Challenges and Choices in an Era of Cheap, Abundant Renewables

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Although the US now obtains 9% of its electricity from wind and solar, other countries have shown that share can go much higher.
Renewables Now Meeting Up to 2/3 of Electric Load in California on Peak Production Days

The Least Expensive New Solar Projects in the World Dropped from Below 4 cents/kWh to Below 2 Cents/kWh in the Last Two Years

• India - 750 MW bid in 2016: 4 cents/kWh
• Chile - 2016 bid at 2.91 cents/kWh and 2017 bid at 2.15 cents/kWh
• Mexico - 80 MW bid in November 2017: 1.97 cents/kWh
• Saudi Arabia - 300 MW bid in October 2017: 1.79 cents/kWh
• Experts forecasting 1 cent/kWh possible by 2019
US Wind Power Projects Are Converging to 2 Cents/kWh
Colorado Solar, Wind and Storage Continue to Get Cheaper

• Xcel Energy just announced the results of their most recent bids from energy suppliers last month.

• They received about 100,000 MW of renewable energy bids from 198 separate projects.

• The median wind bid was 1.81 cents/kWh and the median solar bid was 2.95 cents/kWh, with the lowest bids likely to be significantly cheaper.

• The median bids for wind and solar projects that include energy storage were 2.1 to 3.6 cents/kWh.
Electricity Prices Are Also Dropping Because Energy Efficiency Standards, Utility Incentive Programs, and Rooftop Solar Are Slashing Demand, but Renewables May Become Cheaper than Efficiency in the Years Ahead...

https://www.nwcouncil.org/energy/powerplan/7/home/
Tri-State Will Continue to Have Surplus Generation Until It Retires Three Old Coal Plants Over the Next Eight Years

Key Assumptions
- San Juan 3 Retired 12.31.2017
- Nucla Retired 12.31.2022
- Craig Unit 1 Retired 12.31.2025
- Load Serving Capacity: Wind 5%, Solar 0% in Winter 25% in Summer
- Contract Purchases Include Member & Small Generators and Utility Scale Renewables
- No Specific Niobrara Shale Load Additions or Self Generation Deductions
Wholesale Power Prices are Dropping Nationally and in the Southwest, But Tri-State Wholesale Rates to Member Co-ops Have Steadily Risen

Wholesale power prices (2016 $/MWh)

![Graph showing wholesale power prices from 2006 to 2016 for various regions such as NYISO, ISONE, CAISO, PJM, MISO, ERCOT, and Northwest. The graph indicates a decline in prices for most regions except for Tri-State sales to 3rd parties, which have risen steadily over the years.]

Bloomberg New Energy Finance

Guinn Unger, “LPEA Long Term Strategy Discussion,” 9/18/17
Choices Faced by Tri-State and other Utilities with Significant Remaining Ownership of Costly Coal Plants

• Write down (take an immediate loss on) coal plants that have yet to be fully depreciated, reflecting the fact that their current market value is lower than their book value
• Retire them early rather than continue to invest in them
• Release co-op members from obligation to buy nearly all power from them at above-market rates, or risk additional defections (Kit Carson leaving Tri-State and Aztec leaving PNM are the most recent examples, but others are likely)
• Own fewer assets directly and buy more power opportunistically from the market as prices continue to drop
In An Era of Abundant, Cheap Renewables, Shiftable Load Beats Steady Load

• Utilities have long prized having a high load factor -- loads that are steady and continuous instead of varying widely over time.

• This makes sense in an era where most of your power is coming from coal and nuclear plants that prefer to run continuously.

• But if the majority of our electricity will increasingly come from variable renewables, because they are the least expensive and cleanest source, the most attractive loads to utilities will be those that:
  • are coincident to when the sun is shining and the wind is blowing
  • or can be easily, cheaply, automatically shifted to occur at those times -- like electric vehicle charging and water heating