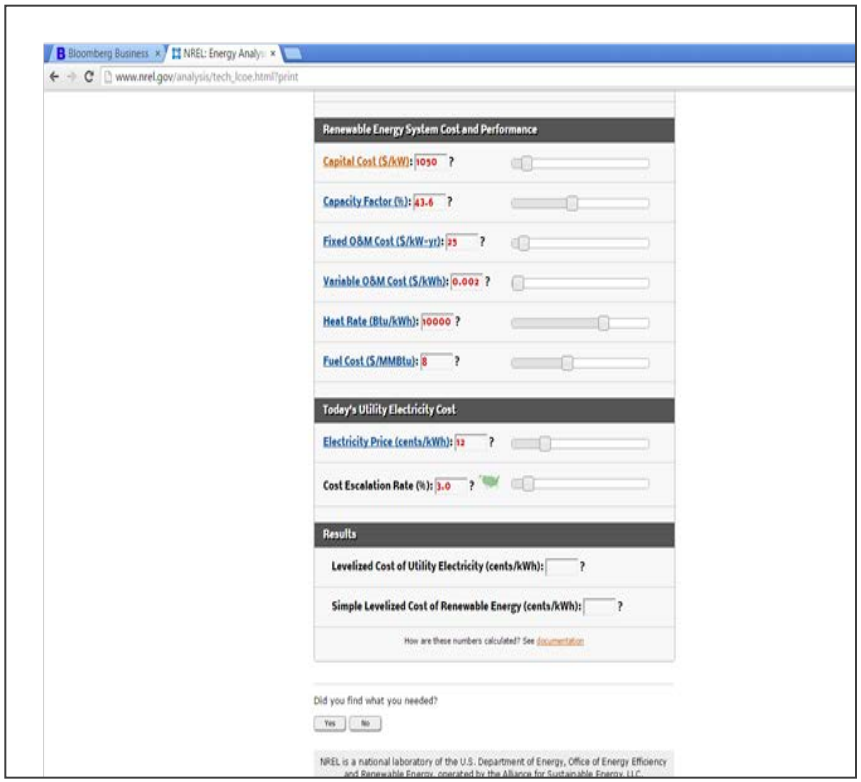
CREST

https://financere.nrel.gov/finance/content/crest-cost-energy-models



LCOE Calculator

http://www.nrel.gov/analysis/tech_lcoe.html



Using LCOE

Calculating and comparing LCOE can:

- Measure value across the longer term, showing projected life-cycle costs
- Highlight opportunities for Tribes to develop different scales of projects (facility, community, or commercial)
- Inform decisions to pursue projects on an economic basis, compared to utility rates

Most renewable energy projects have zero fuel costs (with biomass being the possible exception)