



# Operating SPP through an extreme weather event

GUNNAR SHAFFER

REAL TIME OPERATIONS SHIFT ENGINEER

6/22/2021

*Helping our members work together to keep  
the lights on... today and in the future.*



SouthwestPowerPool

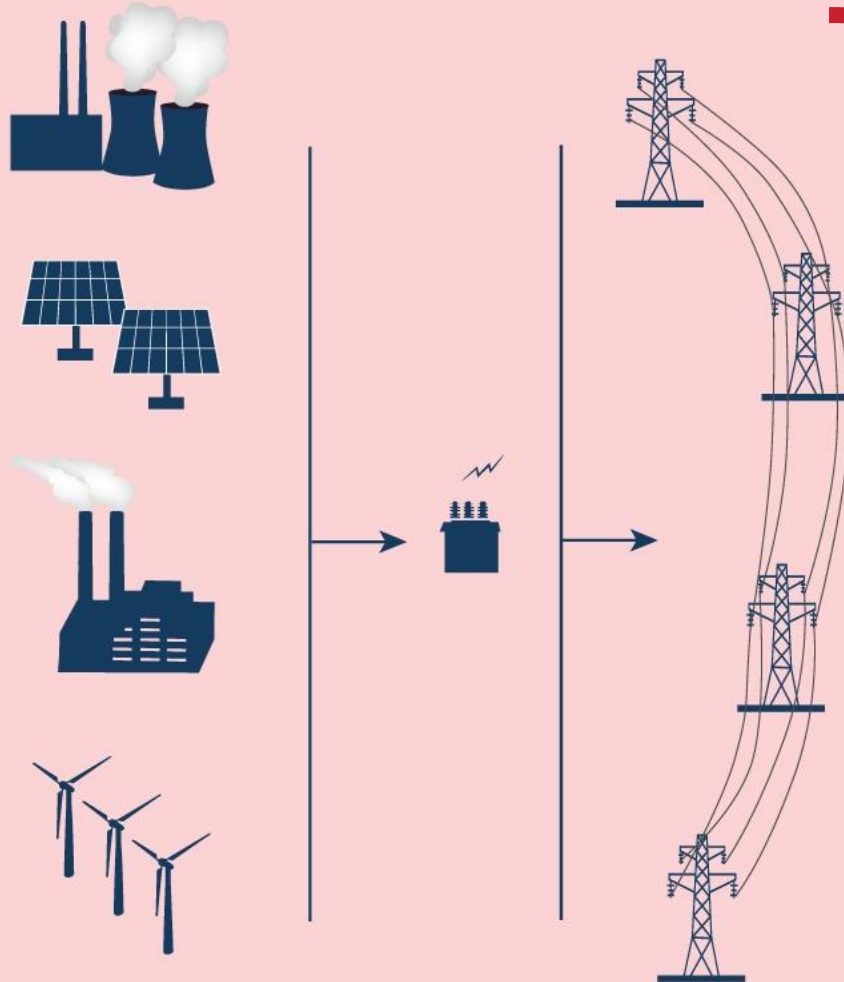


southwest-power-pool

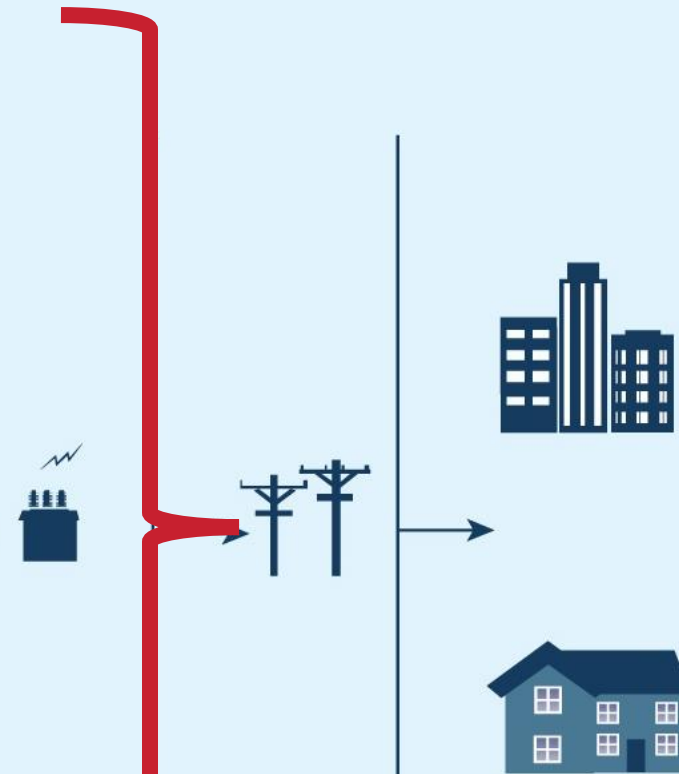


SPPorg

## WHOLESALE ENERGY AND TRANSMISSION



## RETAIL ENERGY AND DISTRIBUTION



Pro-Rata Load Shedding

# THE BIG PICTURE: FEB 15-18<sup>TH</sup> 2021



## Early prep helped

**2/4:** Issued cold weather alert

**2/8:** Issued resource alert

**2/11:** Committed long-lead generation



## Public appeals reduced demand

Demand dropped below forecast, helping minimize interruptions



## We used every MW we could get

We ran every available generator and imported energy from neighbors



## Service interruptions required

**2/15**  
~1.5% of system demand for 57 min.

