Brad Burns - Introduction

Brad Burns is the Program Area Manager for the Fleet Management and Operations area, which includes 3 programs - Plant Management Essentials, Integrated Asset Management, and Boiler and Turbine Steam and Cycle Chemistry.

His responsibilities include defining and overseeing research programs in the areas of power plant operations, maintenance, reliability engineering, and cycle chemistry for a global group of energy companies. The goal of Fleet Management and Operations area research and development is to provide tools and knowledge to assist generator owners and operators with reducing unplanned outages, lowering operations and maintenance costs, and improving unit safety, reliability, and resiliency across all plant asset types.

Before joining EPRI in 2017, Burns held several roles at Duke Energy thermal plants including chemistry supervisor, technical manager, and operations superintendent. Earlier in his career, Brad worked for Progress Energy as the chemistry program manager for the company's fossil generation fleet.

Burns received a bachelor of science degree in chemical engineering from the Georgia Institute of Technology. He is a professional engineer registered in North Carolina.

Brad Burns
Program Area Manager
Fleet Management and Operations
Generation Sector

Extreme Cold Weather Preparation Best Practices

EPRI R&D Overview for ERCOT Webinar

Fleet Management and Operations Research Area
Brad Burns, Program Area Manager

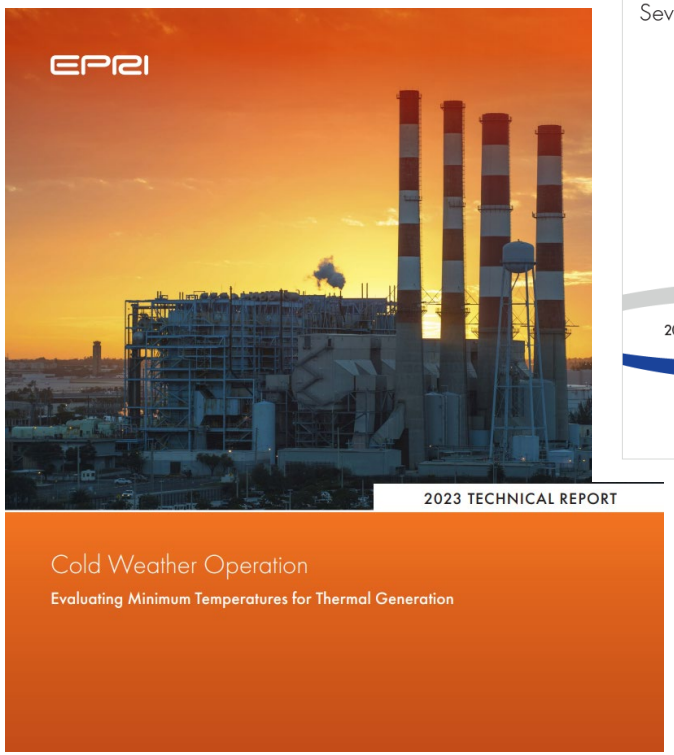
October 28, 2024

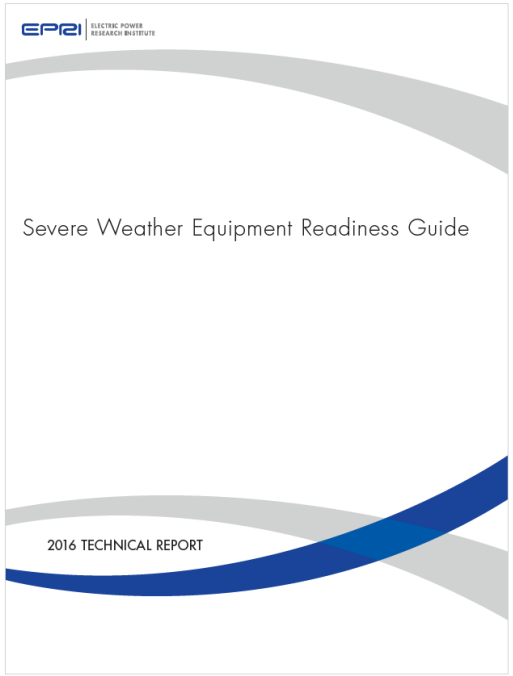
EPRI Generation Sector R&D on Extreme Cold Weather Preparation and Operation

