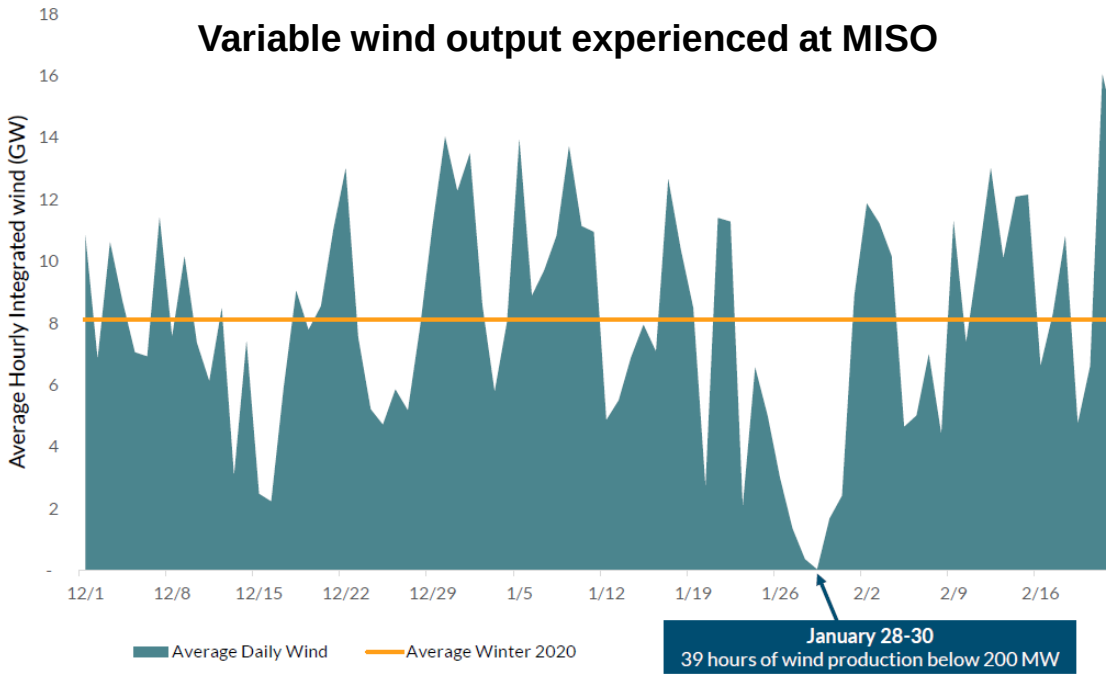
Forecasting in RTO Reliability Imperative

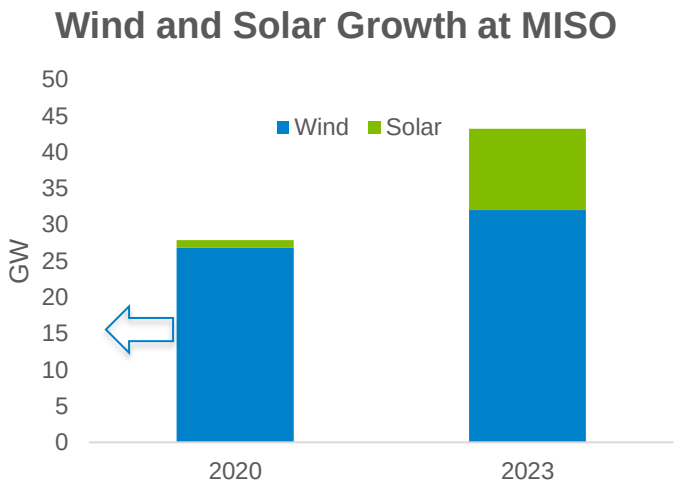
SETO Renewable Forecasting Workshop

May 6, 2021

Why is forecasting important for grid Operators?
Part of the solution for renewable integration…