**2/16**  
Up to ~6.5% of system demand for 3 hr. 23 min.



## Collaboration reduced impact

Controlled, temporary interruptions prevented uncontrolled blackouts







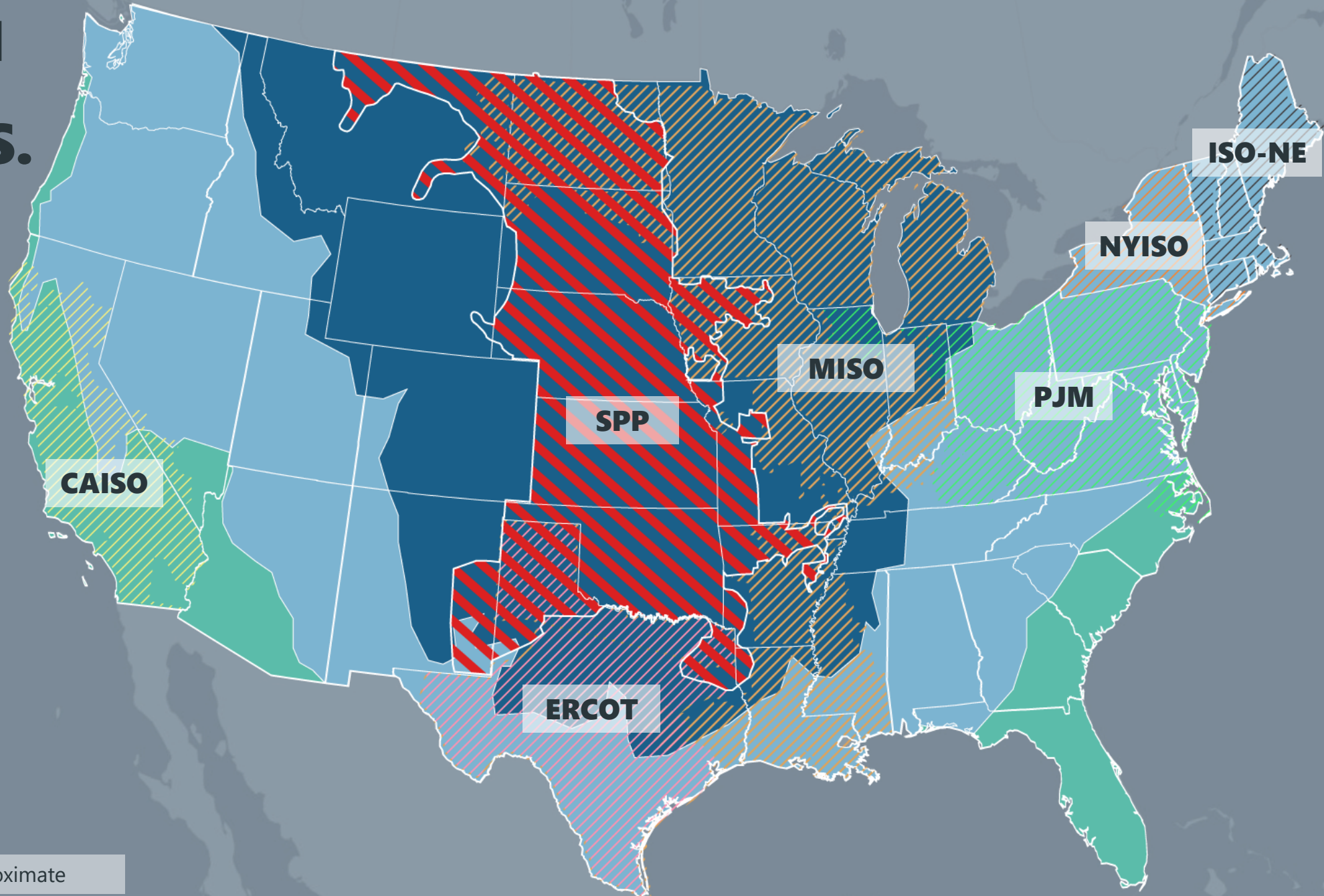
# SPP REGION IN COLDEST PART OF U.S.



Lowest temperatures forecast  
for Feb. 14-16, 2021

Sources: National Weather Service,  
Global Forecast System

-  SPP service territory/  
balancing authority
-  Temperatures below 0°F
-  Between 0° and 32°F
-  Above 32°F



\* Locations of ISOs/RTOs are approximate

# **HISTORIC WEATHER EVENT**

- **73% of mainland U.S. covered in snow <sup>1</sup>**
- **3,000 daily and 79 all-time local low temperature records broken <sup>2</sup>**
- **“Comparable to the historical cold snaps of Feb. 1899 & 1905.” <sup>3</sup>**

1 – [National Operating Hydrologic Remote Sensing Center](#)