- Program 225 – Plant Management Essentials
  - Seasonal Readiness Guidelines
  - Key Aspects of Cold Weather Preparedness Planning for EOP-012 Compliance (December 2024)
  - Guidance on Calculating the Extreme Cold Weather Temperature for EOP-012 Compliance (December 2024)
- Climate READi
  - **Re**siliency and **Ad**aptation to Climate Related Challenges
  - Develop a framework that can be utilized to develop practices and approaches to address future climate impacts on power system assets
- Supplemental Project supporting EOP-012 compliance
  - 50+ participating companies with user group format
  - Multiple workshops and webcasts since May 2023

Existing EPRI Resources – Free and Public

- Cold Weather Operation: Evaluating Minimum Temperatures for Thermal Generation
- Equipment Seasonal/Weather Readiness: Severe Weather
- Cooling Water Intake Debris Management: Frazil Ice



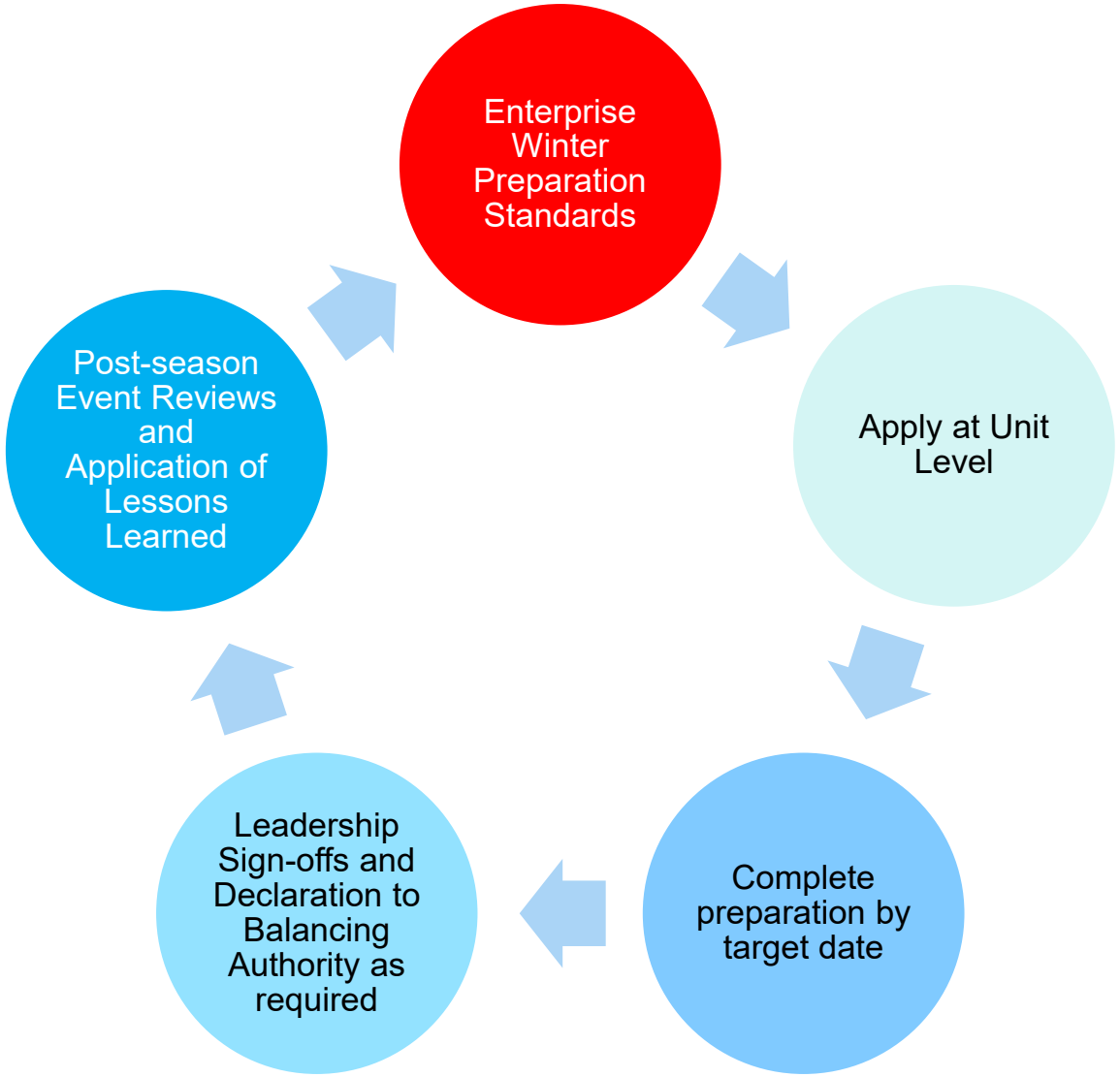


Common Challenges with Winter Preparation and Operation

Sensing Lines and Instrumentation	Lack of insulation, heat trace, or enclosures Low to no flow conditions in small diameter piping
Cold startup during an extreme cold weather event	
Completion and documentation of training the “right” personnel	
Heat Trace and Insulation Systems	Mechanical damage to insulation or water intrusion Heat trace not designed for load under extreme cold
Icing of Open Systems	Intakes, circulating water, cooling towers, and service water systems Lack of accurate weather monitoring to allow for mitigation
Fuel and Material Handling	Coal, Limestone, and other material delivery challenges due to freezing Oil Tanks gelling and crystallizing

Winter Readiness Best Practices

- Develop and utilize an enterprise program document
  - Standard requirements promote a consistent approach
  - Events and lessons learned implemented fleet wide
  - Leadership sign-off & acknowledgment that winter preparation is complete and approval of exceptions with known risk
  - Declaration to Balancing Authority, as required
- Plant and unit-specific procedures and training
  - Staffing approach
  - Supplies – what is needed, where to store it
  - PM Work Orders and Corrective Work Order Backlog
