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Tuesday 12th 2016, AMS 7Energy, New Orleans, LA
-- Please consider our other presentations --

396 Leigh Terry – Poster Session Monday

429 Julia Paine – Poster Session Monday

TJ13.6 Paul Picciano – 14:45 Today, Room 245

J6.4A Leigh Terry (Chris Clack) – 09:15 Thursday, Room 355
Weather is Critical in the Assessment of Weather-Driven Renewable Energy

Wind Capacity Factors at 90m

- A decade at 13-km (2006-2015)
- Three years at 3-km (2012-2015)
- Three years overlap 3-km and 13-km different model physics.

Solar PV Capacity Factors

- Utilizes RUC, RAP, HRRR & FIM
- Power estimates take into account: icing, snow cover, REWS, turbulence, downtimes, and more.
The Electric Power System in 2012

Documentation at http://www.esrl.noaa.gov/research/renewable_energy/news-simulator.html
Cost optimized US Electric Power System for 2030
(Geographic Scaling Nodes)

Documentation at http://www.esrl.noaa.gov/research/renewable_energy/news-simulator.html
The model solutions from NEWS suggest that Energy Autarky for States seems detrimental.
HVDC Transmission Overlay

** Node locations for each state determined by population-weighted centroid of top 5 most populated cities

Documentation at http://www.esrl.noaa.gov/research/renewable_energy/news-simulator.html
Electric Losses and Integration Costs are modeled within each State

Documentation at http://www.esrl.noaa.gov/research/renewable_energy/news-simulator.html
Cost optimized US Electric Power System for 2030

Dispatch Stack

Hydroelectric
Nuclear
Natural Gas
Solar PV
Wind

Installed Capacity (GW)

0 100 200 300 400 500 600

Time (Hrs)

0 168 336 503 671 839

Generation & Load (GW)

0 200 400 600

Retail Cost of Electricity
8.38 ¢ / kWh

Documentation at http://www.esrl.noaa.gov/research/renewable_energy/news-simulator.html
Cost optimized US Electric Power System for 2030 (variability mitigation enabled)

Carbon-Free generation can never be less than 50% (can go all the way to 100% with increasing costs)

Documentation at http://www.esrl.noaa.gov/research/renewable_energy/news-simulator.html
Wind Placements are “pushed” to the edge of the domain (why?)
Variability for National Minimum Standard

Winter Dispatch Stack

Spring Dispatch Stack

Summer Dispatch Stack

Fall Dispatch Stack
Variability for National Minimum Standard

Dispatchable Generation Necessary

Percentage of Electric Demand

Curtailment Necessary

0 1000 2000 3000 4000 5000 6000 7000 8000
-100% -80% -60% -40% -20% 0% 20% 40% 60% 80% 100%
Duration Curve for National Minimum Standard

Duration Curve for Carbon-emission Free Generation

- Dispatchable Generation Necessary
- All Carbon Free
- Wind and Solar PV
- Load following reserve carried
- Planning Reserve Held
Each State benefits differently – 44 of the 48 States have new wind or solar PV deployed!

* More of this information in the talk on Thursday!
Questions?