



**TEXAS RE**  
Ensuring electric reliability for Texans

# Generator Weatherization Workshop

*September 3, 2020*



**TEXAS RE**  
Ensuring electric reliability for Texans

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# **NERC and Texas RE Update**

**Mark Henry**

**Reliability Services, Texas Reliability Entity, Inc.**

**ERCOT/Texas RE Generator Winter Weatherization Workshop**

**September 3, 2020**

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# NERC Industry Metric on Events Caused by Gas-Fired Unit Forced Outages Due to Cold Weather or Gas Unavailability

## Why is it important?

- Reduce risk to BPS reliability due to gas-fired unit outages during cold weather or gas unavailability

## How is it measured?

- Firm load loss due to cold weather or gas unavailability
- MWh of potential production lost initiated by cold weather and gas unavailability

<p><b>Data (Annual Measurement)</b></p> <ul style="list-style-type: none"> <li>▪ No firm load loss due to gas-fired unit outages during cold weather: <i>Zero is green, else is red</i> (Cold weather months: January – March and December of the same calendar year) <i>As of 6/30/2020, Metric status is Green.</i></li> </ul>	<p><b>2020 Status</b></p> 
<p><b>Data (Annual Measurement)</b> (Match with 4.4, year defined as Q3-Q2)</p> <ul style="list-style-type: none"> <li>▪ No firm load loss due to gas unavailability: <i>Zero is green, else is red</i> <i>As of 6/30/2020, Metric status is Green.</i></li> </ul>	
<p><b>Data (Compared to a 5-year rolling average)</b></p> <ul style="list-style-type: none"> <li>▪ Percentage of winter period net MWh of potential production lost due to gas-fired unit outages during cold weather (Cold weather months: January – March and December of the same calendar year) <i>Five-year average: 0.0058%</i></li> </ul>	<p>0.00149%      0.00053%</p> 
<p><b>Data (Compared to a 5-year rolling average)</b></p> <ul style="list-style-type: none"> <li>▪ Percentage of annual net MWh of potential production lost due gas unavailability compared to a 5-year rolling average (Due to data availability, year defined as Q3-Q2) <i>Five-year average: 0.1513%</i></li> </ul>	<p>0.192%      0.0898%</p> 

# NERC Cold Weather Guideline Revision in Progress

**Added: Schedule ... “winterization” work to occur prior to the local NOAA First Frost Date. Un-doing winterization should wait until after NOAA Last Frost Day...**

**Updates to list of typical problem areas:**

- Item 4.a: *Calibration of dew point monitoring*
- Item 10: Lube oil and greases for mechanical equipment in exposed locations
- Item 11: Exposed batteries and UPS systems
- Item 12: Heat tracing, insulation & temperature responsive ventilation (heaters, fans, dampers and louvers)

**New Lesson Learned LL20200601 – “Unanticipated Wind Generation Cutoffs during a Cold Weather Event” and emphasis on communication of this risk of low temperature cutoffs**

# NERC Cold Weather Reliability Standard

## NERC Project 2019-06: Cold Weather

- Third version posted and comments received May 21, 2020
- Fourth version up for NERC Standards Committee approval in late September with reposting this fall for additional comments



## Standard Authorization Request (SAR)

Complete and submit this form, with attachment(s) to the [NERC Help Desk](#). Upon entering the Captcha, please type in your contact information, and attach the SAR to your ticket. Once submitted, you will receive a confirmation number which you can use to track your request.

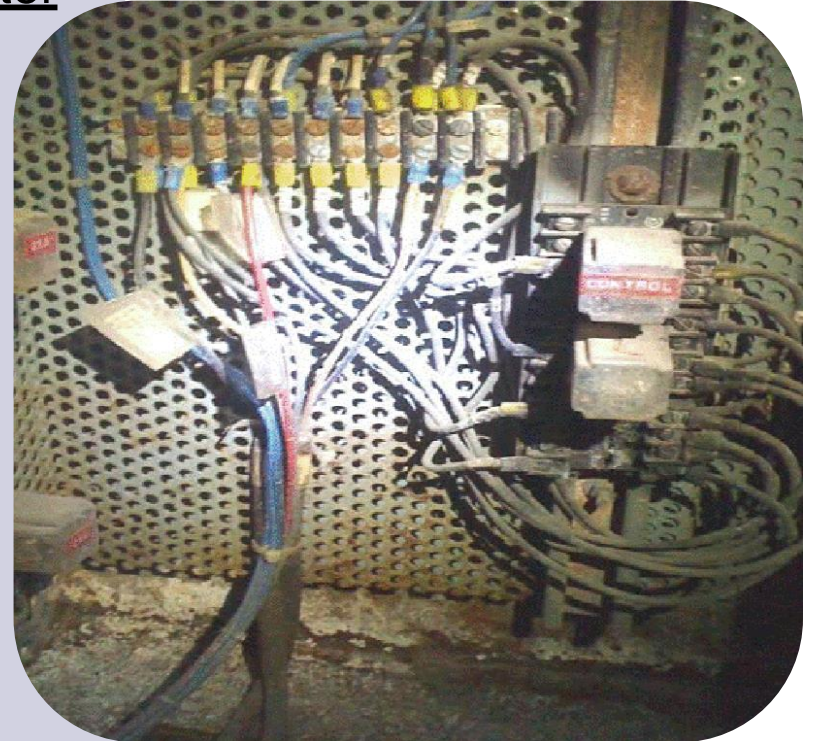
The North American Electric Reliability Corporation (NERC) welcomes suggestions to improve the reliability of the bulk power system through improved Reliability Standards.

Requested information	
SAR Title:	<del>Extreme</del> Cold Weather Preparedness <u>and Communication Requirements between Functional Entities</u>
Date Submitted:	September 20, 2019
SAR Requester	
Name:	Michael Desselle, VP Process Integrity/Chief Compliance and Administrative Officer
Organization:	Southwest Power Pool, Inc.

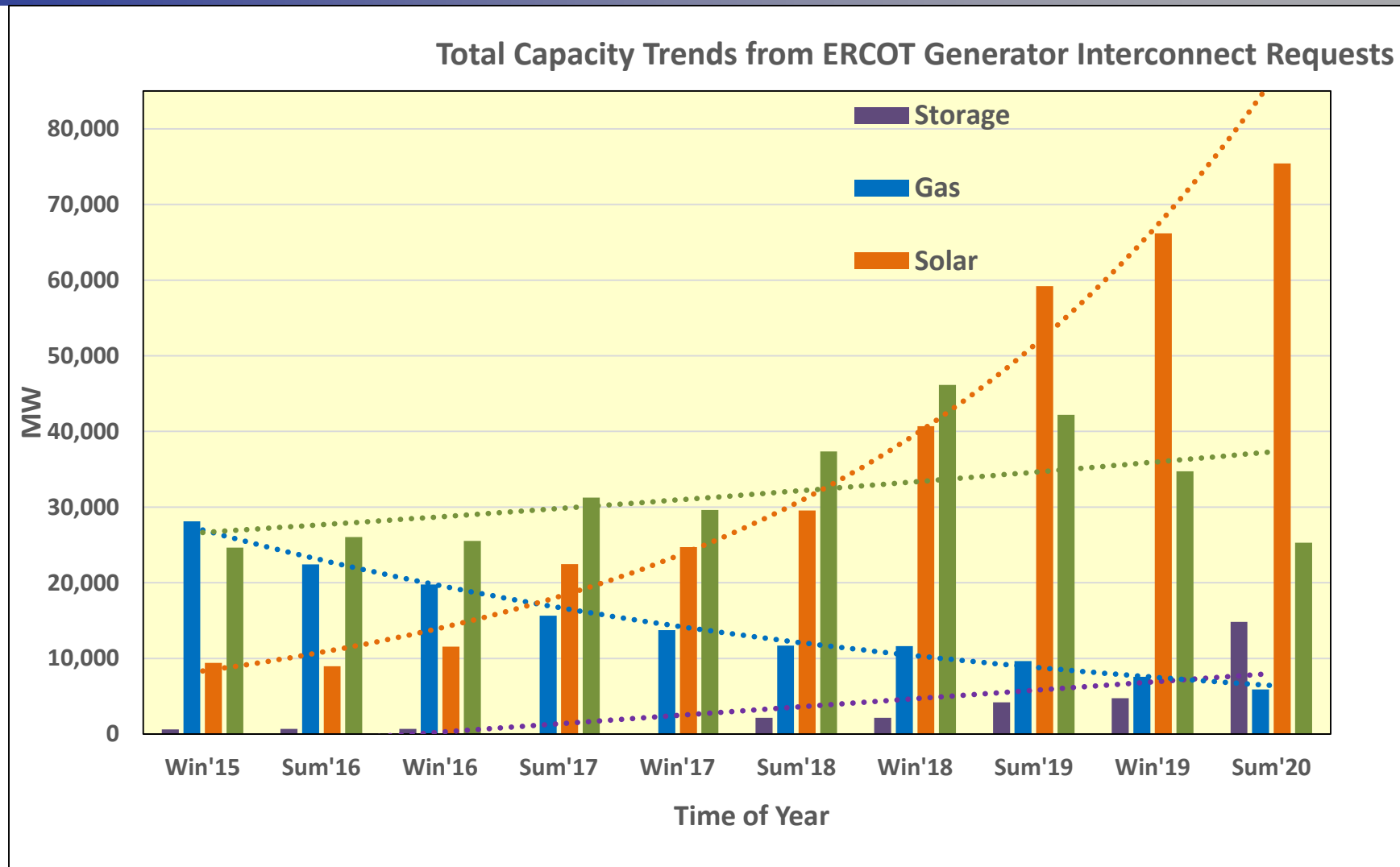
# Human Performance Observations

## Inadequate Generator Winter Preparedness

- How does Human Performance impact winter preparedness?
  - Design
  - Equipment selection
  - Installation
  - Maintenance
- Rule-based errors?
  - Inadequate work practices, procedures, and checklists
- Knowledge and skill-based errors?
  - As-left personnel errors
- Change management?
  - Work plans not accounting for field conditions
  - Project schedules too compressed
  - Scope changes

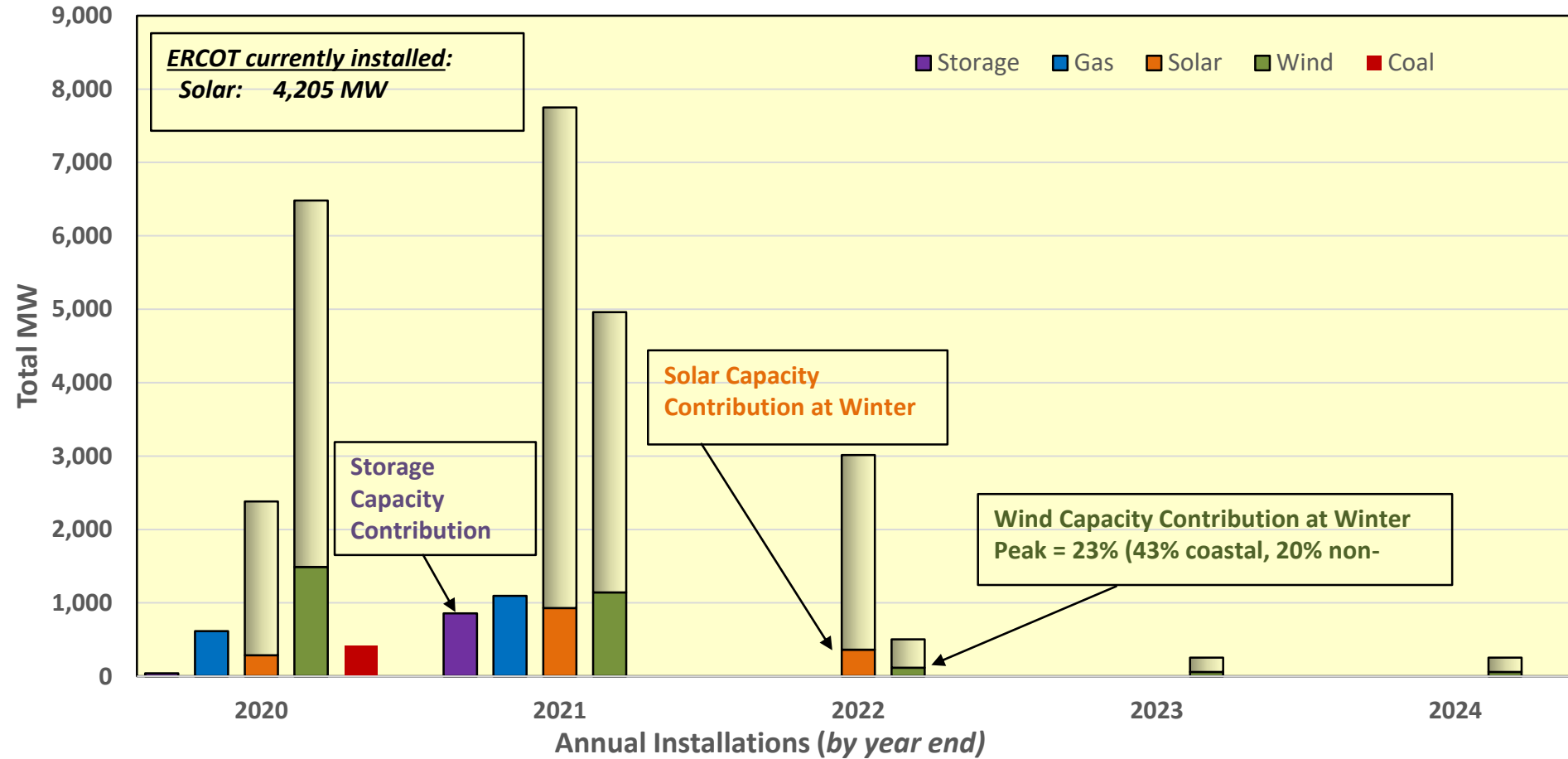


# Meeting Winter Peak as Generation Mix Changes

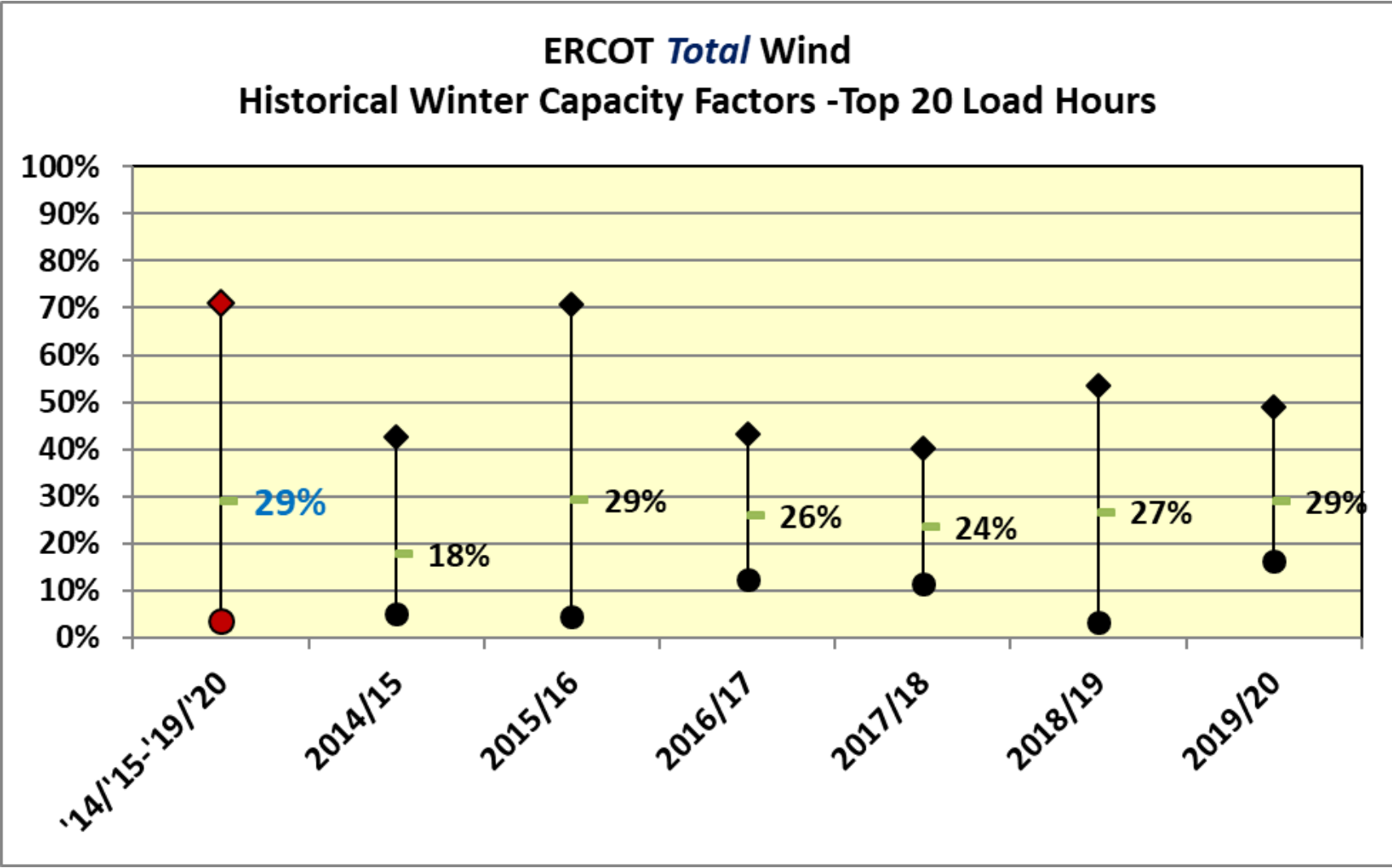


# Meeting Winter Peak as Generation Mix Changes

August 2020 ERCOT Generator Interconnect Requests with **Signed** Agreements



# Wind Power *Winter* Capacity Contribution in Texas RE Region



# TCEQ Enforcement Discretion ... Power Emergency

**NOTICE DATE:** Some Future Winter Day

**NOTICE TYPE:** M-AMMDDYY-NN Operations ...

**INTENDED AUDIENCE:** QSEs with Resources and Resource Entities ...

**LONG DESCRIPTION:** The ERCOT Region is expecting ..... a power emergency. The Texas Commission on Environmental Quality (TCEQ) has communicated to ERCOT that, effective immediately, ...TCEQ will exercise its enforcement discretion for exceedances of emission and operational limits of power generating facilities for generators that exceed air permit limits.

Any generating facility that expects to exceed its air permit limits to assist during these extreme temperatures shall provide a notice of this action to Kelly Cook ([kelly.cook@tceq.texas.gov](mailto:kelly.cook@tceq.texas.gov)), Director of Critical Infrastructure Division for TCEQ. ....

See “Procedure for Requesting TCEQ Enforcement Discretion Relating to a Power Emergency in Texas for ERCOT, MISO, or SPP Regions,” available at

<https://www.tceq.texas.gov/assets/public/response/power-emergency/enforcement-discretion.pdf>.

# Contacts

## Contact:



**Mark Henry - Director**

- [Mark.Henry@texasre.org](mailto:Mark.Henry@texasre.org)
- 512-583-4988



**Bob Collins**

- [Bob.Collins@texasre.org](mailto:Bob.Collins@texasre.org)
- 512-583-4986

[RAPA@texasre.org](mailto:RAPA@texasre.org)



# Questions?



# Winterization at Silas Ray



# Agenda

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- About the facility
- Previous Issues
- Measure taken to correct the issue
- Pre Winter Checklist



There we are

# Brownsville Public Utilities Board Silas Ray Power Station

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- Location Brownsville, Texas
- 120 MW Facility:
  - 1 simple cycle Natural Gas fired Turbine and 1 Cogeneration Gas Turbine/ Steam Turbine
- Simple Cycle: 1 Gas Turbine GE-LM6000 Aeroderivative (50MW)
- Cogeneration:
  - 1 Gas Turbine Siemens Westinghouse-251B12 (50MW)
  - 1 Steam Turbine Westinghouse (20MW)
- Commissioned in the 1940's
- Ownership: 100%
- NERC Region: Texas RE
- Located on the border of Texas and Mexico

# Notable weather Events

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- January 17, 2018:
  - Unit 6, HRSG - Feed Water Control Valve froze
  - Unit 10 Staring Skid Tripping:
    - Temperature Issue required additional windbreaks to alleviate the problem.
  - Unit 10 SCR Ammonia Injection System:
    - Heater Temperature Issue required a windbreak at the blower intake location. Temperature and ammonia vaporization issues are a frequent concern.

# Winterization Improvements

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- O'Brien Boxes
  - Molded glass fiber reinforced polyester enclosures designed to withstand exposure to industrial and outdoor environments
  - Heat Trace installation on HRSG
- Wind Breaks/ Skid Covering
  - Windbreaks put in place to alleviate the northern winds and wind chill factor
- Thermaxx Jackets- WeatherMaxx Covers/ Valve windbreak
  - Quality Removable Insulation blankets for pipes, valves, and heavy equipment.

# O'Brien Boxes

- Molded glass fiber reinforced polyester enclosures designed to withstand exposure to industrial and outdoor environments. Protects instrument from corrosion, chemical attack, mechanical abuse, and freezing and weather.
- We added O'Brien Boxes to all of the HRSG critical transmitters. As part of our Winterization checklist., we check for proper heater operation inside all boxes, verify that the thermometer on the box is functioning, and that the boxes are secured and damage free.
- Along with the HRSG Critical Transmitter, we also added heat trace to all HRSG Drum Level – Transmitters/tubing. As part of our Winterization checklist it gets tested and checked that all heat trace cables are secured to equipment.



# O'Brien Boxes

## Silas Ray Power Plant Critical Components Checklist 2019

Item No.	Component Description	Critical Component (Y/N)	Tag #	Heat Trace Circuit Associated w Component	Amps (A)	Control	Breaker Status Inspection		Insulation Inspection on sensing line (signature)	Insulation Condition Comments	O'Brien Cabinet-Heater /Thermometer Working - inspected by (signature)	Condition Comments	Windbreak Installation (if required)
							Status (Closed/Open)	Signature					
1	HRSG - Box Heater 6C/PT-1A		3SGA-PT-A	Breaker # 1,2	N/A								
2	HRSG -Box Heater 6D/PT-1B		3SGA-PT-B	Breaker # 1,3	N/A								
3	HRSG -Box Heater 6E/PT-1C		3SGA-PT-C	Breaker # 1,4	N/A								
4	HRSG -Box Heater 4A/LT-1A		3SGA-LT-A	Breaker # 1,5	N/A								
5	HRSG -Box Heater 4B/LT-1B		3SGA-LT-B	Breaker # 1,6	N/A								
6	HRSG -Box Heater 4C/LT-1C		3SGA-LT-C	Breaker # 1,7	N/A								
7	HRSG -Heat Trace circuit #1		D/WG# B001-PT1A-BPPA	Breaker # 3		TA4X140				N/A			
8	HRSG -Heat Trace circuit #2		D/WG# B002-LT1A-BPPA	Breaker # 3		TA4X140				N/A			
9	HRSG -Heat Trace circuit #3		D/WG# B003-LT1B-BPPA	Breaker # 3		TA4X140				N/A			
10	HRSG -Heat Trace circuit #4		D/WG# B004-PT1B-BPPA	Breaker # 3		TA4X140				N/A			
11	HRSG -Heat Trace circuit #5		D/WG# B005-PT/LT1C-BPPA	Breaker # 3		TA4X140				N/A			
<b>UNIT 10 - NELSON SYSTEM 1</b>													
12	Sprint Skid - Heat Trace circuit		#3			PLANT LIGHTING PANEL LP2-10E016							
13	MLO Skid - Heat Trace circuit#1		#5			PLANT LIGHTING PANEL LP2-10E016							
	MLO Skid - Heat Trace circuit#2		#5			PLANT LIGHTING PANEL LP2-10E016							
14	Hydraulic Starter Skid - Heat Trace Circuit #1		#8			PLANT LIGHTING PANEL LP2-10E016							
15	Hydraulic Starter Skid - Heat Trace Circuit #2		#8			PLANT LIGHTING PANEL LP2-10E016							
16	Hydraulic Starter Skid - Heat Trace Circuit #3		#8			PLANT LIGHTING PANEL LP2-10E016							
						PLANT LIGHTING							



# Wind Breaks

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- We have added several Wind Breaks/ Skid Housing for the winter period on certain locations such as: Hydraulic Starter Skid , Gas Compressor Skid, Ammonia/SCR Skid, HRSG Penthouse, Circulating Water Pumps
- Within each Wind breaks, Heat Lamps can be place in the event additional heating is necessary.



