

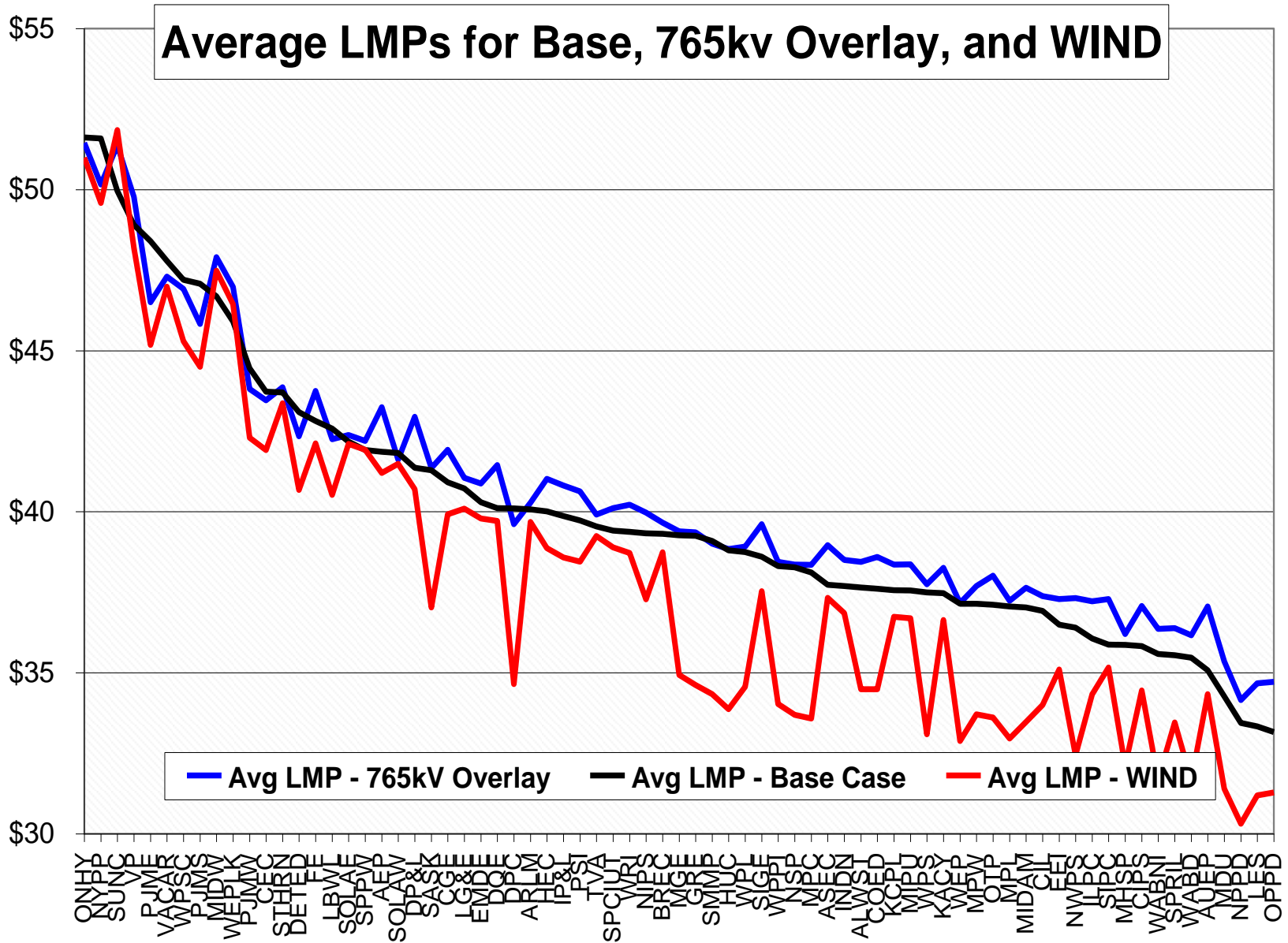
HVDC for DOE

September 28th

