

The background features abstract, overlapping green geometric shapes, primarily triangles and polygons, in various shades of green, creating a modern and dynamic visual effect.

Discussion of Levelized Cost of Electric Energy Research by Lazard and Request for Proposal Results for Xcel Energy in Colorado

Steve Tobin, BPU Member

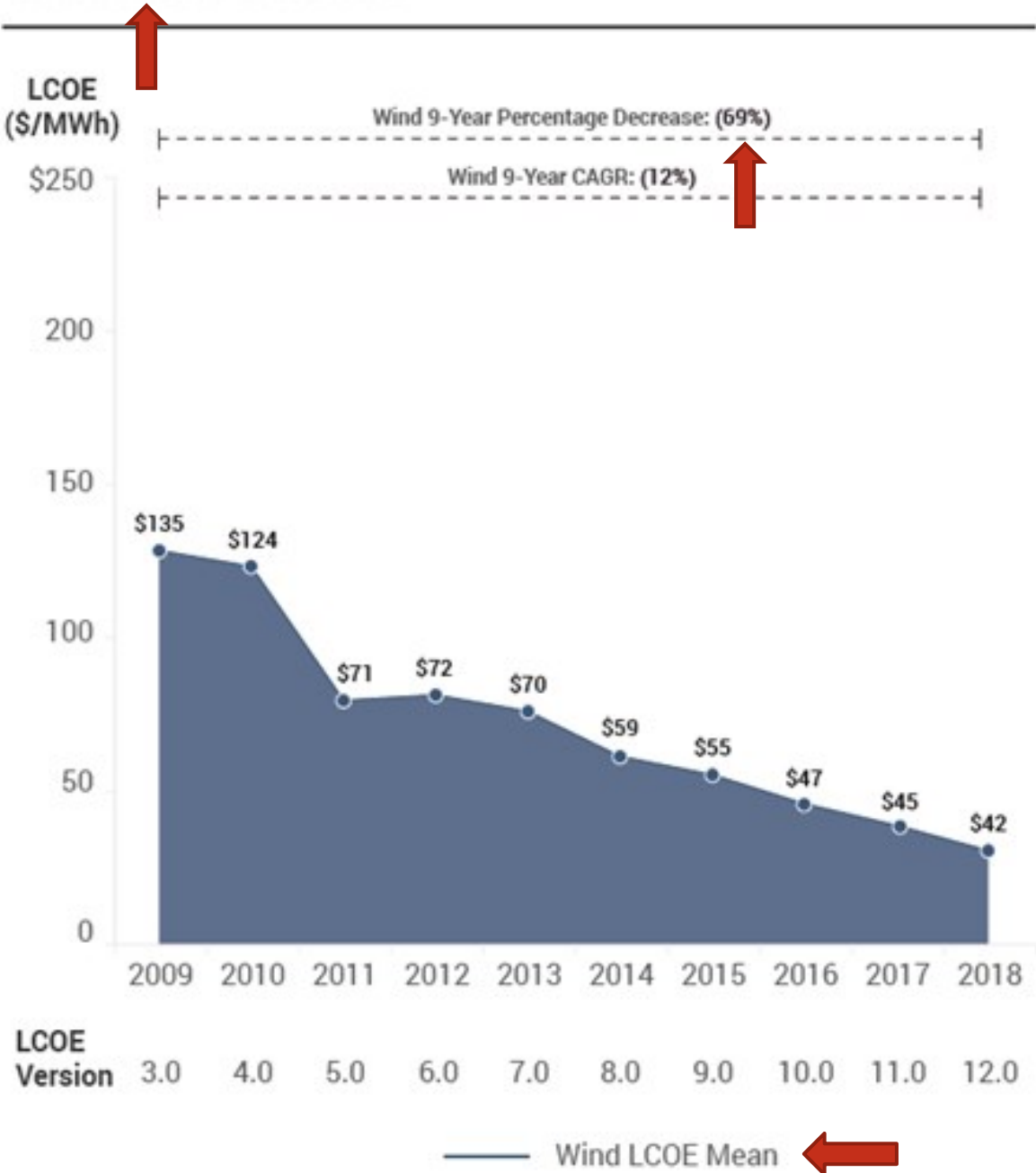
Motivation

- ▶ Provide economic context to decisions LAC will face in electricity generation
- ▶ Facilitate conversation on a complex topic