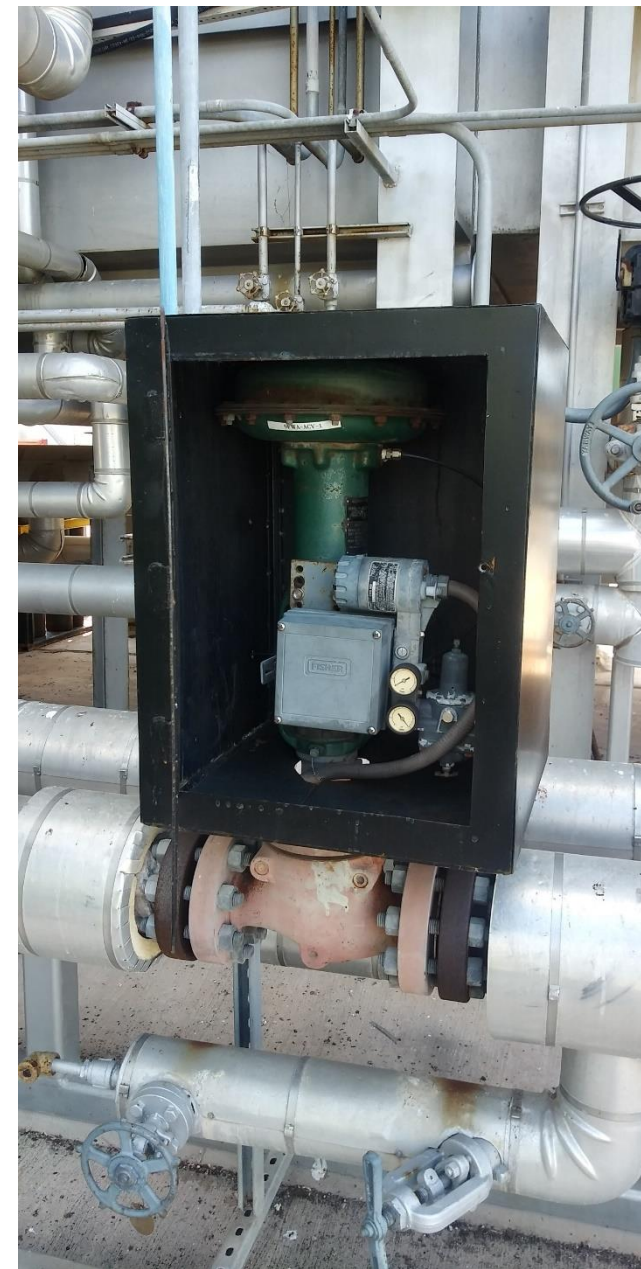
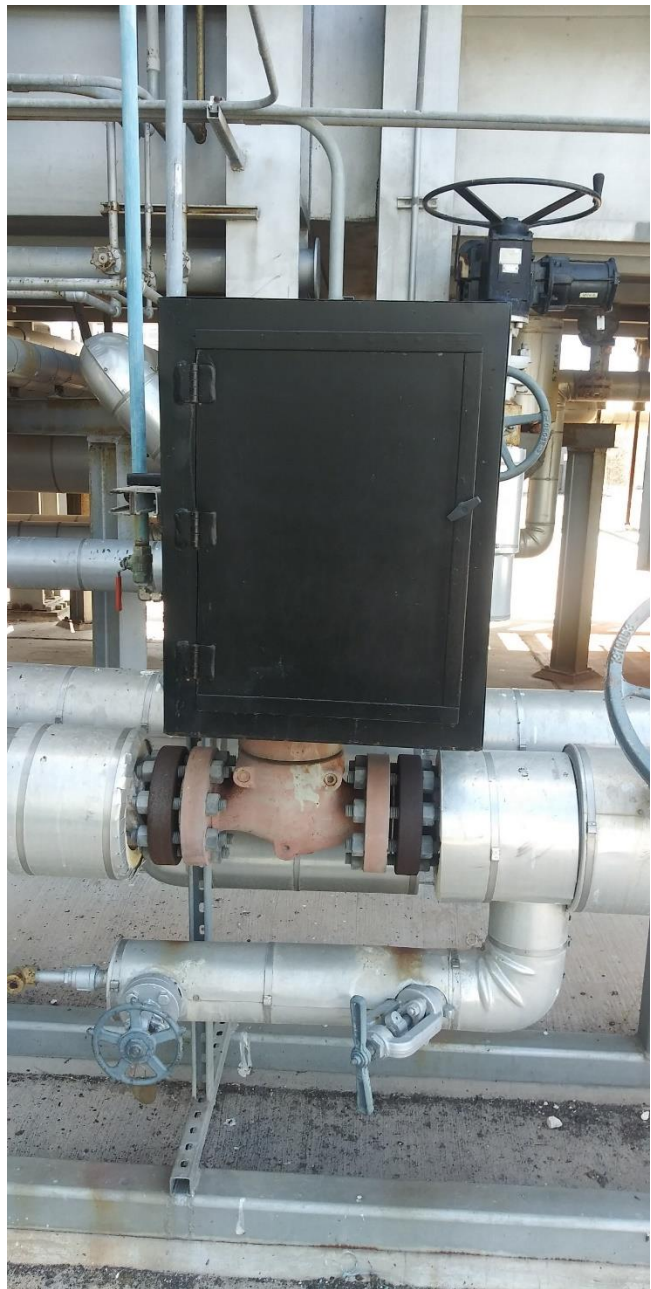


# Feed Water Control Valve Cover

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- January 17, 2018: Issues we noticed with our Feed Water Control Valve
  - The Valve was frozen stuck and wasn't responding.
  - How it was resolved at the time of the event. We wrapped the Valve with a tarp and put a heat lamp on the controller to defrost it. As the valve was defrosting, the operator had to manually bypass the valve.
  - We believe the controller froze due to the harsh weather conditions, but we also went ahead and checked the air dryers for condensation built up in the Instrument air.
- After this issue occurred we looked around and ending up ordering a Quality Removable Insulation blankets from Thermaxx Jackets- WeatherMaxx Covers. Which is weather resistant, waterproof, resistant to severe chemical and temperature exposure, flame retardant, and UV resistant.
- To factor out the idea of possible condensation build up we also have certain PM's associated to the Air Dryers. Such as filter replacement, desiccant replacement, and dew point monitor calibration.

# Feed Water Control Valve



# Pre Winter Season Checklist at Silas Ray

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- Winter Preparedness Checklist
  - Overall checklist for Engineering Dept., Operations, & Maintenance
- Inventory List Checklist
  - Spare equipment for Winter emergency's
- Winterization Kit Checklist
  - Containers per Unit 9, Unit 10, & HRSG Penthouse
- Heater Verification Checklist
- Critical Component Checklist
  - HRSG box heater
  - HRSG heat trace circuit
  - Nelson Heat Trace
- Heat Trace Verification Checklist
  - All Heat Trace throughout the plant
- Provide training refresher on winter procedures to staff

# References

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- <https://www.thermaxxjackets.com/products/weathermaxx-cover-2/>
- <https://www.obcorp.com/product/instrument-enclosures-protection/full-enclosures>
- <https://www.weather.gov/media/bro/wxevents/2018/pdf/2018January16to17Summary.pdf>

Question

A 3D rendered graphic featuring the word "Question" in a light gray, sans-serif font. The letters are thick and have a slight shadow beneath them. At the end of the word, a large, vibrant red question mark is positioned, appearing to be part of the word's structure. The entire graphic is set against a plain white background.



# Winterization Lessons Learned - Air Liquide Bayport

THIS DOCUMENT IS PUBLIC

Houston, TX • 9-3-2020

Abdul Usmani • Air Liquide Large Industries

**LARGE  
INDUSTRIES**



# Contents

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- 1 Air Liquide Bayport Site Overview
- 2 Previous Winterization Plan
- 3 Updated Winterization Plan
- 4 Spot Check Key Takeaways
- 5 Questions

# Air Liquide Bayport Key Information

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- **Air Liquide's Largest Production Facility in North America**
- **Water Systems**
  - 30 million GPD of treated river water
  - 6.2 million GPD of demineralized water
- **Steam Methane Reformer (2006)**
  - 100 million scfd Hydrogen production and 175 kpph steam
- **4 Cogen Units (1985) and 3 Aux Boilers**
  - 360MW power production
  - Over 3 million lbs/hr steam production capacity
  - 5 miles of steam pipeline
  - Condensate recovery and treatment
- **Bayport Air Separation Units - Plant 3A (1999) and Plant 4 (1990)**
- **~35 Customers in the Central Basin**

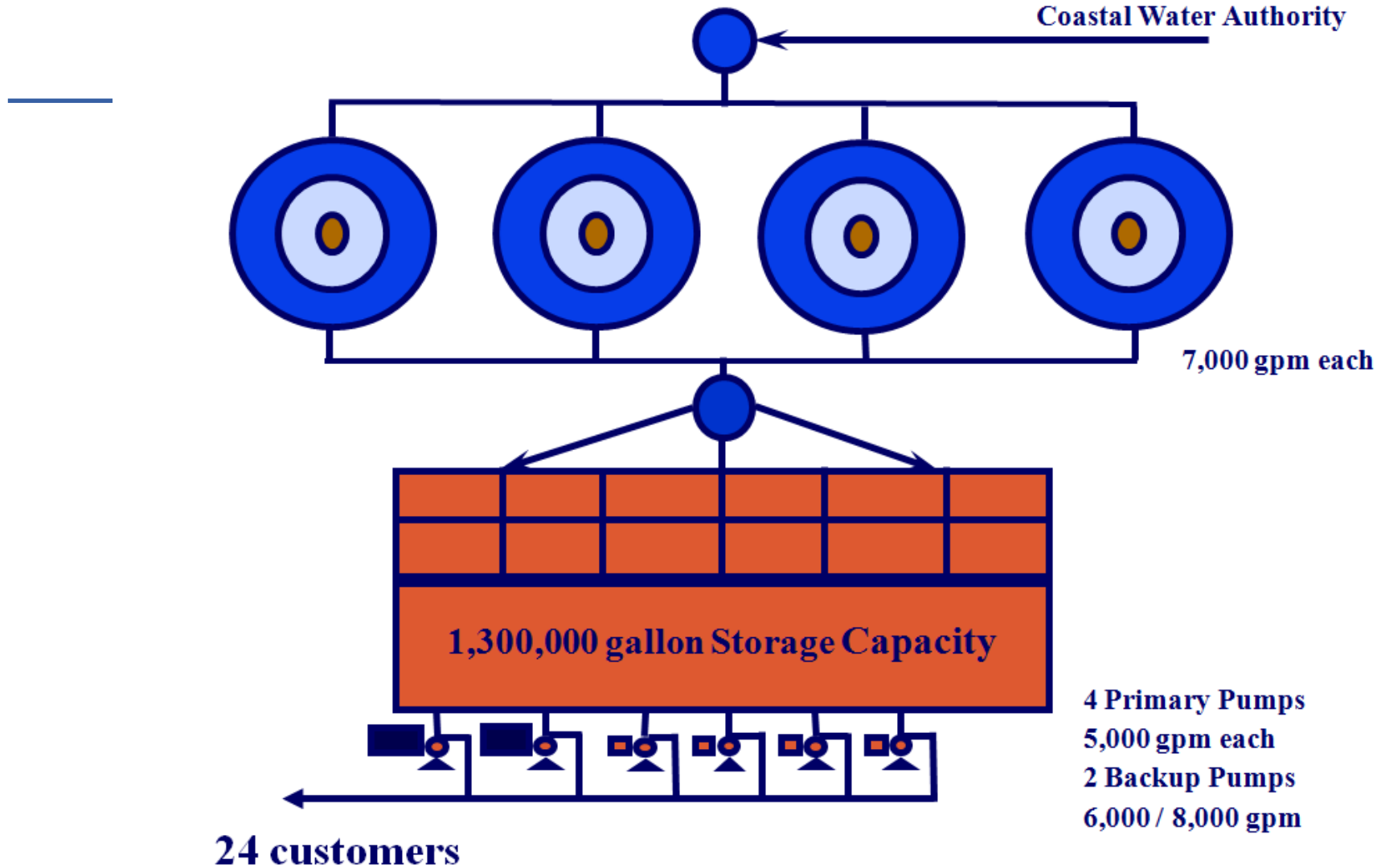
# Bayport Site Overview



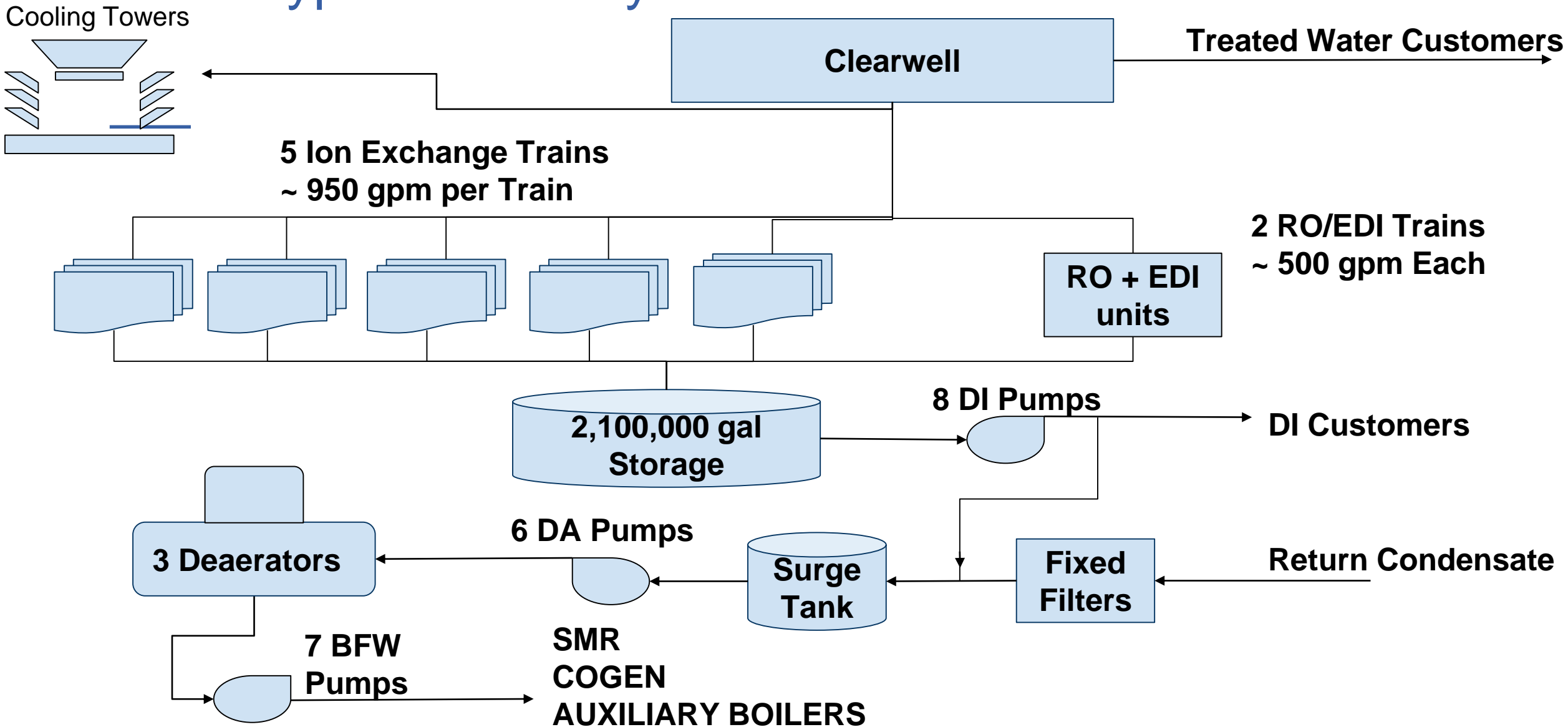
THIS DOCUMENT IS PUBLIC

AIR LIQUIDE, A WORLD LEADER IN GASES, TECHNOLOGIES AND SERVICES FOR INDUSTRY AND HEALTH

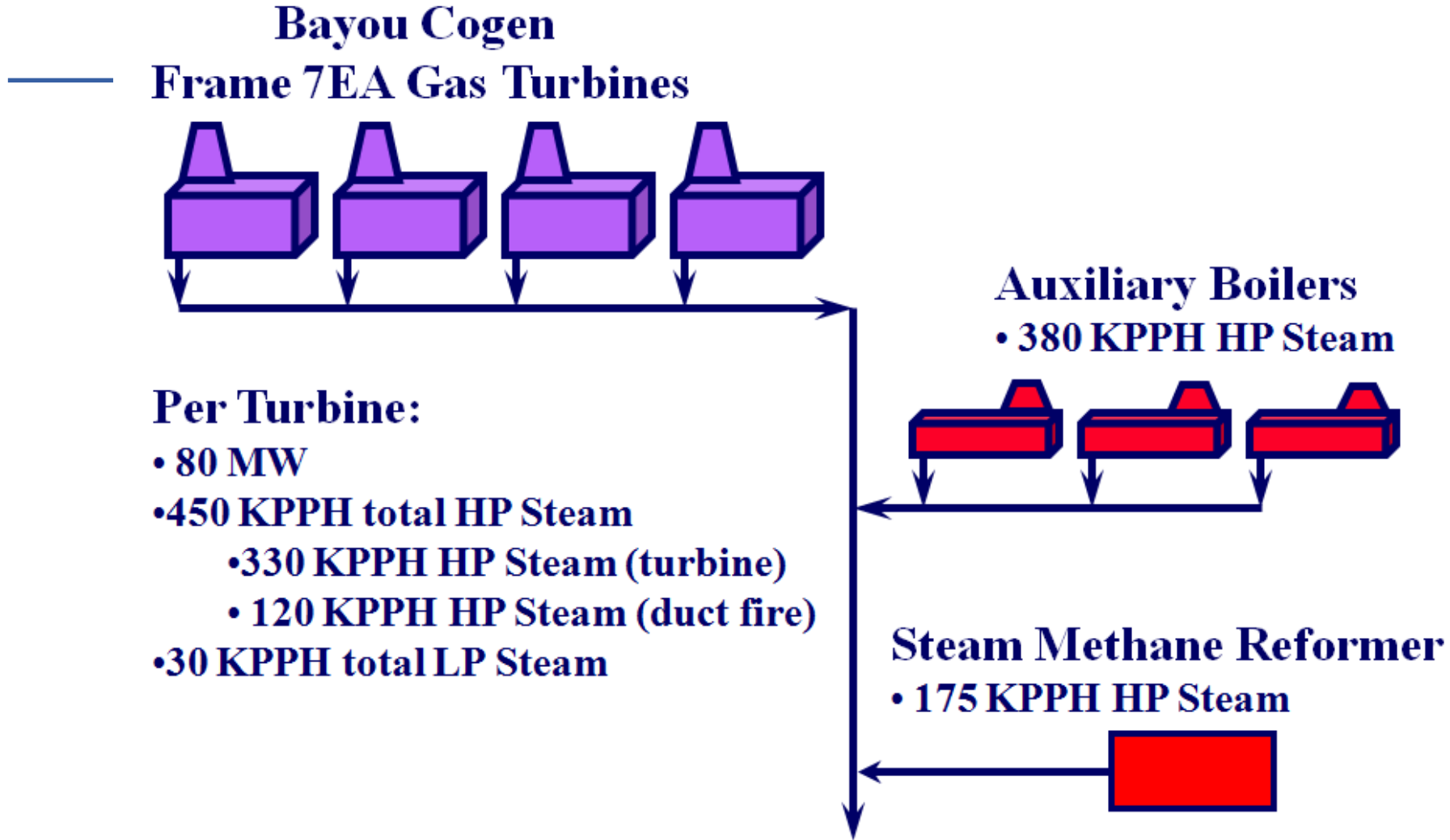
# Industrial Water Treatment Plant



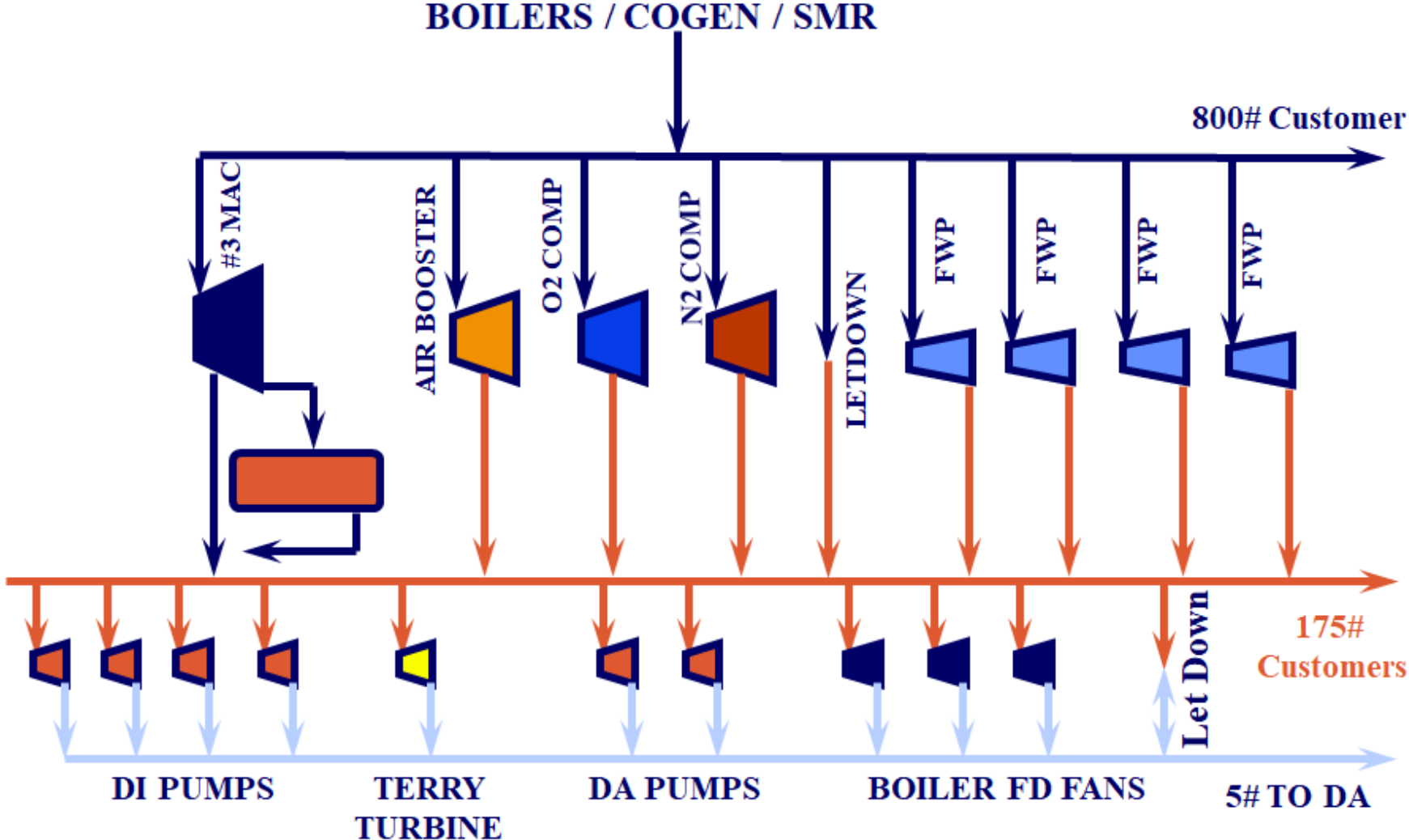
# Bayport Water System



# Bayport Steam Production



# Bayport Steam System





# Winterization Plan Prior to 2018

- Winterization plan was in place but vague in many areas
- Success of the winterization plan was highly dependent on prior knowledge at the plant
- Many critical areas of the facility were not explicitly part of the plan
  - Ex. Instrument air system and Heat trace circuits



# Winterization Plan After 2018

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**Winter readiness plan updated to include:**

- **Critical heat trace testing and comparison to previous year**
- **Critical insulation inspection**
- **Instrument air system readiness testing to ensure adequate dryness**
- **Minimum Staffing requirements for the different phases of the winter weather plan**



# Winterization Spot Check Takeaways

- **Ensure everything done in preparation is well documented and specified in procedures:**
  - **Specify the different tasks required for winter preparation for each craft**
  - **Develop a list of the critical areas in the plant that need to be addressed based on experience**
  - **Documentation, documentation, documentation!**





Questions?