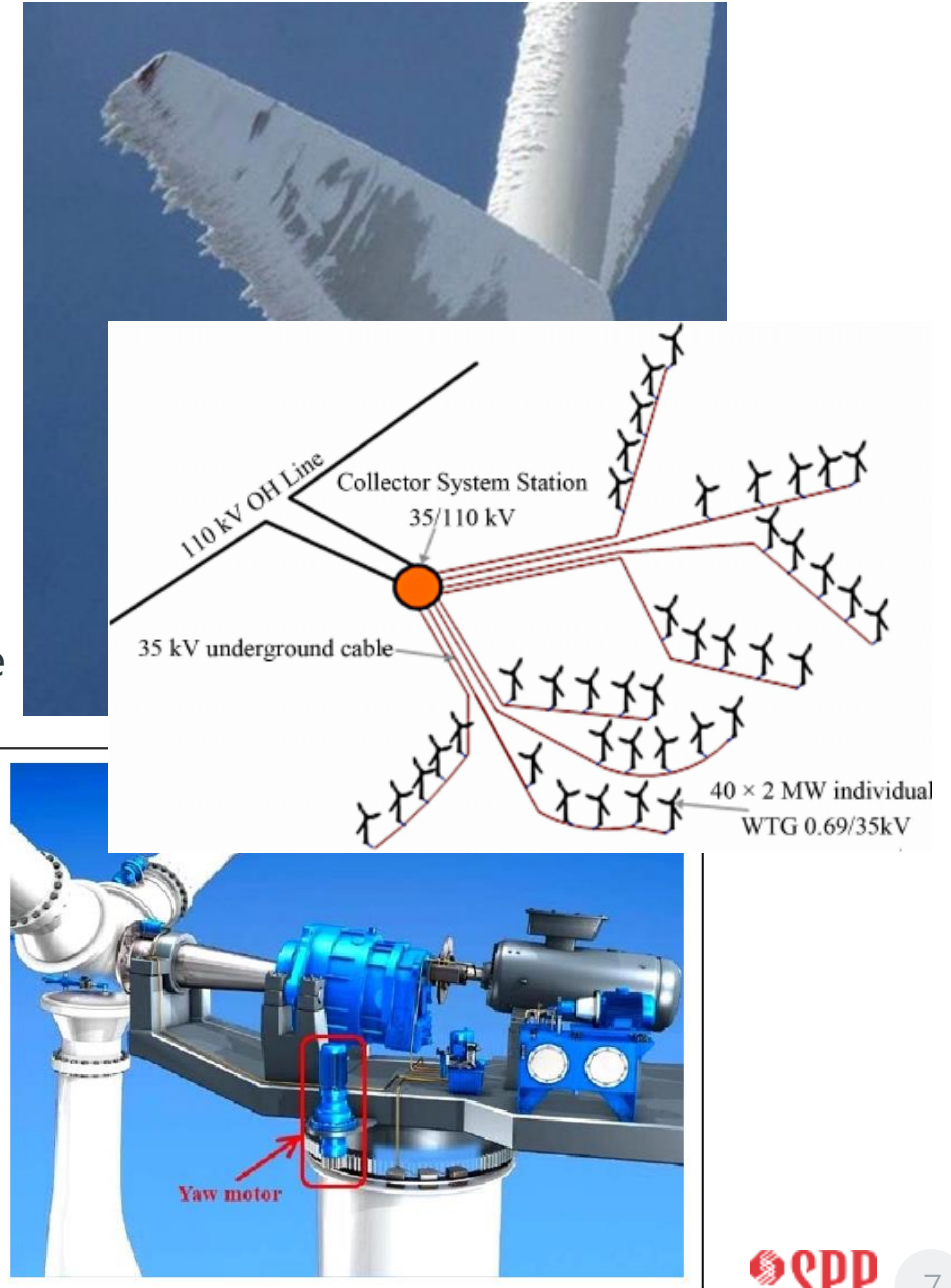
2 – [National Weather Service Weather Prediction Center](#)

3 – [National Weather Service Weather Prediction Center](#)