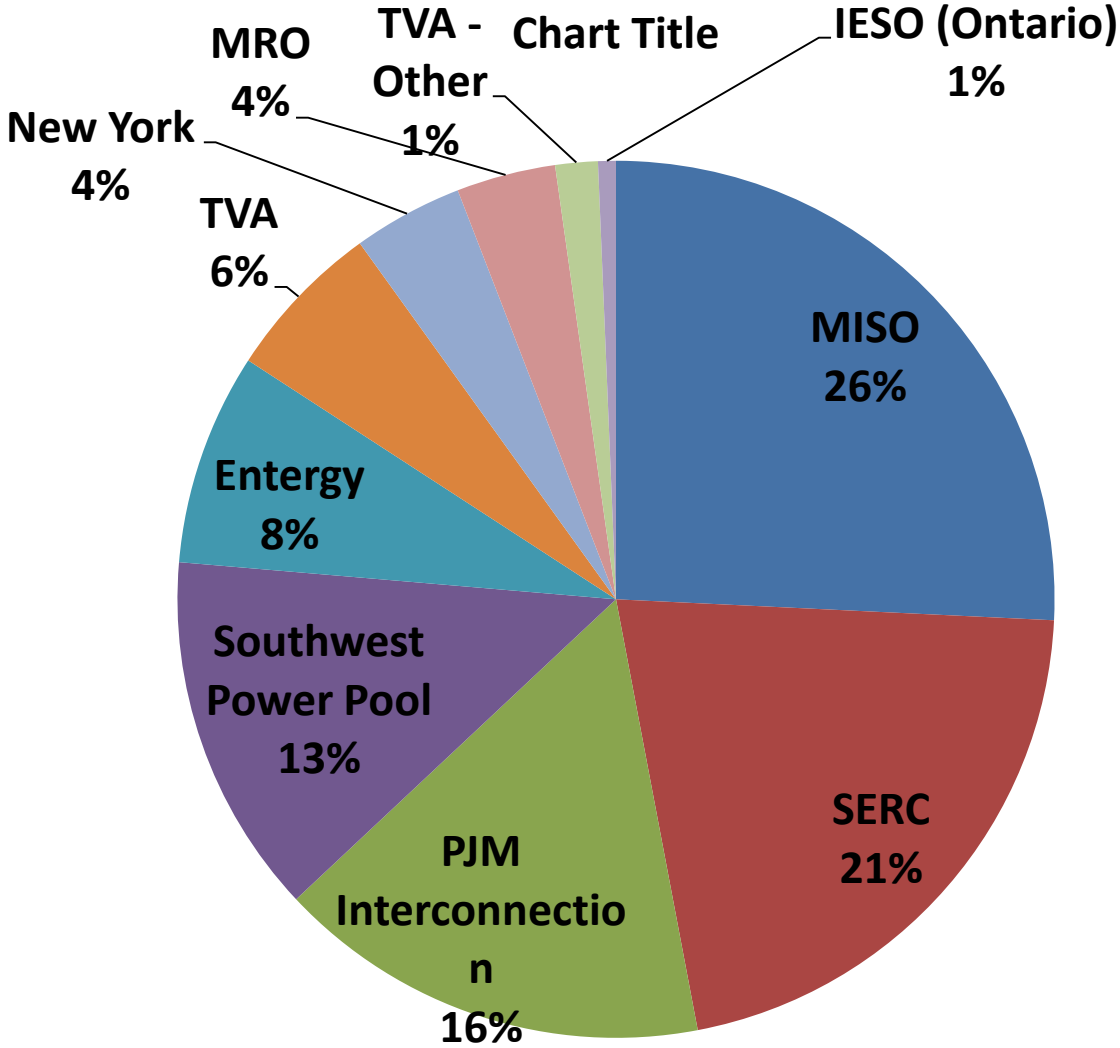
Dale Osborn

MISO

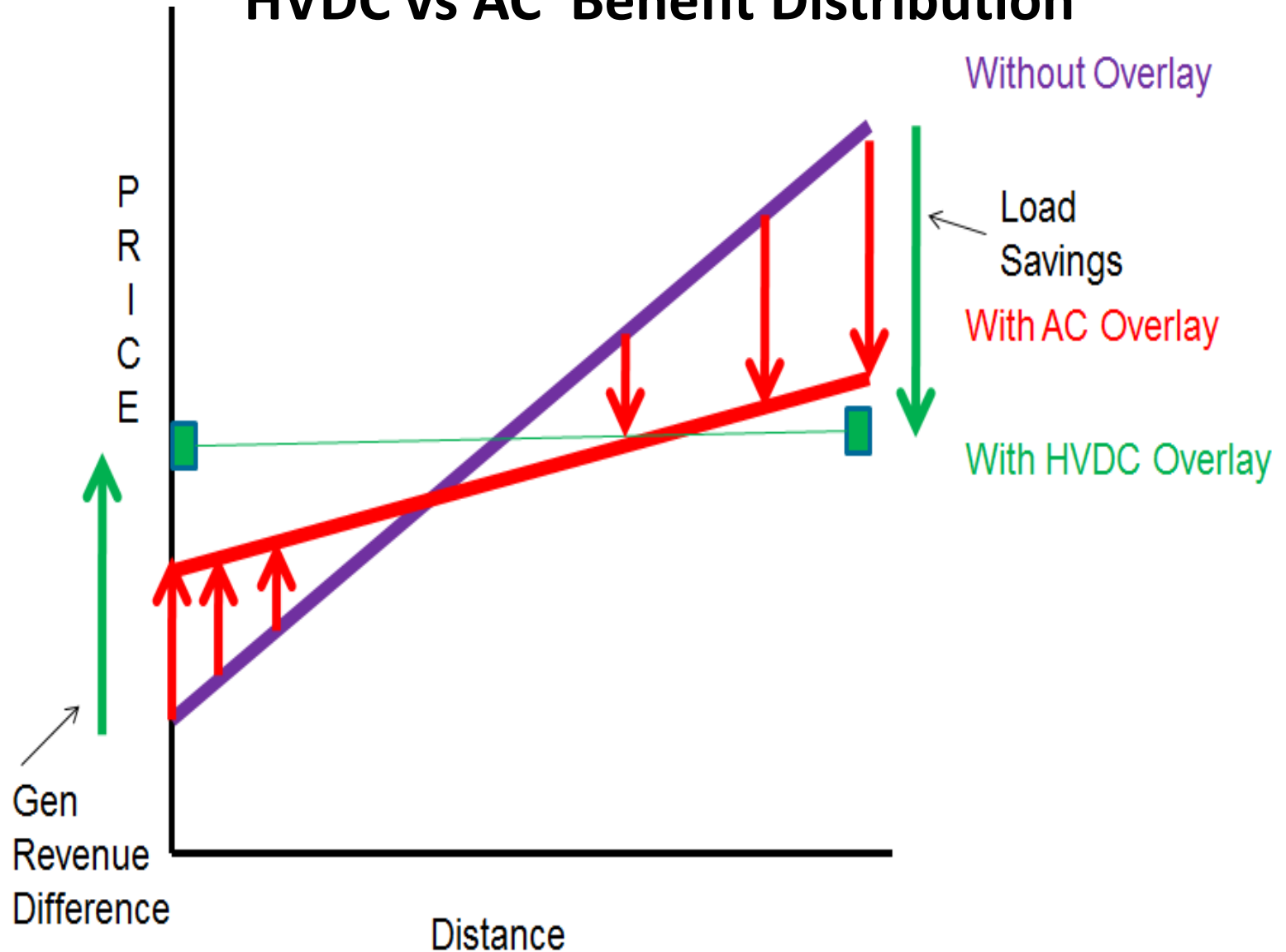
AC Transmission Does Not Work Well for Inter-regional Markets