  - Unit specific checklists for pre-season and pre-event



Winter Readiness Best Practices

Utilize CMMS

- Generate seasonal readiness tasks & track their completion
- Prioritize status to seasonal deficiencies entered as future work orders
- Include lagging/insulation, heat trace, and enclosures as specific task work orders
  - Add work steps to existing job aids to prevent maintenance activities from defeating protective functions (e.g. heat trace de-energized during freezing conditions, insulation removed and left off for extended periods)

Plant walk-downs

- Utilize checklists
- Building penetrations properly insulated and sealed from elements (doors, windows, louvers, dampers, etc.)

Winter Readiness Best Practices (cont'd)

Training

- Plant staff awareness on plan updates/lessons learned from previous events
- Event reviews should be conducted immediately following an event.

Monitoring

- Continuously monitor heat tracing systems and sensors - assign someone for this function.
- Increase operator rounds during cold weather event
  - Check heat trace systems during the event to look for discoloration or heat damage in relays, tripped breakers, etc.
  - IR cameras provide quick and useful system condition updates

Winter Readiness Best Practices (cont'd)

- Develop a winter readiness supply list and dedicated storage location
  - Temporary heaters (PM)
  - Tarps, heaters-electric and fueled, winter clothing, cots, blankets, food, ice melt, crampons, chainsaws, etc.

- Request periodic starts to heat units

- Don't forget about vehicle winterization
  - Trucks, UTV's, snowplows, and ice melt spreaders
  - Operators still may need to access remote areas even if icey conditions with trees down

Summary of EPRI Cold Weather Critical Component Workshop

Knoxville, TN - August 2023

- Not every freeze-susceptible or temperature-affected component is a cold weather critical component (CWCC)

- CWCC identification should have sufficient input from plant level O&M personnel
  - Controls (DCS) specialist are often a good resource

- Time Lag
  - Emphasis on immediate load impacts
  - Other components/systems that affect makeup water, fuel or reagent supply, or environmental controls should be considered