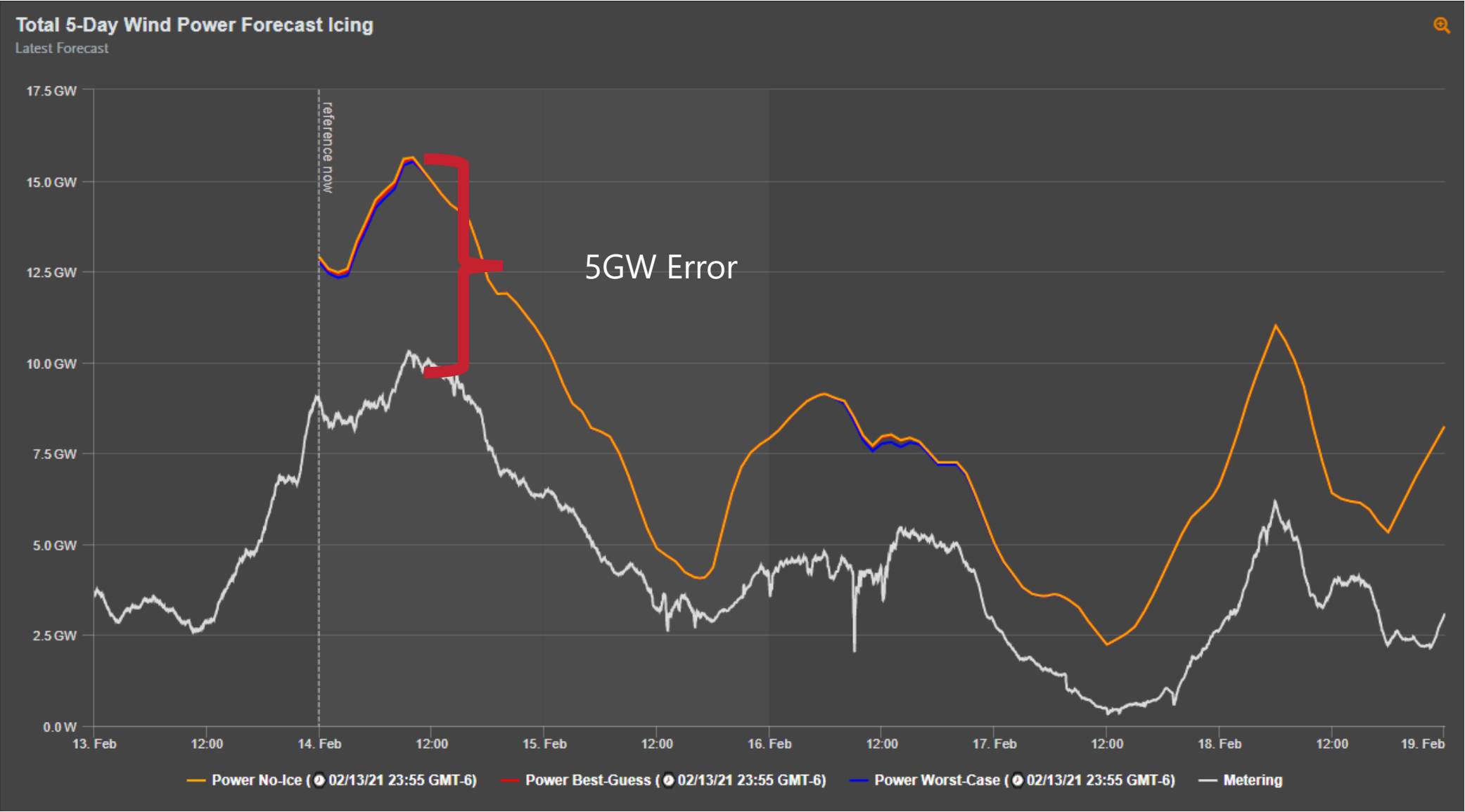


# WIND CHALLENGES

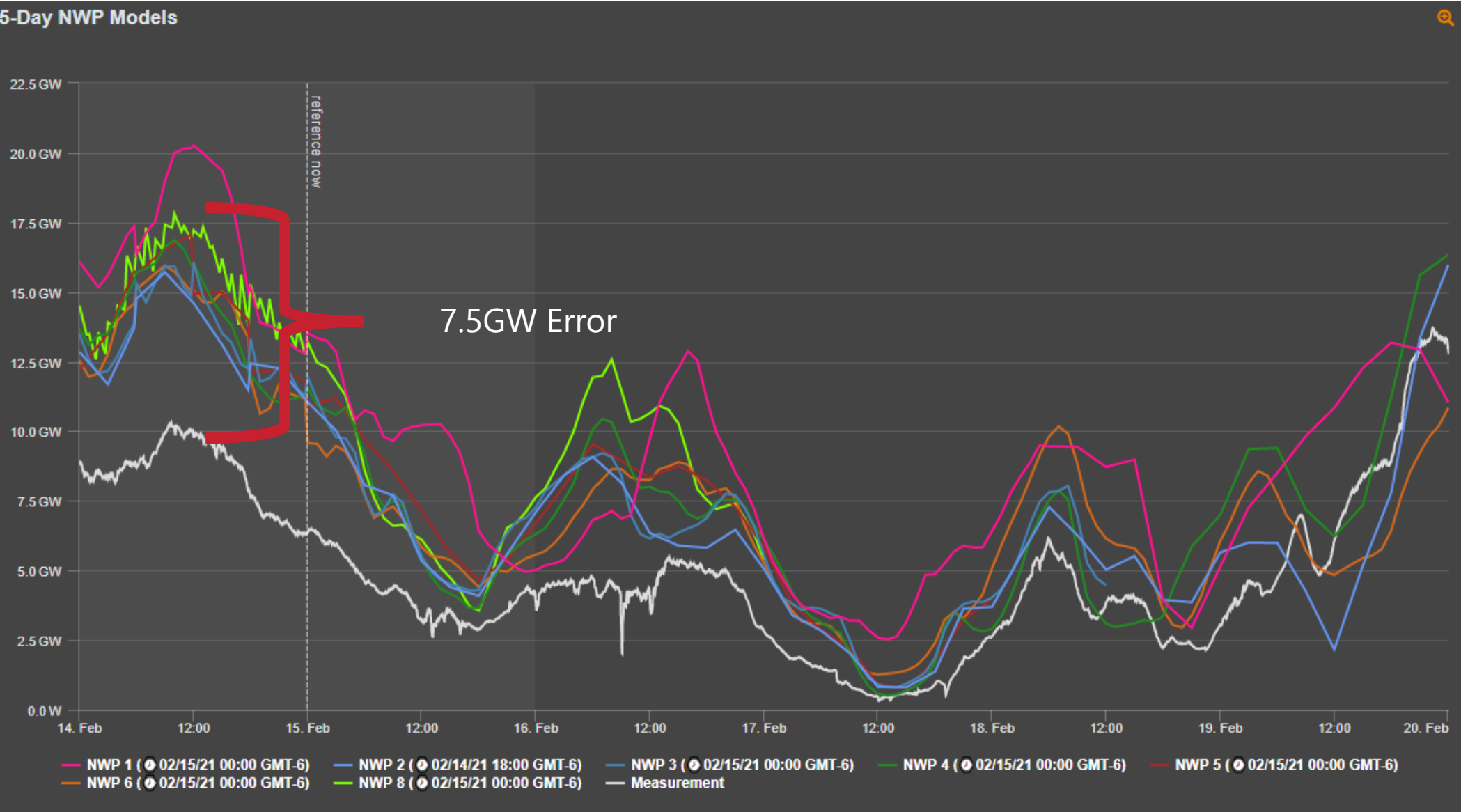
- Blade icing
- Turbines fault due to uneven icing inducing vibrations
- Gear Lubricant gelling inducing fault
- Feeder Faults
- Once turbine is off... its of... hours→days to come back online
- Cannot physically drive to turbine to check/clear fault.