MISO Pays 100%, 34% Benefits For MISO Central to Entergy Transmission



HVDC vs AC Benefit Distribution



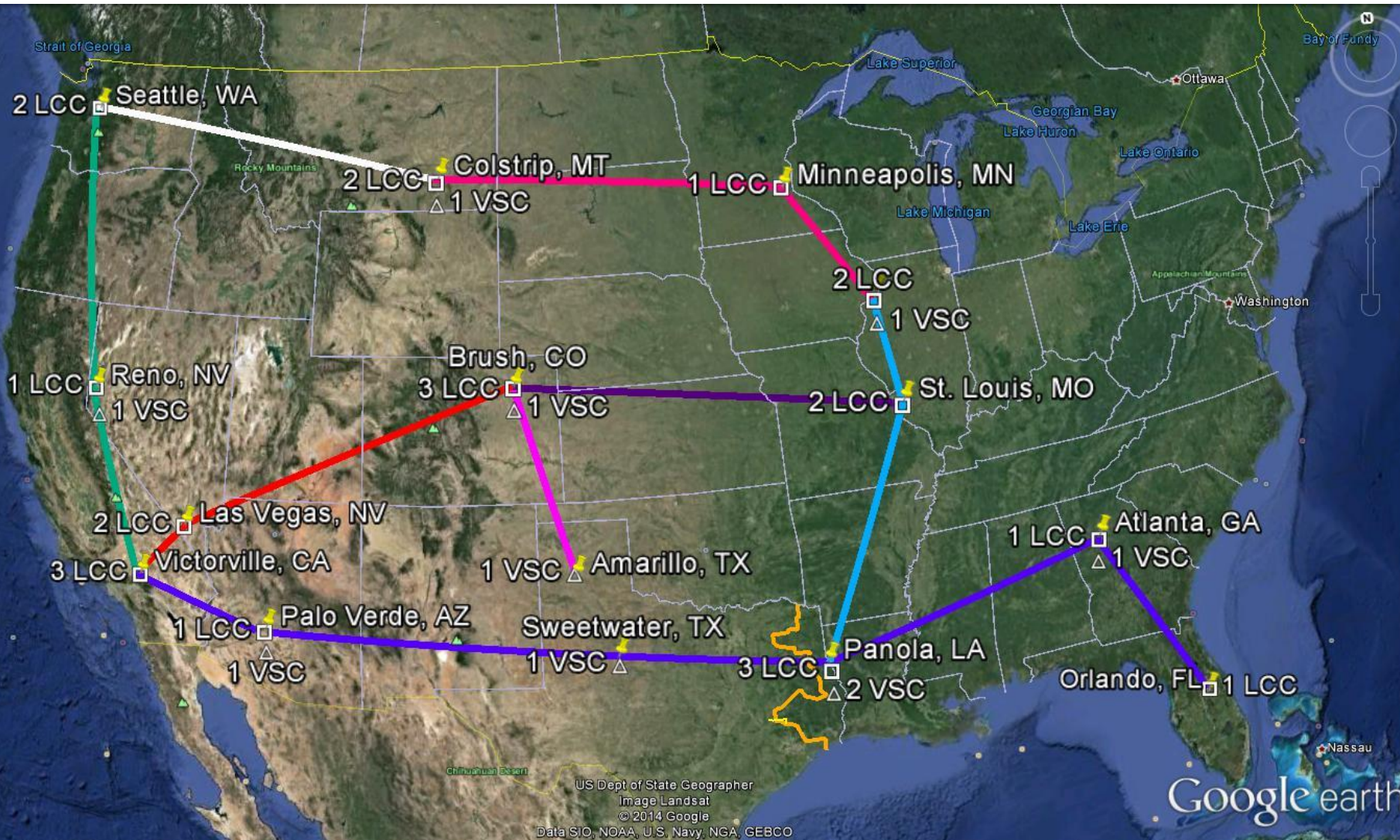
HVDC vs AC

- HVDC
 - Schedule power and energy according to Market price signals directly
 - More benefits captured by the participants in a transaction. Cost proportional to benefits.
- AC
 - Power and energy distributed by the laws of physics by power angles and shift factors
 - Benefits are distributed also broadly