Summary of Cold Weather Critical Component Workshop

Knoxville, TN - August 2023

- Granularity
  - Level of appropriate granularity for Cold Weather Critical Component selection should align with potential cause analysis in the event of a reliability event
  - Don’t group entire systems into a single CWCC if there are individual components within the system that can cause an event all themselves independent of the other components in the same system
  - A single FPM could be used to protect multiple CWCC’s

- Startup Challenges
  - Pre-warming with ignitors, pegging steam, or equivalent should be considered as a freeze protection measure
  - Use information from previous startup failures to develop CWCC list

Summary of Cold Weather Critical Component Workshop

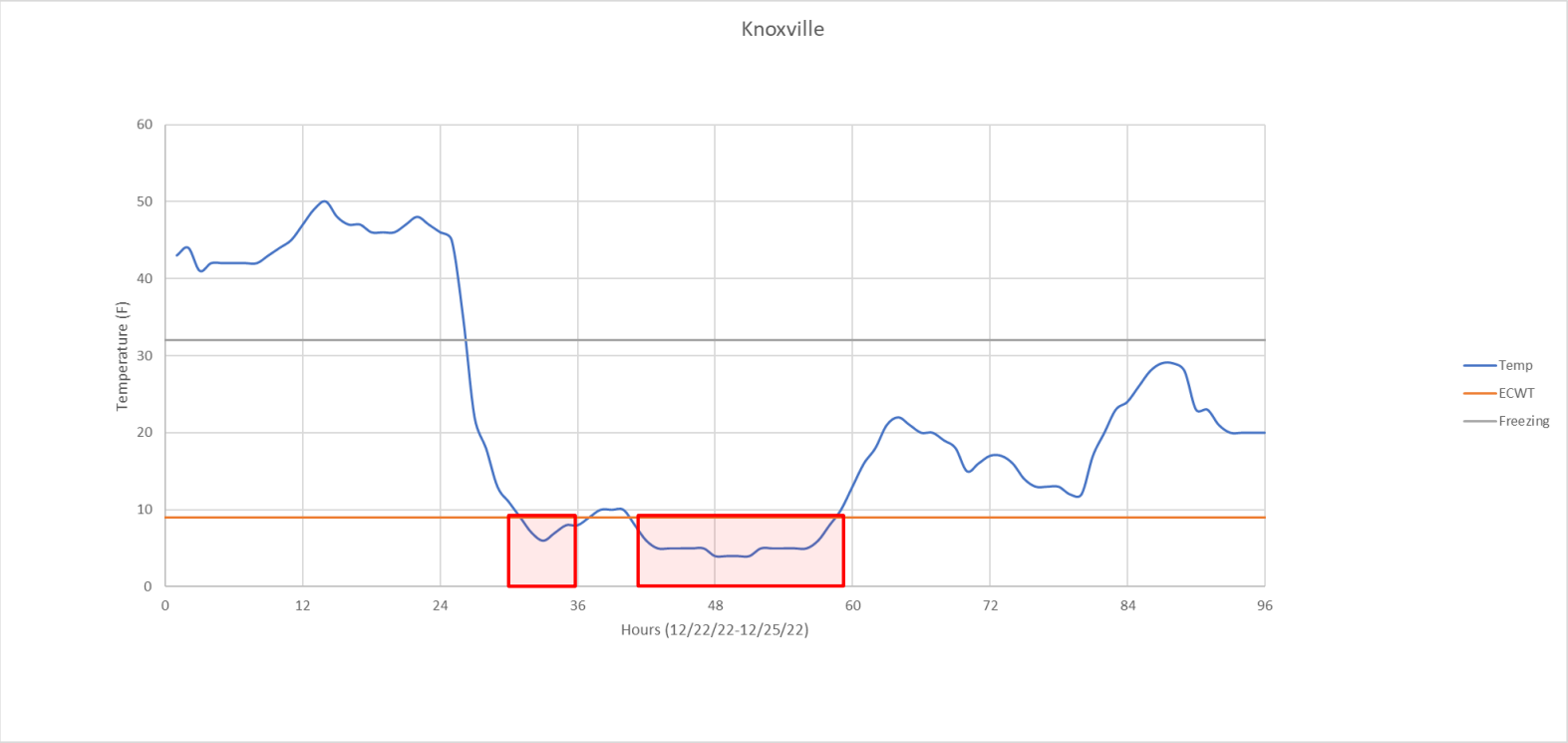
Knoxville, TN - August 2023

- Cold Weather Preparedness Plans are Unit Specific
  - Training for personnel responsible for implementing unit-specific CWPP's should be trained on CWPP's for units they could work on
  - If an employee is not working specifically to implement a CWPP on a unit, generic overview training is most appropriate

- CWPP Training
  - Timing is key – refresher training before winter season begins
  - Complete before performing work related to the generating unit's cold weather preparedness plan

Putting the ECWT in context…

- During Winter Storm Elliott (December 2022), ambient temperatures in Knoxville, TN plummeted below freezing and then below the ECWT for approximately 5 hours, rising slightly, to only plunge again below the EWCT for an additional 20 hours.



