## **Comments from a Meteorological Perspective**

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Planning Time ScalesOperational Time Scales

## Planning Time Scale

• Tutorial on Weather Data Sets for Power System Planning held on Tuesday

#### Where we are

- o Many (historical and future) datasets with vastly different attributes are available
- $\circ$  Arguably, almost all have serious issues for most of the primary planning applications
- No meaningful guidance on relative suitability of datasets for specific applications is available
- NREL is conducting a survey on user perspectives, needs and practices
  - You can still participate! (see Luke Lavin's tutorial slides for details)
  - This will be valuable guidance for the community's future path

### • Thoughts for the Future

- o Should we create a state-of-the-art dataset specifically for power system planning?
- Need standards for dataset inter-comparison to facilitate informed decision-making
  - Key attributes are use-case dependent
  - Need to define a set of reference metrics for a set of primary use-cases
- **Underlying Issue:** what are the relative merits (on a range of planning horizons) of using extrapolated historical attributes with recent trends vs climate model simulations?

## Operational Time Scale – Part 1

### Probabilistic Forecasts

 Impressive effort by ISOs to develop tools/procedures to use probabilistic forecasts/information to estimate & manage generation/load uncertainty

#### Potential Next Steps: optimize the probabilistic information being used

- Two main issues in many current probabilistic forecast use-cases
  - Many use only historical forecast error distributions (not very sensitive to cases/scenarios)
  - Ensemble users often employ uncalibrated & sometimes very small ensembles (probably a biased representation of true uncertainty)
- Evaluation of attributes of probabilistic forecasts has mostly not been considered
  - Which methods provide the best information about variations in uncertainty?

### • AI/Machine Learning

- Rapidly advancing sophistication of AI/Machine Learning tools to energy forecasting problems on a broad range of times scales
- Results indicate significant improvement on time scales where NWP has not been especially effective (intra-hour, seasonal)
- But what is the future? Will AI/ML continue to provide significant increases in forecast value?
- What benefits might be obtained from the emerging AI/ML-based Weather Prediction models?

# Operational Time Scale – Part 2

### • Where to put forecast improvement effort?

- $\,\circ\,$  David Larson (EPRI) commented "reducing average error" is not enough
- $\,\circ\,$  Improvement in which forecast performance attributes will provide the most value?
- $\circ$  Use-case dependence
- Changing relationships of met variables to power system variability
  - Hybrid power plants (information for battery charge management)
  - EVs (how will EV charging be weather-dependent?)
  - Dual mode heating pump (presentation about PEI by Debbie Lew/Nick Miller)
  - $\,\circ\,$  What are we not thinking about?

## From a Societal Perspective

### • WHAT are we doing?

- Estimates are that we need to 4X the current renewable installation rate to transition the current electric system to meet ~2050 GHG emission goals
- Yet we sees that load growth is now poised to dramatically accelerate
  - Part of this represents electrification of heating (heat pumps) and transportation (EVs) to reduce non-electric emissions
  - But it appears a substantial amount is increased energy use (e.g. data centers)
- What is actually achievable if we accept increased energy use?