# WIND ICING FORECAST



# WIND NWP FORECAST





# SOLAR CHALLENGES

- Ice
- Snow → Ice
- Uneven melting
- Icing on single axis farms
- Loss of rooftop solar

Fixed Axis



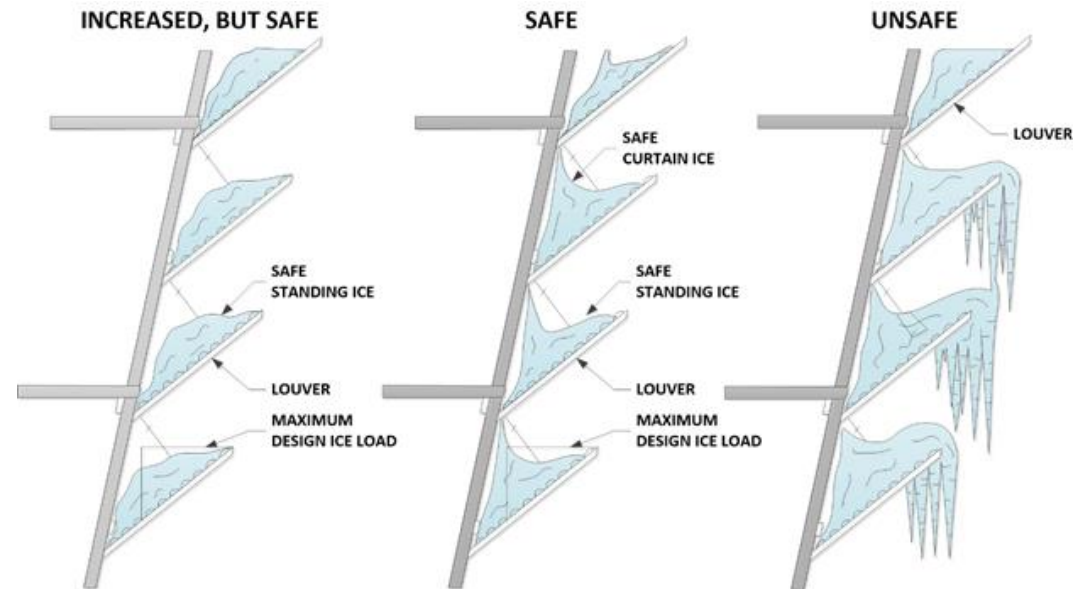
Single Axis Tracking



BTM Solar

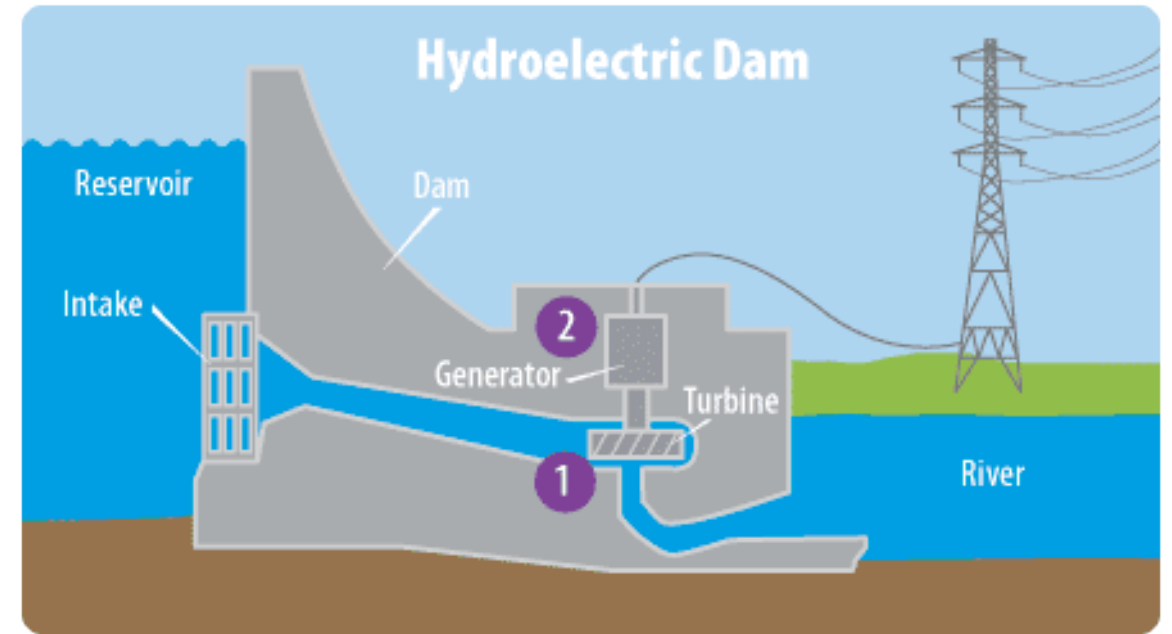
# NUCLEAR CHALLENGES

- Water intake
- Cooling towers, fans and pipes frozen (weight)
- Surrounding transmission system monitoring
- Extremely vulnerable to voltage fluctuations and disturbances