Meeting the ECWT is the minimum requirement for compliance but ensuring winter resiliency may require sustained operation at lower ambient temperatures. To accomplish this will require a balanced, risk-informed approach to make the most of available resources

Winter Readiness to Improve Starting Reliability at OPPD

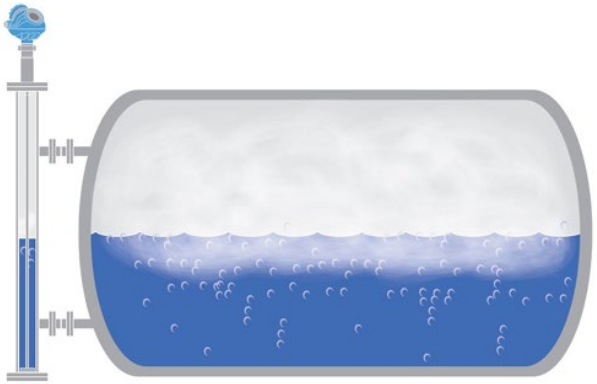
- **Peaking Station Improvements**
  - Lube Oil Regulator Cabinet heating modifications
  - Heat Trace Control Panel Improvements
  - Insulation of exposed Fuel Oil and Water piping
  - Additional space heating in breaker sheds
  - Additional 480V Welding receptacles for portable heaters
  - Glycol heating systems for engine compartments
  - Install Fuel Oil Storage tank filter/heater skids
  - Enclosure with heating around CO_2 Tank skid
  - Installation of Fuel Oil tanks and Gas only sites
- **Administrative Improvements**
  - New Preventative Maintenance Tasks – heater, heat tracing and ventilation damper checks
  - Revised Cold Weather Procedures at each site
  - Improved collaboration with Fuel Oil and CO_2 vendors

Omaha Public Power District
Jones Street Station 1 & 2

Information provided by Ken Kingston, OPPD – used with permission

Winter Readiness at Oglethorpe Power Company (OPC)

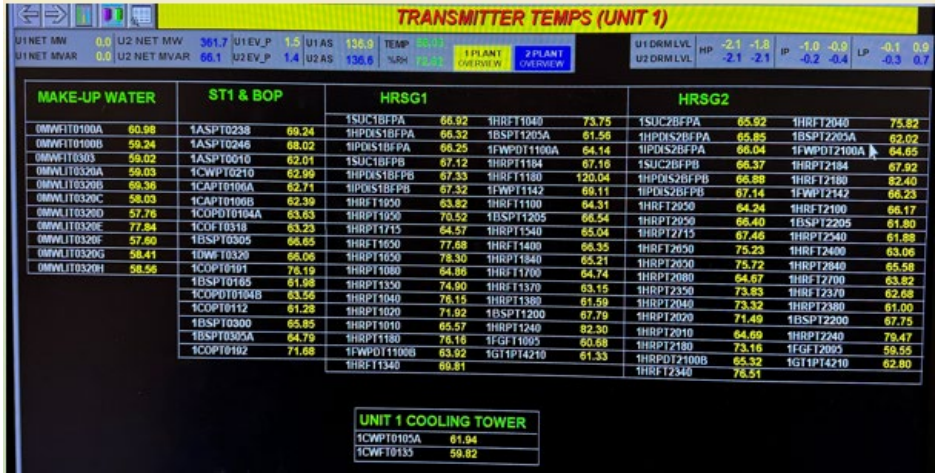
- Heat Trace DCS Interface
- Enclosures for Chemical Storage
- Guided Wave Radar drum level indication on all 3 CCGT
  - Uses microwave technology
  - Device mounted on a chamber sends low energy pulse down a probe which is reflected up the probe to the device