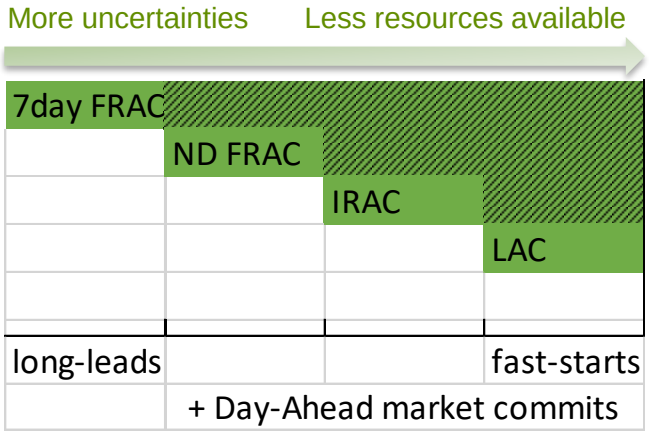
- Industry shifting from conventional baseload power plants to more weather-dependent, intermittent renewables





Provides critical foresight for operations decisions…

- Least cost commitment while lead time permits
- Pre-position resources for system changes
- Optimal scheduling of energy-limited resources



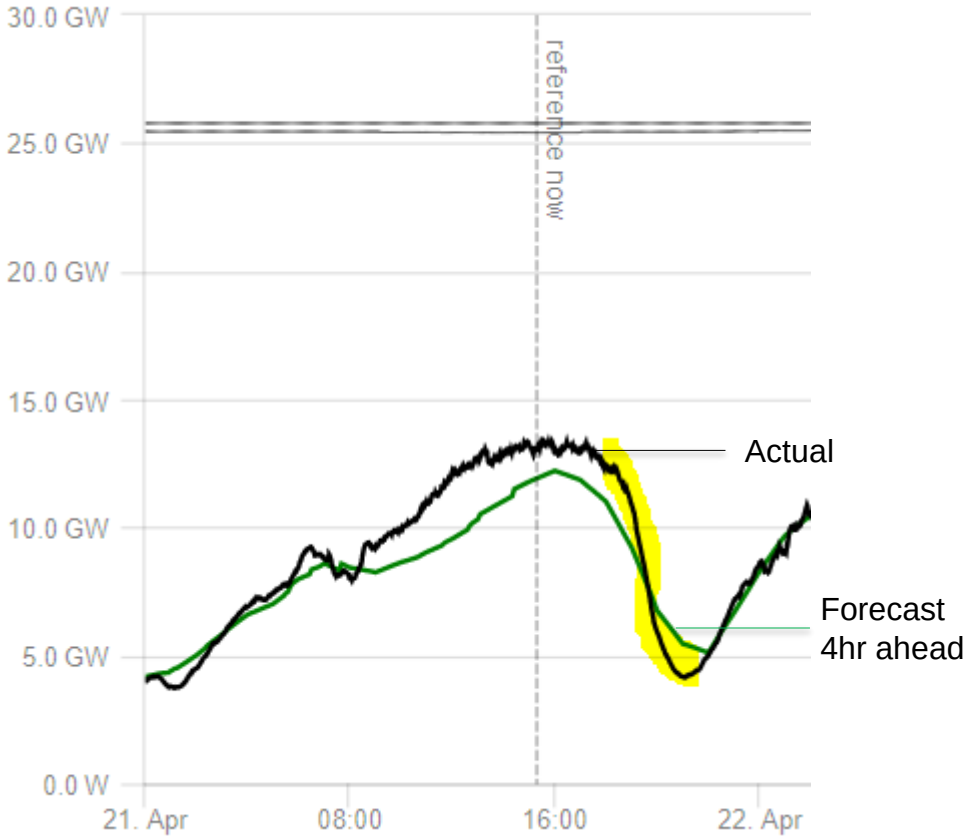
Credit: Roz Chast, New Yorker, December 2004

FRAC: Forward Reliability Assessment Commitment; IRAC: Intra-day RAC; LAC: Look Ahead Commitment

