WIND AND SOLAR FORECASTING TRIALS EXPERIENCE: DO'S AND DON'TS

PART 2: INTRODUCTION TO THE IEA WIND TASK 36 GUIDELINE FOR EVALUATION OF FORECASTING APPROACHES AND SELECTION

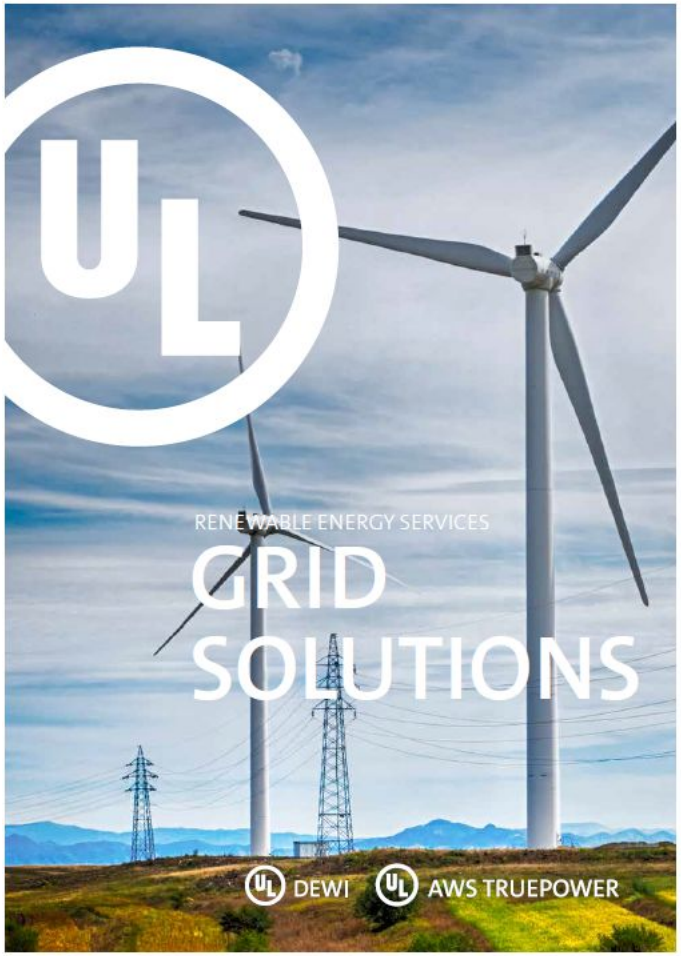
John W Zack, Ph.D.
Vice President – Grid Solutions
jzack@awstruepower.com

OVERVIEW AND CONNECTION TO IEA TASK 36 WP 2

- AWS Truepower Intro
- Trial planning & Setup
- Evaluation Data
- Representativeness of Sample
- Performance Metrics
- Communication of Results to Forecasters

AWS TRUEPOWER, A UL COMPANY

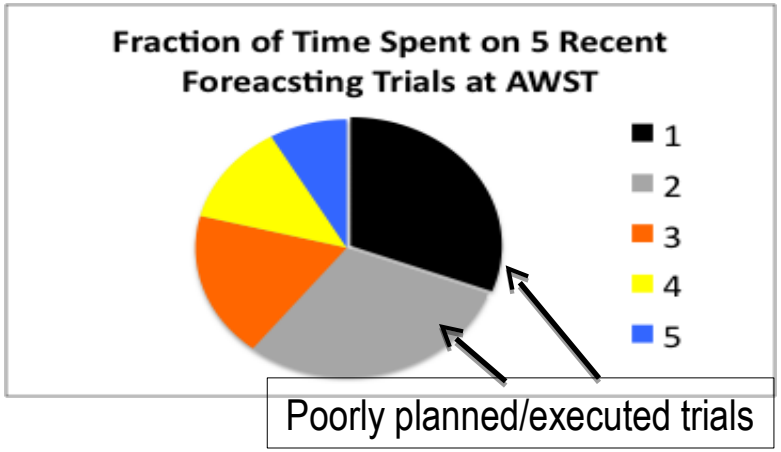
GRID SOLUTIONS BRIEF



- Founded in 1983 in Albany, NY
- Acquired by Underwriters Laboratory in 2016
- Short-term and seasonal forecasting for renewable energy generation, utility electric loads, and other weather-sensitive industries
- Began renewable energy forecasting in 1998
- Atmospheric modeling and applied research
- Grid integration and curtailment studies
- Emerging smart grid applications related to transmission management, distributed generation, storage management, and others
- Climate change assessment and impact mitigation

