REINHOLD ENVIRONMENTAL ®

2022 Reinhold/PCUG Round Table Presentation

Hosted by Duke Energy in the Charlotte Sheraton/Le Meridien Hotel, Charlotte, NC on June 27-28, 2022

Fleet Flexibility Panel Discussion

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June 27, 2022

Southern Company

Topics For Panel Discussion

- Fleet Flexibility Drivers
- Co-Firing Natural Gas and Coal
- Minimum Operating Temperatures
- Fuel Supplies/Mixes/Variability/Availability
- Load Cycling/Turndowns/Starts & Stops
- Open Topics to Conference Attendees

Fleet Flexibility Drivers

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- How does variable generation require fleet flexibility (California duck curve)
- How do utilities value turndown capability? (is it only a measure of negative power prices?)
- Do you think we will need spinning magnets or can we use smart inverters and over build on the renewable side to cover short term needs?
- What is the impact on reserve margin?
- Do ramp rates play a bigger role today versus years past?
- What are your thoughts on required flexibility for a large system (% turndown or other metric)?
- With coal plants going away, how will systems/utilities turn down?
- Other thoughts

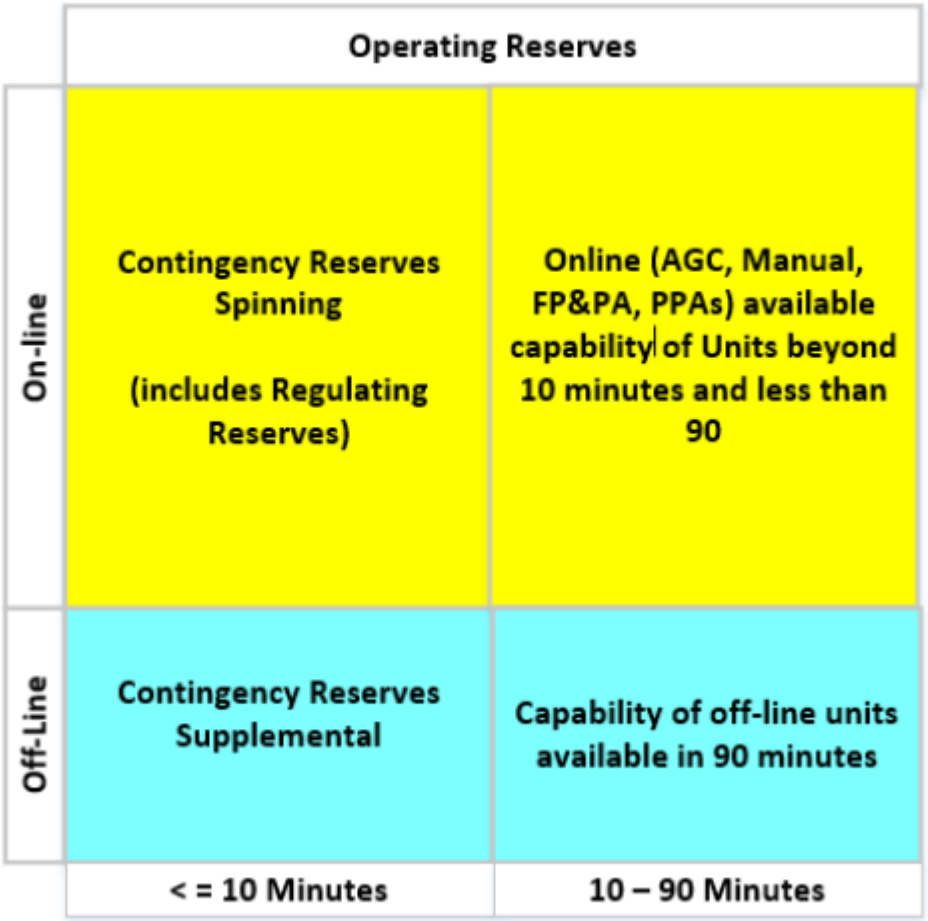

Figure 1: Operating Reserve Definition Diagram

Co-Firing of Natural Gas and Coal

Co-Firing of Natural Gas and Coal

- Who is currently Co-Firing NG and Coal? Who has in the past or ran tests runs? What percentages? Who has plans within next few years?
- Was it successful and do you plan to continue?
- Did you experience any compliance issues? Do you run through your environmental controls during these periods?
- Did you experience any turndown issues?
- Did you experience logic or I&C issues?
- Did you experience moisture issues?
- Other thoughts

Minimum Operating Temperatures

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- Are you still optimizing for MOT on your units?
- Static vs. dynamic MOT calculations? If calculating MIT/MOT in real-time, what equations are you using (e.g., Matsuda, EPRI/UC-Irvine data, other?) and with what inputs?
- Have your units implemented a “tiered deNOx” approach where NOx emission setpoints are increased/decreased as needed for additional unit turndown, while still meeting instantaneous and rolling average permit limits?
- Have your units implemented sorbet injection (e.g., hydrated lime or SBS) upstream of the SCR for SO3 reduction? What issues/concerns were encountered?
- Did other processes (baghouse, air heaters, scrubbers, etc) effect MOT?
- Did you experience moisture issues?
- What are your combined cycle units doing for MOT and flexibility?
- Other thoughts

Fuel Supply Impacts

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- What impacts have you experienced on fuel supply variability and availability?

- Are you changing fuel types/mixes and what impacts have you experienced?

- Have you changed up the way you operate the unit based on fuel changes?

- Have you experienced turndown issues with parts of the unit processes? Have you had to add/change equipment to either increase flows or allow for additional turndown capability?

- Other thoughts

Load Cycling

Load Cycling

- Has load cycling increased on your units?
- What impacts have you experienced with load cycling?
- What limitations have you experienced during periods of load cycling?
- Other thoughts

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