Its reliability impact is pronounced

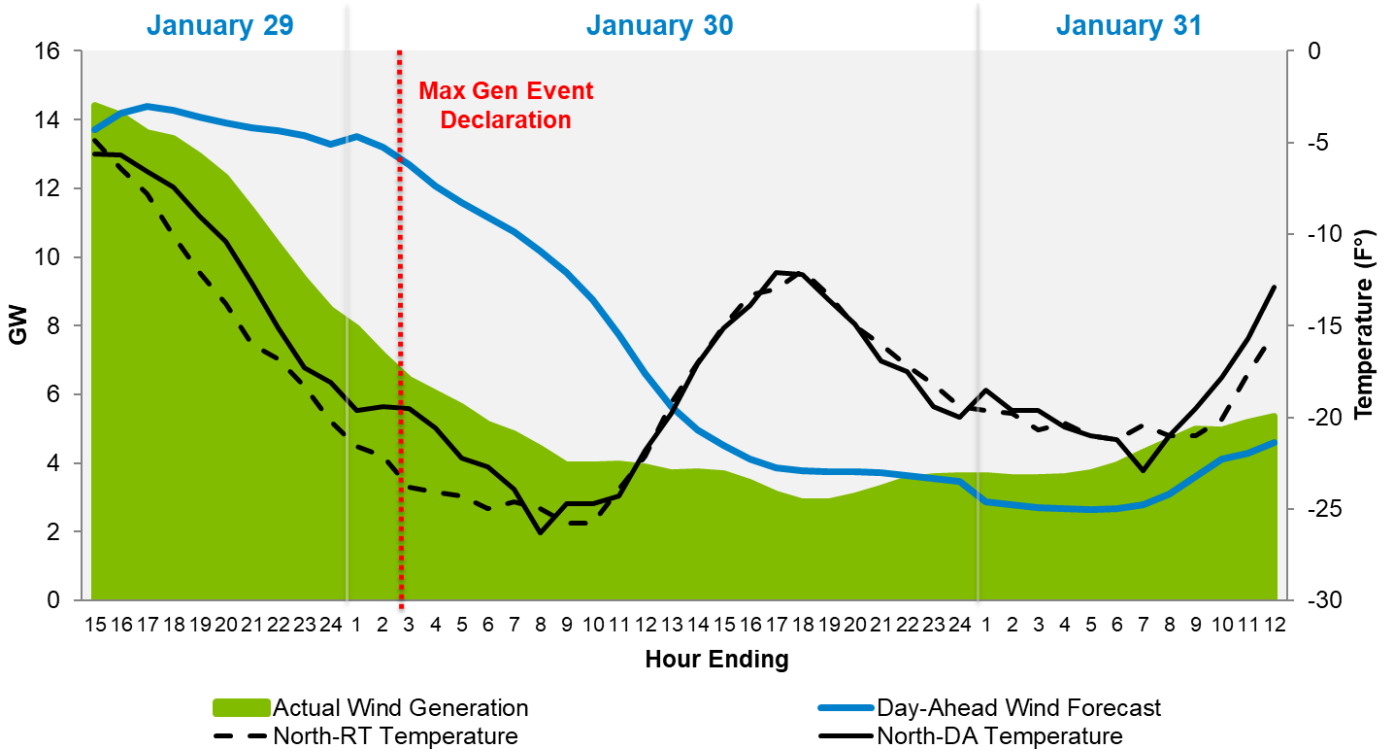
Example 1

- More accurate forecast could have better pre-positioned system to manage a sudden loss of wind at evening load peak