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*ercot* 



**TEXAS RE**  
Ensuring electric reliability for Texans

**Break**

BASTROP ENERGY CENTER  
WINTER WEATHERIZATION  
PROCEDURE IMPROVEMENTS  
AND BEST PRACTICES

The background is a solid blue gradient. On the right side, there are several white, parallel diagonal lines that sweep from the bottom left towards the top right, creating a sense of motion and modern design.





Texas

Fort Worth • Dallas

El Paso

Austin

Houston

Bastrop Energy Center  
Combined Cycle Plant  
567 Mw's  
Cedar Creek Tx

# BASTROP ENERGY CENTER

***Total plant output is 567Mw's***

***Commissioning operating date : May 2002***

***Two GE 7FA Combustion Turbine/Generators***

***Two Aalborg Heat Recovery Generators with Duct Burners***

***One Toshiba Steam Turbine/Generator***

***Plant Controls System: Westinghouse Ovation/GE Mark VI***

***Added Peak fire Capabilities, providing an additional 12 Mw's***

# WEATHERIZATION PROCEDURE

## ▶ Plant Director

- Ensure seasonal readiness PMs are safely performed and completed in advance of appropriate time for certification of readiness dates.
- Insure seasonal readiness PMs are developed, as appropriate.
- Ensure personnel receive annual orientation or refresher training in winter.
- Shall consider arranging for accommodations for personnel.
- Ensure that all Management of Change (MOC) activities are performed so changes maintain seasonal readiness of plant.

# PROCEDURE UPDATES

## ► Severe Weather Coordinator

- Coordinate and oversee Weatherization Plan activities.
- Coordinate winter plant operator and maintenance training.
- Maintain site specific severe weather readiness programs, processes, procedures, and implementation checklists. Incorporate lessons learned on an annual basis.
- Provide and retain objective documentary evidence of compliance to support Plant Manager with certification of readiness.
- Update Plant Director on repair status of critical components by November 15<sup>th</sup> which shall include a repair schedule of all uncompleted repairs.

# SEVERE WEATHER STAFFING

- ▶ Forecasted temperatures to fall below 35F and any form of precipitation.
  - Management will evaluate weather conditions and determine if additional support is needed.
- ▶ Forecasted temperatures to fall below 32F for more than 8 hours in a 24-hour period.
  - Two maintenance personnel and one additional operator shall be scheduled to be on site during the duration of this period.
- ▶ Forecasted temperatures to fall below 26F.
  - Two maintenance personnel and one additional operator shall be scheduled to be on site during the duration of this period.
- ▶ Forecasted temperatures to fall below 20F.
  - Two maintenance personnel, one additional operator, Plant Manager, Operations Manager, Maintenance Manager, or Plant Engineer to be on site.


# IDENTIFIED CRITICAL HEAT TRACE CIRCUITS

Winterization Critical List

ID	Mainsaver Tag Number	Component	Description	Area	Critical	Heat trace panel	Heat trace breaker	Heat trace drawing	P&ID drawing	Location drawing	Control logic drawing	Drawing Number
33	BA500-1AS-PT-0101	Transmitter, Pressure	CRH AUX LETDOWN PRESSURE	BOP	Yes	Y	9	8608-175	0-PD-4-AS-0-1			
34	BA500-1AS-PT-0102	Transmitter, Pressure	HP STEAM AUX LETDOWN PRESSURE	BOP	Yes	Y	42	175	0-PD-4-AS-0-1			
35	BA500-1AS-TV-0100	Valve, Control	AUX STEAM DESUPERHEATER SPRAY CONTROL VALVE	BOP	Yes	Y	27	8608-193	0-PD-4-AS-0-1			
48	BA500-1BS-FT-0046	Transmitter, D/P	LP B/P STEAM SPRAY FLOW	BOP	Yes	Y	42		1-PD-4-BS-0-3			
57	BA500-1BS-PT-0508	Transmitter, Pressure	LP STEAM PRESSURE	STG	Yes	Y	42		1-PD-4-BS-0-3			
55	BA500-1BS-PT-0011	Transmitter, Pressure	CRH STEAM PRESSURE	BOP	Yes	X	24	8608-168	1-PD-4-BS-0-4			
56	BA500-1BS-PT-0042	Transmitter, Pressure	LP STEAM PRESSURE	BOP	Yes	Y	42		1-PD-4-BS-0-3			
58	BA500-1BS-PT-0049	Transmitter, Pressure	LP BYPASS STEAM TO CONDENSER PRESS	BOP	Yes	X	15		1-PD-4-BS-0-3			
59	BA500-1CC-LT-0353	Transmitter, Level	Closed Loop Cooling Stand Pipe Level	BOP	Yes	X	41	8608-082	1-PD-4-CC-0-1			
60	BA500-1CC-PT-0354	Transmitter, Pressure	CLOSED COOLING WTR SUPPLY PRESS	BOP	Yes	X	39	8608-076	1-PD-4-CC-0-1			
61	BA500-1CO-FT-0300	Transmitter, D/P	CONDENSATE PUMP DISC FLOW	BOP	Yes	Y	21		1-PD-4-CO-0-1			
62	BA500-1CO-FT-0350	Transmitter, D/P	CONDENSER SPRAY CURTAIN FLOW	BOP	Yes	X	8		1-PD-4-CO-0-1			
63	BA500-1CO-LSLL-0303	Switch, Level	Condenser Hotwell Level LO-LO	STG	Yes	Y	33	8608-186	1-PD-4-CO-0-1			
64	BA500-1CO-LT-0302	Transmitter, Displacer	Condenser Hotwell Level	STG	Yes	Y	33	8608-187	1-PD-4-CO-0-1			
65	BA500-1CO-PT-0300	Transmitter, Pressure	CONDENSER PRESSURE	BOP	Yes	Y	33		1-PD-4-CO-0-1			
66	BA500-1CO-PT-0301	Transmitter, Pressure	CONDENSER PRESSURE	BOP	Yes	Y	33		1-PD-4-CO-0-1			
67	BA500-1CO-PT-0306	Transmitter, Pressure	VAC COND PMP DISC PRESS ALARM	BOP	Yes	Y	21		1-PD-4-CO-0-1			
68	BA500-1CO-PT-0320	Transmitter, Pressure	IP/CRH STM SUPPLY PRESS.	BOP	Yes	X	22		1-PD-4-CO-0-2			
70	BA500-1CO-PT-0323	Transmitter, Pressure	AUX STEAM SUPPLY PRESSURE	BOP	Yes	X	22		1-PD-4-CO-0-2			
90	BA500-1FW-FT-1750A	Transmitter, D/P	BFP A DISCH FLOW	HRSG1	Yes	X	34		1-PD-4-FW-1-1			
91	BA500-1FW-FT-1750B	Transmitter, D/P	BFP B DISCH FLOW	HRSG1	Yes	X	34		1-PD-4-FW-1-2			
92	BA500-1FW-FT-1751	Transmitter, D/P	FW TO HP BP SPRAY FLOW	HRSG1	Yes	X	34		1-PD-4-FW-1-1			
93	BA500-1FW-FT-2750A	Transmitter, D/P	BFP A DISCH FLOW	HRSG2	Yes	Y	38		1-PD-4-FW-2-1			
94	BA500-1FW-FT-2750B	Transmitter, D/P	BFP B DISCH FLOW	HRSG2	Yes	Y	38		1-PD-4-FW-2-2			
95	BA500-1FW-FT-2751	Transmitter, D/P	FW TO HP BP SPRAY FLOW	HRSG2	Yes	Y	38		1-PD-4-FW-2-1			
98	BA500-1FW-PT-1708	Transmitter, Pressure	BFP SUCTION PRESS	HRSG1	Yes	X	36		1-PD-4-FW-1-1			
99	BA500-1FW-PT-1751	Transmitter, Pressure	BFP IP DISCH PRESS	HRSG1	Yes	X	36		1-PD-4-FW-1-1			
104	BA500-1FW-PT-1756	Transmitter, Pressure	BFP HP DISCH PRESS	HRSG1	Yes	X	36		1-PD-4-FW-1-1			
105	BA500-1FW-PT-2708	Transmitter, Pressure	BFP SUCTION PRESS	HRSG2	Yes	Y	37		1-PD-4-FW-2-1			
106	BA500-1FW-PT-2751	Transmitter, Pressure	BFP IP DISCH PRESS	HRSG2	Yes	Y	37		1-PD-4-FW-2-1			
111	BA500-1FW-PT-2756	Transmitter, Pressure	BFP HP DISCH PRESS	HRSG2	Yes	Y	37		1-PD-4-FW-2-1			
115	BA500-1HR-FT-1400	Transmitter, D/P	HP STEAM SH SPRAY FLOW	HRSG1	Yes	X	36	EHT-0011	1-PD-4-HR-1-1			
116	BA500-1HR-FT-1401	Transmitter, D/P	RH SPRAY FLOW	HRSG1	Yes	X	32		1-PD-4-HR-1-1			
117	BA500-1HR-FT-1402	Transmitter, D/P	HP STEAM FLOW	HRSG1	Yes	X	37		1-PD-4-BS-0-1			
118	BA500-1HR-FT-1420	Transmitter, D/P	HP DRUM FW FLOW	HRSG1	Yes	X	39		1-PD-4-HR-1-2			
119	BA500-1HR-FT-1440	Transmitter, D/P	IP STEAM TO RH FLOW	HRSG1	Yes	Z	6	EHT-0012				
120	BA500-1HR-FT-1441	Transmitter, D/P	LP STEAM FLOW	HRSG1	Yes	X	39					
121	BA500-1HR-FT-1445	Transmitter, D/P	HRH B/P STM SPRAY FLOW	HRSG1	Yes	X	42		1-PD-4-BS-0-2			
122	BA500-1HR-FT-1460	Transmitter, D/P	IP DRUM FW FLOW	HRSG1	Yes	X	39					
123	BA500-1HR-FT-1480	Transmitter, D/P	LP DRUM FW FLOW	HRSG1	Yes	X	32					
124	BA500-1HR-FT-2400	Transmitter, D/P	HP STEAM SH SPRAY FLOW	HRSG2	Yes	Y	37					
125	BA500-1HR-FT-2401	Transmitter, D/P	RH SPRAY FLOW	HRSG2	Yes	Y	40					
126	BA500-1HR-FT-2402	Transmitter, D/P	HP STEAM FLOW	HRSG2	Yes	Y	39					
127	BA500-1HR-FT-2420	Transmitter, D/P	HP DRUM FW FLOW	HRSG2	Yes	Y	39					
128	BA500-1HR-FT-2440	Transmitter, D/P	IP STEAM TO RH FLOW	HRSG2	Yes	S	23					
129	BA500-1HR-FT-2441	Transmitter, D/P	LP STEAM FLOW	HRSG2	Yes	Y	39					
130	BA500-1HR-FT-2445	Transmitter, D/P	HRH B/P STM SPRAY FLOW	HRSG2	Yes	X	8		1-PD-4-BS-0-2			
131	BA500-1HR-FT-2460	Transmitter, D/P	IP DRUM FW FLOW	HRSG2	Yes	Y	39					
132	BA500-1HR-FT-2480	Transmitter, D/P	LP DRUM FW FLOW	HRSG2	Yes	Y	40					
133	BA500-1HR-LT-1420A	Transmitter, Level	HP DRUM LEVEL A	HRSG1	Yes	Z	11		1-PD-4-HR-1-2			

Reviewed  
R. Ramo  
10/29/2019

# CRITICAL HEAT TRACE LIST IDENTIFICATION

- ▶ Tag Number
  - ▶ Component (Pressure, Temperature, D/P)
  - ▶ Description
  - ▶ Area location
  - ▶ Heat traced (yes or no)
  - ▶ Panel and breaker number
  - ▶ P&ID number
  - ▶ Drawing number
- 
- A decorative graphic consisting of several parallel white lines of varying lengths and thicknesses, arranged in a diagonal pattern from the bottom right towards the top right of the slide.

# CRITICAL HEAT TRACE IDENTIFICATION IN FIELD



Panel No. 1EH-PL-Y

HEATER NO.	BREAKER POLE	VOLT AMPERES			CKT. NO.	BUS CKT. NO.	VOLT AMPERES			BREAKER POL	BAMP		
		A	B	C			A	B	C				
HTR-134	1	30	1700		1	2					1	30	
HTR-012, 135, 136, 137	1	30		1235	3	4			1272			1	30
HTR-018, 133, 139	1	30			1638	5	6			395		1	30
HTR-138, 454, PWP10730	1	30	1100		7	8		2104				1	30
HTR-278, PT0321, PT0101, PT0521	1	30		1721	9	10			1519			1	30
HTR-184, 187, 266, 268	1	30			1716	11	12			2520		1	30
HTR-310, 313, 317, 318	1	30	1750		13	14		1821				1	30
HTR-024, 297	1	30		2191	15	16			2200			1	30
HTR-096, 097, 098, 099, 160, 165, 204	1	30			2256	17	18			2473		1	30
HTR-100, 101, 102, 103, 142, 385, 394	1	30	2354		19	20		2900				1	30
HTR-072, 180, 189, PT0306, FT0300	1	30		2204	21	22			2750			1	30
HTR-172, 180, 191	1	30			1944	23	24			1708		1	30
HTR-051, 052, 055, 057, 058, 085, 185, 440	1	30	1771		25	26		1400				1	30
HTR-168, 171, 175, 179, 181, 193, SP0519	1	30		2236	27	28			1380			1	30
HTR-034, 405, 464	1	30			756	29	30			1300		1	30
HTR-003, 004	1	30	1320		31	32		2200				1	30
HTR-006, 061, 062, P1001, P1002, P1003, P1004, P1005, P1006, P1007, P1008	1	30		1752	33	34			1428			1	30
HTR-044, 184, 192, SP1503	1	30			2552	35	36			1248		1	30
P0207A, P0207B, P1208, 01208, P1209, P1210, P1211, P1212, P1213	1	30	2354		37	38		2200				1	30
FT2441, FT2420, FT2480, PT2441, FT-2402	1	30		1666	39	40		2100				1	30
PT0502, PIT0604, HTR-179	1	30			1939	41	42			1420		1	30
					43	44							
					45	46							
					47	48							
					49	50							
					51	52							
					53	54							
<b>Totals</b>			<b>12,318</b>	<b>13,276</b>	<b>12,868</b>			<b>12,806</b>	<b>12,656</b>	<b>11,684</b>			

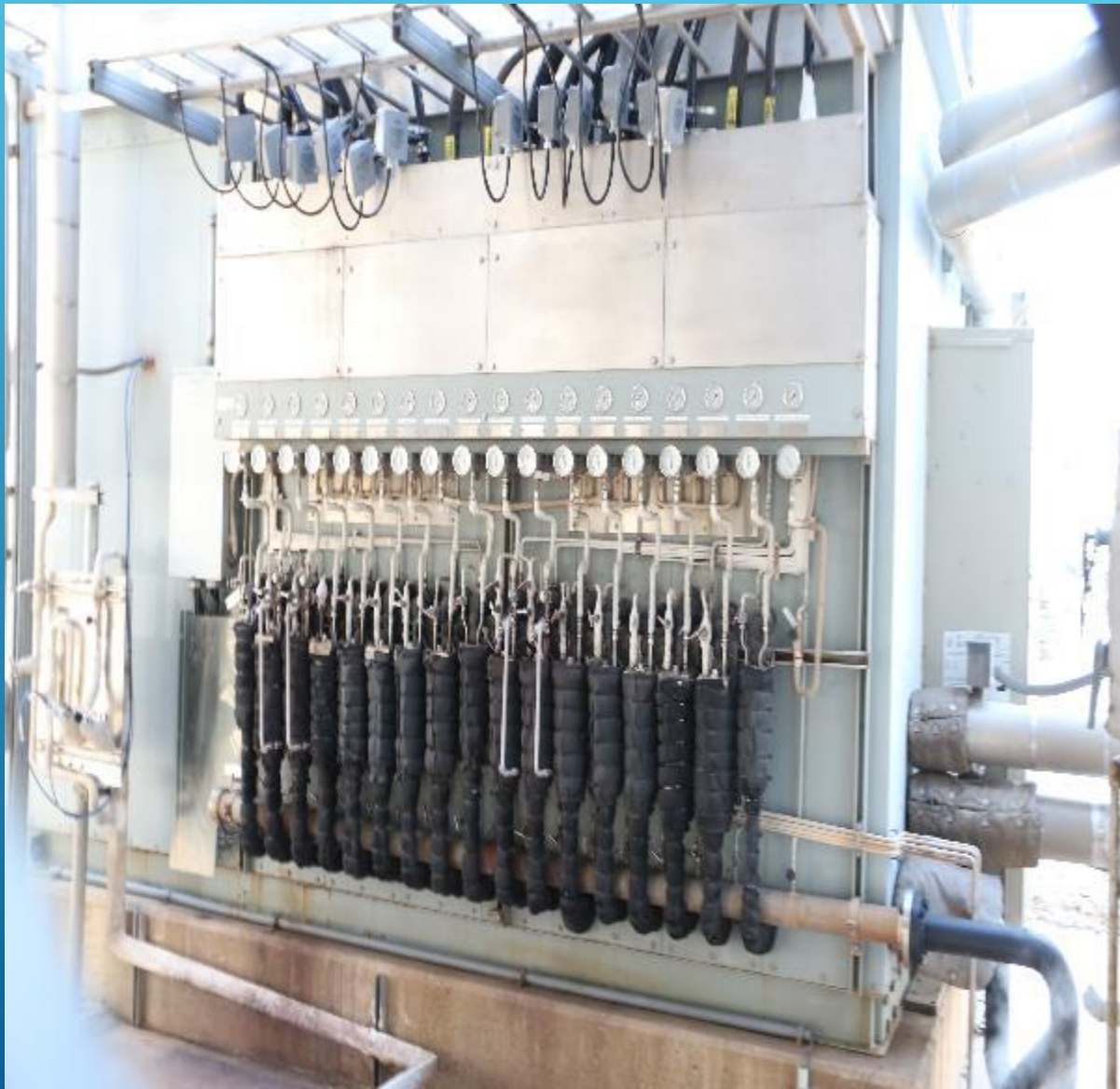
LOADS  
 Bus A: 25,124  
 Bus B: 25,932  
 Bus C: 24,552  
 Total: 75,608

Average: 25,203  
 % Imbalance: 5.3% min Brkr. Size (80% rule):  
 Service Voltage: 208

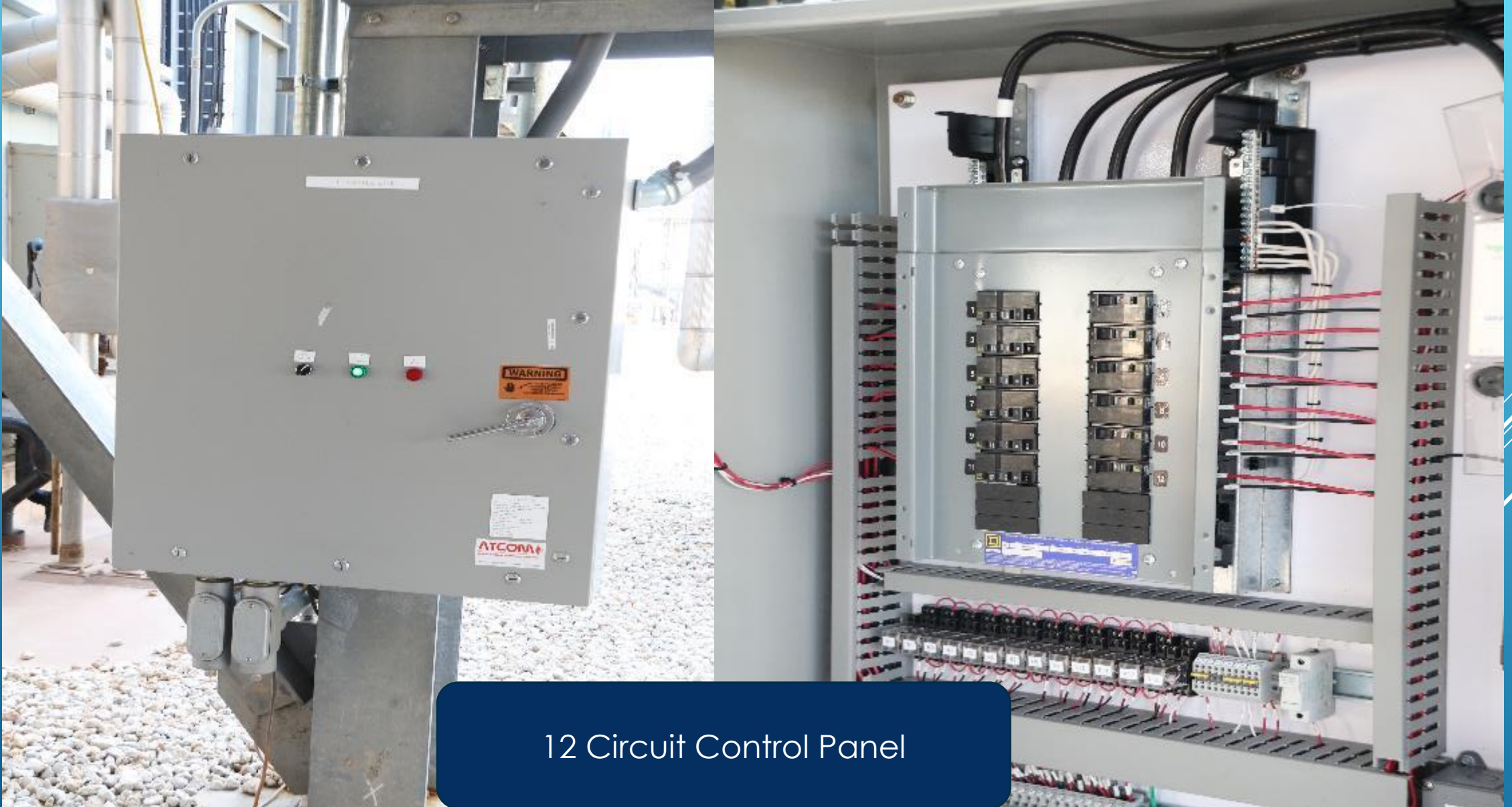
# HEAT TRACE YEARLY INSPECTION

- ▶ 2018 – Outside Vender performed a comprehensive audit on the Bastrop Heat Trace System to establish a baseline.
  - ▶ Audit identified issues with HRSG sample line heat trace.
  - ▶ While the sample line heat trace was not considered critical heat trace, they shared the same breakers with many critical heat trace circuits.
  - ▶ Sample lines were upgraded and put on individual circuits.
- ▶ 2019 – Outside Vender Conducted a yearly Heat Trace Audit of all Heat Trace panels.
  - ▶ 14 circuits were identified and repaired

# HRSG SAMPLE BUNDLE REPLACEMENT




# HRSG SAMPLE BUNDLE REPLACEMENT



12 Circuit Control Panel

# HRSG SAMPLE BUNDLE REPLACEMENT

Installation Price - \$354,000

- ▶ 300' Cooling Tower Water Treatment Tubing
  - ▶ 1320' I HP Tubing
  - ▶ 1150' IP and LP Tubing
  - ▶ 12- Circuit Control Panel and Power Distribution
    - ▶ Allow system to have continuous runs for the sample line.
  - ▶ Labor
  - ▶ Misc. Materials
- 
- A decorative graphic consisting of several parallel white lines of varying lengths and orientations, located in the bottom right corner of the slide.