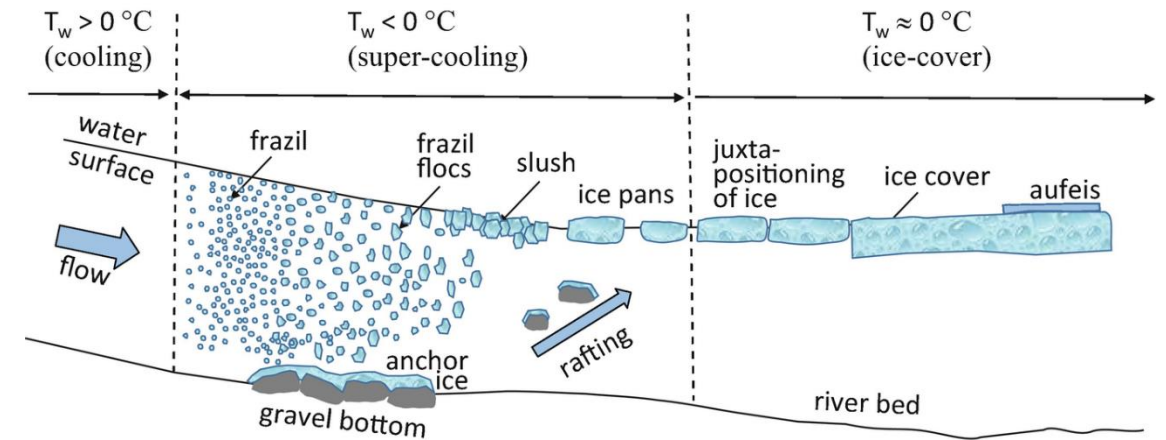


# HYDRO CHALLENGES

- Run of River vs Lake Dam
- Icing in the intake
- Small ice fragments damaging turbines
- Breaking down stream ice and pushing ice downriver



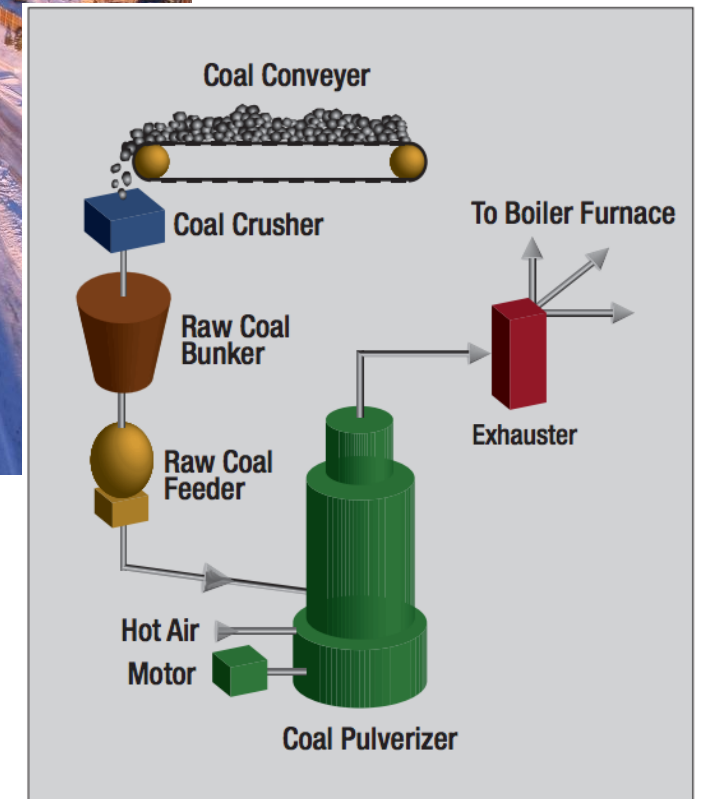
EIA



ASCE

# COAL CHALLENGES

- Train bins frozen
- Conveyor belts frozen
- Pulverizer and Frozen Coal Chunks
- Cooling towers frozen
- Piping within power plants frozen





# NATURAL GAS PROBLEMS

- Lack of winterization
- Large switch to residential use
- Frozen wellheads and iced roads slowed crews
- Pumping station equipment and valves froze
- Electrical equipment was out of power forcing more gas out



