LEVELIZED COST OF ENERGY FOR COMMUNITY SOLAR PROJECTS IN NEW JERSEY

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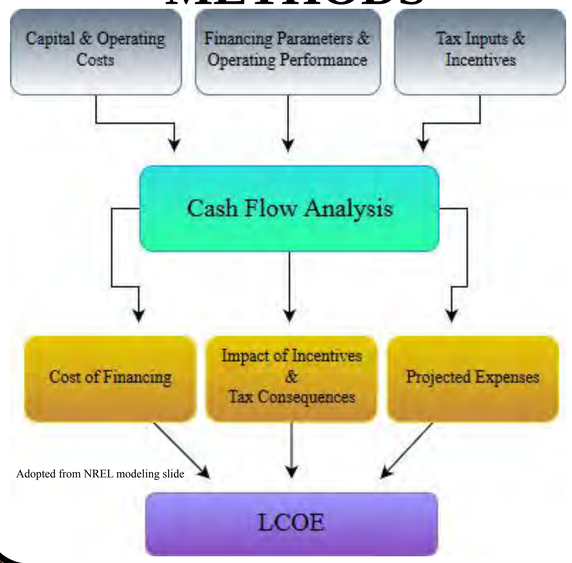
ABSTRACT

Renewable energy technologies are gaining momentum in New Jersey as the state gets more ambitious sustainability and carbon footprint goals. The development of community solar is one strategy that can be integrated within the current energy mix to accelerate progress towards these goals. The objective of this research is to evaluate the Levelized Cost of Energy (LCOE), which is a present value calculation of the unit-cost of electricity over the lifespan of a generating asset. We estimate LCOE using National Renewable Energy Laboratory's (NREL) modeling tool, Cost of Renewable Energy Spreadsheet Tool (CREST). We estimated project LCOE for multiple project sizes by incorporating a range of policy assumptions, financial requirements, and development of community solar projects in New Jersey. Our results highlight the wide range of LCOE estimates and identifies the key drivers based on LCOE sensitivity to model inputs. This research is timely and can be used to develop policy designs that help New Jersey's transition to a clean energy future. All system sizes have a Base Model Assumption of 25 years for project life, 24.5% for Net Capacity Factor, and 0.5% for Annual Product Degradation

Objective

The goal of the project was to obtain the LCOE of different size solar projects in New Jersey, and calculate/determine sensitive variable factors that effect the LCOE .

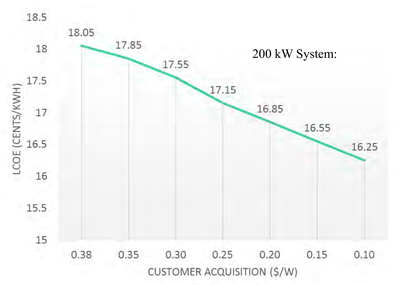
METHODS

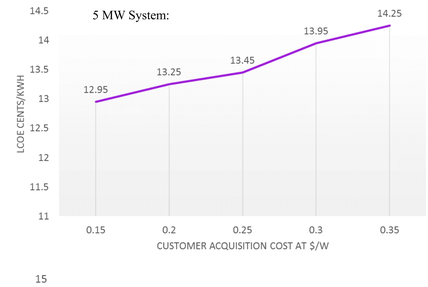


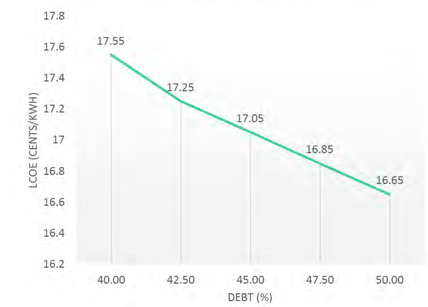
System Size:	200 kW	500 kW	5 MW
LCOE:	17.55 cents/kWh	16.35 cents/kWh	13.45 cents/kWh
Sensitivity Analysis:	LCOE 16.25-22.55 cents/kWh	LCOEs: not highly sensitive to IR assumptions.	Ground-Mount system on Rural Landfill: LCOE=13.25 cents/kWh
Results:	CA, PT, O&M expenditures varied + with LCOE. Debt=inverse relations w/ LCOE values	LCOE: mean v: 19.73 cents/kWh Median c: 16.75 cents/kWh	If municipality agree to lease land for $6,000/year

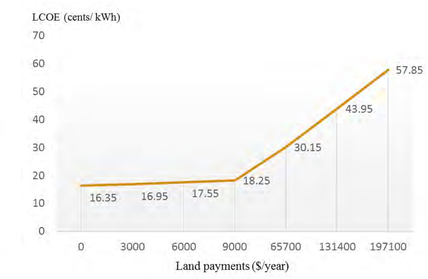
NCF: New Cap Factor / IR: Interest rate / CA: Customer Ac / PD: Annual Product degradation / PT: Property Taxes

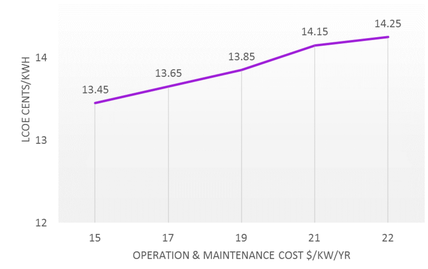
RESULTS











Scenario	5 MW ground-mount system on rural landfill	400 kW rooftop on University	1 MW car park canopy
CC: Capital Costs	Assumed landfill is owned by municipality	Assumed CC similar to .5 MW plant	Canopy construction ~entail greater costs for installing panels. Assumed BoP costs at 110%
CA: Customer Acquisition	Land lease for $6,000/year	CA: $0.29/W	Higher fixed O&M expenses at $20/ kW-yr to accommodate canopy structure
LCOE:	13.25 cents/kWh	20.15 cents/kWh	18.25 cents/kWh

CONCLUSION / ONGOING WORKS

Overall, as projects sizes increases, LCOE deceases.

For the Ground-tracking system, although the initial investment and operation maintenance costs are higher, the percent efficiency of the system is presumed to increase as the panels follow the track of the sun to absorb more energy throughout daily operation.

200 kW: Customer acquisition, property taxes, O&M expenditures varied positively with LCOE, whereas level of debt had an inverse relationship with LCOE values.

500 kW: Property tax is an important factor as the LCOE is sensitive to assumptions for this variable. LCOE estimates are highly sensitive to the assumption pertaining to payments for land lease.

- Socioeconomic feasibility for inner city solar communities and solar farms.
- Extend data collection towards solar panel project for different sizes, parking lots, brownfields, canopies, and etc.

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State of New Jersey Board of Public Utilities

REFERENCES

Darling, S. B., You, F., Veselka, T., & Velosa, A. (2011). Assumptions and the levelized cost of energy for photovoltaics. *Energy & Environmental Science*, *4*(9), 3133-3139.
Feldman, D. & Schwabe, P. (2017). PV Project Finance in the United States, 2017
Fu, R., Feldman, D., Margolis, R., Woodhouse, M., & Ardani, K. (2017). U.S. Solar Photovoltaic System Cost Benchmark: Q1 2017. National Renewable Energy Laboratory.
Jordan, D.& Kurtz S. (2012). NREL Photovoltaic Degradation Rates — An Analytical Review
https://www.nrel.gov/docs/fy12osti/51664.pdf
US Solar Tariff policy https://news.energysage.com/2018-us-solar-tariff-impact-prices