OglethorpePower

Freeze Protection Technology

Heat Trace DCS interface



OglethorpePower

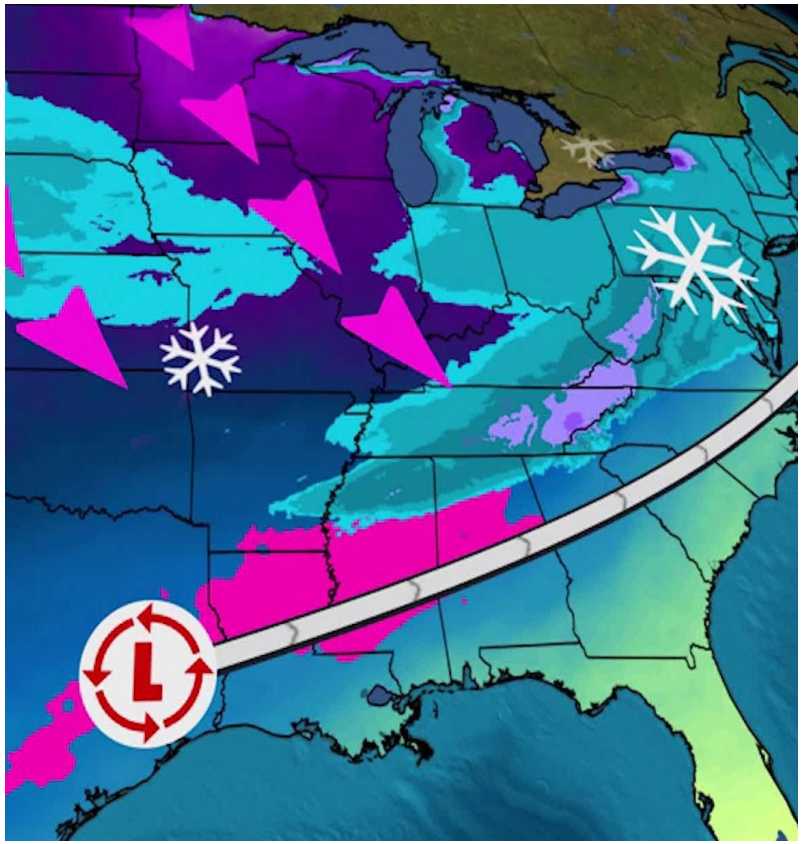
Freeze Protection Technology

Chemical Storage

Information provided by Teresa Czyz, OPC – used with permission

Tennessee Valley Authority (TVA) Experience

- Developed a site assessment tool
- Conducted readiness reviews
  - 1407 items evaluated across gas and coal fleet (1139 in gas fleet)
  - 89 follow up items or corrections (55 in gas fleet)
  - 75 administrative corrections
  - 14 field walkdown findings mitigated
- Significant improvement from Winter Storm Elliott 2022 compared to Winter Storm Heather 2024
- New Freeze Protection Measures:
  - Smart Panels for Heat Trace
  - New H/T and Insulation
  - Permanent Hard Side Enclosures
  - Permanent Heater Evaluation and Replacement



TVA saw the highest total energy for one week in its history (4,792 GWh) during the January 2024 Event (Heather)

Information provided by Norm Flake, TVA – used with permission

TOGETHER…SHAPING THE FUTURE OF ENERGY®

www.epri.com