

It's a New Day

Introducing the Bergey Excel 15

Small Wind
Conference 2017

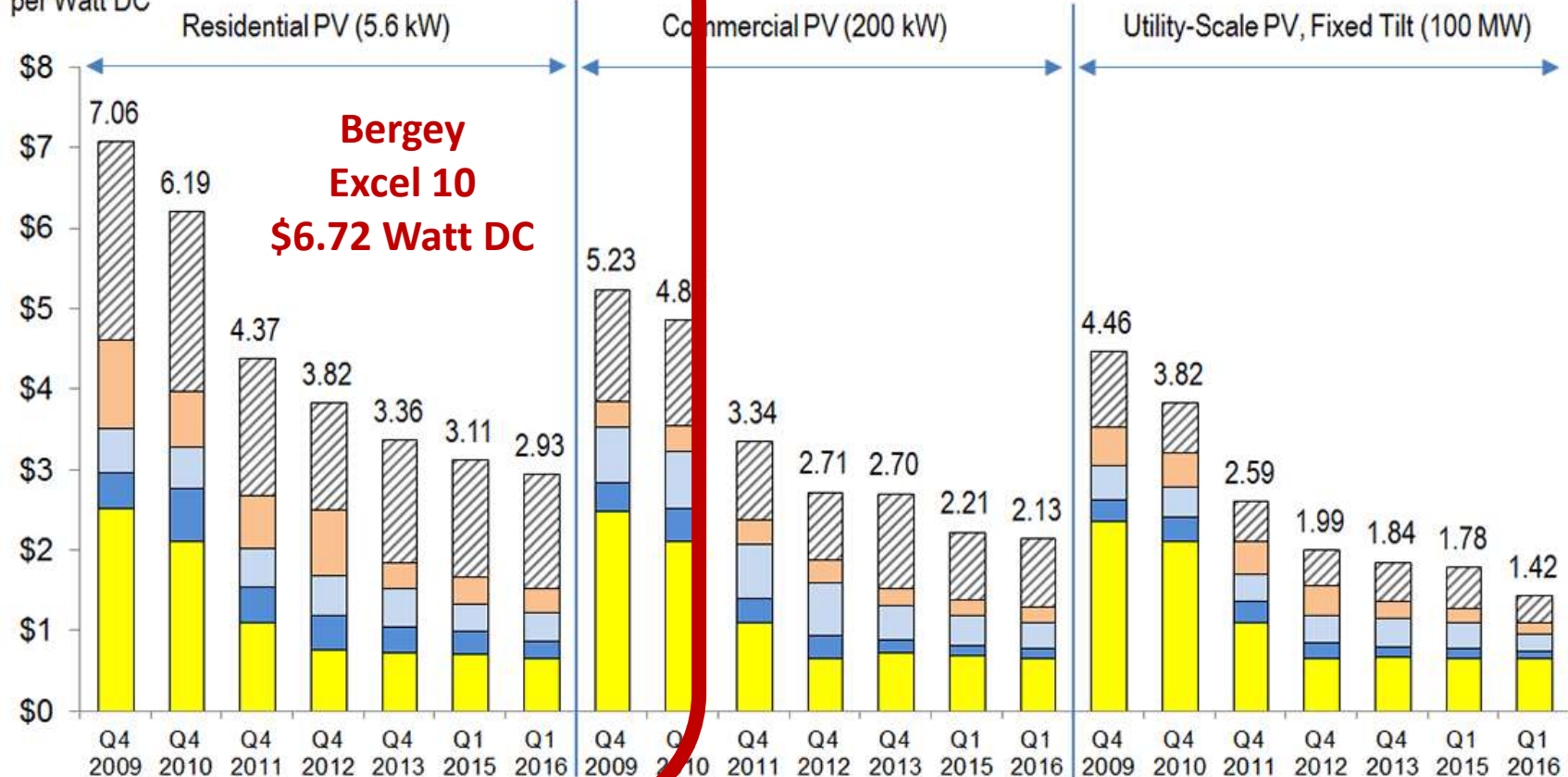
Mike Bergey
President & CEO

April 11, 2017



Small Scale Solar System Costs

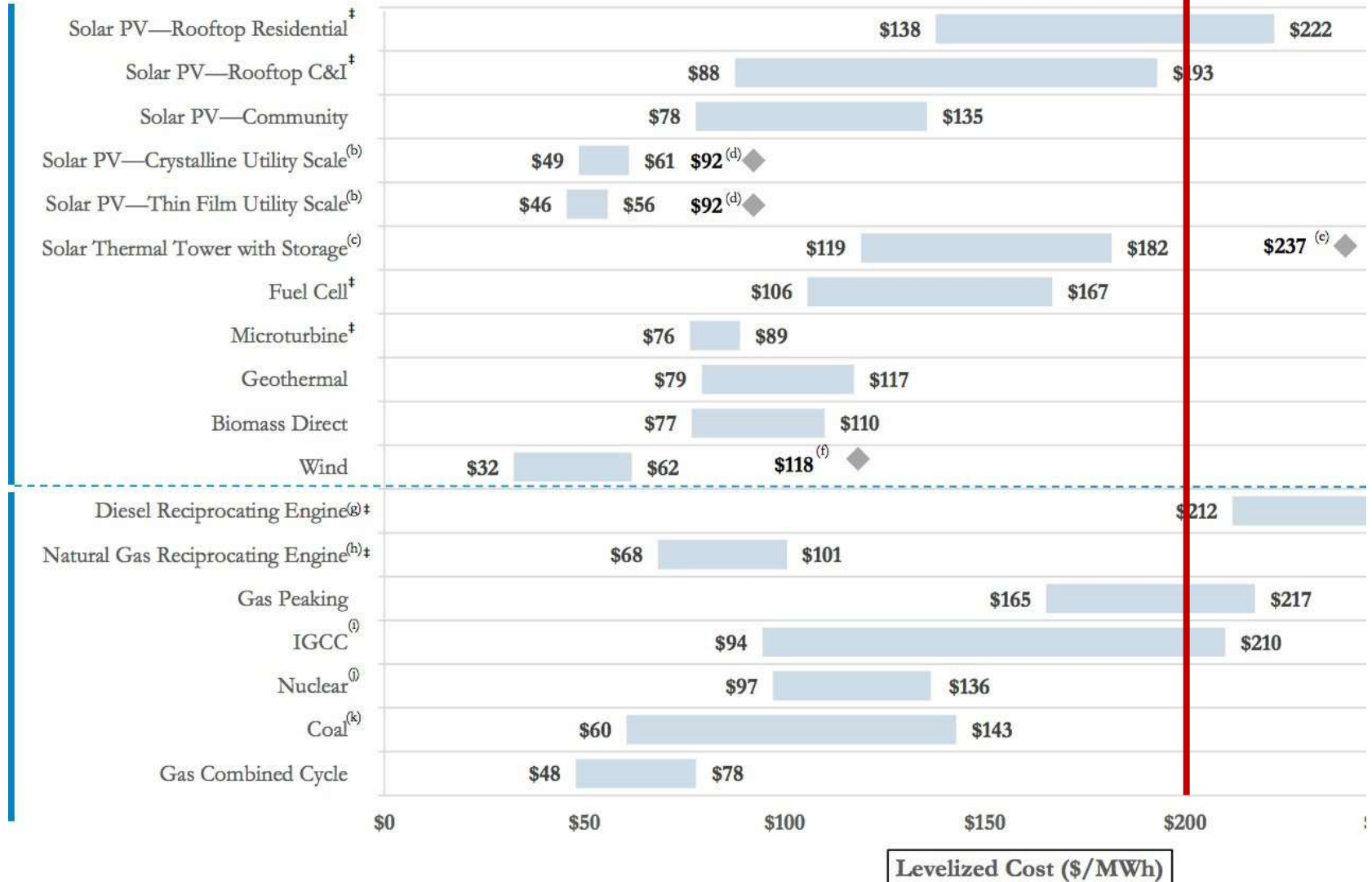
2016 USD
per Watt DC



- ▨ Soft Costs - Others (Pll, Land Acquisition, Sales Tax, Overhead, and Net Profit)
- Soft Costs - Install Labor
- Hardware BOS - Structural and Electrical Components
- Inverter
- Module

Levelized Cost of Energy (LCOE)

Excel 10, 30m SSL (\$200)



So, Are We the Walking Dead?