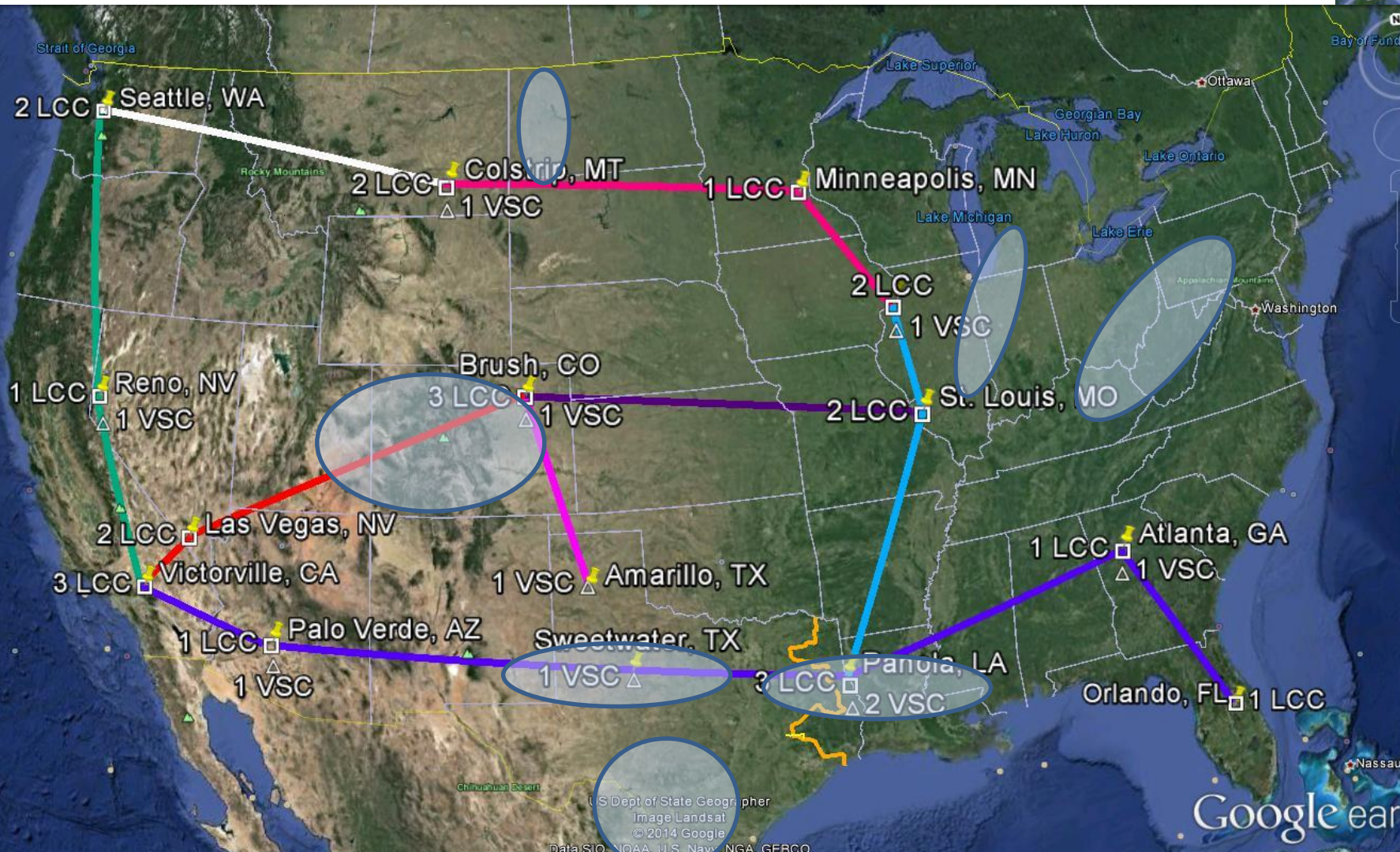
HVDC vs AC

- Market flows could be separated onto an HVDC Overlay from Load Serving flows of the AC underlay
 - Regional and Inter-regional Market design and planning are simplified
 - AC cost allocation would not have to be applied Regionally or Inter-regionally
 - Market benefits and costs from transactions would be more in balance

