U.S. Energy Market Trends

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My Background

• Spent the last 17 years as a weather/energy trader and meteorologist at Munich Re and RenRe
• 2 years energy trading floor meteorologist
• 7 years as a forecaster for the U.S. National Weather Service and TV meteorologist
Talking Points

1. Warmth in Winter 2019-20
2. U.S. Gas Supply & Dynamics
3. U.S. Power with a Focus on Renewables
U.S. Winter Temperatures

- Winter got off to a promising start with a cold November
U.S. Winter Temperatures

- Warmth in Dec/Jan quickly ended any optimism
Natural Gas Focus – Global Prices

Global Prices

Global Cash Gas

2nd Month Futures

Forward Curve

Q3 20

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U.S. storage levels currently in the middle of the 5-yr range
Natural Gas Focus – Key Shale Production Regions
Natural Gas Focus – Key Shale Production Regions

• Lower prices in the Northeast are leading to decreasing rig counts

• Permian production still progressing higher as pent up gas is finally getting out with new pipeline build

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Power burns of NatGas this winter were much higher than expected given the (lack of) weather
**Natural Gas Focus – Localized Price Spikes**

**Tetco-M3 example**

- Plenty of supply in the Northeast US
- But problems getting the gas to where it is needed
- Results in huge price spike potential in winter months
U.S. Power Markets Focus

Source: FERC
Renewable generation in the U.S. has nearly doubled since 2008
- Around 20% of U.S. electricity generation in 2020

- 2008: 382 million MWh produced
- 2018: 742 million MWh produced

Generation increase drivers:
- Capacity additions
- Growth in technologies
- Policy and tax credits

Hydroelectric has remained fairly flat
Growth in Renewables

Electricity generation from selected fuels (AEO2020 Reference case) billion kilowatthours

- 2019
- history
- projections
- natural gas
- renewables
- nuclear
- coal
- 2010, 2020, 2030, 2040, 2050
- 0 to 6,000
- 37%, 38%, 12%, 19%, 24%, 13%

Renewable electricity generation, including end use (AEO2020 Reference case) billion kilowatthours

- 2019
- history
- projections
- solar
- wind
- geothermal
- hydroelectric
- other
- 2010, 2020, 2030, 2040, 2050
- 0 to 2,500
- 46%, 33%, 38%, 14%, 3%

2020 Installed Capacity Growth Driven by Wind & Solar

Planned U.S. electric generating capacity additions (2020) gigawatts (GW)

- Wind: 18.46 (44%)
- Natural Gas: 13.48 (32%)
- Solar PV: 9.31 (22%)
- Other: 0.73 (2%)

Source: U.S. Energy Information Administration, *Preliminary Monthly Electric Generator Inventory*
ERCOT (Texas) has seen the most interest due to the explosive nature of the market

- Reserve margins are quite low
- When reserve margins get too low, by rule prices go to $3,000
- When the wind blows: no problems
  - On low wind days, it can be bad news
- ERCOT Price Cap $9,000
Electric Reliability Counsel of Texas (ERCOT), Solar

- Behind the curve - solar development is just beginning to gain traction, accounting for 1,900 MW
- 60,000 MW capacity under study
- Uptick in interconnection requests due to declining costs and West Texas opportunity
- >1/3 of capacity under study is concentrated in West Texas
- 2/3 of capacity under study spread throughout the remaining region
- Wind and Solar have potential to assist each other over the course of a day
  - Wind: late afternoon and early morning
  - Solar: daylight hours

Source: Ercot.com
U.S. Power Markets Focus -- ERCOT

- Coal retirements over the past 3 years
- Increase in solar and wind

Source: ERCOT Fact Sheet
Electric Reliability Counsel of Texas (ERCOT), Wind

- Capacity Increase
  - 2000: ~100 MW
  - 2019: 22,000+ MW
- Growing resource mix means updated technical and market requirements
  - Ancillary Services- ensures reliability and efficiency of grid
- Wind typically bids into the market at lower prices, along with solar
- Federal Tax Credits- allow offers to be made at extremely low, sometimes negative prices (as low as negative $250/MWh)

Source: Ercot.com
U.S. Power Markets Focus – ERCOT Summer 2019
Renewables
- Growing capacity
- Wind accounts for roughly ½

Renewable Portfolio Standards (RPS): outline goals set by state for renewable resources

Total Generation Requests in PJM
- 1st: Solar
- 2nd: Wind

Price Caps
- $1,000/MWh cap or cost based for incremental offer, whichever is higher
- Cost based offer is capped at $2,000/MWh

Source: PJM.com
On Peak, Daily PJM West Hub, Real Time Price over Time

Source: PJM.com
CAISO: More solar capacity than wind

Total Capacity: Roughly 58,000 MW

Renewable capacity: ~23,000 MW
- Solar: ~12,600 MW
- Wind: ~7,000 MW

Developing Renewable Energy
- New Solar Homes Partnership- initiative started in 2006 to financially incentivize home builders to install solar energy systems
- Energy Commission Geothermal Grant
- Renewable Energy for Agriculture Program: up to $10 million in grants to Agriculture to install renewable energy
Questions?

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