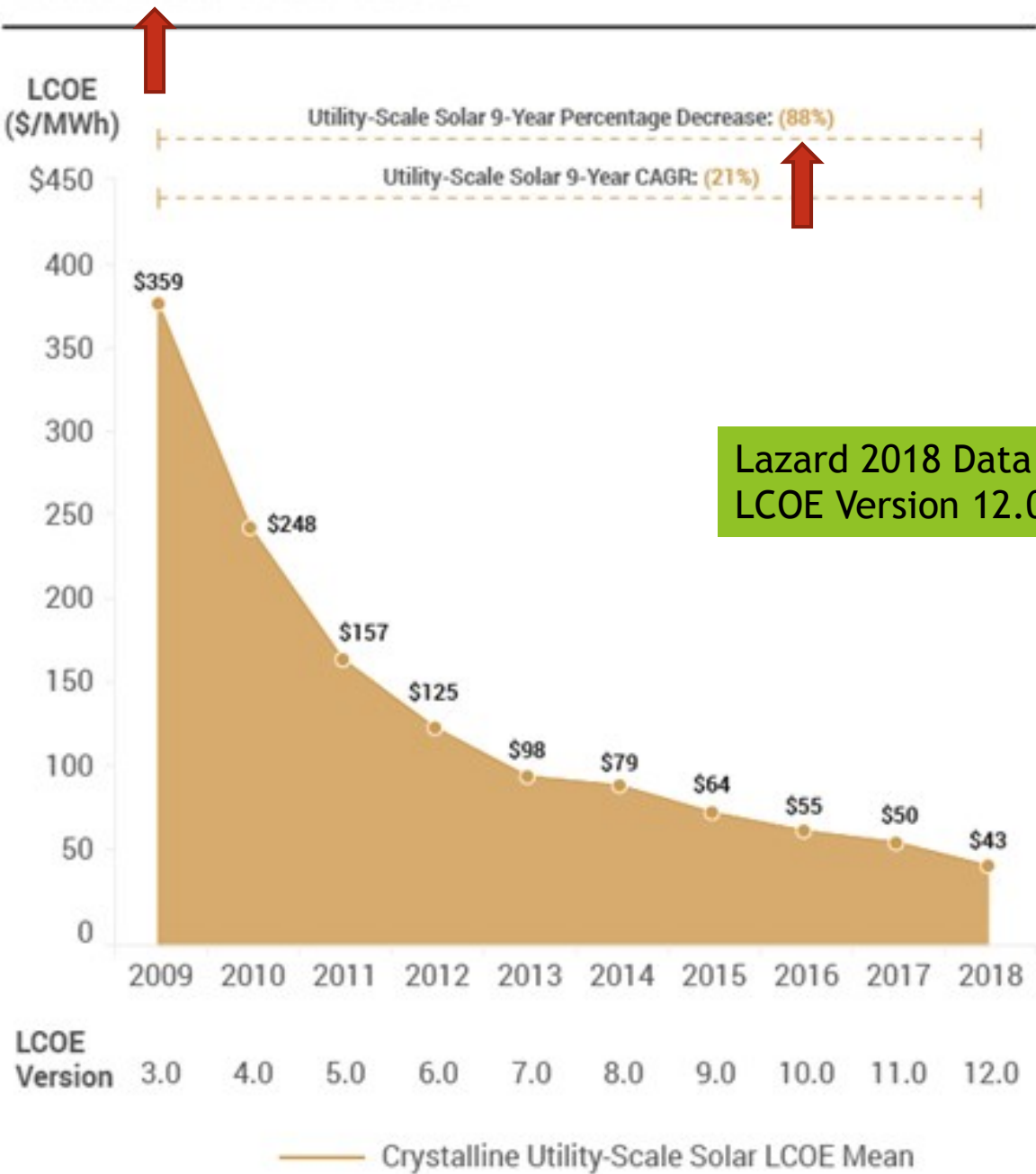
Starting Point: Levelized Cost Of Energy (LCOE)