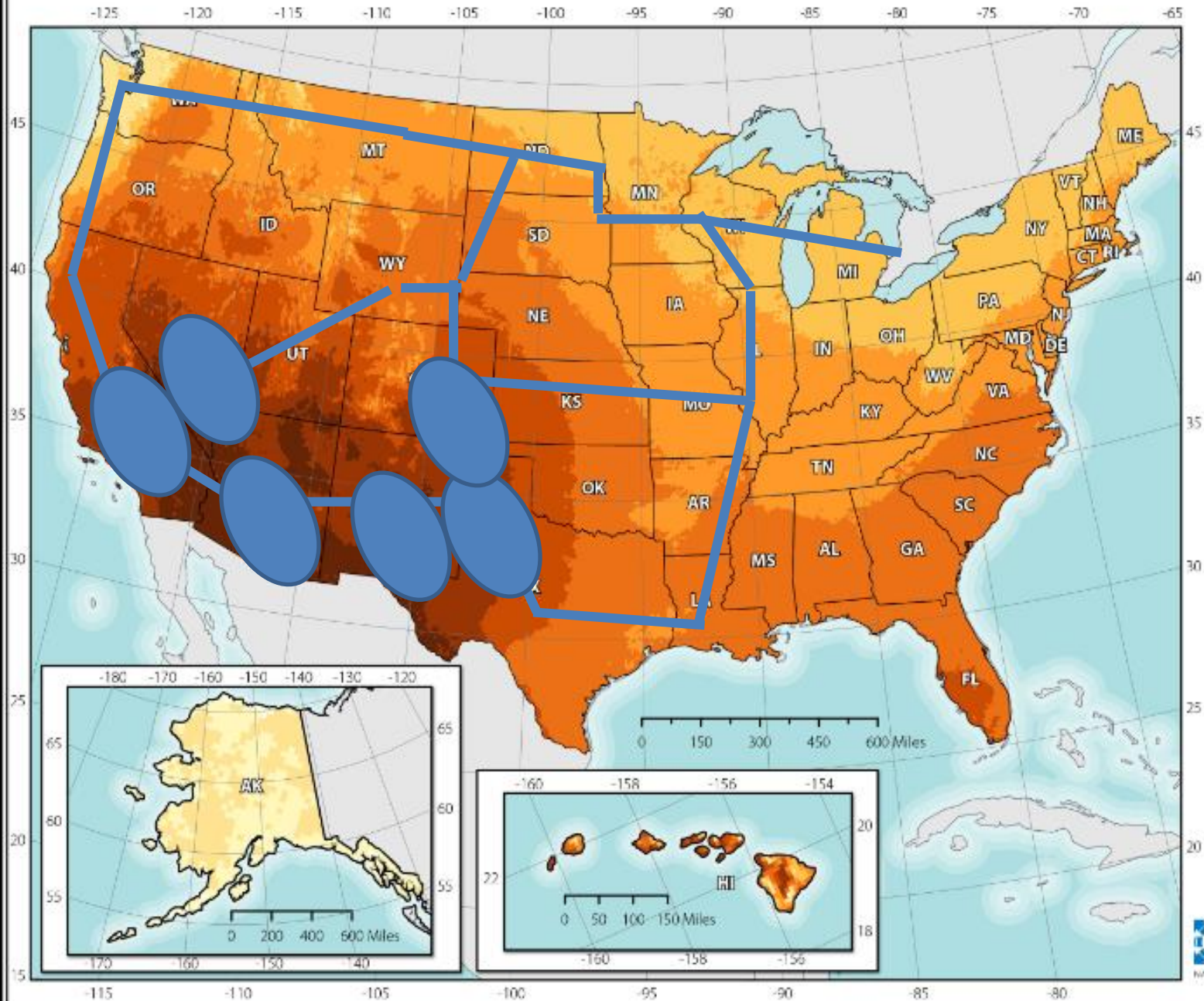
HVDC Network Concept



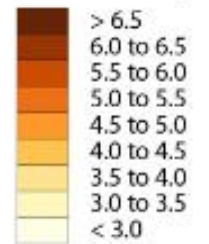
HVDC Network Concept with Some Gas Fields