# HRSG SAMPLE BUNDLE REPLACEMENT DESIGN

**Heat Trace Design Temperature -(-20°F)**

**Maintain Temp (Freeze) - 40°F**

**Maximum Exposure Temp -1050F, 750F, 400F**

**Insulation Type - Insulation Blankets**

**Operating Voltage - 277 Volts**

# WEATHERIZATION PLAN ORGANIZATION

## 8.3.2 Pre-Winter Activities (per Mainsaver PM)

8.3.2.1 Preventative maintenance shall be completed before October 31st of each year. It consists of the following items:

- a) Yearly Winterization training shall be conducted and documented before October 31<sup>st</sup>.
- b) Plant-wide heat tracing checks of all circuits completed by I&E Techs before October 31<sup>st</sup>. All critical circuit repairs shall be completed by December 1<sup>st</sup>.
- c) Perform an insulation survey on all critical components. Complete all repairs as necessary prior to October 31<sup>st</sup>. Outstanding repairs not completed shall be priority to be completed by December 1<sup>st</sup>.
- d) Test run portable "torpedo" heaters
- e) Verify heater operation
  - Chemical buildings
  - Deluge buildings
  - Space heaters checked on EHC skid
  - CEM's buildings
  - Fire pump house
  - Warehouse buildings
- f) Install temporary tarps and deploy as needed per weather conditions.
  - Air Compressor Skid
  - EHC enclosure
  - River Station Building Air Inlet.
- g) Review and update Critical heat trace circuits list by October 31<sup>st</sup>
- h) Verify the Instrument Air system PMS are current and the dryers are producing air at a dew point of -40° F or lower.
- i) Confirm MIPW has completed winterization checks on demineralizer system.

Procedure tabs align with weatherization plan

<b>NAES</b>		
<b>Bastrop Energy Center – Emergency Response Plan</b>		
Subject: Incident Weather and Natural Disaster Procedures		
Procedure No. ERP-006	Rev No. 3	Date Issued: 6/1/2011
Author: M. Adams	Approver: Jerome Szatek	Page No. 5 of 31
Last Review: 6/23/2010	Next Review: 4/2015	

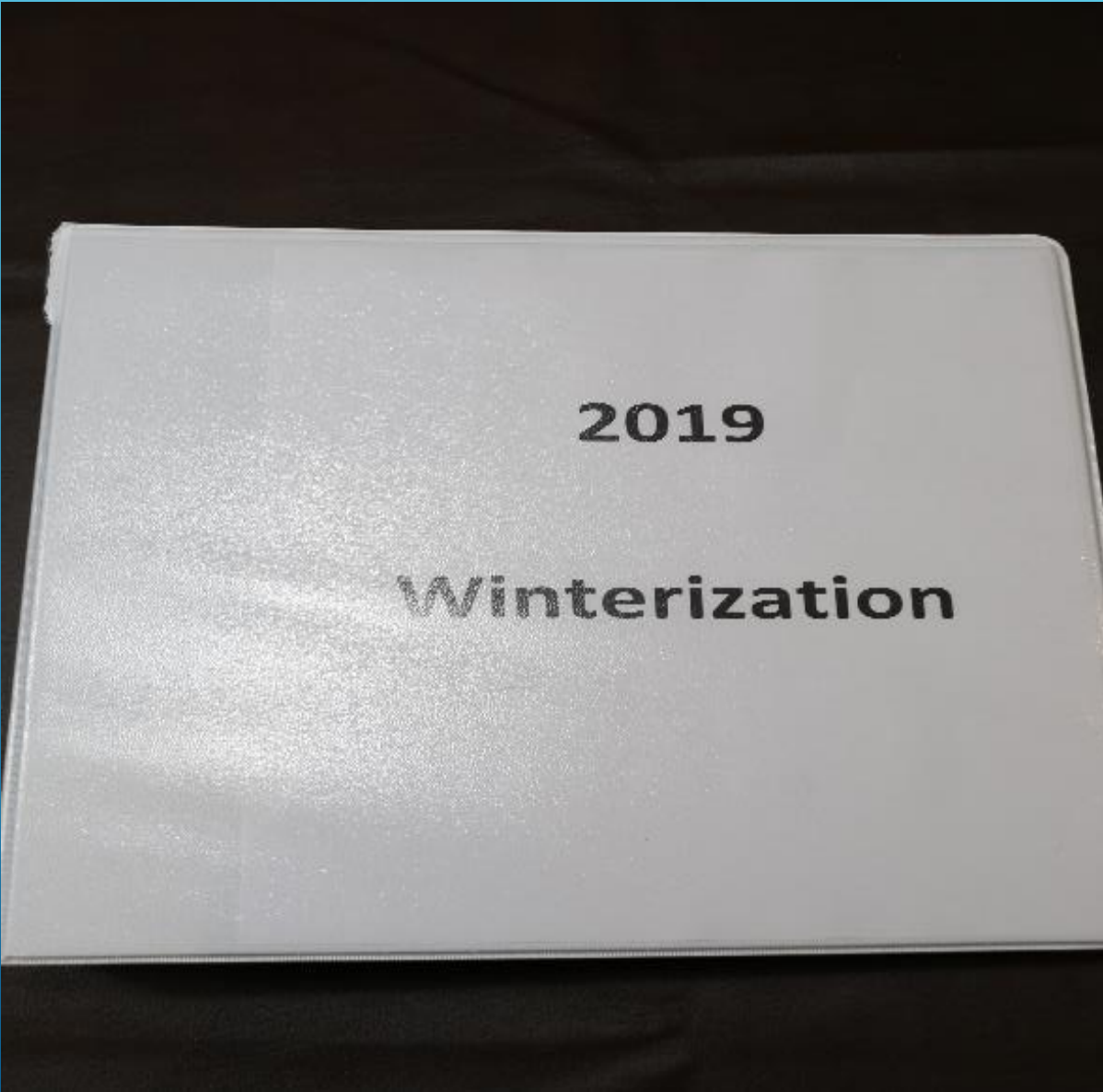
- 8.3.1.5 Additional personnel  
Unexpected conditions may call for immediate repairs and/or personnel may be called in to maintain operation.
- 8.3.1.6 National Weather Service and Outlook Express  
The National Weather Service radio will be monitored continuously and web based weather reports obtained every 4 hours for changing conditions when weather conditions warrant. The CRC will maintain Outlook Express OPEN on the Control Room PC to receive severe weather alerts from the Police Department.

## 8.3.2 Pre-Winter Activities (per Mainsaver PM)

8.3.2.1 Preventative maintenance shall be completed before October 31st of each year. It consists of the following items:

- a) Yearly Winterization training shall be conducted and documented before October 31<sup>st</sup>.
- b) Plant-wide heat tracing checks of all circuits completed by I&E Techs before October 31<sup>st</sup>. All critical circuit repairs shall be completed by December 1<sup>st</sup>.
- c) Air compressors jacketed and/or insulated
- d) Space heaters checked on EHC skid
- e) Perform an insulation survey on all critical components. Complete all repairs as necessary prior to October 31<sup>st</sup>.
- f) Test run portable electric heaters and verify adequate extension cords
- g) Test run portable "torpedo" heaters
- h) Verify heater operation
  - Chemical buildings
  - Deluge buildings
  - Air Compressor Skid
  - EHC enclosure
  - River Station Building Air Inlet.
- i) Review and update Critical heat trace circuits list by October 31<sup>st</sup>
- j) Verify the Instrument Air system PMS are current and the dryers are producing air at a dew point of -40° F or lower.

# BASTROP WINTERIZATION SPOT CHECK



- **Information is organized**
- **ERCOT spot checks are less stressful**
- **Tool to identify missing or incomplete preparation**

# BASTROP WINTERIZATION IMPROVEMENTS



Installed Building  
over Chemical  
Areas

# BASTROP WINTERIZATION IMPROVEMENTS



Local Heaters

Spray on Insulated Walls

# BASTROP WINTERIZATION IMPROVEMENTS



Moved Drum Level Transmitters closer to the HRSG

# BASTROP WINTERIZATION IMPROVEMENTS



Cooling Tower Bypass

- Normal Operation – Valve closed
- Cold Weather Event – Valve is used to control the basin temperature to prevent icing on cooling tower media.

# BASTROP WINTERIZATION IMPROVEMENTS



Transmitter Box Local  
Temperature Gauge

Questions?





# **COLORADO BEND II EXELON POWER**

- Commercial Date 6/23/2017
- 2x1 Configuration
- 7HA.02 GE Gas Turbines
- D602 GE Steam Turbine
- Total Output 1,200 MW


# **COLORADO BEND II FREEZE PROTECTION PLAN**

- Driven from our Winter Readiness Matrix
- Corporate Seasonal Readiness Procedure
- Site specific Winter Readiness Procedure

For Example:

- System Readiness Review due by mid September
  - Inventory Cold Weather Material by Nov 1
  - Ensure Winter PMs are completed by Oct 1

- Training Material
  1. Lessons Learned, Winter Expectations and Heat Trace Rounds
- Created a SUN for all to sign



**Title:** Winter Readiness  
**DATE:** 10/08/2019  
**Document (if applicable):** N/A  
**Description:** CBECII Winter Readiness Training and Discussion

Please review and sign the Winter Readiness Training and Discussion material.

\_\_\_\_\_ \*\*\*\*\* - Ops Foreman  
 \_\_\_\_\_ \*\*\*\*\* - Ops Manager

SUN SIGN-OFF SHEET

The following Operations Personnel have reviewed this S.U.N.

Last Name	First Name	Station	Date	Signature
A*****	H*****	CBEC 2		
B*****	O*****	CBEC 2		
B*****	C*****	CBEC 2		
B*****	F*****	CBEC 2		
B*****	C*****	CBEC 2		
B*****	R*****	CBEC 2		
C*****	R*****	CBEC 2		
C*****	M*****	CBEC 2		
F*****	S*****	CBEC 2		
H*****	R*****	CBEC 2		
L****	N*****	CBEC 2		
O*****	S*****	CBEC 2		
O*****	L*****	CBEC 2		
W****	J*****	CBEC 2		
W*****	B*****	CBEC 2		
Y*****	W*****	CBEC 2		

## Winter Readiness 2019-20

Colorado Bend 2 Winter  
Readiness Training and  
Discussion



- Test Exercise for Heat Trace
- Great for training new employees

**CBEC2 Freeze Protection Execution Plan**

LIGHT

WHEN TEMPERATURE DROPS BELOW 38°, FREEZE PROTECTION ROUNDS EVERY 4 HOURS.  
WHEN TEMPERATURE IS FORECASTED BELOW 34°, FIRE AUX BOILER AND PLACED ONLINE  
WHEN TEMPERATURE DROPS BELOW 32°, COOLING TOWER FANS OUT OF SERVICE and START STANDBY PUMPS ALLOW TO RECIRCULATE  
WHEN TEMPERATURE DROPS BELOW 30°, FREEZE PROTECTION ROUNDS EVERY 2 HOURS.  
WHEN TEMPERATURE DROPS BELOW 28°, FREEZE PROTECTION ROUNDS EVERY 1 HOUR.

CIRCUIT BREAKERS ARE LOCATED INSIDE PANELS

INITIAL EACH SECTION	DO NOT USE CHECK MARKS												
	17:00	18:00	19:00	20:00	21:00	22:00	23:00	0:00	1:00	2:00	3:00	4:00	5:00
PPS-PN-0001 POWERED FROM MAIN PDC HRSG 7 EAST SIDE CLOSE TO WATER WASH Test panel lights, Verify panel has power, Control switch is in AUTO and Heaters are Energized, Investigate fault indications.													
PPS-PN-0002 ELA-MCC-7031 HRSG7 PDC HRSG 7- N.E. SIDE CLOSE TO CONDENSATE FEED Test panel lights, Verify panel has power, Control switch is in AUTO and Heaters are Energized, Investigate fault indications.													
PPS-PN-0003 ELA-MCC-0031 MAIN PDC HRSG 8 EAST SIDE CLOSE TO WATER WASH Test panel lights, Verify panel has power, Control switch is in AUTO and Heaters are Energized, Investigate fault indications.													
PPS-PN-0004 ELA-MCC-8031 HRSG8 PDC HRSG 8- N.E. SIDE CLOSE TO CONDENSATE FEED Test panel lights, Verify panel has power, Control switch is in AUTO and Heaters are Energized, Investigate fault indications.													
PPS-PN-0005 ELA-MCC-0041 STG9 PDC WATER TREATMENT BUILDING Test panel lights, Verify panel has power, Control switch is in AUTO and Heaters are Energized, Investigate fault indications.													
PPS-PN-0006 ELA-MCC-0042 STG9 PDC NORTH OF CCW HEAD TANK Test panel lights, Verify panel has power, Control switch is in AUTO and Heaters are Energized, Investigate fault indications.													
PPS-PN-0007 ELA-MCC-0032 MAIN PDC FUEL GAS YARD, N.E. CORNER Panel has no indicating lights, Verify Heat Trace are powered ON, Investigate fault indications, breakers located inside panel).													
PPS-PN-0008 ELA-MCC-0041 STG9 PDC NORTH SIDE OF TED CLOSE TO VACUUM PUMPS Test panel lights, Verify panel has power, Control switch is in AUTO and Heaters are Energized, Investigate fault indications.													

*Handwritten notes on the table:*

- #11 Unit Standby (near 21:00, 22:00)
- Lo (near 22:00)
- Test (large diagonal across the table)
- #12 Fault (near 22:00)
- Lo (near 22:00)
- #24 No. w/ Do not remove (near 22:00)
- Lo + Holder locked on. (near 22:00)
- #21 Unit for over heating cond. classes tank. (near 22:00)



## OPERATIONS OBRIEN BOX CHECKS

- LOCAL INSPECTIONS START AT 38°
- CHECKING BOX INTERNAL TEMPERATURE
- FREQUENCY INCREASES AS TEMPERATURES DECREASE

Date: _____	CBEC2 Freeze Protection Execution Plan (O'Brien Boxes)													DAYS
WHEN TEMPERATURE DROPS BELOW 38°, FREEZE PROTECTION ROUNDS EVERY 4 HOURS.														
WHEN TEMPERATURE IS FORECASTED BELOW 34°, FIRE AUX BOILER AND PLACED ONLINE														
WHEN TEMPERATURE DROPS BELOW 32°, <b>COOLING TOWER FANS OUT OF SERVICE</b> and <b>START STANDBY PUMPS ALLOW TO RECIRCULATE</b>														
WHEN TEMPERATURE DROPS BELOW 30°F - VERIFY TEMP GAUGES ON O'BRIEN ENCLOSURE(S) ARE ABOVE FREEZING - EVERY 4 HOURS														
WHEN TEMPERATURE DROPS BELOW 30°, FREEZE PROTECTION ROUNDS EVERY 2 HOURS.														
WHEN TEMPERATURE DROPS BELOW 28°, FREEZE PROTECTION ROUNDS EVERY 1 HOURS.														
ENTER AMBIENT TEMPERATURE														
INITIAL EACH SECTION <span style="float: right;">DO NOT USE CHECK MARKS</span>														
		5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00
U7-01	HRSG 7 TOP DECK (NORTH LP DRUM)													
O'BRIEN BOX ID# 206		SLP-PIT-7849												
U7-02	HRSG 7 TOP DECK (SOUTH WEST HP DRUM)													
O'BRIEN BOX ID# 213		SHP-PIT-7646												
U7-03	HRSG 7 TOP DECK (HP STEAM OUTLET)													
O'BRIEN BOX ID# 224		HP-PT-7725-01												
U7-04	HRSG 7 TOP DECK (HP STEAM OUTLET)													
O'BRIEN BOX ID# 221		SHP-PIT-7708-01												
U7-05	HRSG 7 TOP DECK (SRH STEAM OUTLET)													
O'BRIEN BOX ID# 216		SRH-PIT-7737-01												
U7-06	HRSG 7 TOP DECK (NORTH EAST HP DRUM DOG HOUSE)													
O'BRIEN BOX ID# 230		SIP-FIT-7791-01, SIP-FIT-7791-02												
U7-07	HRSG 7 TOP DECK (SOUTH EAST IP DRUM DOG HOUSE)													
O'BRIEN BOX ID# 233		SIP-PIT-7785-01												
U7-08	HRSG 7 TOP DECK (SOUTH EAST IP DRUM DOG HOUSE)													
O'BRIEN BOX ID# 237		SIP-PIT-7734-01, SIP-PIT-7737-01, SIP-PIT-7740-01												
U7-09	HRSG 7 TOP DECK (EAST LP DRUM DOG HOUSE)													
O'BRIEN BOX ID# 243														
U7-10	BYPASS DECK U7													
O'BRIEN BOX ID# 201		BFW-PIT-7300-02, IE-01, BFW-PIT-7300-03												
U7-11	BYPASS DECK U7													
O'BRIEN BOX ID# 177		BFW-FIT-7203-04, IE-05, BFW-PIT-7203-03												
U7-12	BYPASS DECK U7													
O'BRIEN BOX ID# 197		BFW--PIT-7401-03, IE-02, BFW--PIT-7401-02												
U7-13	BYPASS DECK U7													
O'BRIEN BOX ID# 183		BFW-FIT-7204-04, IE-06, BFW-PIT, 7204-03												
U7-14	BYPASS DECK U7													
O'BRIEN BOX ID# - NO LABLE		BFW-FIT-7500-04												
U7-15	BYPASS DECK U7													
O'BRIEN BOX ID# 191		BFW-FIT-7303-04, IE-04												
U7-16	BYPASS DECK U7													
O'BRIEN BOX ID# 189		BFW-PIT-7303-03, IE-03, BFW-PDIT-7303-02												
INITIAL EACH SECTION <span style="float: right;">DO NOT USE CHECK MARKS</span>														

INSTRUMENT DEVICE ID #	BRACE - O'BRIEN BOX HEAT TRACE ID #	INSTRUMENT ENCLOSURE ID #	CBEC 2 FREEZE PROTECTION OBRIEN BOX ID #	OBRIEN BOX HEATER FREEZE PROTECTION PANEL NUMBER	OBRIEN BOX HEATER CIRCUIT BREAKER
SHP-PIT-7104-01	88	IE-22	U7-34	FPS-PN-001	10
SHP-PIT-7104-02	88	IE-22	U7-34	FPS-PN-001	10
BFW-PIT-7102-06	94	IE-16	U7-35	FPS-PN-001	15
BFW-PIT-7102-07	94	IE-16	U7-35	FPS-PN-001	15
SHP-PIT-7108-07	82	IE-20	U7-36	FPS-PN-001	4
SRH-PIT-7101-03	85	IE-21	U7-37	FPS-PN-001	10
SRH-PIT-7101-04	85	IE-21	U7-37	FPS-PN-001	10
SLP-PIT-7101-05	75	IE-25	U7-38	FPS-PN-001	7
SHP-PIT-7108-02	75	IE-25	U7-38	FPS-PN-001	7
SHP-FIT-7108-06	80	NONE	U7-39	FPS-PN-001	3
SHP-FIT-7108-05	80	NONE	U7-39	FPS-PN-001	3
BFW-PIT-7206-02	96	NONE	U7-40	FPS-PN-001	12
BFW-FIT-7206-03	98	NONE	U7-41	FPS-PN-001	12
WWC-PIT-7125-03	19	IE-138	U7-42	FPS-PN-002	8
WWC-FIT-7125-05	19	IE-138	U7-42	FPS-PN-002	8
BFW-FIT-7304-03	54	NONE	U7-43	FPS-PN-001	2
BFW-PIT-7304-02	56	NONE	U7-44	FPS-PN-001	2
SLP-PIT-8852-01	202	NONE	U8-01	FPS-PN-004	24
SLP-PIT-8849-01	202	NONE	U8-01	FPS-PN-004	24
SLP-PIT-8855-01	202	NONE	U8-01	FPS-PN-004	24
BFW-PIT-8783-01	243	NONE	U8-02	FPS-PN-004	
SIP-PIT-8734-01	235	NONE	U8-03	FPS-PN-004	15
SIP-PIT-8737-01	235	NONE	U8-03	FPS-PN-004	15
SIP-PIT-8740-01	235	NONE	U8-03	FPS-PN-004	15
SIP-PIT-8785-01	231	NONE	U8-04	FPS-PN-004	15
SIP-FIT-8791-01	223	NONE	U8-05	FPS-PN-003	21
SIP-FIT-8791-02	223	NONE	U8-05	FPS-PN-003	21
SRH-PIT-8732-01	213	NONE	U8-06	FPS-PN-003	16
SHP-PIT-8708-01	216	NONE	U8-07	FPS-PN-003	15
SHP-PIT-8725-01	219	NONE	U8-08	FPS-PN-003	15
SHP-PIT-8646-01	208	NONE	U8-09	FPS-PN-003	22
SHP-PIT-8649-01	208	NONE	U8-09	FPS-PN-003	22
SHP-PIT-8652-01	208	NONE	U8-09	FPS-PN-003	22
BFW-PIT-8300-02	177	IE-01	U8-10	FPS-PN-004	9
BFW-FIT-8300-03	177	IE-01	U8-10	FPS-PN-004	9
BFW-PIT-8203-03	182	IE-31	U8-11	FPS-PN-004	1
BFW-FIT-8203-04	182	IE-31	U8-11	FPS-PN-004	1
BFW-PIT-8401-03	188	IE-32	U8-12	FPS-PN-004	10

CREATED UNIT SPECIFIC OBRIEN BOX IDENTIFICATION NUMBERS TO QUICKLY LOCATE IN CASE OF EMERGENCY

LIST ALL HEAT TRACE CIRCUITS, FREEZE PROTECTION PANELS, CIRCUIT BREAKERS, AND LOCATIONS.

HEAT TRACE CIRCUIT LOCATIONS AND INSTRUMENT DESCRIPTIONS

TEAM DECIDED WHICH CIRCUITS WERE CRITICAL AND COULD LEAD TO A PLANT TRIP.