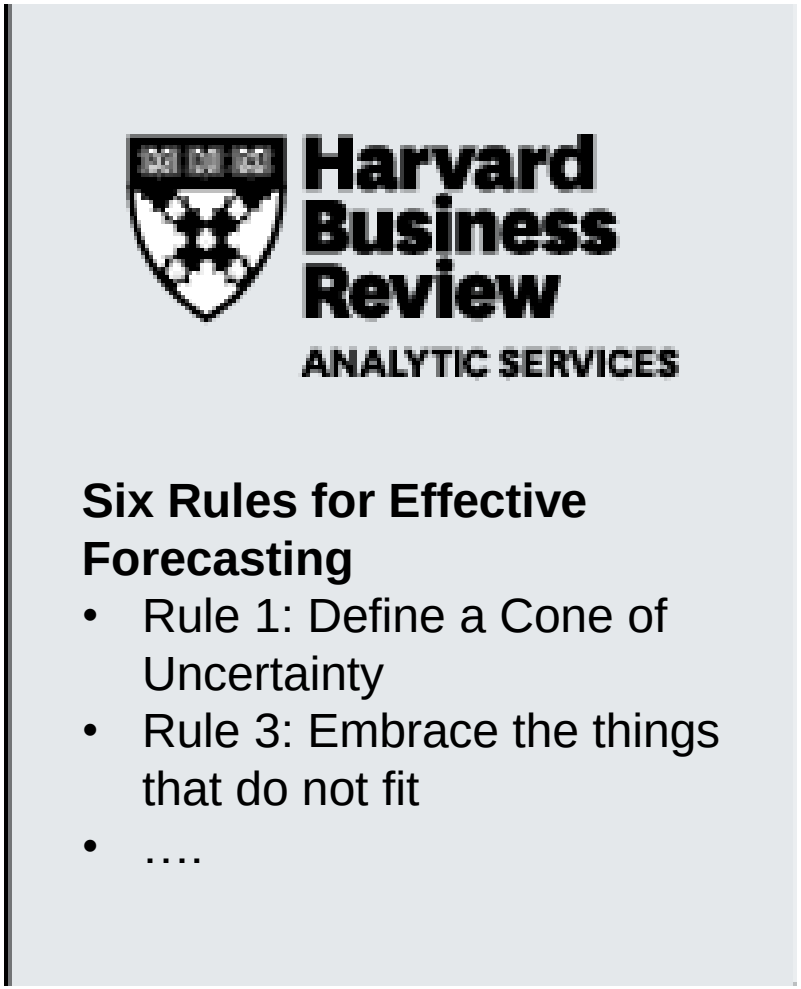


Example 2

- An earlier than expected wind drop increased risk of insufficiency at morning peak, triggering capacity **Emergency**



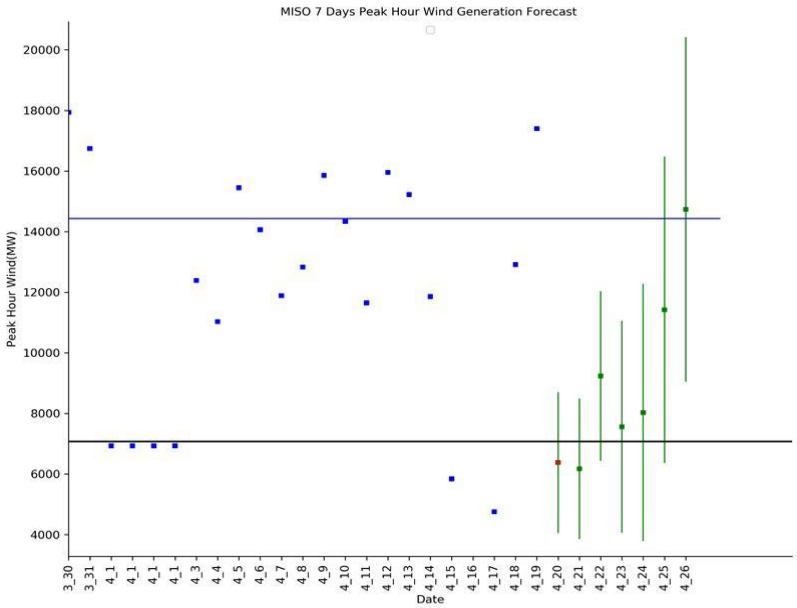
What grid operators most want solved?
Uncertainty Management



- Need accurate forecast, of course
- Assess reserve or flexibility requirements to procure sufficient resources for supply and demand balancing at all times
- Forecast extreme days/events and prepare ahead with resource availability and flexibility