It's a New Day – All New Excel 15



- 31.5 ft. Diameter
- Rated Power: 15.6 kW*
- Rated AEO: 30,100 kWh*
- IEC Class II (8.5 m/s Ave.)
- Limited variable speed
- Stall regulation (inverter + dump load)
- Dynamic brake backup for outages and overspeeds (idles at ~ 50 RPM)
- Same towers as Excel 10
- Pre-production prototype operated for 16 months
- Currently in certification

* - Preliminary, Pre-Certification

Excel 15 - Advanced Technology



- Tailored Aerodynamics
- Carbon Fiber Blades
- Stall Control
- Limited – Range
Variable Speed (0 – 140 RPM)
- 25 kW BWC Powersync[®] III inverter, with 14 kW dump load
- Also working with InterGrid's Advanced 25 kW Inverter

Excel 15 - Advanced Technology



- Record Small Wind Efficiency: 42% to grid
- Same tower loads as 10 kW, with 88% more rotor
- Two Moving Parts
- Quiet
- R&D and certification supported by US-DOE under CIP

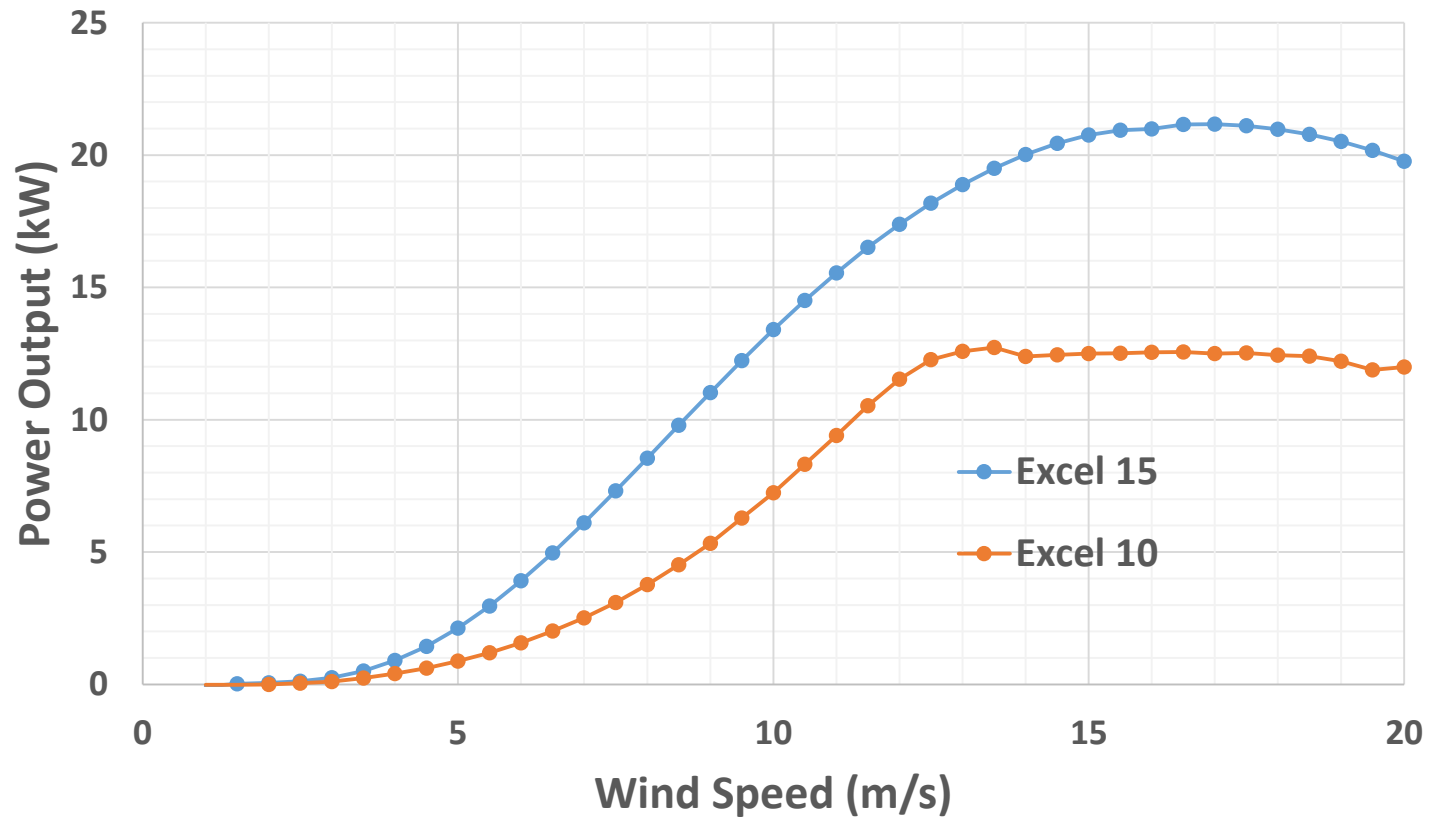
Excel 15 – Cert. Testing - First 24 Hours