Photovoltaic Solar Resource of the United States



kWh/m²/Day

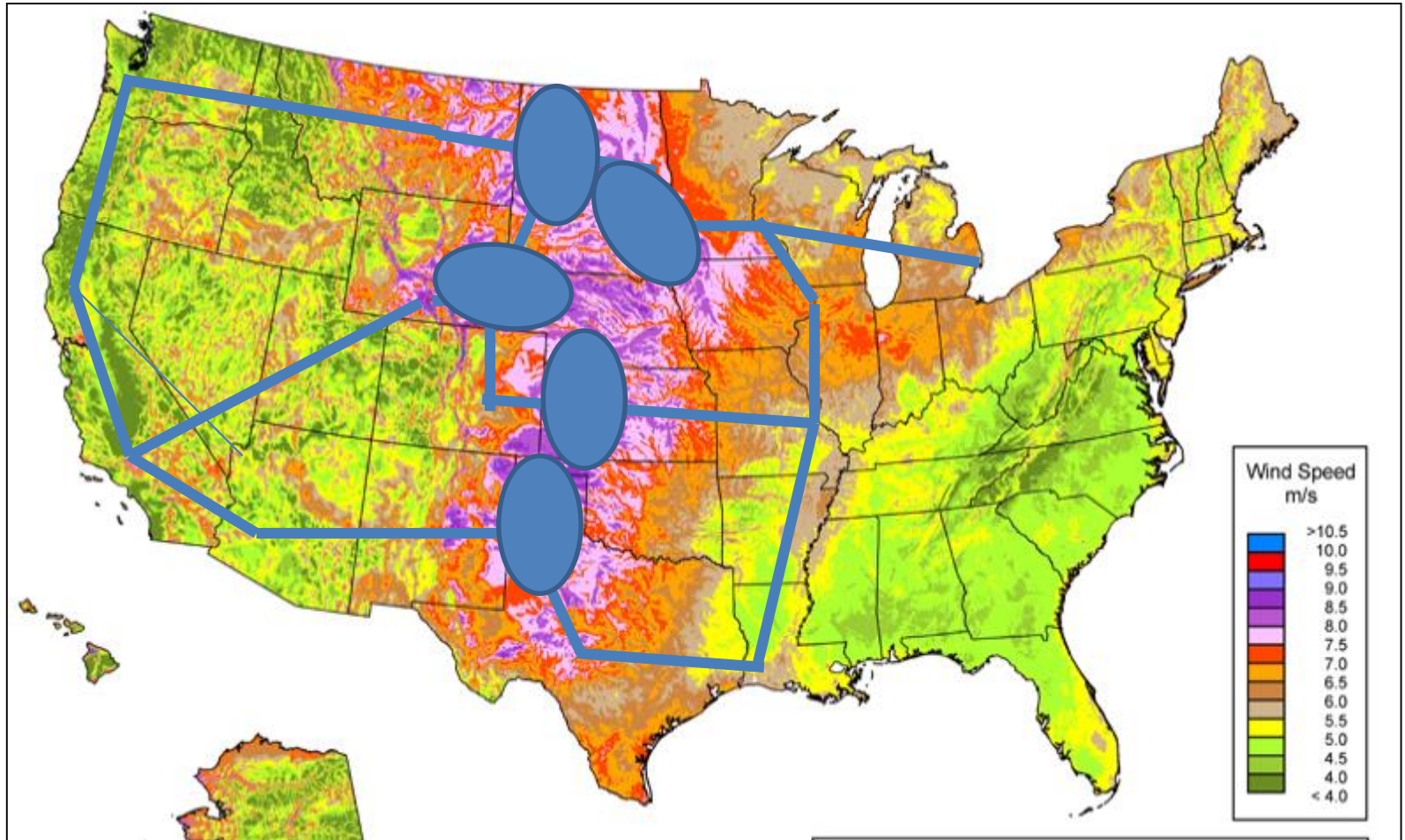


Annual average solar resource data are shown for a tilt = latitude collector. The data for Hawaii and the 48 contiguous states are a 10km satellite modeled dataset (SUNY/NREL, 2007) representing data from 1998-2009.

The data for Alaska are a 40 km dataset produced by the Climatological Solar Radiation Model (NREL, 2003).