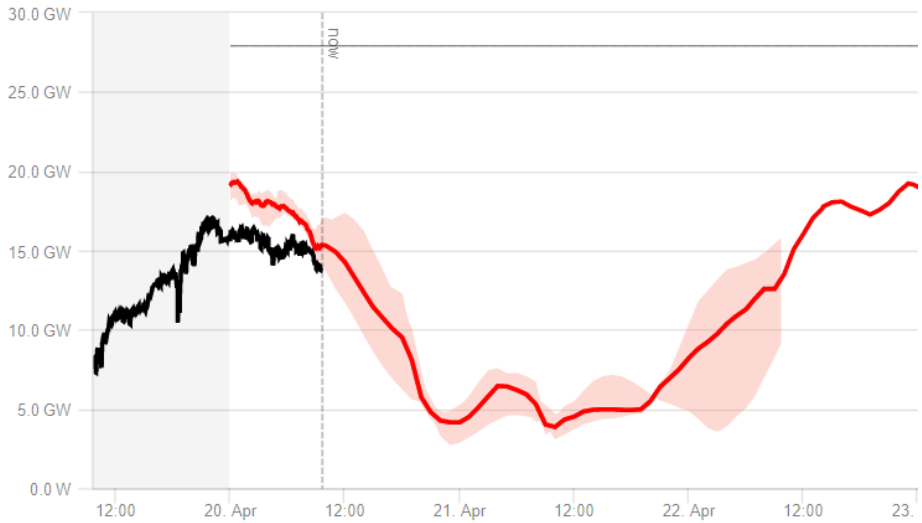
  Pre-indicators or Weather risks: cold/hot temperature cutoff, icing, high wind cutoff, …

- Define uncertainty based on historical forecast error



Static: cannot capture on days when weather risks are expected

- Assess uncertainty based on multiple weather models

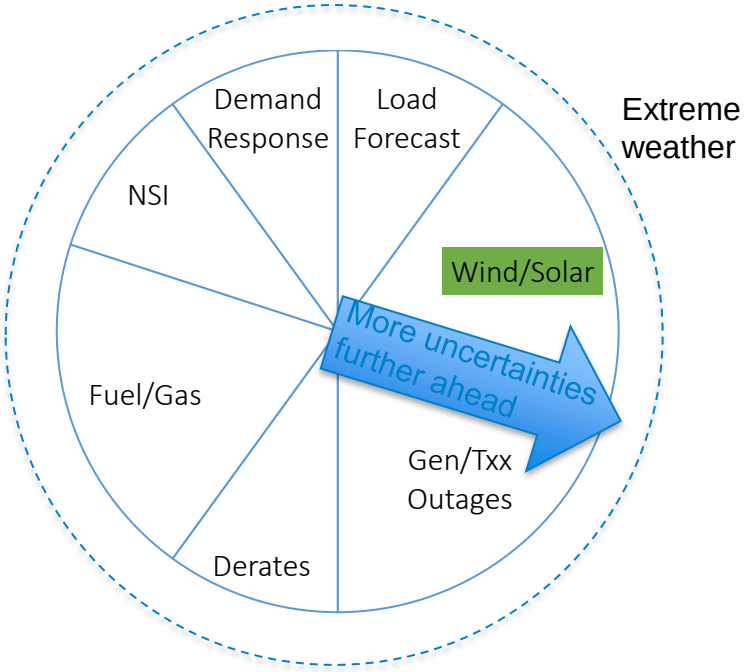


Empirical: no well defined confidence level

Research questions: How do we leverage both knowledge from history and weather to dynamically define risks while not over planning?

