

2018 Forecasting Workshop: Applying Meteorology to Power System Planning and Operation

St. Paul, MN
June 19-21, 2018

Meeting Overview – Day 1

Pre-Workshop Tutorial on Tuesday Morning

- Incorporating Variable Generation Forecasts into Power System Operational Procedures – Where is it Applicable?

Chairs: Erik Ela and Aidan Tuohy, EPRI

Tuesday Afternoon – Opening Session

- *Local Welcome*

Michael Noble, Executive Director, Fresh Energy

- *Opening Remarks*

Mark Ahlstrom, President, ESIG Board

- *Keynote Comments -Improved Forecast Value from Energy Systems Integration Application*

Mark Ahlstrom, President, ESIG Board

- *Meeting Overview*

Charlie Smith, Executive Director, ESIG

Meeting Overview – Day 1 pm and Day 2 am

Tuesday pm Sessions

- *Session 1 - Opening Plenary - Meteorology, Climate and the Electric Sector - Forecasting for an Integrated Energy System*
Chair: Sue Haupt, NCAR
- *Session 2 - Solar and Wind R&D Advances*
Chair: Justin Sharp, Sharply Focused

Networking Reception

Wednesday am Sessions

- *Session 3 - Integration of Probabilistic Forecasts into the EMS and MMS – Status and Prospects*
Chair: Bob Zavadil, EnerNex
- *Session 4 - Integration and Use of Solar Forecasts for Operating Storage Systems, Distribution Systems and Real Time Markets*
Chair: Mark Ahlstrom, NextEra Energy

Meeting Overview – Day 2 pm and Day 3 am

Wednesday pm Sessions

- *Session 5 - VG Forecasting and Market Operation Experience*
Chair: Alain Forcione, IREQ
- *Session 6 - VG Forecasting and Market Operation Advances*
Chair: Craig Collier, DNV/GL

Thursday am Sessions

- *Session 7 - Advances in Forecast Applications and Market Design*
Chair: Erik Ela, EPRI
- *Session 8 - Closing Plenary – Joint Session with IEA Wind Task 36 on Forecasting for Wind Energy*
Chair: John Zack, AWS Truepower
- *Thursday pm and Friday – IEA Workshop*
IEA Wind Task 36 forecasting meeting – Chair, Gregor Giebel, DTU

Renewable Energy is Very Competitive

- Lazard reports on lowest unsubsidized energy costs at end of 2017 for:

Simple Cycle GT	\$156/MWh
Rooftop residential solar	\$187/MWh
Nuclear	\$112/MWh
Coal	\$60/MWh
Combined Cycle GT	\$42/MWh
Utility scale solar	\$43/MWh
Wind energy	\$30/MWh

- Other reports from industry pubs on recent PPA prices:
 - Utility scale solar \$23-\$40/MWh
 - Wind energy \$11-\$24/MWh

An Industry Maturing - Global

- Global wind capacity end of 2017: 540 GW
- Global PV capacity end of 2017: 400 GW
- Global VG installations in 2017
 - Wind 53 GW
 - PV 92 GW
- Ballpark estimates for 2018 global VG installations
 - Wind 60 GW
 - PV 100 GW

NextEra Energy Earnings Call

From an article by David Roberts reporting on the NextEra Energy earnings release conference call of January 26, 2018 by CEO Jim Robo:

- Robo predicted that by the early 2020s, it will be cheaper to build new renewables than to continue running existing coal and nuclear plants.
- Here are the costs Robo anticipates 'early in the next decade':
 - Unsubsidized new wind: 2.0-2.5 cents per kilowatt-hour
 - Unsubsidized new solar: 3.0-4.0 cents per kilowatt-hour
 - Variable operating costs of existing coal or nuclear plants: 3.5-5.0 cents per kilowatt-hour
- If those predictions hold up, it is game over for coal (and nuclear, unless it gets support based on its low carbon emissions). No one will ever build another coal plant in America, and the ones still running would likely shut down sooner than scheduled.