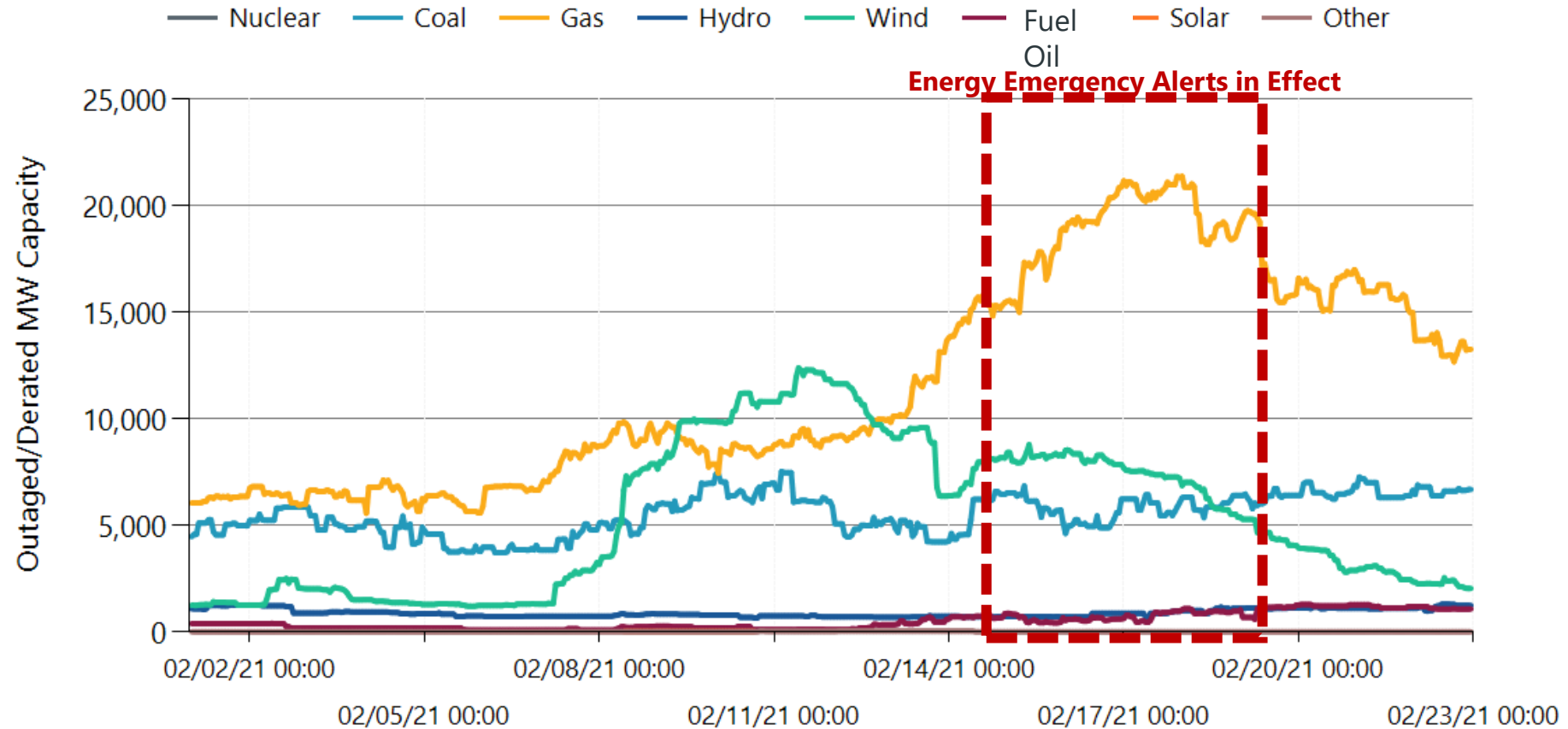
# DIESEL PROBLEMS

- Fuel gels
- Rarely run
- Small
- BUT...SUPER important to start units, backup power for units, hospitals, nursing homes, etc...



# GENERATING CAPACITY OUTAGES

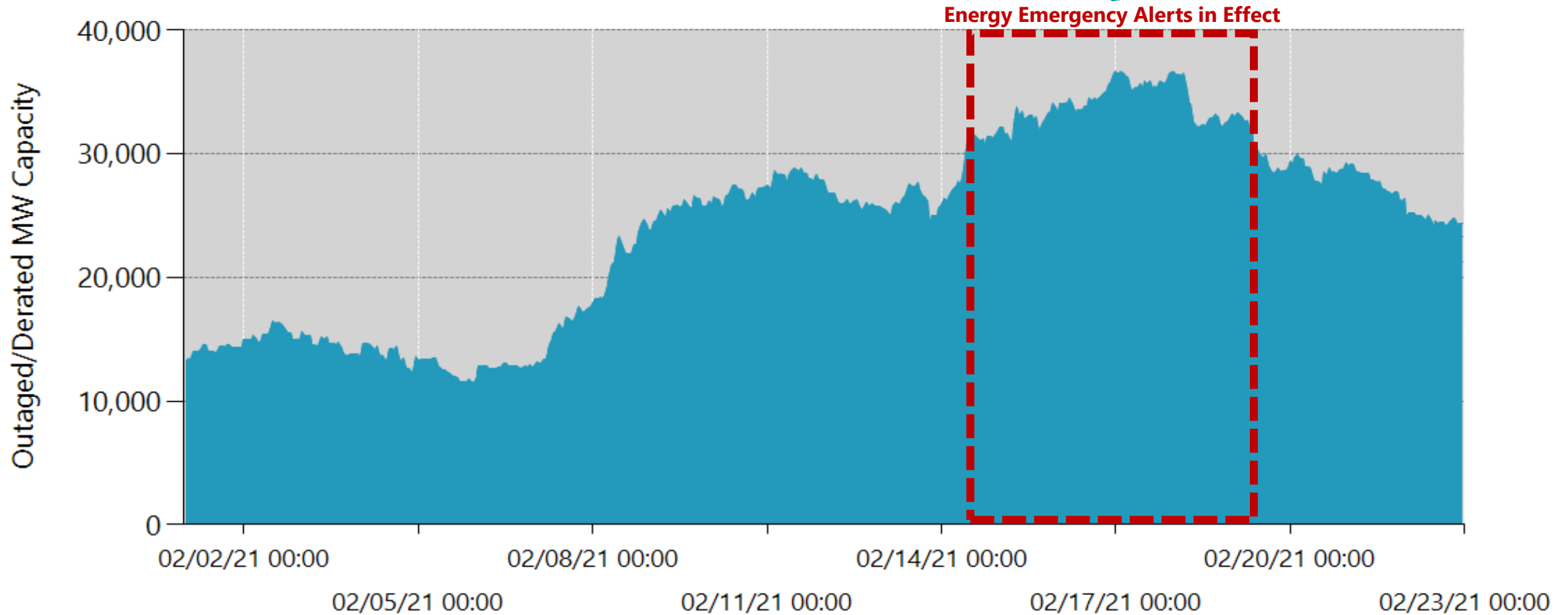
- 42% of Total nameplate gen available
- Wind 15% of nameplate
- Gas 35% of nameplate
- Coal 80% of nameplate



# TOTAL GENERATION OUTAGES

Up to 35,000 MW of generating capacity unavailable to meet demand

Nearly 2.5x more outages than first week of Feb.