PLANNING FOR TRIAL/BENCHMARK PROJECT

- **Considerations**
  - **PREPARE DETAILED TRIAL/BENCHMARK PLAN:** before the trial setup begins evaluator should prepare a detailed trial plan
  - **PROVIDE TRIAL PLAN TO EACH PROVIDER**
  - **ALLOW TIME FOR PROVIDER TO PROVIDE FEEDBACK**
  - **DO NOT CHANGE PLAN DURING TRIAL WITHOUT NOTIFICATION**
- **Impact**
  - Misunderstandings in trial setup often waste the time of evaluators and providers and can negatively impact representativeness of results



- Trial/Benchmark Plan should include:
  - Accurate locations of forecast sites
  - Content and format of data to be provided
  - Mechanism and frequency of providing data
  - Precise definition of forecast target variables
  - Mechanism and frequency of forecast delivery
  - Specify expected outcomes (selection criteria etc.)

DATA FOR FORECAST EVALUATION

- **Considerations**
  - **PROVIDE EVALUATION DATASET**: evaluator should either:
    - Provide documentation of exactly how the raw evaluation data will be quality-controlled so that the providers can perform the identical QC, OR
    - Provide the exact QC'd dataset that will be used to evaluate the forecasts
- **Impact**
  - Having the exact data that will be used for evaluation enables
    - the provider to routinely compute their own performance metrics
    - the provider to know exactly the nature of the forecast target variable (for example how outages and curtailments are identified and handled)
  - Impact of differences in QC procedures can often be on the order of the differences in performance among providers

REPRESENTATIVENESS OF SAMPLE

- **Considerations**
  - **SIZE**: should be large enough to produce statistically meaningful results.
    - Adjacent forecast cases are often highly correlated
    - Differences in forecast performance may be variable and noisy
    - 3 months may be adequate under ideal circumstances
  - **REPRESENTATIVENESS**: should include all of the important modes of variability for the forecast parameter that are relevant to the user
    - Trial timing (winter, summer etc.) & duration should be chosen carefully
- **Impact**
  - Long trials are a burden to the evaluator and the providers but unrepresentative ones may be useless

PERFORMANCE METRICS

- **Considerations**
  - **VALUE FOR USER'S APPLICATION**: ideally metrics should measure the sensitivity of the user's application to forecast error
    - MAE/RMSE are popular, but do they measure what the user should want to know?
    - Worthwhile reading: DOE SUNSHOT report/papers on forecast metrics
  - **REPRODUCIBLE:** method to calculate metrics should be well documented and able to be independently calculated by evaluator and providers
  - **ASSESSMENT OF DELIVERY RELIABILITY:** If a real-time trial, a metric for the missed forecast rate should be a part of the trial
  - **APPROPRIATE TREATMENT FOR MISSING FORECASTS**: Evaluation sample should be the same for all providers.
    - Eliminate times missed by any provider for ALL providers OR
    - Fill-in the missing forecasts with a reference forecast (e.g. persistence, climatology)
- **Impact**
  - Inappropriate metrics fail to provide optimal information for the evaluator's decision-making process (business case etc.)

COMMUNICATION WITH FORECASTER PROVIDERS

- **Considerations**
  - **RECONCILIATION OF PERFORMNCE RESULTS**: Entity conducting the trial should periodically reconcile performance results with each provider
    - Find reasons for any differences
  - **PERIODIC COMPETITIVE PERFORMNCE UPDATES**: provide each provider with anonymous competitive performance data with respect to other trail participants and/or the user's reference benchmark
- **Impact**
  - Lack of reconciliation can result in persistence of flaws in the execution of the performance analysis and invalidate results
  - Feedback on competitive standing provides forecaster with value for their effort (especially important in free trials) and can also provides added incentive for forecast optimization