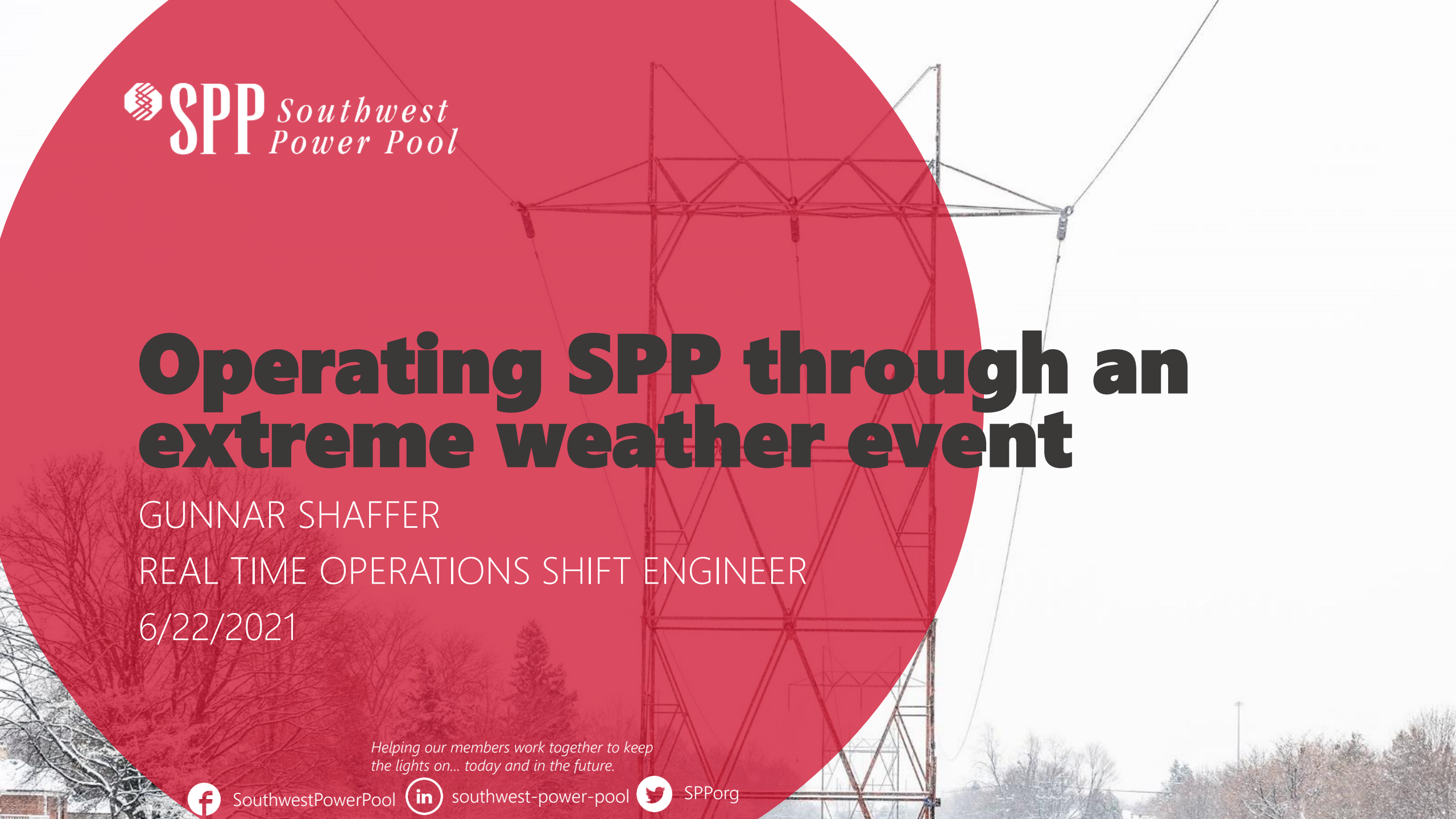
SPP Southwest Power Pool

Operating SPP through an extreme weather event

GUNNAR SHAFFER

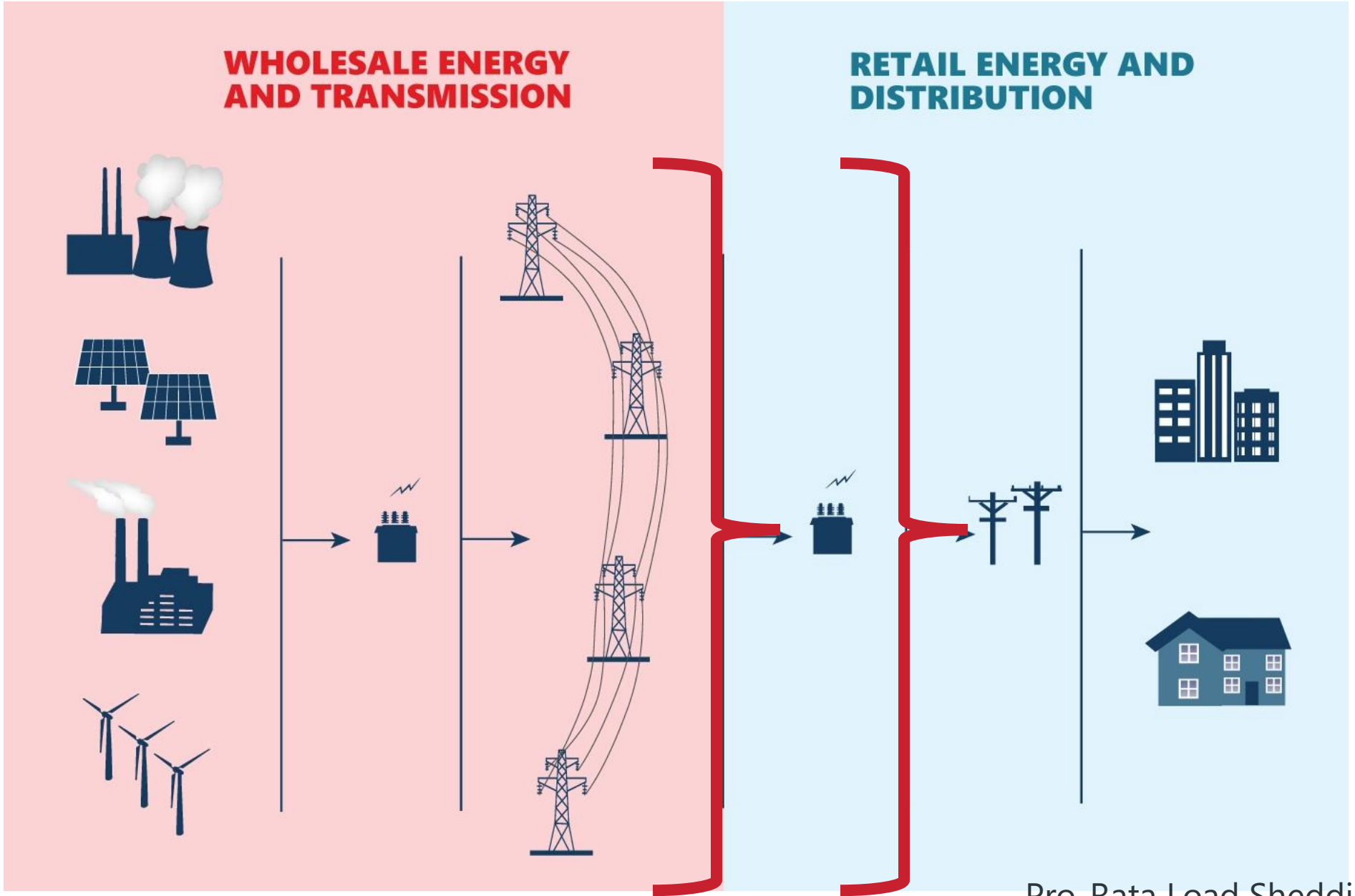
REAL TIME OPERATIONS SHIFT ENGINEER