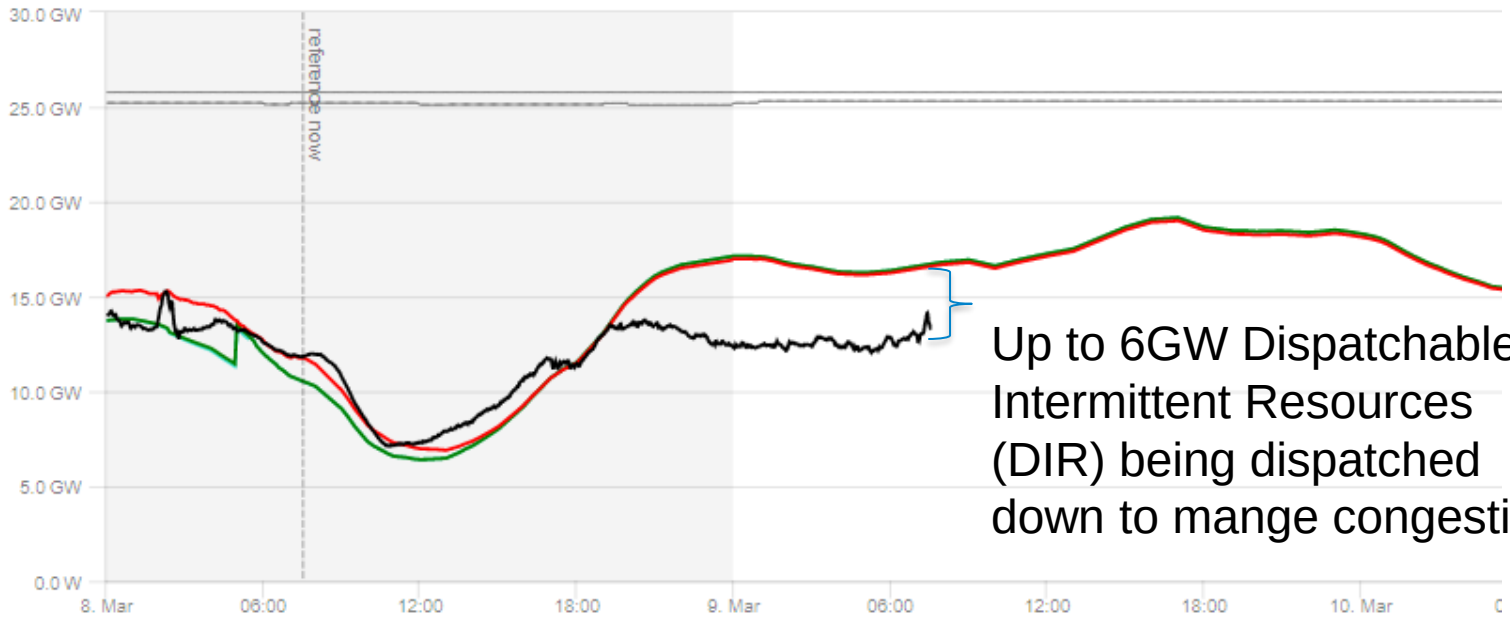
Synthesize uncertainties from multiple sources to inform decisions

Various Sources of uncertainties



- More risks arise when “things happen together” or “at the critical timing”

Renewables being dispatched down due to transmission congestion



Up to 6GW Dispatchable Intermittent Resources (DIR) being dispatched down to mange congestion

Research questions: How can we forecast congestion or assess renewables stranded behind transmission constraints?

Congestion management is increasingly challenging with renewable volatile output and siting

Significant impacts on reliability

- Efficient scheduling of units to **manage congestion** and minimizing **renewable curtailment**
- Appropriate accounting for undeliverable renewable capacity to maintain **sufficiency**

Pervasive impacts on markets

- Direct impact on **Energy and Ancillary Service markets** through Unit commitment and Economic dispatch
- Flow differences result in **FTR** funding inefficiency
- Deliverability affects renewable accreditation in **Resource Adequacy**

A vision of clean, reliable & economic energy

How does forecasting help us get there?

Full visibility and foresight of system conditions

Grid pre-positioned with flexibility to manage uncertainties at the least cost

Sufficient resources available to reliably manage extreme events

Situation Awareness

- Visualization of forecasted system conditions and uncertainties
- Synthesize data into useable information leveraging Data Analytics

Operations Planning

- Better forecasting to capture more unknows into operations decisions
- Outage coordination, Fuel assurance, Extreme weather preparation, etc.

Look-Ahead Unit Commitment

- Sufficiency and flexibility to manage various scenarios of system conditions

Initiatives on-going

- Forecasting improvements*
- Capacity Sufficiency Analysis Tool
- Look-Ahead Commitment enhancements*
- New Market Products

Future challenges anticipated

- **Solar Forecast**: fast growth, short-term forecast & intra-hour NWP
- Wind Forecast: high penetration
- “Load” Forecast: BTM solar and demand-side activities
- New Resources: DER and hybrid resources