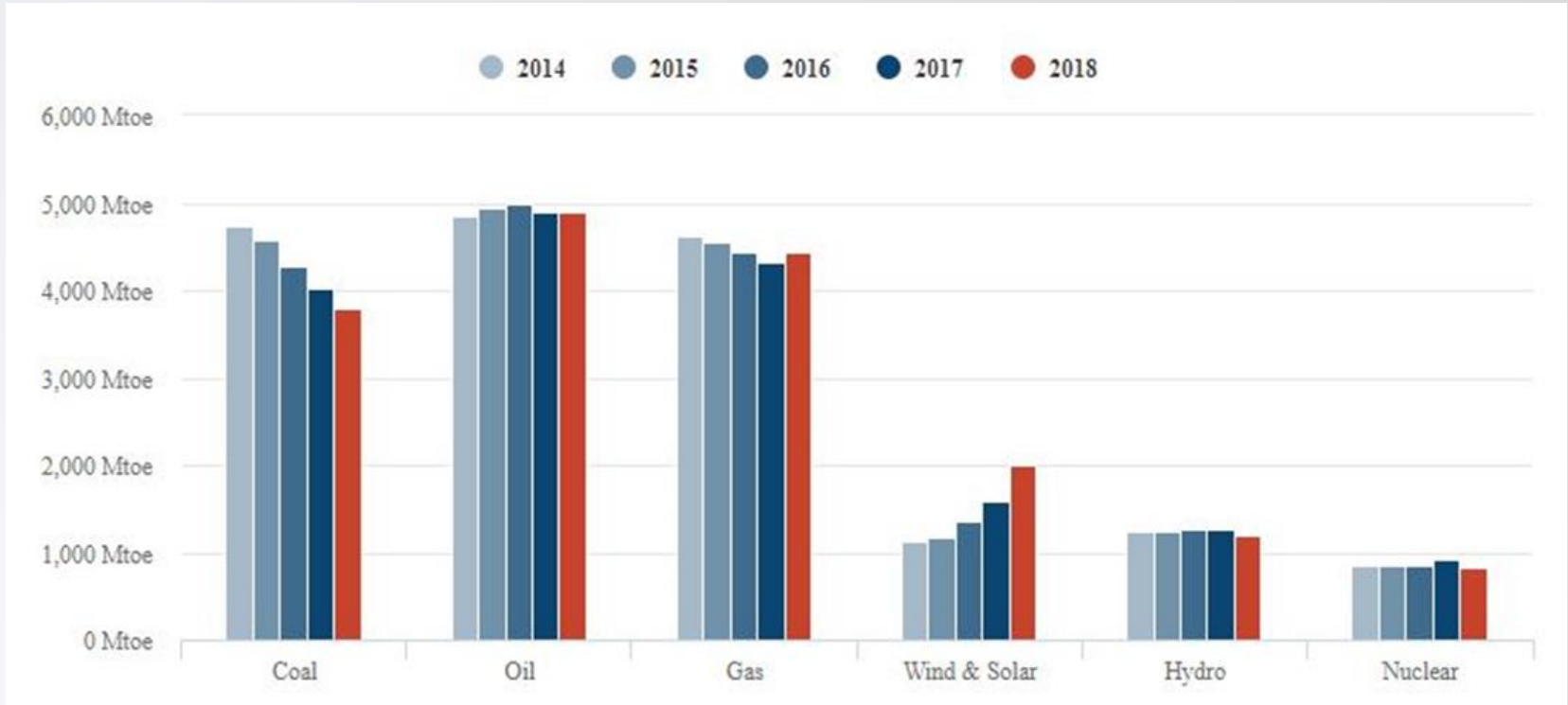
David Roberts, Vox.com, Jan 29, 2018

As If That Wasn't Enough...

- BP's latest Energy Outlook forecasts a peak in oil demand for the first time—while renewables will grow even faster than previously expected.
- Peak oil driven by the rise of shared and autonomous electric vehicles. Under the Evolving Transition (ET) scenario, which assumes that policies and technology continue to evolve at a speed similar to that in recent past, oil demand slows and then plateaus in the late 2030s.
- Several other energy research groups have upped their EV forecasts in recent years. However, BP's latest projection ranks among the most ambitious.