- 17.1 kW Average (Capacity Factor = 114%); 410 kWh
- Peak Wind = 25.5 m/s (57 mph)

Excel 15 – Performance

Excel 15 Power Curve*
Curve Fit of Averaged Field Test Data

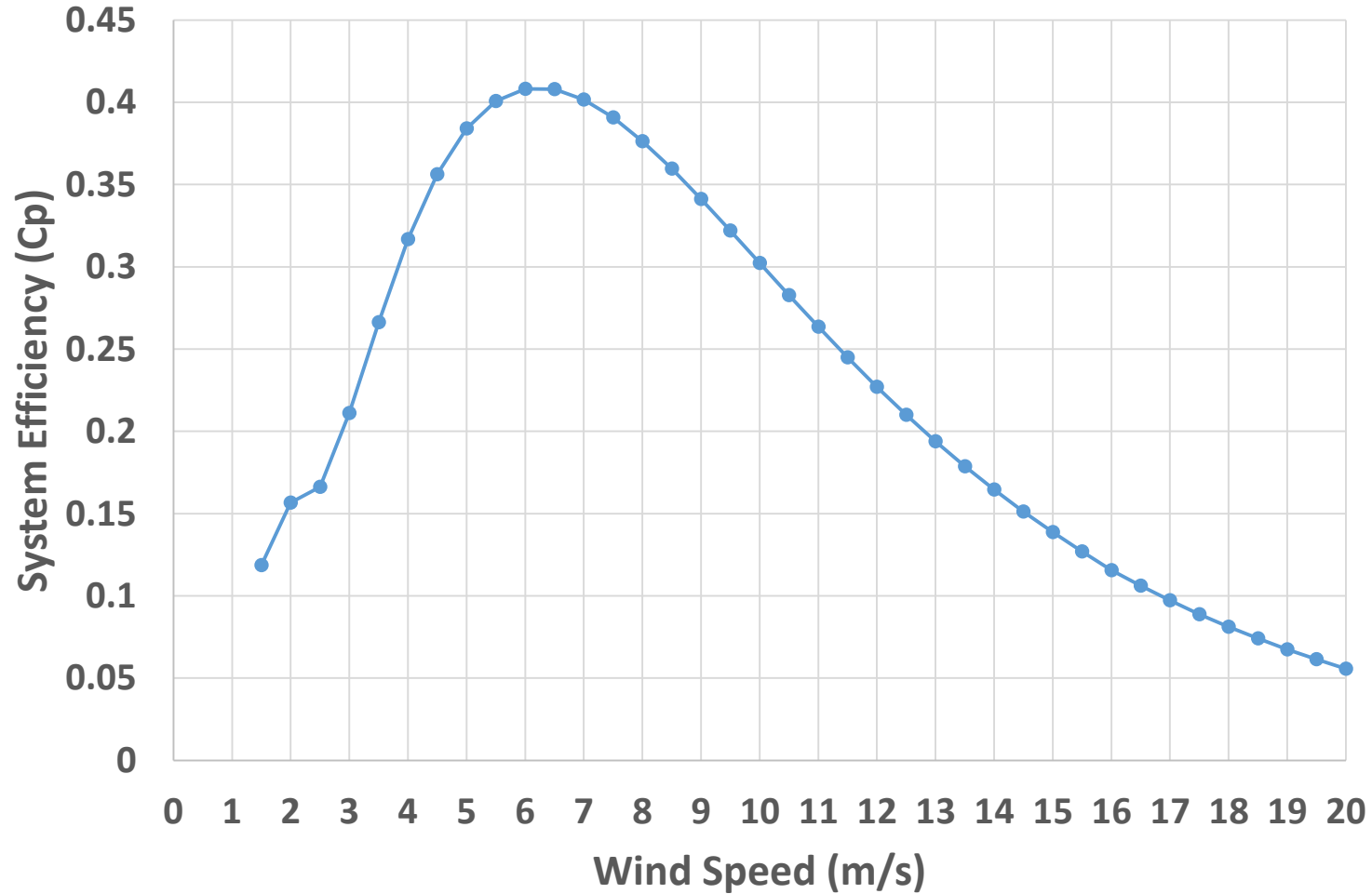


* - Preliminary, Pre-Certification

Excel 15 – Performance