LOCATION	DESCRIPTION	CRITICAL
GROUND LEVEL U7 (EAST SIDE BLOWDOWN TK)	HP BYPASS TO CRH PRESSURE TRANSMITTER "A"	CRITICAL TRANSMITTER
GROUND LEVEL U7 (EAST SIDE BLOWDOWN TK)	HP BYPASS TO CRH PRESSURE TRANSMITTER "B"	CRITICAL TRANSMITTER
GROUND LEVEL U7 (EAST SIDE BLOWDOWN TK)	BFW-PP-7002 SUCTION PRESSURE TRANSMITTER "A"	NORMAL CIRCUIT
GROUND LEVEL U7 (EAST SIDE BLOWDOWN TK)	BFW-PP-7002 SUCTION PRESSURE TRANSMITTER "B"	CRITICAL TRANSMITTER
GROUND LEVEL U7 (EAST SIDE BLOWDOWN TK)	HRSG HP STEAM OUTLET PRESSURE	NORMAL CIRCUIT
GROUND LEVEL U7 (EAST SIDE BLOWDOWN TK)	HRH OUTLET PRESSURE TRANSMITTER "A"	NORMAL CIRCUIT
GROUND LEVEL U7 (EAST SIDE BLOWDOWN TK)	HRH OUTLET PRESSURE TRANSMITTER "B"	NORMAL CIRCUIT
GROUND LEVEL U7 (EAST SIDE, EYE WASH)	LP STEAM HEADER PRESSURE	NORMAL CIRCUIT
GROUND LEVEL U7 (EAST SIDE BLOWDOWN TK)	HRSG HP STEAM OUTLET PRESSURE	NORMAL CIRCUIT
GROUND LEVEL U7 (EAST SIDE BLOWDOWN TK)	HRSG HP STEAM OUTLET FLOW TRANSMITTER "B"	CRITICAL TRANSMITTER
GROUND LEVEL U7 (EAST SIDE BLOWDOWN TK)	HRSG HP STEAM OUTLET FLOW TRANSMITTER "A"	CRITICAL TRANSMITTER
GROUND LEVEL U7 (EAST SIDE BLOWDOWN TK)	BOILER FEEDWATER DESUPERHEATER PRESSURE	NORMAL CIRCUIT
GROUND LEVEL U7 (EAST SIDE BLOWDOWN TK)	BOILER FEEDWATER DESUPERHEATER FLOW	CRITICAL TRANSMITTER
GROUND LEVEL U7 (WEST SIDE BLOWDOWN SUMP)	U7 WASTE WATER DISCHARGE PRESSURE	CRITICAL TRANSMITTER
GROUND LEVEL U7 (WEST SIDE BLOWDOWN SUMP)	U7 WASTE WATER DISCHARGE FLOW	CRITICAL TRANSMITTER
GROUND LEVEL U7 WEST SIDE PERFORMANCE HTR	HRH DESUPERHEATER FLOW	CRITICAL TRANSMITTER
GROUND LEVEL U7 WEST SIDE PERFORMANCE HTR	HRH DESUPERHEATER FLOW	CRITICAL TRANSMITTER
HRSG 8 TOP DECK (NORTH LP DRUM)	LP DRUM PRESSURE TRANSMITTER "B"	CRITICAL TRANSMITTER
HRSG 8 TOP DECK (NORTH LP DRUM)	LP DRUM PRESSURE TRANSMITTER "A"	CRITICAL TRANSMITTER
HRSG 8 TOP DECK (NORTH LP DRUM)	LP DRUM PRESSURE TRANSMITTER "C"	CRITICAL TRANSMITTER
HRSG 8 TOP DECK (EAST LP DRUM DOG HOUSE)	IP FEEDWATER PRESSURE	NORMAL CIRCUIT
HRSG 8 TOP DECK (SOUTH EAST IP DRUM DOG HOUSE)	IP DRUM PRESSURE TRANSMITTER "A"	CRITICAL TRANSMITTER
HRSG 8 TOP DECK (SOUTH EAST IP DRUM DOG HOUSE)	IP DRUM PRESSURE TRANSMITTER "B"	CRITICAL TRANSMITTER
HRSG 8 TOP DECK (SOUTH EAST IP DRUM DOG HOUSE)	IP DRUM PRESSURE TRANSMITTER "C"	CRITICAL TRANSMITTER
HRSG 8 TOP DECK (SOUTH EAST IP DRUM DOG HOUSE)	IP DRUM OUTLET PRESSURE	NORMAL CIRCUIT
HRSG 8 TOP DECK (NORTH EAST HP DRUM DOG HOUSE)	IP STEAM FLOW TRANSMITTER "A"	CRITICAL TRANSMITTER
HRSG 8 TOP DECK (NORTH EAST HP DRUM DOG HOUSE)	IP STEAM FLOW TRANSMITTER "B"	CRITICAL TRANSMITTER
HRSG 8 TOP DECK (SRH STEAM OUTLET)	HRSG HRH OUTLET STEAM PRESSURE	CRITICAL TRANSMITTER
HRSG 8 TOP DECK (HP STEAM OUTLET)	HRSG HP OUTLET STEAM PRESSURE	NORMAL CIRCUIT
HRSG 8 TOP DECK (HP STEAM OUTLET)	HP STEAM OUTLET ERV PRESSURE	CRITICAL TRANSMITTER
HRSG 8 TOP DECK (SOUTH WEST HP DRUM DOG HOUSE)	HP DRUM PRESSURE TRANSMITTER "A"	CRITICAL TRANSMITTER
HRSG 8 TOP DECK (SOUTH WEST HP DRUM DOG HOUSE)	HP DRUM PRESSURE TRANSMITTER "B"	CRITICAL TRANSMITTER
HRSG 8 TOP DECK (SOUTH WEST HP DRUM DOG HOUSE)	HP DRUM PRESSURE TRANSMITTER "C"	CRITICAL TRANSMITTER
BYPASS DECK U8	IP ECONOMIZER FEEDWATER PRESSURE	NORMAL CIRCUIT
BYPASS DECK U8	IP ECONOMIZER FEEDWATER FLOW	NORMAL CIRCUIT
BYPASS DECK U8	HP BYPASS DESUPERHEATER PRESSURE	CRITICAL TRANSMITTER
BYPASS DECK U8	HP BYPASS DESUPERHEATER FLOW	NORMAL CIRCUIT
BYPASS DECK U8	BFW TO PERFORMANCE HEATER PRESSURE	CRITICAL TRANSMITTER

INSTRUMENT DEVICE ID #	BRACE - O'BRIEN BOX HEAT TRACE ID #	INSTRUMENT ENCLOSURE ID #	CBEC 2 FREEZE PROTECTION O'BRIEN BOX ID #	O'BRIEN BOX HEATER FREEZE PROTECTION PANEL NUMBER	O'BRIEN BOX HEATER CIRCUIT BREAKER	LOCATION	DESCRIPTION	CRITICAL
SLP-PIT-7849-01	206	NONE	U7-01	FPS-PN-002	21	HRSG 7 TOP DECK (NORTH LP DRUM)	LP DRUM LEVEL TRANSMITTER "A"	CRITICAL TRANSMITTER
SHP-PIT-7646-01	213	NONE	U7-02	FPS-PN-001	22	HRSG 7 TOP DECK (SOUTH WEST HP DRUM)	HP DRUM PRESSURE TRANSMITTER "A"	CRITICAL TRANSMITTER
SHP-PT-7725-01	224	NONE	U7-03	FPS-PN-001	11	HRSG 7 TOP DECK (HP STEAM OUTLET)	HP STEAM OUTLET ERV PRESSURE	NORMAL CIRCUIT
SHP-PIT-7708-01	221	NONE	U7-04	FPS-PN-001	6	HRSG 7 TOP DECK (HP STEAM OUTLET)	HP STEAM OUTLET PRESSURE	NORMAL CIRCUIT
SRH-PIT-7737-01	216	NONE	U7-05	FPS-PN-001	11	HRSG 7 TOP DECK (SRH STEAM OUTLET)	HOT REHEAT OUTLET STEAM PRESSURE	NORMAL CIRCUIT
SIP-FIT-7791-01	230	NONE	U7-06	FPS-PN-002	11	HRSG 7 TOP DECK (NORTH EAST HP DRUM DOG HOUSE)	IP STEAM OUTLET FLOW TRANSMITTER "A"	CRITICAL TRANSMITTER
SIP-FIT-7791-02	230	NONE	U7-06	FPS-PN-002	11	HRSG 7 TOP DECK (NORTH EAST HP DRUM DOG HOUSE)	IP STEAM OUTLET FLOW TRANSMITTER "B"	CRITICAL TRANSMITTER
SIP-PIT-7785-01	233	NONE	U7-07				IP STEAM OUTLET PRESSURE	NORMAL CIRCUIT
SIP-PIT-7734-01	237	NONE	U7-08				IP DRUM PRESSURE TRANSMITTER "A"	CRITICAL TRANSMITTER
SIP-PIT-7737-01	237	NONE	U7-08				IP DRUM PRESSURE TRANSMITTER "B"	CRITICAL TRANSMITTER
SIP-PIT-7740-01	237	NONE	U7-08				IP DRUM PRESSURE TRANSMITTER "C"	CRITICAL TRANSMITTER
BFW-PIT-7783-01	243	NONE	U7-09				IP FEEDWATER PRESSURE	CRITICAL TRANSMITTER
BFW-PIT-7300-02	201	IE-01	U7-10				IP ECONOMIZER FEEDWATER PRESSURE	NORMAL CIRCUIT
BFW-FIT-7300-03	201	IE-01	U7-10				IP ECONOMIZER FEEDWATER FLOW	CRITICAL TRANSMITTER
BFW-FIT-7203-04	177	IE-05	U7-11				BFW-PP-7001 MIN FLOW TO LP DRUM	CRITICAL TRANSMITTER
BFW-PIT-7203-03	177	IE-05	U7-11				BFW-PP-7001 MIN FLOW - PRESSURE TO LP DRUM	CRITICAL TRANSMITTER
BFW-PIT-7401-03	197	IE-02	U7-12				BFW TO PERFORMANCE HEATER PRESSURE	NORMAL CIRCUIT
BFW-FIT-7401-02	197	IE-02	U7-12				PERFORMANCE HEATER FEEDWATER FLOW	CRITICAL TRANSMITTER
BFW-FIT-7204-04	183	IE-06	U7-13				BFW-PP-7002 RECIRC.TO LP DRUM FLOW	CRITICAL TRANSMITTER
BFW-PIT-7204-03	183	IE-06	U7-13				BFW-PP-7002 MIN FLOW - PRESSURE TO LP DRUM	NORMAL CIRCUIT
BFW-FIT-7500-04	NONE	NONE	U7-14				HP BYPASS DESUPER HEATER FEEDWATER FLOW	NORMAL CIRCUIT
BFW-FIT-7303-04	191	IE-04	U7-15				HP DESUPERHEATER BYPASS FLOW	CRITICAL TRANSMITTER
BFW-PIT-7303-03	189	IE-03	U7-16	FPS-PN-001	15	BYPASS DECK U7	HP BYPASS DESUPER HEATER FEEDWATER PRESSURE	NORMAL CIRCUIT
BFW-PDIT-7303-02	189	IE-03	U7-16	FPS-PN-001	15	BYPASS DECK U7	HP BYPASS DESUPERHEATER STRAINER D/P	CRITICAL TRANSMITTER
BFW-FIT-7200-02	169	NONE	U7-17	FPS-PN-002	2	MEZZANINE DECK U7	BOILER FEEDWATER DISCHARGE FLOW	CRITICAL TRANSMITTER
BFW-PDIT-7102-04	166	IE-10	U7-18	FPS-PN-001	20	MEZZANINE DECK U7	BFW-PP-7002 PUMP SUCTION D/P	CRITICAL TRANSMITTER
BFW-PDIT-7101-04	166	IE-10	U7-18	FPS-PN-001	20	MEZZANINE DECK U7	BFW-PP-7001 PUMP SUCTION D/P	CRITICAL TRANSMITTER
CNS-FIT-7100-04	174	NONE	U7-19	FPS-PN-002	3	MEZZANINE DECK U7	CONDENSATE/FEED WATER TO LP DRUM FLOW	CRITICAL TRANSMITTER
BFW-FIT-7201-06	172	IE-07	U7-20	FPS-PN-002	3	MEZZANINE DECK U7	BFW-PP-7001 DISCHARGE FLOW TRANSMITTER CHANNEL B	CRITICAL TRANSMITTER
BFW-FIT-7201-05	172	IE-07	U7-20	FPS-PN-002	3	MEZZANINE DECK U7	BFW-PP-7001 DISCHARGE FLOW TRANSMITTER CHANNEL A	CRITICAL TRANSMITTER
CNS-PIT-7100-03	150	IE-12	U7-21	FPS-PN-001	18	MEZZANINE DECK U7	LP FEEDWATER MAKE UP PRESSURE	CRITICAL TRANSMITTER
SLP-PIT-7101-02	150	IE-12	U7-21	FPS-PN-001	18	MEZZANINE DECK U7	LP STEAM HEADER PRESSURE	CRITICAL TRANSMITTER
SRC-PIT-7110-04	163	NONE	U7-22	FPS-PN-001	14	MEZZANINE DECK U7	COLD REHEAT HEADER PRESSURE TRANSMITTER "A"	CRITICAL TRANSMITTER
SRC-FIT-7110-02	161	IE-15	U7-23	FPS-PN-001	16	MEZZANINE DECK U7	COLD REHEAT HEADER FLOW TRANSMITTER "A"	NORMAL CIRCUIT
SRC-FIT-7110-03	161	IE-15	U7-23	FPS-PN-001	16	MEZZANINE DECK U7	COLD REHEAT HEADER FLOW TRANSMITTER "B"	NORMAL CIRCUIT
SRC-PIT-7110-06	156	IE-13	U7-24	FPS-PN-001	16	MEZZANINE DECK U7	COLD REHEAT PRESSURE TRANSMITTER "B"	CRITICAL TRANSMITTER
SRC-PIT-7110-05	156	IE-13	U7-24	FPS-PN-001	16	MEZZANINE DECK U7	COLD REHEAT PRESSURE TRANSMITTER "C"	CRITICAL TRANSMITTER
BFW-FIT-7202-05	153	IE-07	U7-25	FPS-PN-001	18	MEZZANINE DECK U7	BFW-PP-7002 DISCHARGE FLOW TRANSMITTER "A"	CRITICAL TRANSMITTER

**LIST CAN BE FILTERED BY SEVERAL VARIABLES**

- IDENTIFY CIRCUITS FROM PANELS AND CIRCUIT BREAKERS
- LOCATE PANEL AND O'BRIEN BOX PHYSICAL LOCATIONS

ENTER TRANSMITTER DEVICE ID NUMBER (IN YELLOW FIELD)

PT-245A

REHEAT BOWL PRESSURE TRANSMITTER "A"

CBEC 2 O'BRIEN BOX NUMBER	O'BRIEN BOX LOCATION
U9-49	GROUND LEVEL UNDER STG9

O'BRIEN BOX HEATER FREEZE PROTECTION PANEL NUMBER	HEATER CIRCUIT BREAKER NUMBER
FPS-PN-006	7
<b>NORMAL CIRCUIT</b>	
FREEZE PROTECTION PANEL LOCATION	
NORTH OF CCW HEAD TANK	

### HEAT TRACE CIRCUITS POWERED FROM COMMON CIRCUIT BREAKER

DESCRIPTION	PANEL	BREAKER	CRITICAL CIRCUIT
LP STEAM INLET PRESSURE	FPS-PN-006	7	CRITICAL TRANSMITTER
COLD REHEAT, HP EXHAUST PRESSURE TRANSMITTER "A"	FPS-PN-006	7	NORMAL CIRCUIT
COLD REHEAT, HP EXHAUST PRESSURE TRANSMITTER "B"	FPS-PN-006	7	NORMAL CIRCUIT
COLD REHEAT, HP EXHAUST PRESSURE TRANSMITTER "C"	FPS-PN-006	7	NORMAL CIRCUIT
REHEAT BOWL PRESSURE TRANSMITTER "A"	FPS-PN-006	7	NORMAL CIRCUIT
REHEAT BOWL PRESSURE TRANSMITTER "B"	FPS-PN-006	7	NORMAL CIRCUIT
REHEAT BOWL PRESSURE TRANSMITTER "C"	FPS-PN-006	7	NORMAL CIRCUIT
COLD REHEAT, HP EXHAUST PRESSURE TRANSMITTER "1"	FPS-PN-006	7	CRITICAL TRANSMITTER
COLD REHEAT, HP EXHAUST PRESSURE TRANSMITTER "2"	FPS-PN-006	7	CRITICAL TRANSMITTER
COLD REHEAT, HP EXHAUST PRESSURE TRANSMITTER "3"	FPS-PN-006	7	CRITICAL TRANSMITTER

**CONTROL ROOM CAN MANUALLY SEARCH FOR PROBLIMATIC TRANSMITTERS**

- FILTERS OBRIEN BOX NUMBERS AND LOCATIONS
- FREEZE PROTECTION PANEL LOCATIONS AND CIRCUIT BREAKER NUMBERS

**LISTS HEAT TRACE CIRCUITS WITH COMMON POWER SOURCE**

- HEAT TRACE DESCRIPTIONS
- FREEZE PROTECTION PANELS
- IDENTIFY CRITICAL CIRCIUTS



LOCAL TEMPERATURE INDICATION  
DURING ROUNDS

UNIQUE IDENTIFIERS FOR OBRIEN BOXES  
ALLOW QUICK LOCATION IN EMERGENCY





**Laminated Panel  
Schedule with Critical  
Circuits Identified**

- Cold Weather Box with Inventory Label Inside
- One For Each HRSG



# LESSONS LEARNED

- Developed site procedure for establishing vacuum without Aux Boiler
- Created a more efficient way to help identify heat trace components in the field
- PM for annual calibrations on Air Dryer Dew Point sensors
- Conduct annual Heat Trace Audit with vendor (expensive but effective)
- Issued a SUN for Heat Trace breaker reset procedure

# LESSONS LEARNED CONT.

Date	Alarm Type	Name	Description	Value
6/24/2020 9:07:36 AM	ALARM	CND-TE-9001-01-FPPR	FREEZE PROTECTION PLAN RE...	TRUE 1
6/24/2020 9:08:36 AM	ALARM	CND-TE-9001-01-FPPR	FREEZE PROTECTION PLAN RE...	TRUE 1

**THANK YOU**



*ercot* 



**TEXAS RE**  
Ensuring electric reliability for Texans

**Break**



# Temple Power Station

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IMONNIT PRESENTATION

# Outline

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1. Temple Power Station Overview
2. Cold Weather Protection System
3. Winter Weather Procedure
4. Benefits of Remote Temperature Monitoring
5. iMonnit system overview
6. iMonnit system demonstration

# Facility Overview

Temple Power Station consists of two 2 on 1 combined cycle power blocks located in Temple, Texas.

## Temple Power Station Highlights

- Temple I Power Block is owned by Temple Generation I, LLC
- Temple II Power Block is owned by Panda Temple Power, LLC.
- Each Block uses reclaim water for cooling tower makeup.
- The facility is a “zero liquid discharge” facility.
- Heat Trace system designed to °15F with a wind speed of 15mph.

## Facility Location Within ERCOT



## Facility Overview

Location	▪ Bell County, TX
Market Area	▪ ERCOT North
Design Capacity (MW)	▪ Approximately 758 MW
COD	▪ July 2014 and May 2015
Key Equipment	▪ 4 Siemens Model SGT6-5000F CTs. ▪ 4 Benson Heat Recovery Steam Generators ▪ 2 Siemens SST6-5000 Steam Turbines
Fuel	▪ Natural Gas
Electronic Interconnection	▪ Oncor 345 kV Knob Creek Substation
Water Supply	▪ City of Temple, TX

# Cold Weather Protection Systems

- Methods of Protection
  - Heat Trace Systems
    - Power Distribution/Alarm Panel
    - “O’Brien” boxes with heating elements
    - Heat Trace cabling
      - Self Regulating heating cables
      - Mineral Insulated cables (MIQ)
  - Insulation
  - Windwalls
  - Use of iMonnit system for online monitoring



# Winter Weather Procedural Improvements

- Key Components
  - Personnel Training
  - Cold Weather Emergency Kit Inventory
  - System Walkdowns (insulation/windwall verification)
  - HVAC Inspections
    - Conducted by a third party
  - Extreme Cold Weather Checklists
  - Heat Trace and Insulation Verification
    - Conducted by a third party in September.
- Procedural Improvements since initial draft
  - Identification of Critical Transmitters
    - Includes method of protection (Heat Trace, Insulation, Windwalls, etc.)
  - Inclusion of the iMonnit system as a method of monitoring the transmitter boxes.

Temple Power Station		SAFETY MANAGEMENT PLAN	
Number: SMP-2		Subject: ICP – 16 Seasonal Readiness	
Approved for Use by: Sean Hausman		Current Issue: REV 4	Issue Date: 11/13/2019

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SMP-2 INTEGRATED CONTINGENCY PLAN SECTION 16 (Seasonal Readiness) 1 of 56

# Benefits of Remote Temperature Monitoring

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- Global vs. Individual Alarming
  - DCS will alarm a Heat Trace Panel; however, this includes several circuits with several transmitter boxes
  - iMonnit allows individual box alarms
    - Allows O&M staff to troubleshoot quickly
    - Temperature sensor alarms allow for prompt maintenance before it becomes a bigger issue
- Ability to trend temperature data
- Quick dashboard view of the heat trace health
- Additional personnel not needed for physical box rounds during cold weather
  - Physical rounds of transmitter boxes every 2-4 hours (ambient temperature dependent) no longer needed
  - Operators print sensor status page every 2 hours when ambient is below 40 F.
    - Status page includes current box temperature, connectivity, and battery capacity.
- Safety

# iMonnit System Overview (Equipment)

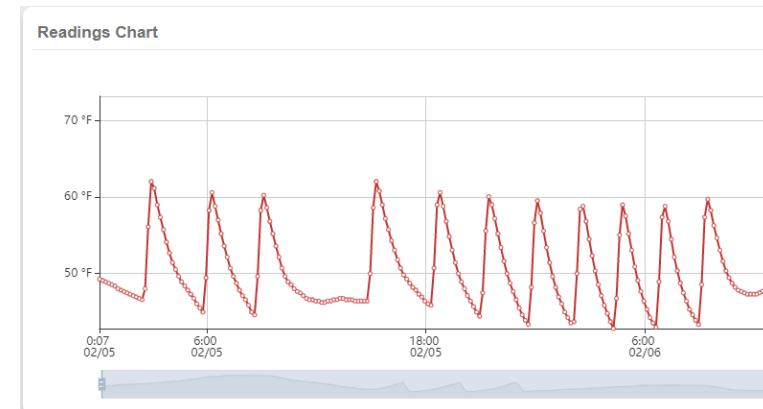
- Top/Down Equipment description
  - Network Requirements
    - Cellular
    - Wifi (Mesh system)
  - Ethernet Gateways
  - Temperature Sensors
    - AA 3.6v lithium battery
    - Frequency Hopping Spread Spectrum (FHSS) 900MHz.
- Estimated equipment cost for 320 sensors and 11 gateways was approximately \$62K.



# iMonnit System Platform

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- Internet
  - Mesh System
    - Independent of business network
    - Setup behind its own firewall
- iMonnit Portal
  - Web-based Interface
  - Annual subscription is approx. \$600 for up to 500 sensors
  - Subscription allows facility to poll each sensor every 10 minutes
    - One-minute polling option for extra cost.
  - Interface allows:
    - User to import maps
    - Make global or individual changes to sensor settings
    - Trend sensor data
    - View battery life and connectivity
    - Creation of event email notifications



## Other iMonnit applications – Summer Operations

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- Additional Temperature Sensors have been placed in:
  - Combustion Turbine Compartments
  - NH3 Dilution Fan Variable Speed Drive Control Cabinets
  - Duct Burner Control Cabinets
  - Auxiliary Boiler Cabinets
  - AI 480vac & 4,160vac Motor Control Center Buildings

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# iMonnit System for Temple Power Station



**Generator Winter  
Weatherization Workshop**  
September 3, 2020

Alan H. Allgower  
Operations Analyst, Senior  
[alan.allgower@ercot.com](mailto:alan.allgower@ercot.com)  
512-248-4613 (o)

# PUCT Regulatory Requirements for Generator Preparedness

- §25.53. Electric Service Emergency Operations Plans.
  - (c)(1)(H) A plan for the inventory of pre-arranged supplies for emergencies.
  - (c)(1)(I) A plan that addresses staffing during severe weather events.
  - (c)(2)(A) A plan that addresses severely cold and severely hot weather.
  - (c)(2)(B) A plan that addresses any known critical failure points, including any effects of weather design limits.
  - (c)(2)(G) Checklists for generating facility personnel to address emergency events.
  - (c)(2)(H) A summary of alternate fuel and storage capacity.
  - (c)(2)(I) A plan for alternative fuel testing if the facility has the ability to utilize alternative fuels.
  - (c)(2)(d) A Market entity shall conduct or participate in one or more drills annually to test its emergency procedures if its emergency procedures have not been implemented in response to an actual event within the last 12 months.