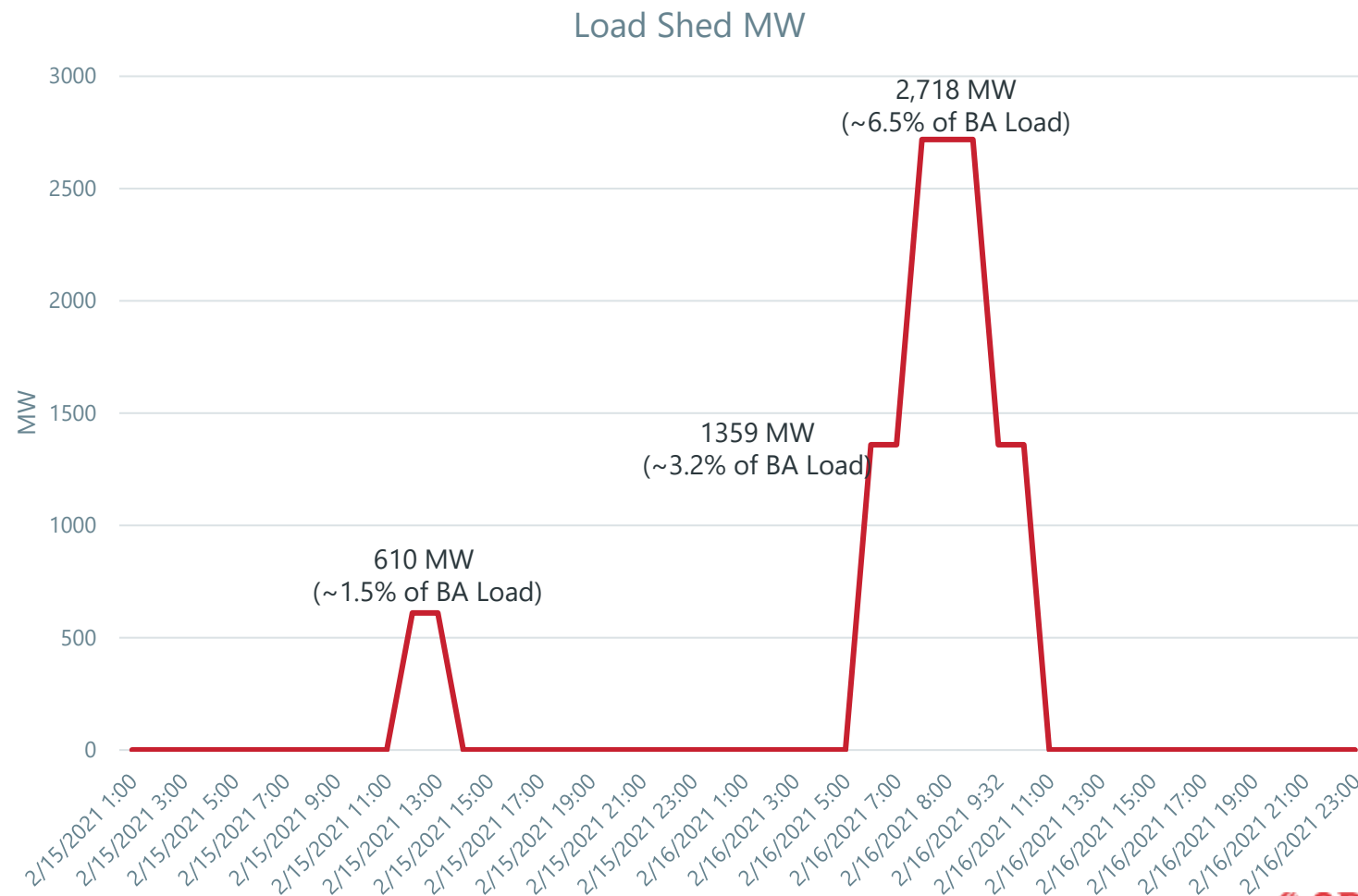


# INTERRUPTIONS BY ENTITY

Participating Entity	% of MW
AEP	16.8
WAPA	13.5
SPS	12.4
OKGE	12.4
KCPL	9.68
WR	8.49
NPPD	6.57
OPPD	4.6
WFEC	3.78
GRDA	2.22
SECI	2.22
EDE	2.19
LES	1.36
SPRM	1.22
KACY_N	0.92
CBPC	0.83
INDN	0.38
SPA	0.28
TSGT	0.13
<b>SPP Total</b>	<b>100%</b>

Winter percentages effective 12/1 through 2/28

Directed interruptions allocated to transmission operators on pro-rata basis



**MERCI**

**TAK**

**DANKE  
SCHOEN**

**THANKS!**

**XIE XIE**

**OBRIGADO**

**GRACIAS**