- ▶ **LCOE = lifetime cost / energy produced**
- ▶ Major Caveats with LCOE as a metric of comparison
 - ▶ Firm vs. Intermittent
 - ▶ CO₂ emission
 - ▶ Marginal cost vs. new build
- ▶ Next 3 slides present analysis performed by **Lazard** which is a financial advisory and asset management firm that engages in investment banking.

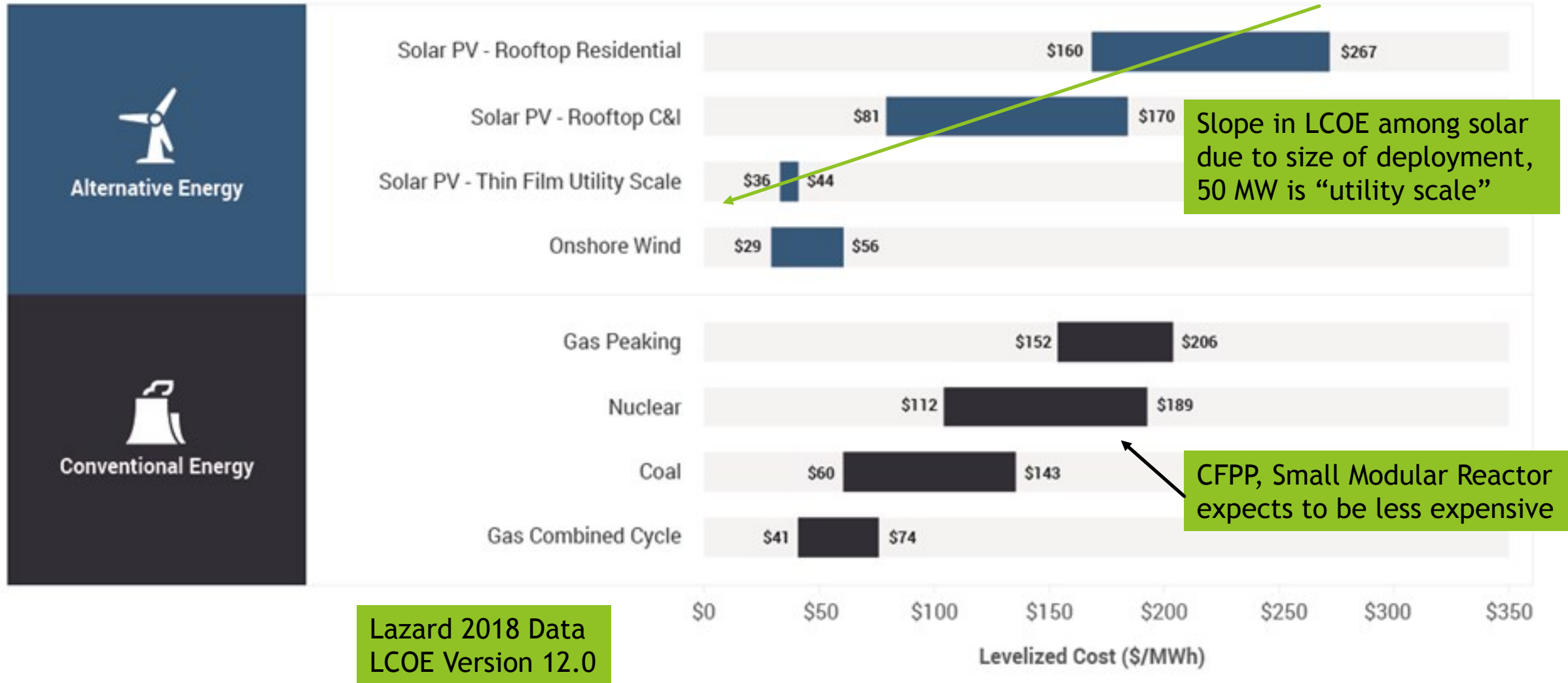
Unsubsidized Wind LCOE



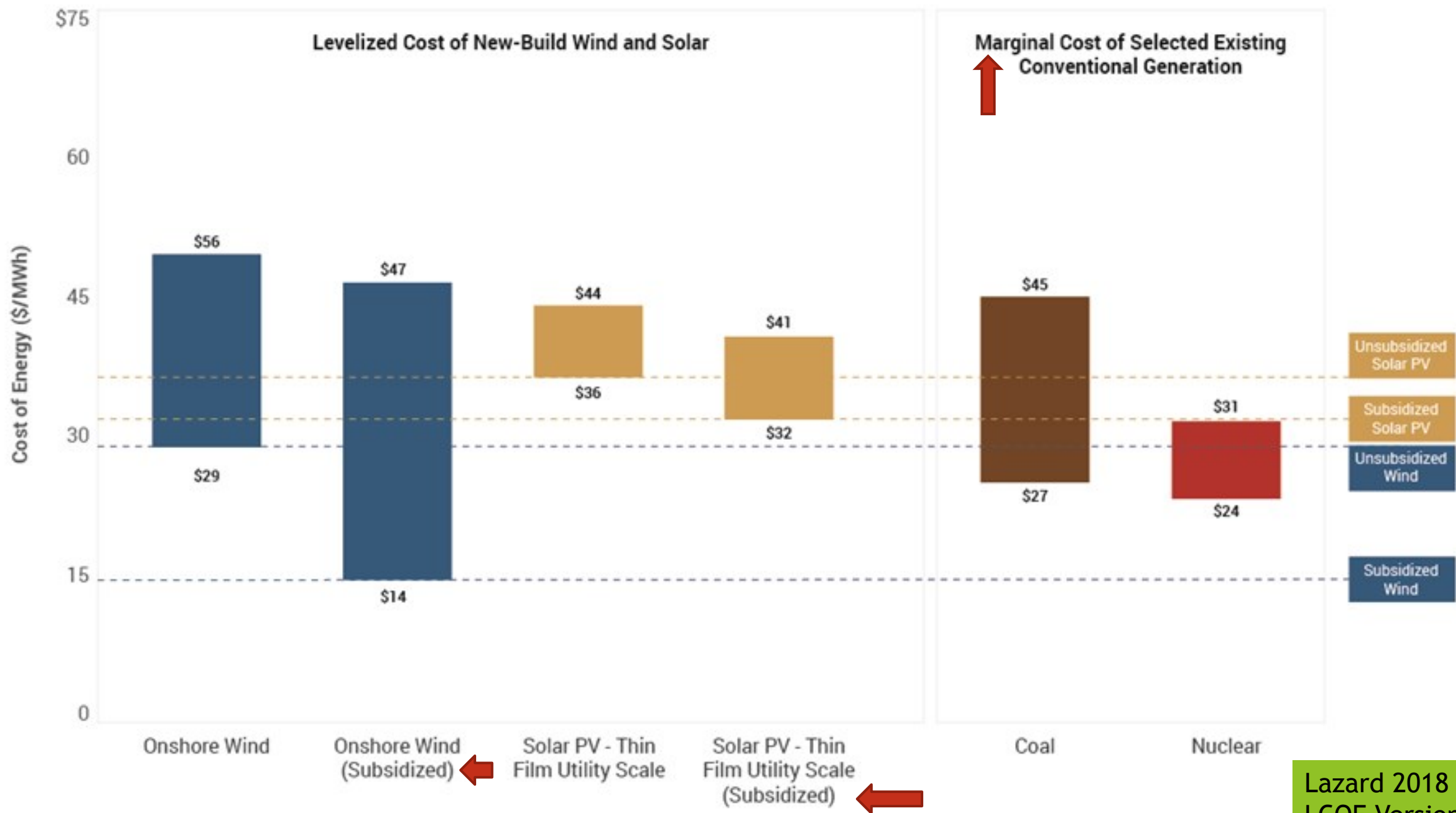
Unsubsidized Solar PV LCOE



Comparison of LCOE Among Options



Two thoughts: (1) Marginal Costs and (2) Subsidies



Switching Gears from Lazard's Analysis to Xcel Energy in Colorado

- ▶ In 2017 Xcel issues an “all-source solicitation” request for proposal to be provided by 2023
 - ▶ Xcel has 3.3 million customers in CO, NM and upper Midwest
 - ▶ Similar wind and solar resources to New Mexico

Xcel Energy data published by Vox, “In Colorado, a glimpse of renewable energy’s insanely cheap future,” Jan. 16, 2018. Online

