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Siemens' Perspective on the GRID DATA Efforts

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Overview

Use of GRID DATA project data sets

What will make the data sets impactful?

Use of Data Sets

What data sets do we currently use?

- Data created in-house
  - Small model size
  - Useful for feature development and debugging
- Customer data
  - Captures unique characteristics of that system
  - Useful for evaluating performance
  - Data matches the unique contracted features
  - Usage is limited by confidentiality and disclosure agreements (on a per contract basis)
    - Ability to report benefits of our software is limited
    - Data cannot be shared or used anywhere else

Use of Data Sets

Envisioned Usage of GRID DATA teams' data sets

- Test features of our software on a wider range of data
  - Individual features
  - Performance
  - Configurations not present in existing customer data
  - Emerging technology (e.g., Storages, DERs, DR)
- Better flexibility in reporting results

Impactful Data Sets

Key features

- Data sets must be generally realistic
  - Reflect “typical” power system behavior
  - Not too fragile
  - Not too robust
  - Reflect the wide range of equipment, configurations, and complexities in various power systems
- Data set that evolve along with emerging technology and industry trends
- Data sets that include complex aspects of power systems

Useful Complexities

Node/switch level models

Contingency lists

Generator MVAR capability curves

Inter-region transmission corridors

HVDC equipment

FACTS devices

- Static Var Compensators
- Thyristor Controlled Series Compensators
- Thyristor Controlled Phase Angle Regulators

Remedial Action Scheme modeling

Useful Complexities

Unit commitment data

- 3 part cost characteristics
- Startup cost
- Minimum load cost
- Energy production costs
- Start up profiles
- Shut down profiles
- Minimum up/down time constraints
- Startup cost and time based on downtime characteristics

Useful Complexities

Incorporate a wide range of resource types

- Thermal units
- Hydro units (including pumped storage hydro)
- Combined cycle plants
- Wind resources
- Solar resources
- Distributed energy resources
- Price sensitive demand resources
- Energy storage resources

Useful Complexities

Thermal units of common fuel types

- Mixed fuel units

Combined cycle plant details

- Configuration details
- Configuration parameters
- Allowed transitions
- Times and costs for transitioning between configurations
- Minimum up and down times, start up and shut down costs and profiles

Useful Complexities

Realistic inter-temporal constraints

- Ramp rates
- Dynamic ramp rates
- Energy limited resource constraints
- Represent forbidden operating regions (and transition times)

Useful Complexities

Renewable resources

- Wind
  - Power output forecasts
- Solar
  - Power output forecasts
- Energy storage
  - Charging characteristics
  - Discharging characteristics
  - State of charge modeling

Distributed energy resources

Useful Complexities

Variety of demand response types

- Price sensitive demand
  - 3 part bids
  - Single part bids
- Dispatchable demand response

Useful Complexities

Ancillary services requirements

- Spinning reserve
- Non-spinning reserve
- Regulation up/down
- Fast Regulation services
- Primary/Fast Frequency Response Reserve
- Flexible Ramping services
- Regional AS requirements

Ancillary services bids or cost representation

Useful Complexities

Distribution system data

Hybrid transmission and distribution system data

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THANK YOU

QUESTIONS?