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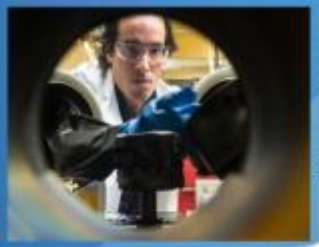


Renewable Energy in GESPCs

6th ESC MTC Conference

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August 11, 2017

NREL is a national laboratory of the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, operated by the Alliance for Sustainable Energy, LLC.

Bundling EE & RE ECMs or ESA

- Acknowledge that a renewable energy project is generation and not energy efficiency. Delivers cost savings in avoided cost of utility electrical purchases
- Renewable Energy Projects often have long paybacks (15-20 years)
- Bundling Energy Efficiency measures like lighting, motors, HVAC fans with 8-15 year paybacks can result in a 20 year project that cash flows
- Alternatively another approach to deploying renewable projects is implement an Energy Services Agreement (ESA), sometimes referred to a Power Purchase Agreement(PPA). With PV installed costs dropping significantly it is feasible to execute an ESA , with an objective of PV price less than the price of utility electricity
- The next couple slides will create ESA project features

Economics of PV ESA

- Installed PV system costs have significantly dropped.
  - 2017 cost is 38% of 2010 cost

Bloomberg NEW ENERGY FINANCE

DATASET Forecast fixed-axis PV capex, 2010-2020, 2013 $/W
UNITS $/W
SENT TO All Solar Insight Clients
DATE 05 February 2015
SOURCE Bloomberg New Energy Finance
Subject to terms and conditions

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Utility										
Module	1.85	1.35	0.84	0.71	0.68	0.61	0.55	0.51	0.47	0.45
Inverter	0.30	0.21	0.12	0.13	0.12	0.11	0.10	0.10	0.09	0.09
Balance of plant	0.50	0.50	0.27	0.27	0.24	0.23	0.22	0.21	0.21	0.20
Engineering, procurement	0.41	0.41	0.32	0.32	0.32	0.31	0.30	0.29	0.28	0.28
Other	0.18	0.18	0.15	0.15	0.14	0.14	0.13	0.13	0.13	0.12
System cost	**3.24**	**2.65**	**1.71**	**1.58**	**1.50**	**1.39**	**1.31**	**1.24**	**1.18**	**1.13**
Commercial										
Module	2.04	1.46	0.90	0.75	0.71	0.63	0.57	0.52	0.48	0.45
Inverter	0.38	0.25	0.19	0.16	0.16	0.15	0.14	0.13	0.12	0.12
BOP	0.62	0.62	0.40	0.40	0.34	0.33	0.32	0.31	0.30	0.29
EPC	0.51	0.51	0.45	0.45	0.40	0.39	0.37	0.36	0.35	0.34
Other	0.47	0.36	0.28	0.25	0.23	0.22	0.21	0.20	0.20	0.20
System cost	**4.01**	**3.20**	**2.21**	**2.00**	**1.84**	**1.71**	**1.61**	**1.52**	**1.46**	**1.40**
Residential										

Economics of PV ESA with Government Ownership

Solar Analysis of 2000KWdc PV system in Las Vegas
  - Recommend ground mount @ 4 acres/MW: 8 Acres available?
- Annual production: 1,914,776 kWh
  - Production degradation @ .5%/yr
- Estimated Price per kWh: $0.0610
- Total Installed Capital Cost: $1,535,972
  - Installed Cost $1.54/Wdc (see Commercial 2017 Total System Cost)
- Inverter replacement assumed at year 10 @$0.10/Wdc :$200,000
- System maintenance $20/kW/yr = $40,000/yr average

- **Summary:**
  - This 2MWdc PV system with Inverter replacement & maintenance has a payback of 16.7 years.
  - Recommend a 20 year term for PV System - Financier preference
  - Site savings after payback years 17-20: ~$440,000

- **KEY**: is $.0610/kWh less than current cost of utility electricity

Economics of PV ESA with Private Ownership

If Private Ownership, the PV System title is held private entity

- Private party is eligible to take 30% Investment Tax Credit (ITC) and Modified Accelerated Cost Recovery System (MACRS) 5 year depreciation, which amounts to about 45% of capital cost
- The key affect is the price/kWh drops by about 40%
- Site would need to provide revocable license so O&M personnel have site access

Solar Analysis of 2000KWdc PV system in Las Vegas

  - Recommend ground mount @ 4 acres/MW: 8 Acres available?
- Annual production: 1,914,776 kWh
  - Production degradation @ .5%/yr
- Estimated Price per kWh: $0.0366
- Total Installed Capital Cost: $1,535,972
  - Installed Cost $1.54/Wdc (see Commercial 2017 Total System Cost)

If a private owned PV system recommend the contractor be responsible for installation, operations, maintenance, repair & replacement during a 20 year contract

- Allows site to establish an annual production and savings guarantee

Summary:

- Site is not responsible for PV system production. Pay only when energy delivered
- Recommend a 20 year term for PV System - Financier preference
- Site savings after payback years 17-20 is small as contractor assumed O,M,R&R

KEY: is $.0366/kWh less than current cost of utility electricity

Conclusion

Renewable energy projects becoming more cost effective, particularly Photovoltaics (PV)

Other benefits:

- **Support goals focused on increasing renewable energy use**
- **Some increase in resiliency**
- **Public relations – Environmental Stewardship**
- **In educational environment, a dashboard showing solar energy production in real time is inspirational for students**

QUESTIONS?

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