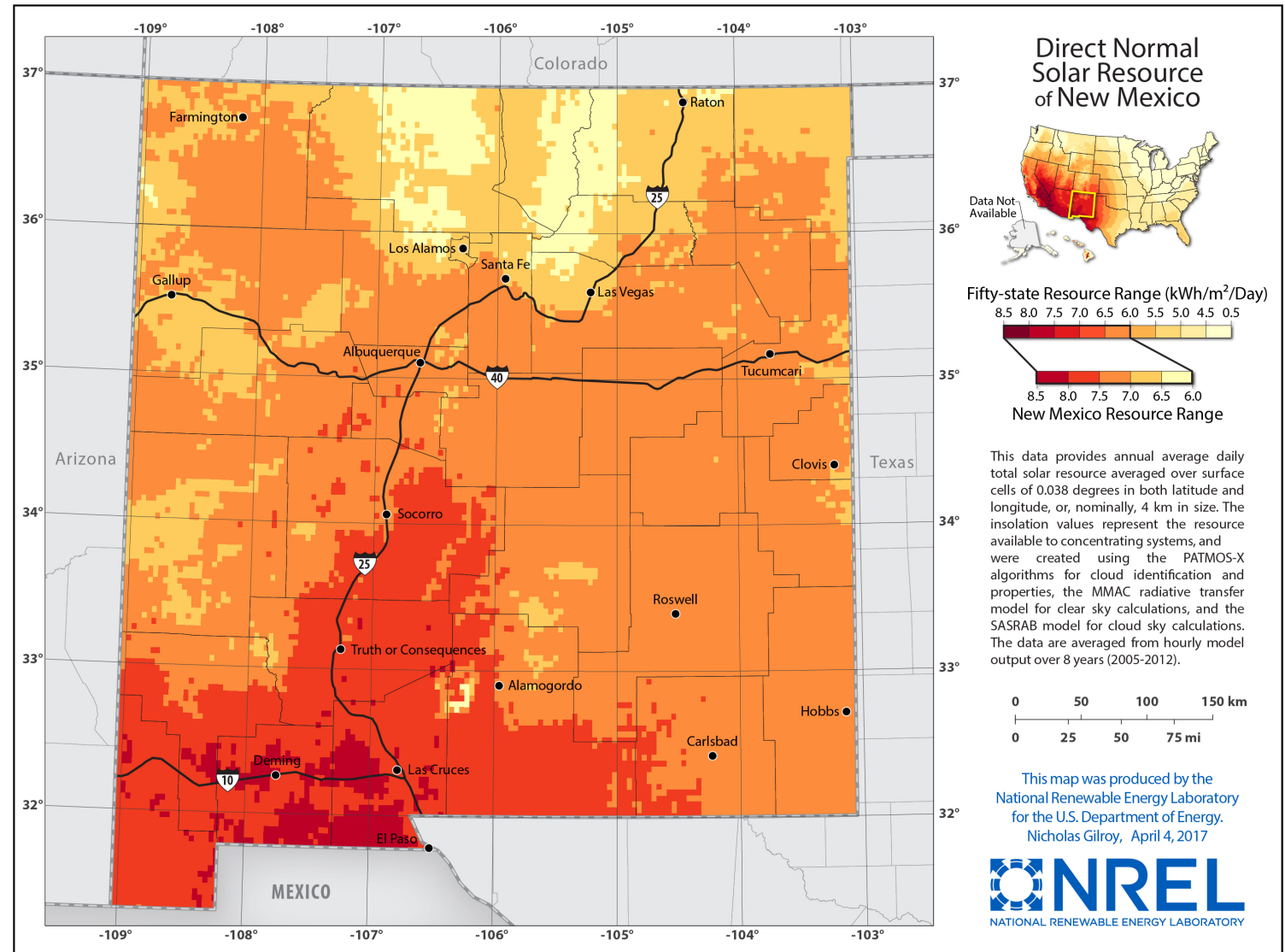
RFP Responses by Technology

Generation Technology	# of Bids	Bid MW	# of Projects	Project MW	Median Bid	Pricing Units
					Price or Equivalent	
Combustion Turbine/IC Engines	30	7,141	13	2,466	\$ 4.80	\$/kW-mo
Combustion Turbine with Battery Storage	7	804	3	476	6.20	\$/kW-mo
Gas-Fired Combined Cycles	2	451	2	451		\$/kW-mo
Stand-alone Battery Storage	28	2,143	21	1,614	11.30	\$/kW-mo
Compressed Air Energy Storage	1	317	1	317		\$/kW-mo
Wind	96	42,278	42	17,380	\$ → 18.10	\$/MWh
Wind and Solar	5	2,612	4	2,162	19.90	\$/MWh
Wind with Battery Storage	11	5,700	8	5,097	21.00	\$/MWh
Solar (PV)	152	29,710	75	13,435	→ 29.50	\$/MWh
Wind and Solar and Battery Storage	7	4,048	7	4,048	30.60	\$/MWh
Solar (PV) with Battery Storage	87	16,725	59	10,813	36.00	\$/MWh
IC Engine with Solar	1	5	1	5		\$/MWh
Waste Heat	2	21	1	11		\$/MWh
Biomass	1	9	1	9		\$/MWh
Total	430	111,963	238	58,283		

The price of electricity in LAC (power, transmission, distribution, etc.) is \$115/MWh. Generation costs are at historic lows, future cost, given renewable, *should be* stable (wind: 15% and solar: 26%).