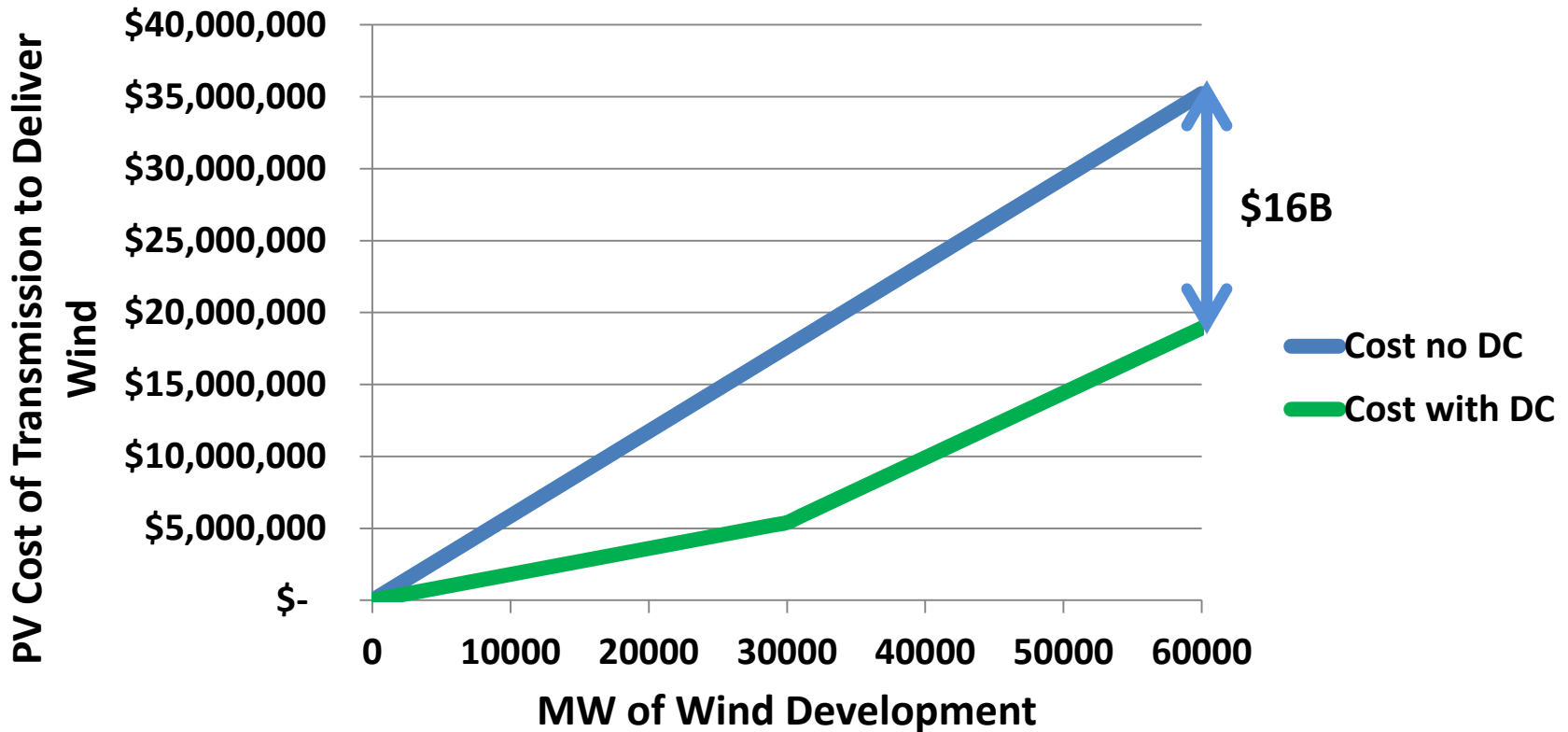
This map was produced by the National Renewable Energy Laboratory for the U.S. Department of Energy.
Billy J. Roberts
19 September 2012

Cost to Deliver Wind Energy with the Macro Grid is 25% of the cost of individual HVDC lines proposed currently because of sharing the cost and more fully utilizing the lines.



Basic Infrastructure of the HVDC Network Lowers the Cost of Future Transmission Expansion

HVDC Network Transmission Cost to Deliver Wind Energy Compared to Present Project Methods



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