# Plant spot checks winter season 2019/2020 results

- 80 units spot checked
  - ✓ The purpose of spot checks is to verify plant personnel are following their weatherization plan.
  - ✓ As necessary, plant personnel are left with a recommendation(s) based on PUCT requirements, lessons learned or best practices observed.
  - ✓ Company senior management is emailed results.
- Fuel types spot checked
  - 71 gas fired units (conventional and combined cycle).
  - 3 coal fired units.
  - 6 gas fired black start contracted units.
- 23 units agreed to improve preparations and/or records management and will be scheduled early in 2020 to verify improvements.
- 57 units had no observed deficiencies in their plan or records management.

# Four coldest days in the past nine years

	EEA3 – 4000MW firm load shed	EEA2	Normal Operations	Normal Operations
	<b>2/2/2011</b>	<b>1/6/2014</b>	<b>1/7/2017</b>	<b>1/17/2018</b>
<b>Dallas</b>	13°/20MPH	15°/9MPH	14°/6MPH	13°/5MPH
<b>Houston</b>	21°/16MPH	27°/16 MPH	21°/11 MPH	19°/13 MPH
<b>San Antonio</b>	19°/25MPH	27°/15 MPH	20°/6 MPH	23°/10 MPH
<b>Austin</b>	18°/26 MPH	20°/13 MPH	19°/10 MPH	18°/10 MPH
<b>Brownsville</b>	32°/26 MPH	37°/17 MPH	30°/27 MPH	30°/14 MPH
<b>Abilene</b>	7°/16 MPH	11°/5 MPH	9°/3 MPH	8°/5 MPH
<b>Midland</b>	6°/16 MPH	14°/12 MPH	10°/4 MPH	28°/7 MPH

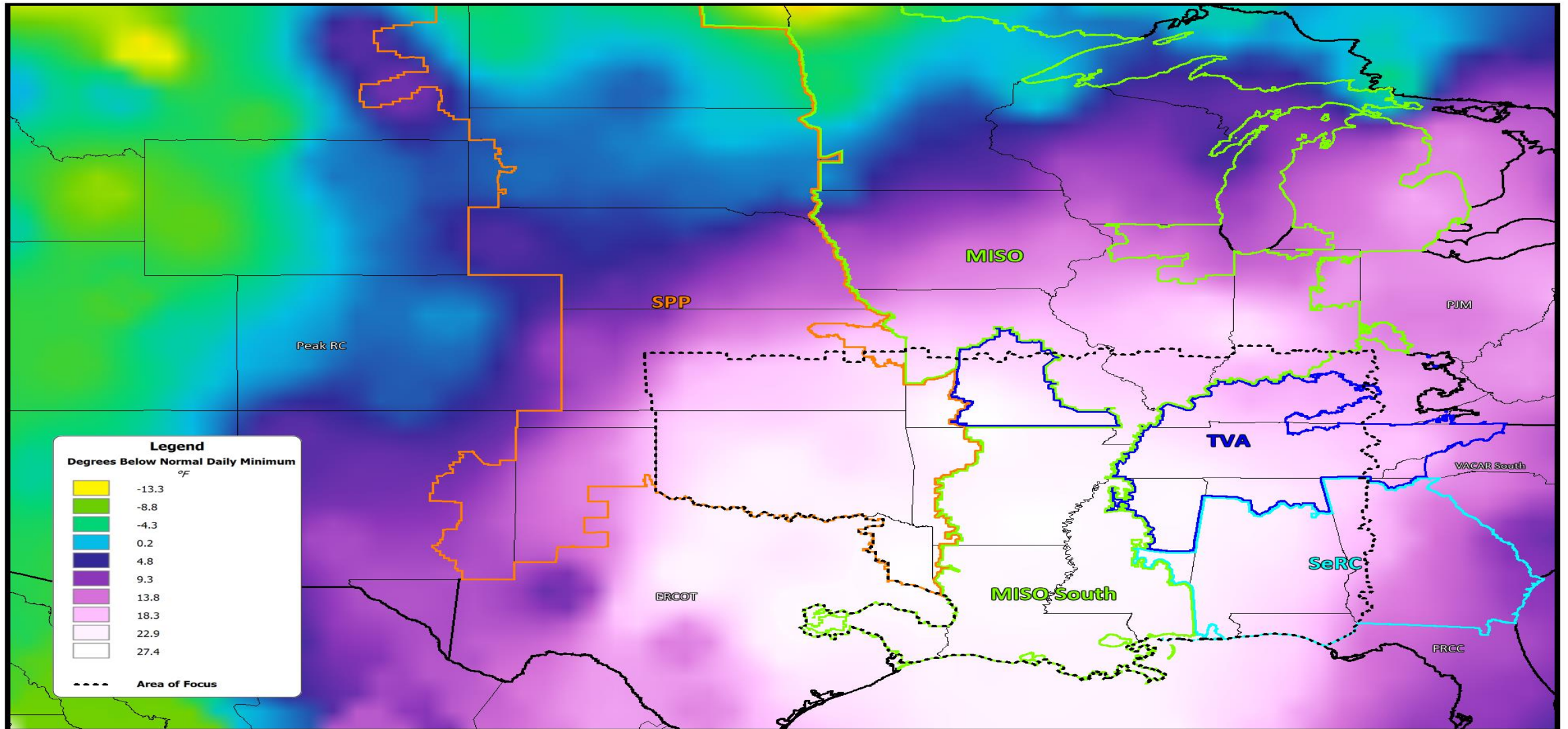
Source: Chris Coleman, ERCOT

## Hours at and below freezing (32 DegF or less) during four coldest days in ERCOT in the past nine years.

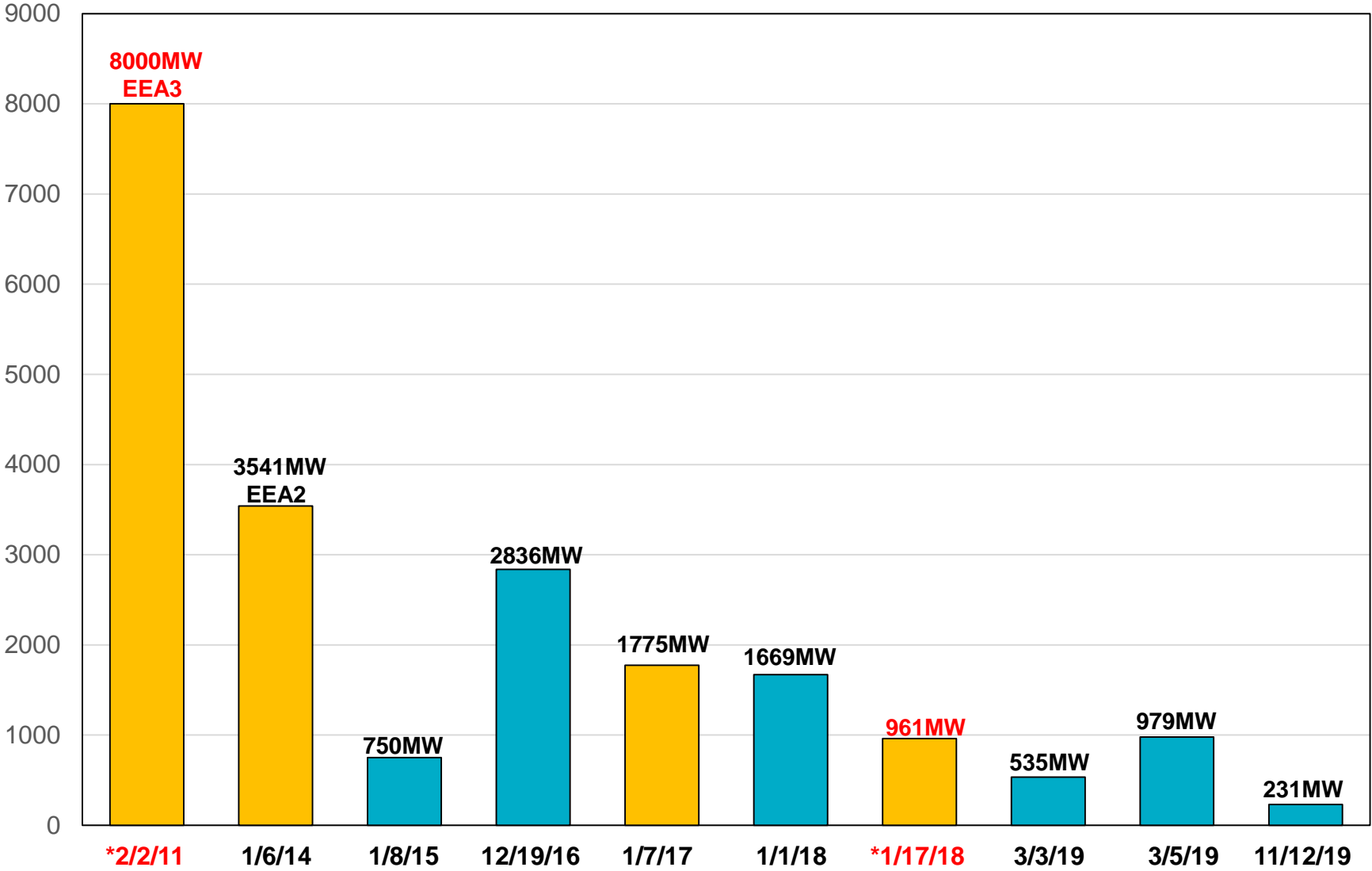
	EEA3 – 4000MW firm load shed	EEA2	Normal operations	Normal operations
	<b>2/2/2011</b>	<b>1/6/2014</b>	<b>1/7/2017</b>	<b>1/17/2018</b>
<b>Dallas</b>	24	22	19	19
<b>Houston</b>	14	18	13	18
<b>San Antonio</b>	24	14	14	12
<b>Austin</b>	24	20	16	20
<b>Brownsville</b>	0	0	5	10
<b>Abilene</b>	24	24	16	19
<b>Midland</b>	24	24	15	10

Source: Chris Coleman, ERCOT

# The South Central United States Cold Weather Event – January 17, 2018



# Generation (MW) tripped or de-rated due to frozen instrumentation



**\*2/2/11 and \*1/17/18 were the two coldest days this decade.**  
**Salmon colored are the four coldest days in last nine years.**

# Resistance temperature detector (RTD) failure – lesson learned

- During the cold front on November 12, 2019 a CT experienced a trip due to transition steam flow showing a high reading.
- Inspection of the transmitter box showed that the heater and heat trace was not energized.
  - I&C technician found that the RTD that senses the ambient temperature for the heat trace panel had failed.
  - RTD measures ambient temperature to energize heat trace circuits.
  - Manufacturer default for a RTD failure is to de-energize heat trace circuits.
- It was also discovered that the thermometer that measures inside transmitter box temperature was reading 15DegF higher than enclosure temperature. This temperature is recorded by operators on rounds and gave the operator a false reading.
- Corrective action:
  - RTD replaced on all heat trace panels of this type.
  - All heat trace panels of this type were re-programmed to energize heat trace circuits for an RTD failure.
  - All transmitter box thermometers that measure the inside temperature have been replaced.
  - During the spring 2020 outage, GMS was upgraded to telemeter internal box temperatures for all critical transmitters into the control system for monitoring by the control room operators.
- Lessons learned shared with the remainder of company fleet.

# Heat trace panel – resistance temperature detector (RTD) failure



## Common causes of transmitter manifolds and/or sensing lines freezing

- Tripped heat trace circuit breaker.
- Blown fuse in heat trace panel.
- Contractor error when terminating heat trace after testing.
- Insulating contractor damage to heat trace.
- Section of heat trace not functioning.
- Incorrect heat trace for application.
- Heat trace open ended and not grounded.
- Transmitter cabinet heater not functioning.
- Poor or lack of wind break measures.
- Transmitter(s) exposed to the elements.
- Gaps in insulation.

## Closing comments.....

- ✓ ERCOT assists generators in preparing for winter operations with spot checks, sharing lessons learned, best practices, recommendations and the annual fall workshop.
- ✓ Recent history has shown us that for every extreme cold weather event, a small amount of generation will experience freeze related derates or trips.
- ✓ For winter 2020/2021, spot checks will begin November 16, 2020 and will conclude February 26, 2021.
- ✓ Due to COVID-19, the majority of the spot checks will be table top WebEx with some on-site visits.

***Thank you generator owners, operators and plant staff for your efforts on winter weatherization!***





## **2020-21 Preliminary Winter Weather Outlook**

Chris Coleman  
ERCOT Sr. Meteorologist

Generator Weatherization Workshop  
Sep 3, 2020

# Agenda

- Updating the summer
- Quick look ahead to fall
- Review of last winter (and other recent winters)
- Expectations for the upcoming winter

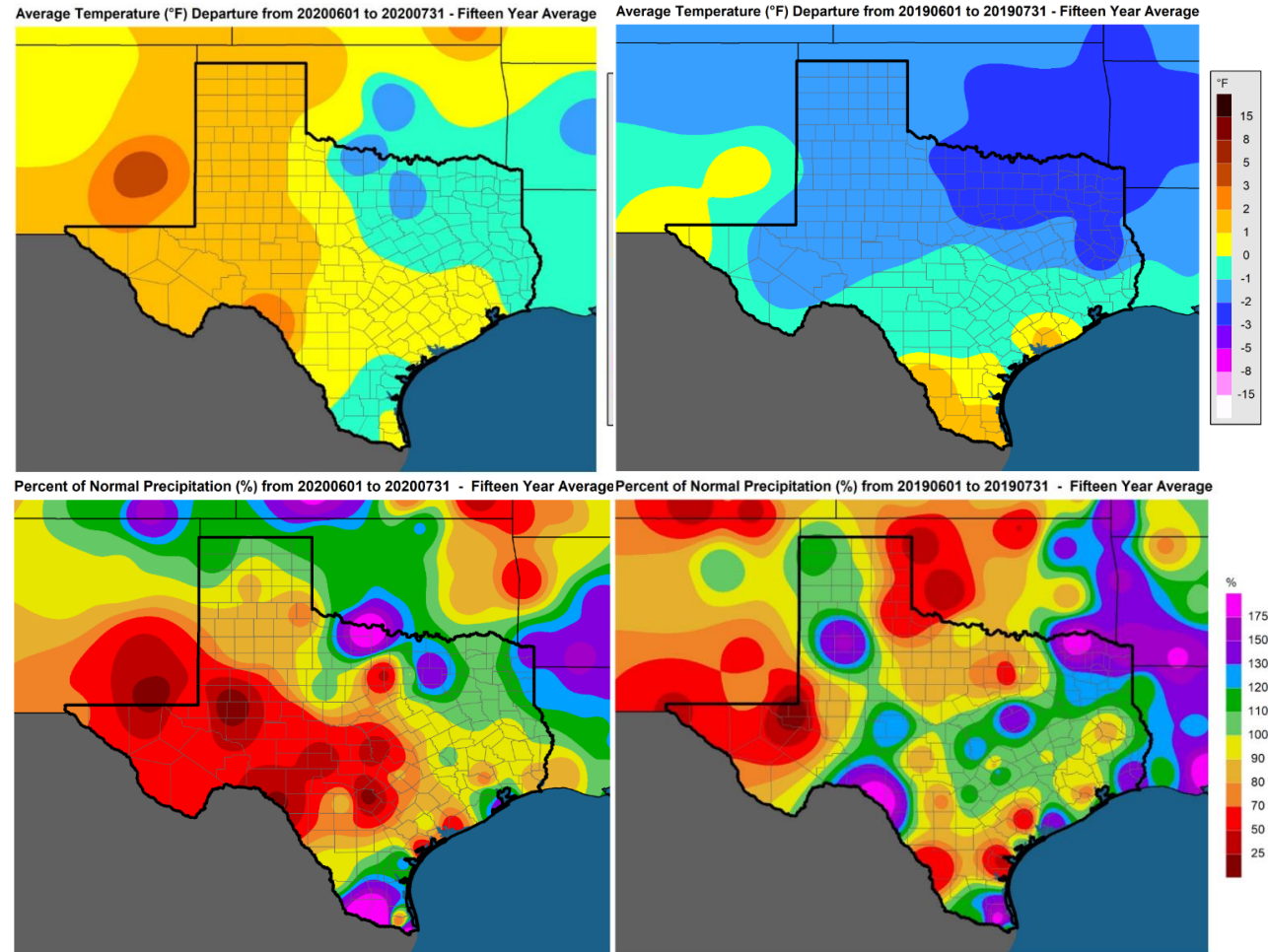


# Updating Summer 2020

- June-July 2020 was the 15<sup>th</sup> hottest on record – much hotter than June-July 2019 (76<sup>th</sup>)
- June-July 2020 tied with 2016 for the 4<sup>th</sup> hottest of the past 10 years (2011, 2012, and 2018 were hotter)
- The largest year-over-year change is in West Texas, which has been much hotter the first-half of this summer
- August has tracked hotter-than-normal for most of the state (similar to Jun-Jul). Summer 2020 should be mostly above-normal for Texas, though parts of North, East, and South Texas may remain closer to normal or a bit below
- Dallas is recording a below-average number of 100° days for the 6<sup>th</sup> year of the past seven. On track for the second-fewest 100-degree days of the past 15 years

2020

2019

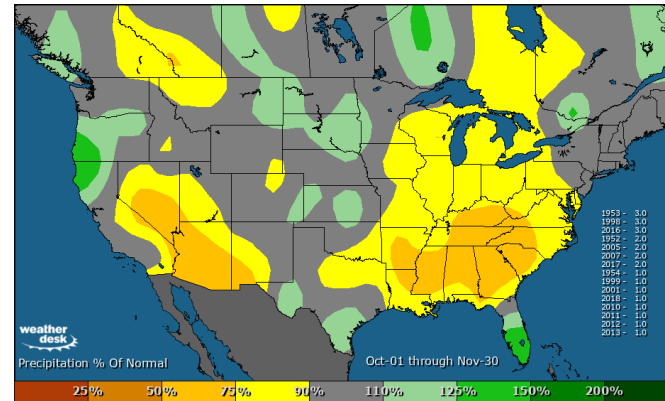
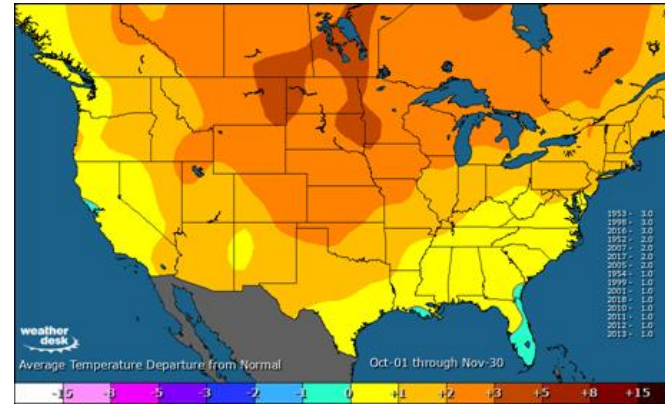


The first-half of this summer was drier for most of the state compared to the first-half of last summer

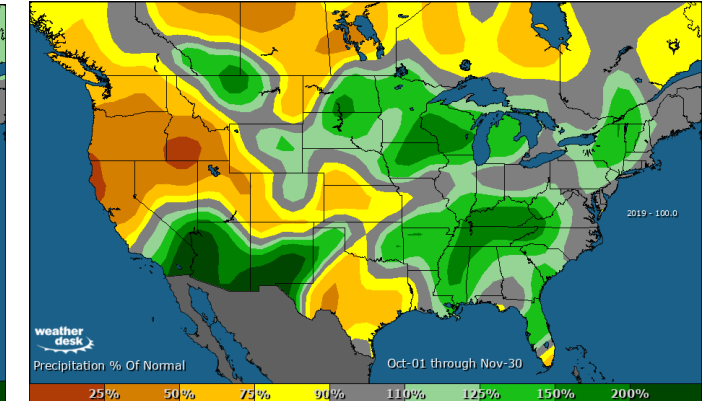
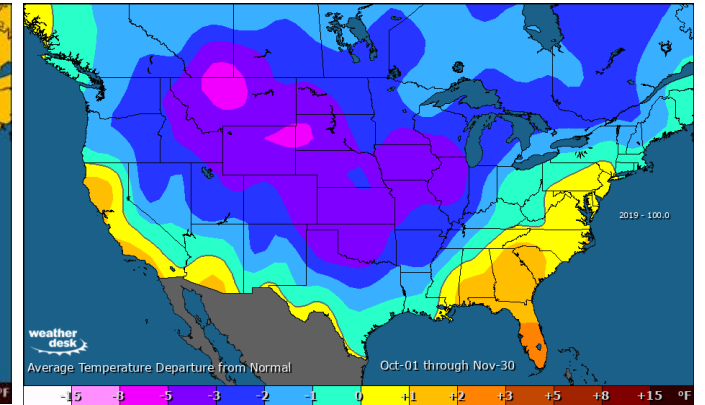
# Fall 2020 Weather Outlook

- Fall of 2019 started out very warm, but turned sharply colder mid-October and persisted below-normal through most of November
- Fall 2020 is expected to continue the warm, above-normal pattern that set up in summer. Very likely to be much warmer than last fall
- November has more above-normal potential than October
- The upcoming fall season is also likely to be mostly dry. Fall 2019 was also dry. Fall 2020 could be just as dry – the forecast is a blend of 15 historical fall seasons – but 11 have more area dry than wet. Best chance of a wetter-than-average fall will be South Texas and part of the Coast

2020



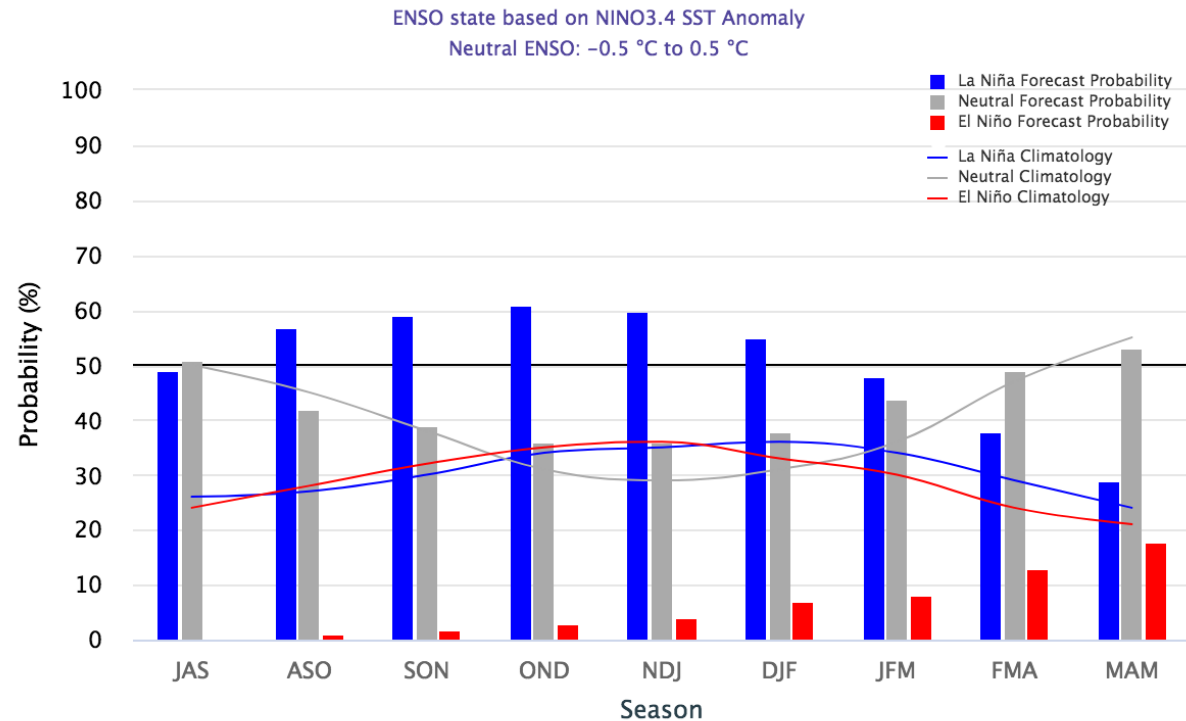
2019



# La Niña

- What's responsible for this warm, dry pattern?
- Certainly many factors, but one of the main drivers is a developing La Niña.
- The last La Niña was in 2017-18 – a weak event. A more pronounced La Niño occurred in 2011-12
- As early as mid-summer, La Niña characteristics were increasing. This event is likely to become an official La Niña during the fall season – however, it will likely be a weak event
- Of the 8 La Niña winters this century, 5 have resulted in warm winters in Texas, 2 in normal winters, and 1 correlated to a cold winter