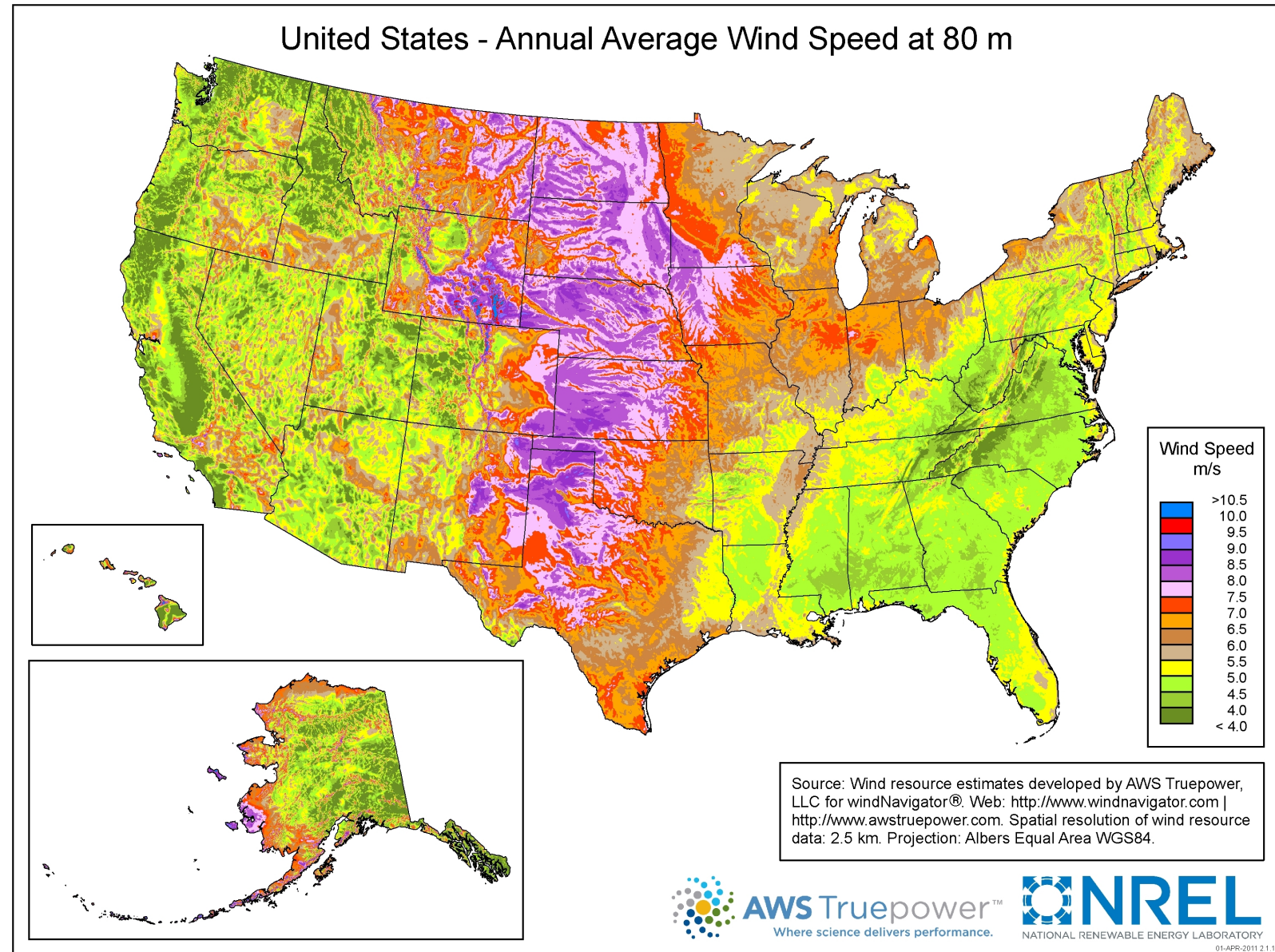
Solar Data in NM

- ▶ 2017 LAC Integrated Resource Plan emphasized **local** solar due to LANL's incentive structure
- ▶ What is optimal for LAC?
 - ▶ Southern NM is part of LAC's "power region"
 - ▶ Solar panel from LAC will generate ~20% more power near Las Cruces
 - ▶ The bigger economic issue is that solar farm need to be large for optimal economics
 - ▶ 50 MW is ~1.4 miles by ~1.4 miles
 - ▶ Note: less than 1% of state surface area needed to meet entire states electric power needs



Wind data for the USA

- ▶ 2017 LAC Integrated Resource Plan for wind had similar constraints as with solar
- ▶ Because wind energy goes as the velocity of the wind squared (v^2), the selection of location is more important than with solar
- ▶ Aside: if obtaining power from Idaho is viable, can we average wind in the Great Planes?



Conclusion/Summary/Discussion

- ▶ Wind and solar have the cheapest energy options in terms of LCOE and NM is exceptionally blessed
- ▶ Intermittency of wind and solar will result in increased cost above LCOE, if we are to use them. Options for managing this?
- ▶ Cost comparison with CFPP SMR of interest
- ▶ My purpose: Facilitate conversation on a complex topic