Renewables are the Way of the Future

BP Outlooks for 2035



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Xcel Clean Energy ERP Filing

- Xcel Energy Colorado submitted Electric Resource Plan (ERP) to CO state regulators on June 6, 2018
- The plan includes "unprecedented low pricing", with wind at levelized cost between \$11-18/MWh, solar between \$23-\$27/MWh, and solar-plus-storage between \$30-\$32/MWh
- The plan would add more than 1,800 MW of solar and wind, paired with 275 MW of battery storage, and 383 MW of existing gas assets

Xcel ERP Filing Impact on Coal

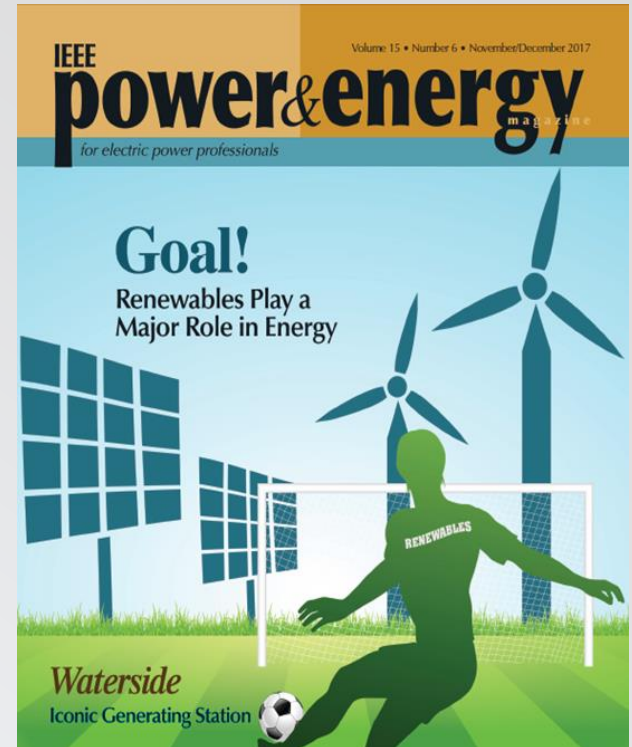
- Comanche Units 1 and 2 produce a total of 660 MW of coal-fired generation, approximately one-third of Xcel Colorado's remaining coal fleet. The Comanche units would be retired in 2022 and 2025, 11 years and 10 years early respectively, as part of the plan
- Through the combination of renewables, gas and energy storage, Xcel expects to increase system reliability, even as coal generation comes offline.

Xcel ERP Filing Bottom Line

- ERP states the clean energy proposal is more compelling because “it delivers lower costs along with substantial environmental and renewable energy gains”
- Favorable economics are influenced by:
 - Robust pool of low-cost renewable bids
 - Transmission access due to early coal retirements
 - Low-cost gas and battery bids that offer flexibility and help meet peaking requirements
- “I will tell you, it's not a matter of if we're going to retire our coal fleet in this nation, it's just a matter of when,” Xcel Energy CEO Ben Fowke said on stage at EEI Annual Convention in San Diego in preview of the plan.

Onward and Upward

- A warm welcome to visitors from afar:
 - Portugal
 - Australia
 - Canada
 - Germany
 - Ireland
 - Colombia
 - United Kingdom
 - Japan
 - Finland
 - Spain
 - Denmark
 - South Korea
 - Texas
- Take the time to make some new friends!
- Looking forward to another great meeting!



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Upcoming 2018-2019 Meetings

2018 Fall Technical Workshop

October 1 - 3, 2018

Embassy Suites – Downtown Denver
Denver, Colorado

2019 Spring Technical Workshop

March 19 – 21, 2019

Hyatt Regency Tamaya Resort & Spa
Bernalillo, NM
(near Albuquerque)

2019 Forecasting Workshop

June 4-6, 2019

Embassy Suites - Downtown Denver
Denver, Colorado

Thank You!

Charlie Smith
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Connect with @ESIG



www.esig.energy

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