Early-August 2020 CPC/IRI Official Probabilistic ENSO Forecasts



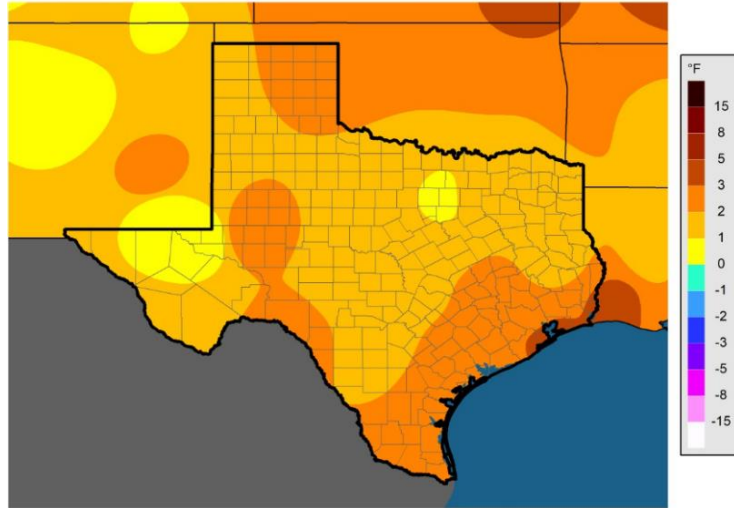
## La Niña winters:

- |                                   |                                   |
|-----------------------------------|-----------------------------------|
| 2017-18: 49 <sup>th</sup> warmest | 2008-09: 14 <sup>th</sup> warmest |
| 2016-17: 1 <sup>st</sup> warmest  | 2007-08: 25 <sup>th</sup> warmest |
| 2011-12: 26 <sup>th</sup> warmest | 2005-06: 18 <sup>th</sup> warmest |
| 2010-12: 57 <sup>th</sup> warmest | 2000-01: 92 <sup>nd</sup> warmest |

# Reviewing Last Winter

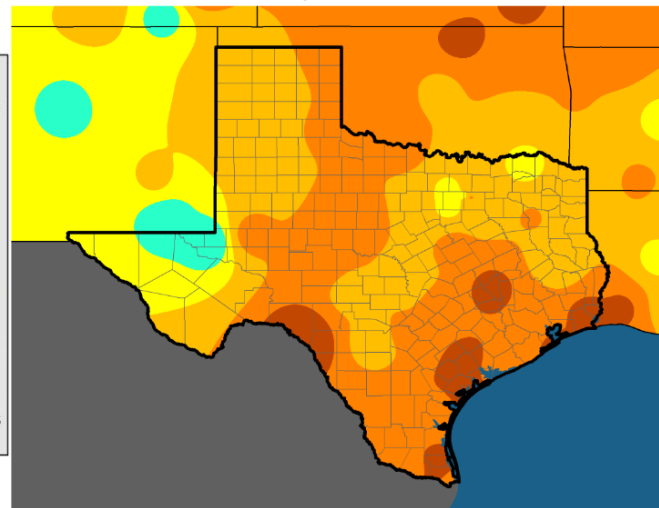
## ERCOT winter (Dec 1 – Feb 28)

Average Temperature (°F) Departure from 20191201 to 20200229 - Fifteen Year Average



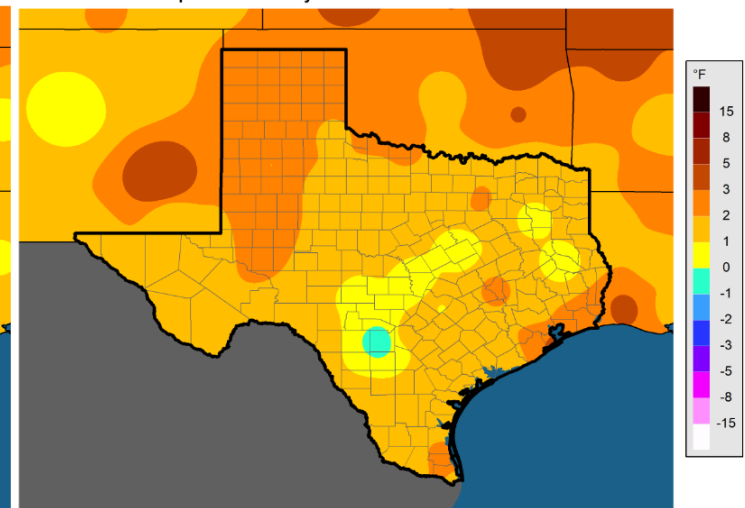
Mean temp anomaly

Fifteen Year Max Temperature Anomaly in °F from 20191201 to 20200229



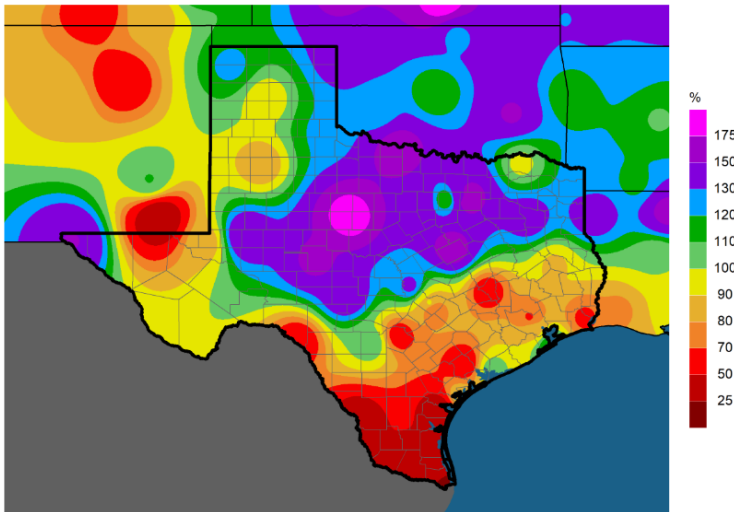
Max temp anomaly

Fifteen Year Min Temperature Anomaly in °F from 20191201 to 20200229



Min temp anomaly

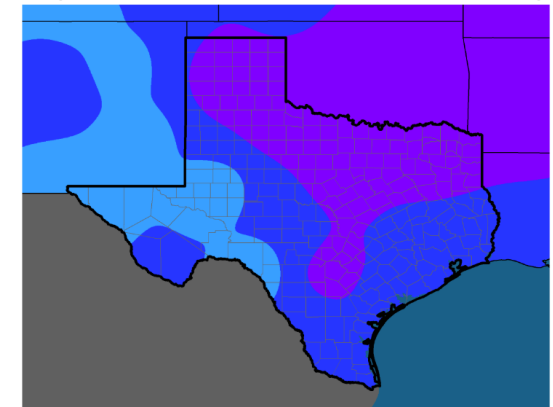
Percent of Normal Precipitation (%) from 20191201 to 20200229 - Fifteen Year Average



Precip Anomaly

- Last winter was the 15<sup>th</sup> warmest on record (125 historical winters)
- Winter of 2016-17 was the warmest on record for Texas
- November was a colder anomaly than any of the winter months (which also happened the year prior)

Average Temperature (°F) Departure from 20191101 to 20191130 - Fifteen Year Average



Nov 2019

# Austin Freezes

Camp Mabry	total #	total #	coldest
Dec - Feb	of freezes	below 40	temp
2019-20	3	24	30
2018-19	5	27	32
2017-18	15	36	18
2016-17	5	16	19
2015-16	4	29	31
2014-15	11	41	23
2013-14	22	48	22
2012-13	11	33	27
2011-12	7	23	27
2010-11	19	46	17
2009-10	23	51	17
2008-09	11	42	28
2007-08	14	41	25
2006-07	13	43	24
2005-06	8	35	23
2004-05	13	26	24
2003-04	6	36	28
2002-03	9	41	24
2001-02	11	44	25
2000-01	16	50	27
Averages:	11.3	36.6	24.6

Only 3 freezes were recorded last winter in Austin – the fewest number this century!

4 of the past 5 winters have had a below-average number of freezes in Austin

Notice the anomaly in the winter of 2016-17  
The coldest temperature was 19, but that winter had fewer days below 40 than any winter this century (it was the warmest winter ever for Texas)

## Mean Temperature Ranking of Recent Texas Winters (125 historical winters)

2019-20	<b>109<sup>th</sup> coldest</b>
2018-19	<b>93<sup>rd</sup></b>
2017-18	75 <sup>th</sup>
<b>2016-17</b>	<b>125<sup>th</sup> coldest (warmest winter on record)</b>
<b>2015-16</b>	<b>117<sup>th</sup></b>
2014-15	67 <sup>th</sup>
2013-14	30 <sup>th</sup>
<b>2012-13</b>	<b>109<sup>th</sup></b>
<b>2011-12</b>	<b>98<sup>th</sup></b>
2010-11	67 <sup>th</sup>
<b>2009-10</b>	<b>8<sup>th</sup></b>

Since 2001, only two winters have ranked in the coldest third (1-42) of historical winters

January 17, 2018  
All-time winter peak  
65,915 MW

Like the winter prior, the coldest period fell outside of the ERCOT winter season  
November 12&13 (56,427/56,120 MW peaks)

February 6, 2020  
was the highest true winter peak at 56,116 MW



# Seasonal Rankings

- ❑ 125-126 years of data, 1895-2020
- ❑ Chart shows the ranking within that set of years, by season
- ❑ 1 = warmest, 126 = coldest
- ❑ Mean temperature trends:
  - Of the past 42 seasons, **26** have ranked in the **warmest** third (1-42; indicated by red-shaded cells)
  - **5** have ranked in the **coldest** third (85-126; indicated by blue-shaded cells)

- ❑ What does this tell you?
  - You should have strong supporting evidence if forecasting a colder-than-normal (coldest third) season

	mean	max	min
spring 2020	11	15	4
winter 2019-20	15	19	18
fall 2019	91	85	102
summer 2019	4	11	3
spring 2019	72	95	43
winter 2018-19	31	54	16
fall 2018	104	117	60
summer 2018	7	31	3
spring 2018	9	6	16
winter 17-18	48	49	54
fall 2017	8	9	16
summer 2017	52	72	22
spring 2017	9	10	9
winter 16-17	1	4	1
fall 2016	1	2	1
summer 2016	19	59	7
spring 2016	23	40	16
winter 15-16	8	10	19
fall 2015	9	32	5
summer 2015	19	35	10
spring 2015	60	100	19
winter 2014-15	56	82	23
fall 2014	66	61	63
summer 2014	52	80	13
spring 2014	83	61	100
winter 13-14	95	77	104
fall 2013	84	91	64
summer 2013	19	33	13
spring 2013	78	54	102
winter 2012-13	15	18	20
fall 2012	20	20	35
summer 2012	14	17	17
spring 2012	1	2	1
winter 2011-12	25	40	15
fall 2011	33	22	54
summer 2011	1	1	1
spring 2011	3	1	13
winter 2010-11	56	35	88
fall 2010	33	13	75
summer 2010	12	43	5
spring 2010	69	68	66
winter 2009-10	116	120	104

## Seasonal Rankings – what is normal?

- ❑ “Normal” may no longer be the best way to express seasonal (or monthly, or possibly even daily) temperatures
- ❑ As Texas keeps having many more above normal temperature seasons, it keeps raising the bar for what is “normal”
- ❑ For an extreme example, say the past ten years were the ten warmest on record of 125 historical years. Then let’s say the next year ranks 11<sup>th</sup> of 125 . Based on the past 10 years, it would rank below the 10-year normal
  - ❑ We aren’t quite to that extreme – but not far from it
- ❑ This is why I’ll oftentimes give all-time rankings and comparisons with recent years (in addition to or instead of “normal”)



# Winter vs Summer

## Winter extremes happen quickly

- A strong cold front moves through dropping temperatures sharply – sometimes 30-40 degrees in a matter of an hour or two.
- High wind speeds also tend to accompany strong cold fronts, resulting in even colder wind chills – and cold air that more readily penetrates buildings and other structures.
- A winter load peak can be 20,000 MW greater than the day prior

## Summer extremes are typical, with an uninterrupted build of heat over an extended period

- A hot summer pattern in Texas is the result of high pressure that parks itself over the state, limiting rain chances and cloud cover, while allowing the high angle of the Texas sun in the summer to reach its full impact
- It's commonly the day-after-day build of heat that result in load peaks during summer
- A summer load peak is likely **only a few hundred** to a couple thousand megawatts higher than the previous day

Because of this difference, a summer long-range weather outlook tends to do a better job at capturing extremes and peaks than a winter long-range outlook. Remember, a very strong cold front can move through in an otherwise mild winter (cold winters are defined more by the frequency of cold fronts).

# Seasonal versus Extremes

**\*\*\*Mild winters can have very cold periods\*\*\***

- February 2, 2011:
- Dallas: 13° (20MPH wind)
- Houston: 21° (16MPH wind)
- San Antonio: 19° (25MPH wind)
- Austin: 18° (26MPH wind)
- Brownsville: 32° (26MPH wind)
- Abilene: 7° (16MPH wind)
- Midland: 6° (16MPH wind)

Winter of 2010-11: **67<sup>th</sup> coldest in TX weather history**

Remains  
the  
winter  
peak  
record  
(65,915  
MW)



- January 17, 2018:
- Dallas: 13° (5MPH wind)
- Houston: 19° (13MPH wind)
- San Antonio: 23° (10MPH wind)
- Austin: 18° (10MPH wind)
- Brownsville: 30° (14MPH wind)
- Abilene: 8° (5MPH wind)
- Midland: 28° (7MPH wind)

Winter of 2017-18: **75<sup>th</sup> coldest in TX weather history**

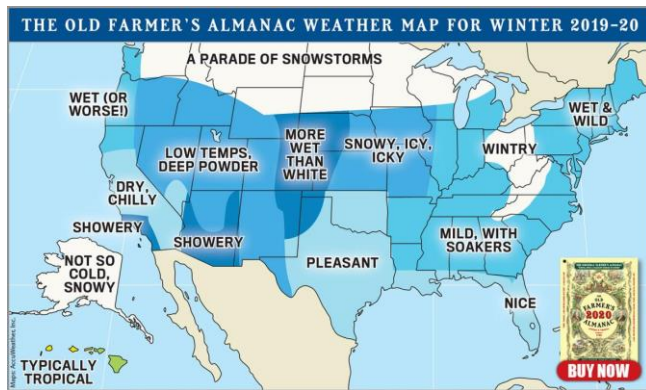
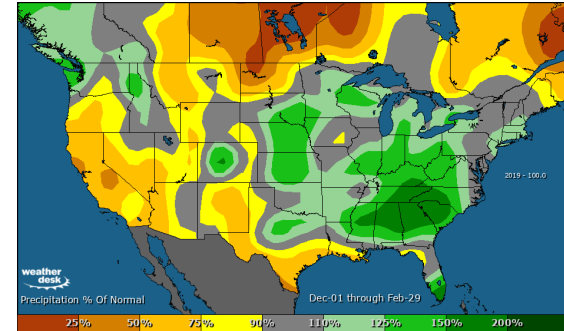
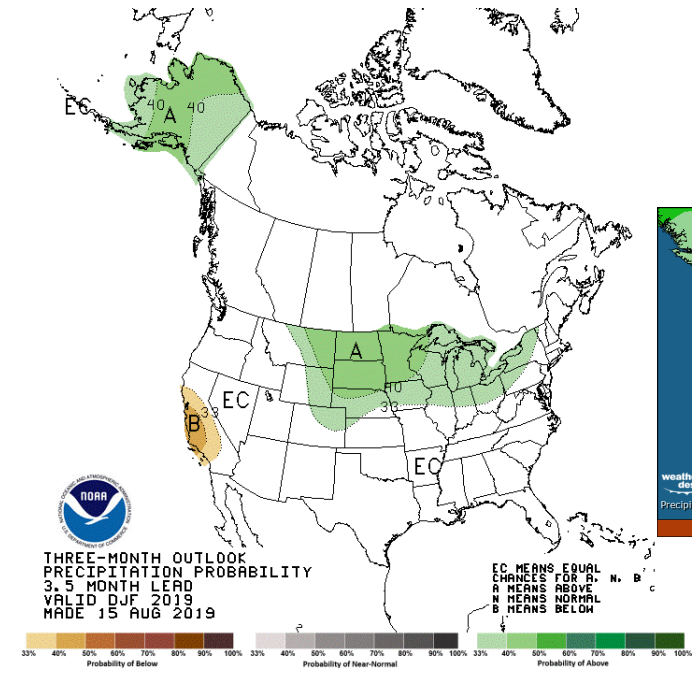
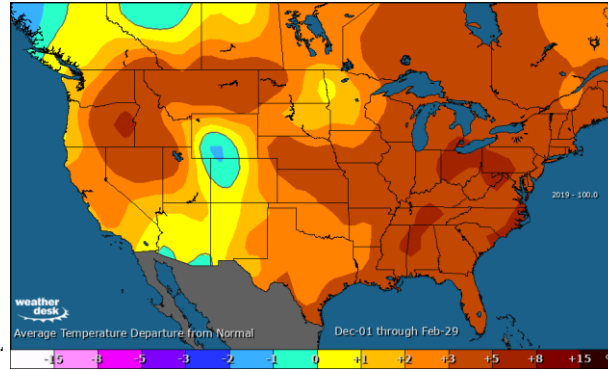
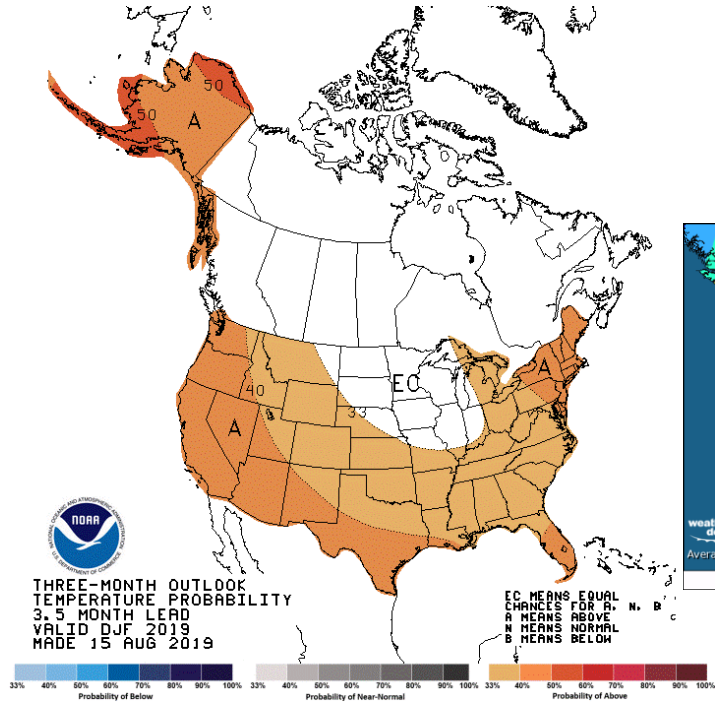
**\*\*\*Including the Coldest day since February 2011\*\*\***

All-time winter peak load on this date: **65,915 MW**

Those were the **two coldest days** this decade

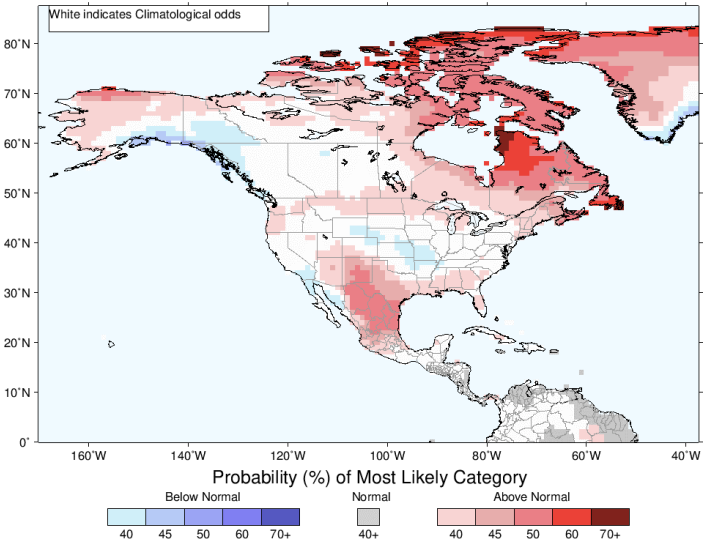
Winter 2013-14 was the coldest of the past ten years (polar vortex winter) – but no single day that winter approached the cold extremes of 2/2/11 or 1/17/18

# How Accurate were Last Winter's Forecasts?

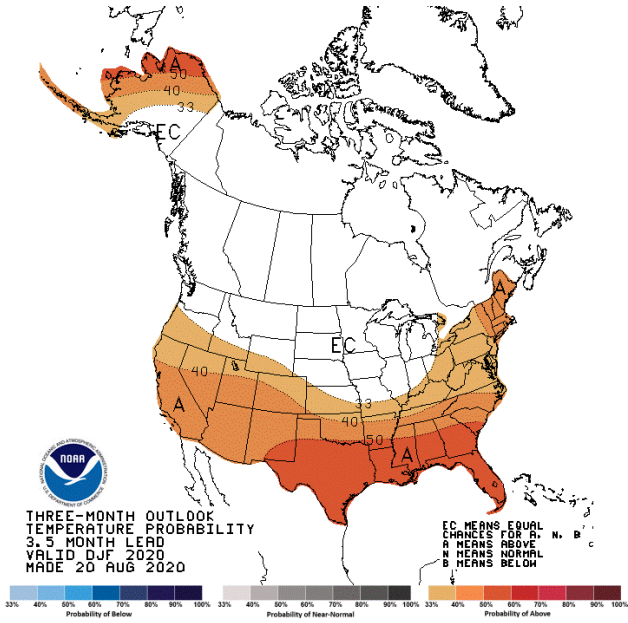


# This Year's Winter Outlooks

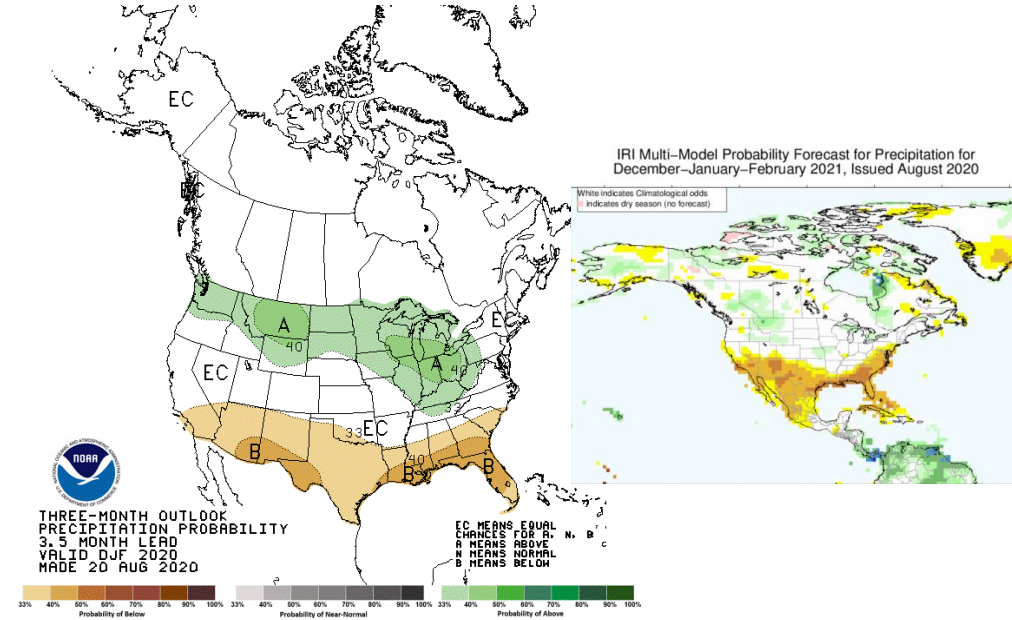
IRI Multi-Model Probability Forecast for Temperature for December-January-February 2021, Issued August 2020