Excel 15 Efficiency (Cp)

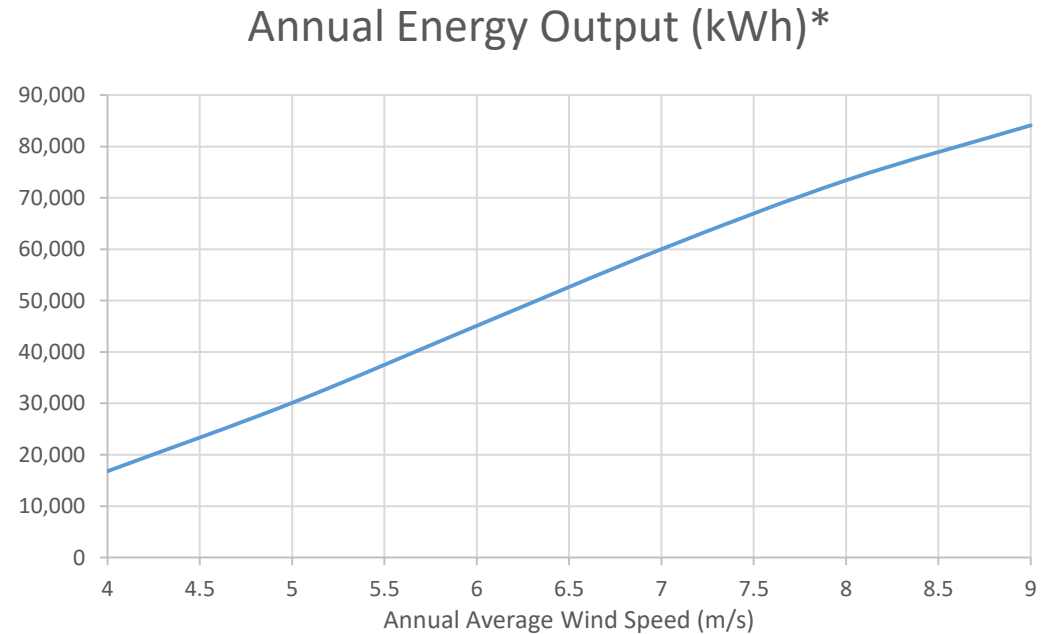
Curve Fit of Averaged Field Test Data



* - Preliminary, Pre-Certification

Excel 15 – Performance

Annual Average Wind Speed (m/s)	AEO (kWh)*
4	16,800
5	30,100
6	45,100
7	60,000
8	73,400
9	84,100



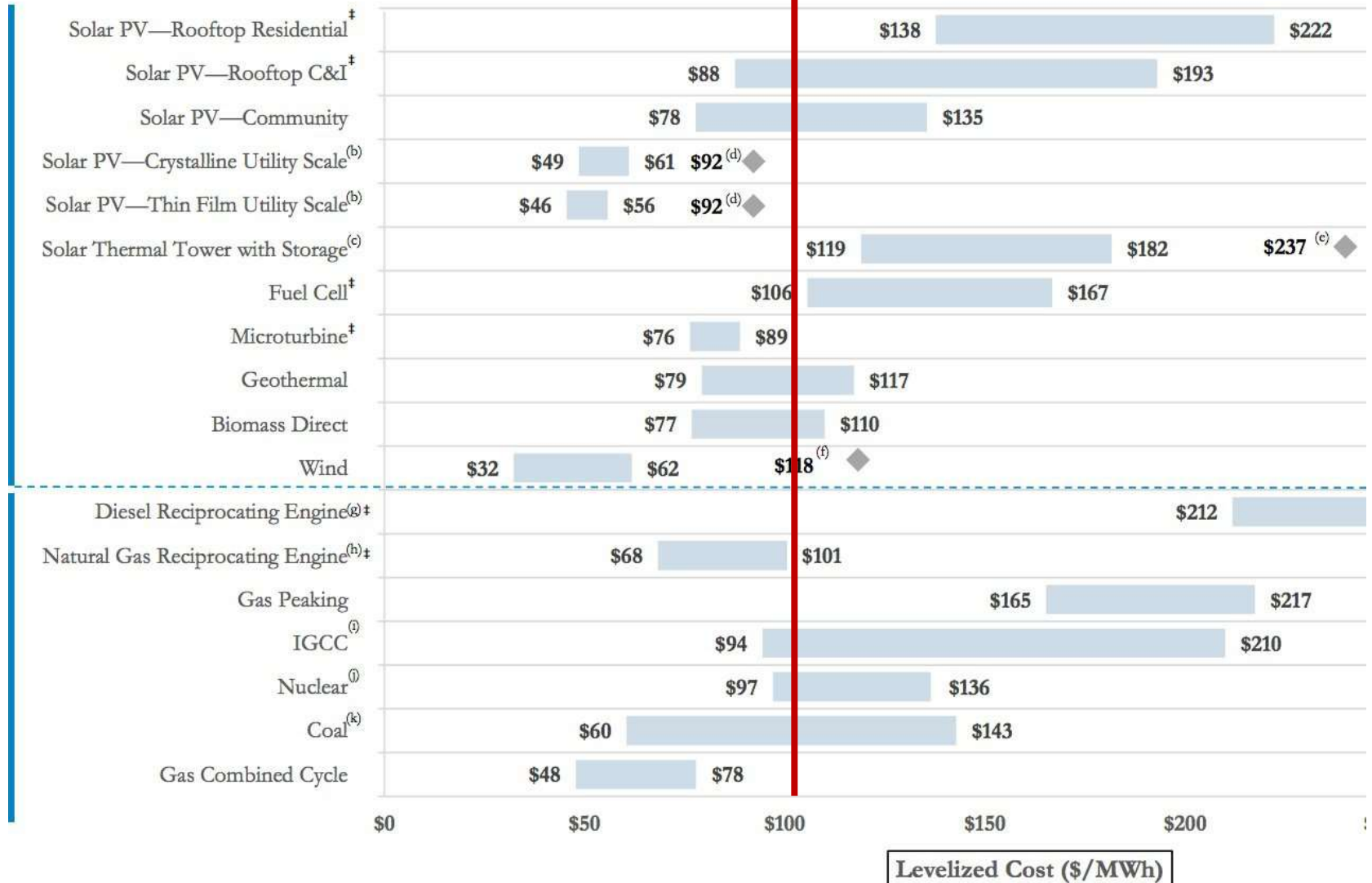
* - Preliminary, Pre-Certification

Excel 15 – Superior Economics

	Excel 10	Excel 15	Change
Rotor Diameter	7m (23 ft)	9.6m (31.5 ft)	+ 37%
Rotor Area	38.5m ²	72.4m ²	+ 88%
Ref. Power (11 m/s)	8.9 kW	15.6 kW	+ 75%
Max. Cp	0.30	0.42	+ 40%
Max. RPM	450	140	- 69%
AEO at 6 m/s (NREL LCOE)	18,825 kWh (CF = 21.5%)	39,300 kWh (CF = 30%)	+ 109%
MSRP, with inverter	\$31,770	~ \$37,500	+ 18%
Retail CAPEX, 30m SSL Tower	\$71,530	\$77,760	+ 9%
Retail NREL LCOE, 30m SSL Tower	20.0¢	10.2¢	- 49%

Levelized Cost of Energy (LCOE)

Excel 15, 30m SSL (\$102)



Excel 15 – Future Plans



- Turbine certifications to AWEA 9.1 and UL 6142
- PSIII certification to UL 1741 (?)
- Work to integrate InterGrid 25 kW inverter
- Blade static and fatigue life testing (CECET)
- Beta tests with ~ 5 systems this Summer (candidates?)
- Goal is first production deliveries by end of year

Excel 15 – Where you come in



Bergey Windpower is:

- Looking for Beta sites
- Promoting and supporting USDA REAP applications
- Expanding dealer network
- Encouraging membership in DWEA

Thank you!