(All based on 30-year normal)

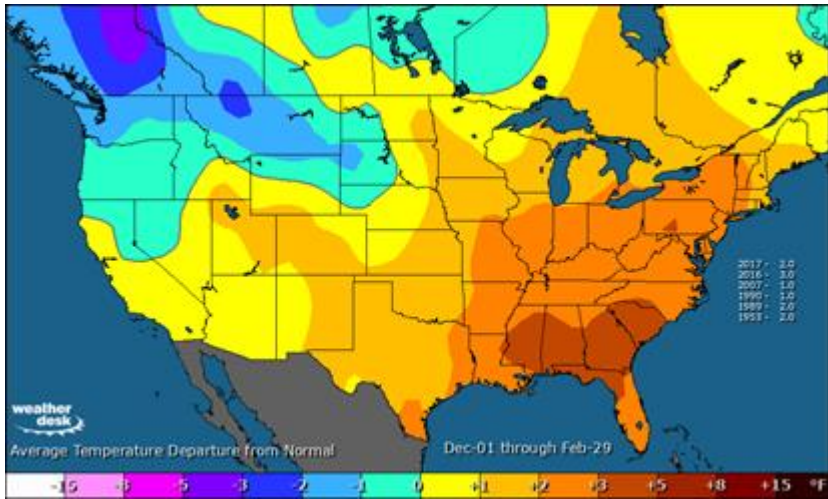


IRI Multi-Model Probability Forecast for Precipitation for December-January-February 2021, Issued August 2020

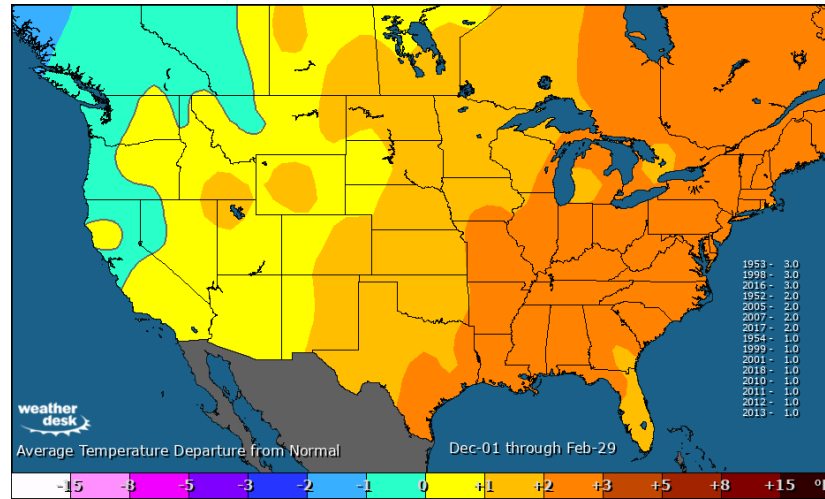


# Preliminary Winter 2019-20 Temperature Outlook

Analog weighted consensus:



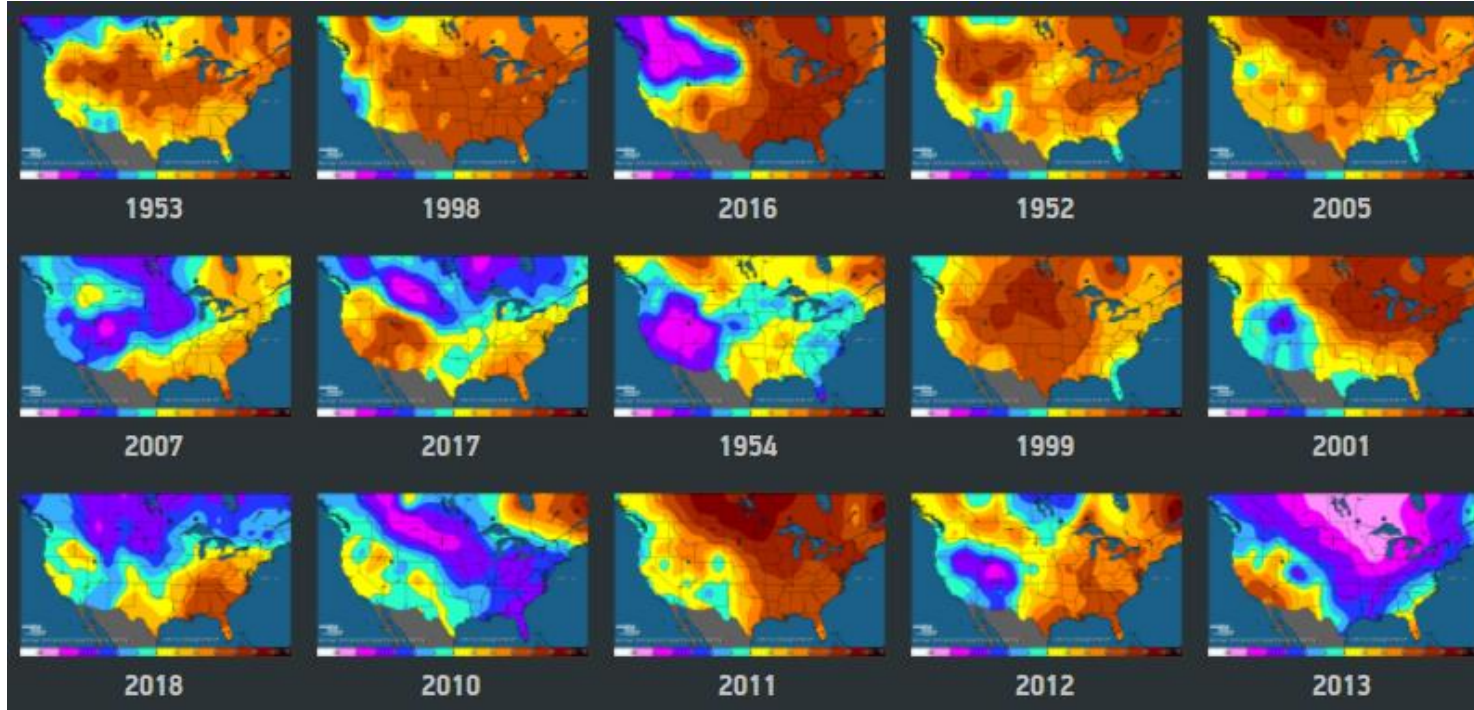
July update



August update

# Historical Matches (Analog)

The top row are those scoring/weighted highest



The bottom row are those scoring/weighted lowest

2010-11 57<sup>th</sup> warmest

2011-12 26<sup>th</sup>

2012-13 15<sup>th</sup>

2013-14 96<sup>th</sup> -- lowest scoring

2016-17 1<sup>st</sup>

2017-18 49<sup>th</sup>

2018-19 32<sup>nd</sup>

1998-99 4<sup>th</sup>

1999-00 3<sup>rd</sup>

2001-02 15<sup>th</sup>

2005-06 18<sup>th</sup>

2007-08 25<sup>th</sup>

1952-53 36<sup>th</sup>

1953-54 34<sup>th</sup>

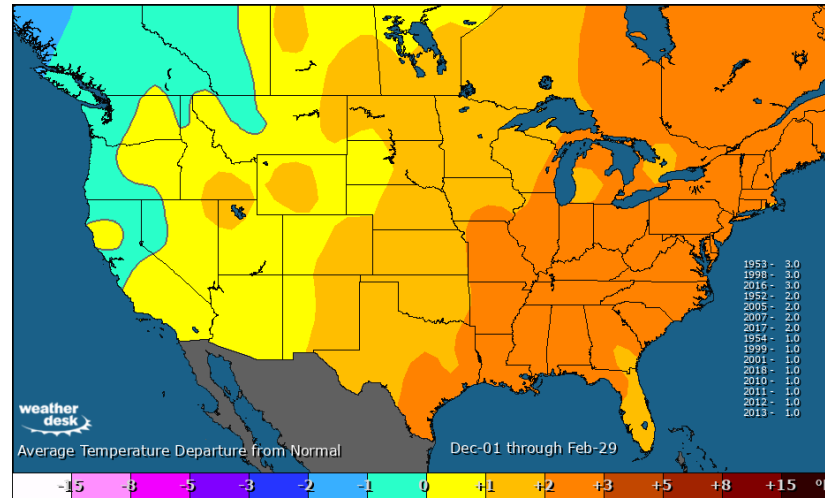
1954-55 52<sup>nd</sup>

Last winter ranked 15<sup>th</sup> warmest; this winter could be similar – although **there may be more opportunities for a strongly cold period or two than experienced the past two winters**

# Preliminary Winter 2020-21 Temperature Outlook

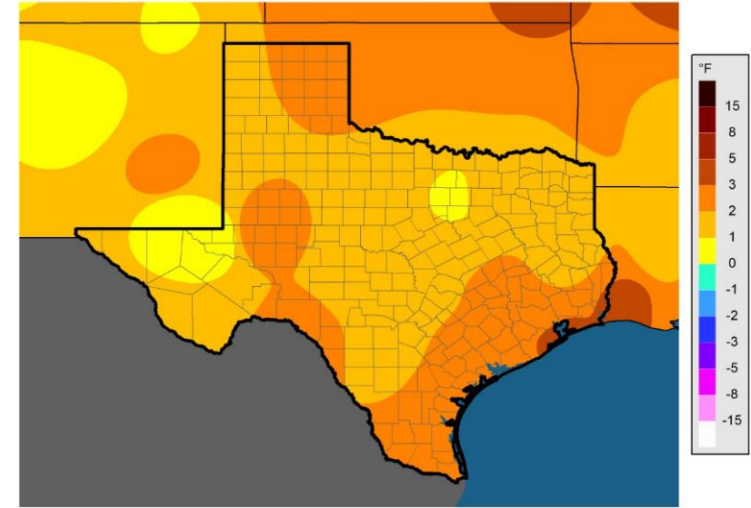
- **Unlikely to see a winter that ranks among the top third coldest** of all-time (2013-14 is the most recent winter that ranked that cold – but it is an outlier historical analog)
- January and February have very warm potential (more so than December)
- February has very cold potential to parts of the North Central and Northwestern U.S. (meaning, some risk of a colder outbreak briefly impacting Texas)
- **Need to analyze more if the expected dry winter could impact temperatures colder at times**
- **Mild winters can – and oftentimes do – have very cold periods!**

## Forecast



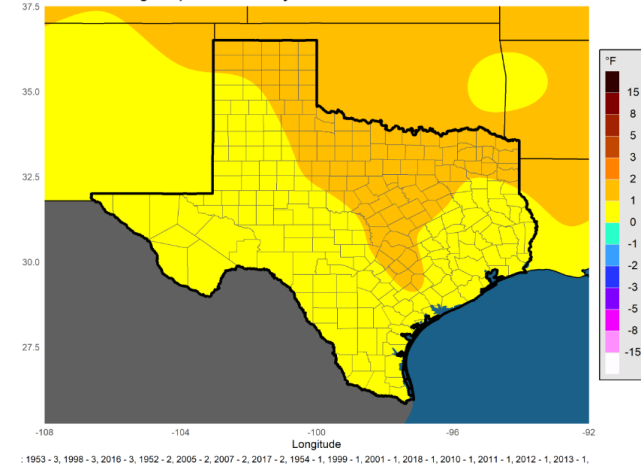
## Last winter

Average Temperature (°F) Departure from 20191201 to 20200229 - Fifteen Year Average



Slightly different forecast – the best chance of above-normal may be the northwest quarter of TX, if any chance of closer to normal or slightly below, East, Coast.

Fifteen Year Avg Temperature Anomaly in °F from 1201 to 0228



# Precipitation Ranking of Recent Winters (Texas)

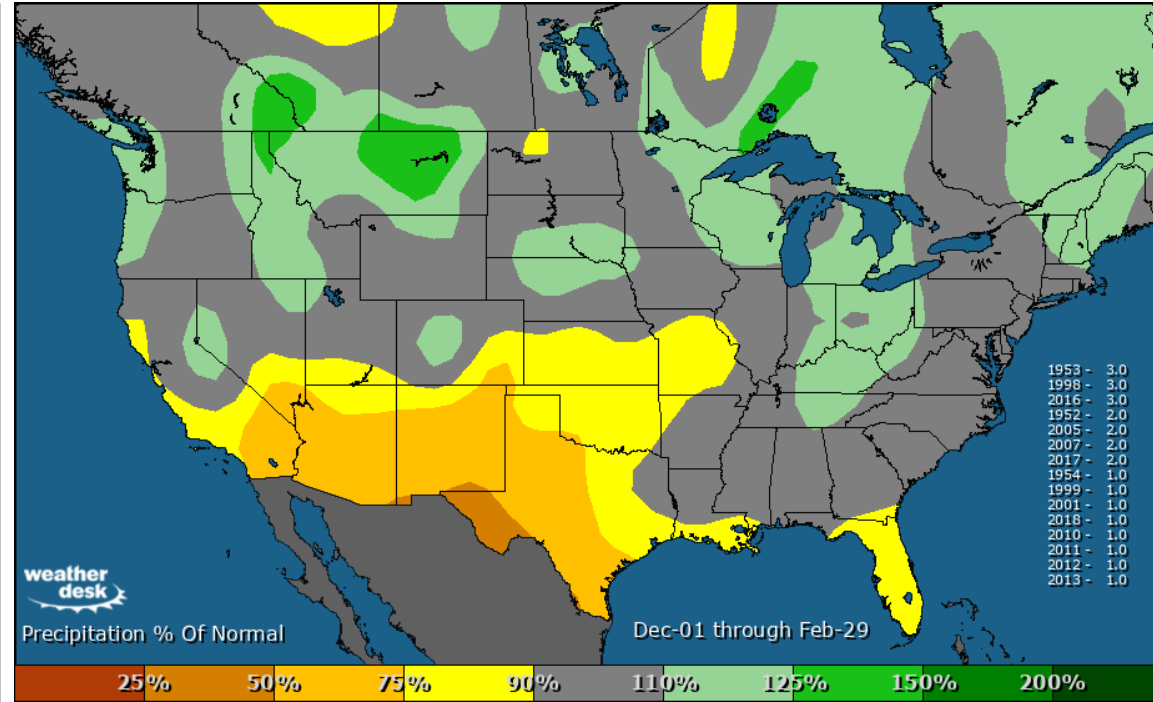
2019-20	62 <sup>th</sup> driest (out of 125)
<b>2018-19</b>	<b>87<sup>th</sup></b>
2017-18	71 <sup>st</sup>
<b>2016-17</b>	<b>94<sup>th</sup></b>
2015-16	56 <sup>th</sup>
2014-15	70 <sup>th</sup>
<b>2013-14</b>	<b>11<sup>th</sup></b>
2012-13	60 <sup>th</sup>
<b>2011-12</b>	<b>114<sup>th</sup></b>
<b>2010-11</b>	<b>17<sup>th</sup></b>
<b>2009-10</b>	<b>113<sup>th</sup></b>

Last dry winter was 2013-14 (during long-term drought)

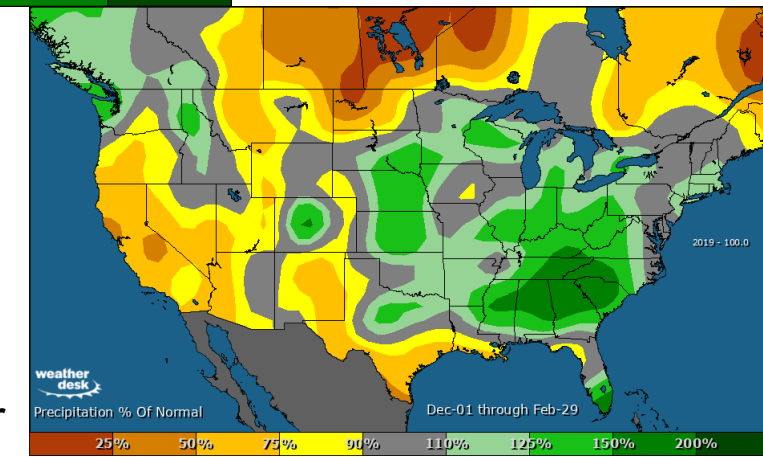
Recent winters have been quite variable in regards to precipitation

# Winter 2020-21 Precipitation Outlook

- For the state on-average, last winter was a very “normal” winter for precipitation – though it varied significantly from north to south
- **The upcoming winter looks drier than last winter**
- **This winter has the potential to be the driest since the winter of 2013-14**

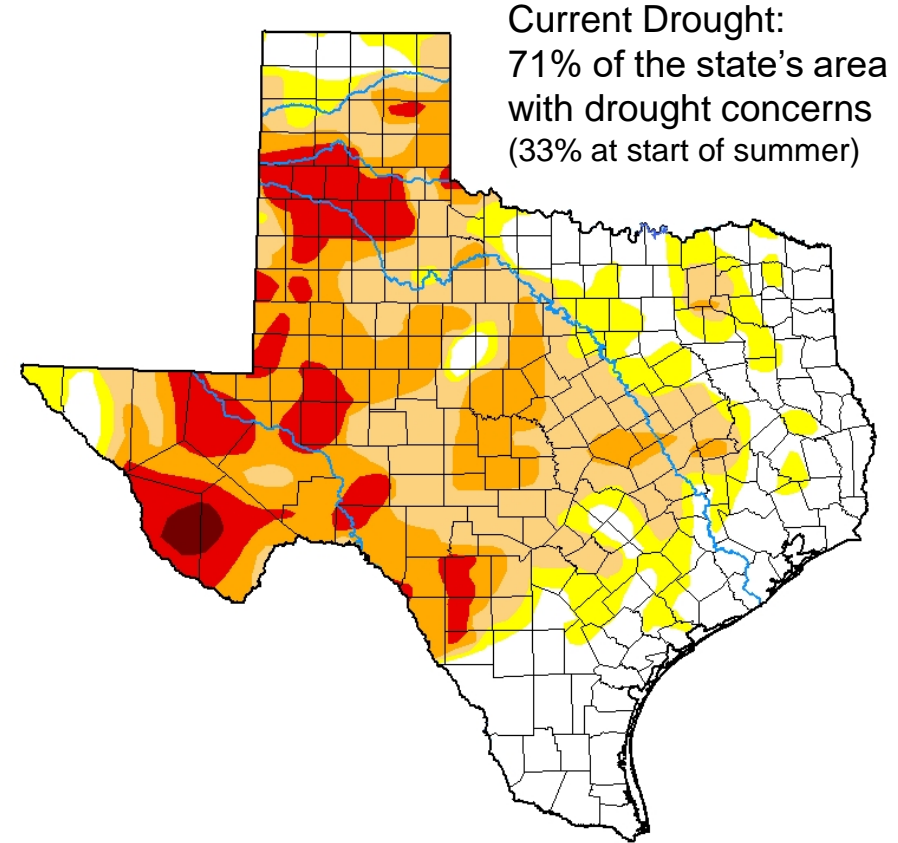
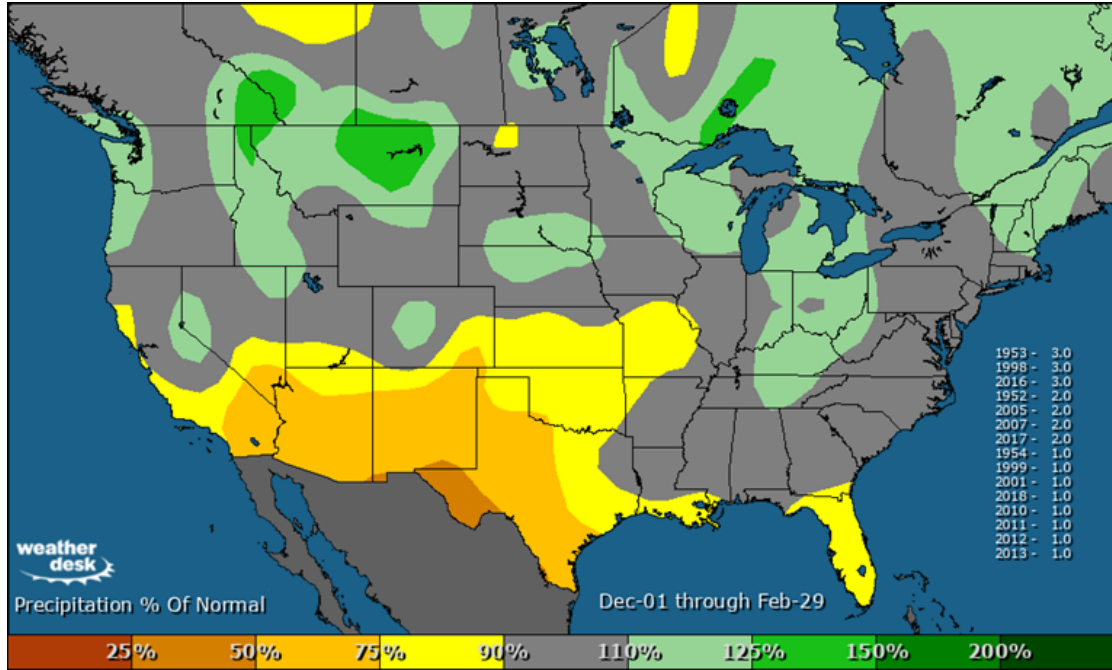


2020-21 forecast



Last winter

# Winter 2020-21 Precipitation Outlook vs Drought



Significant concerns that the drought that's developed in 2020 will carry forward and worsen in spots through the upcoming winter season

# Winter Weather Outlook Summary

- This is preliminary. The winter forecast will be finalized by early-November and will be available on the ERCOT website
- The 2020-21 winter is most likely to either rank in the warmest third or middle third of winter rankings. Least likely is the coldest third
- **A drier winter has historically allowed for colder outbreaks (polar vortex) to impact Texas a time or two. Late-winter has some signals that could encourage this to happen**
- Drought may continue to expand and worsen during the winter season
- **Even the mildest/warmest winters are capable of producing a period of extreme to record breaking cold.** Winter is a much more volatile weather pattern than the summer season. Extreme cold can only be forecast in the shorter-term – not long-range, several months out forecasts





**TEXAS RE**  
Ensuring electric reliability for Texans

# Closing Remarks