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

THE BIG PICTURE: FEB 15-18TH 2021

Early prep helped

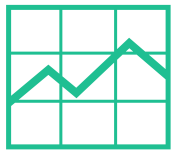
2/4: Issued cold weather alert

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

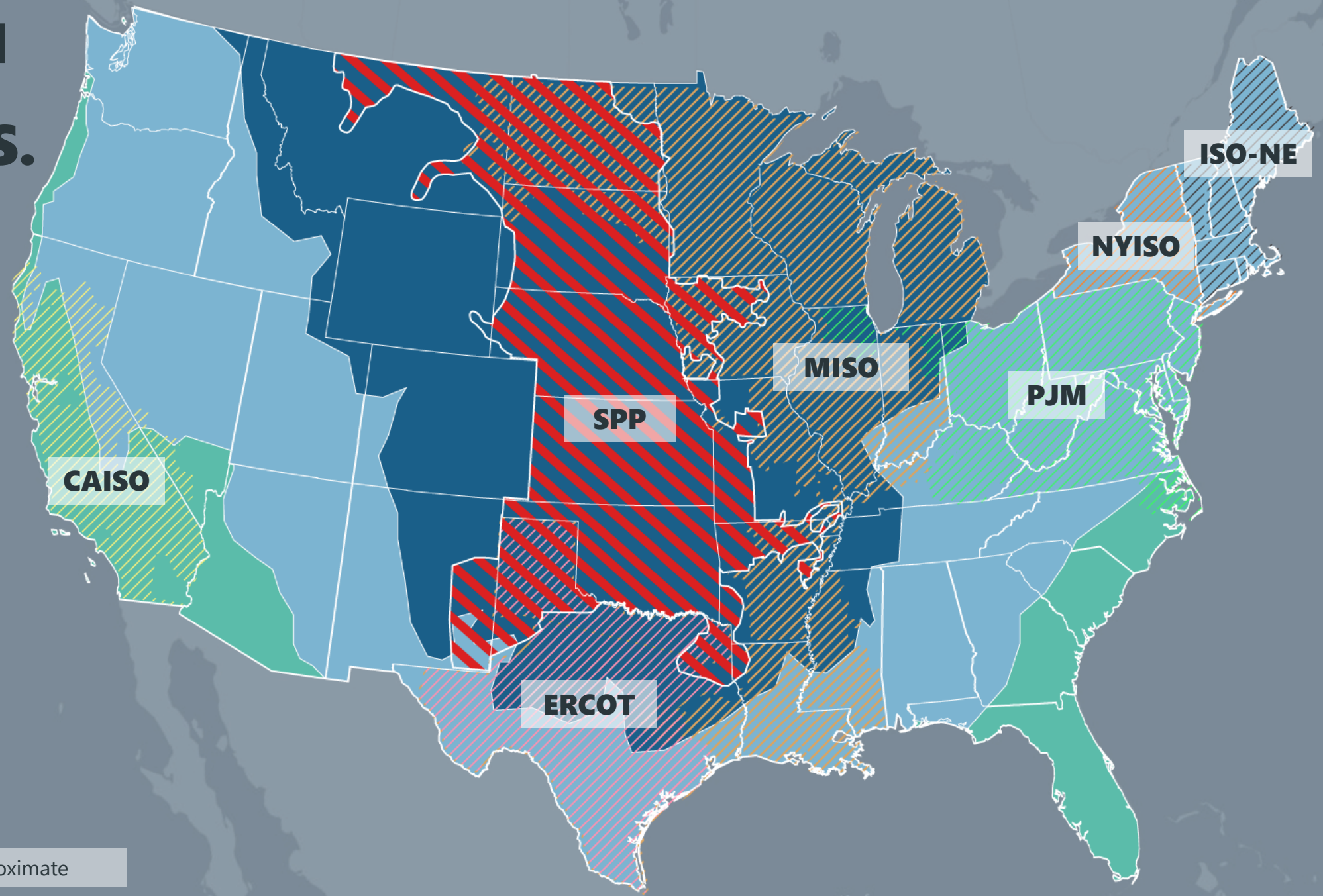
SPP REGION IN COLDEST PART OF U.S.

SPP Southwest Power Pool

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

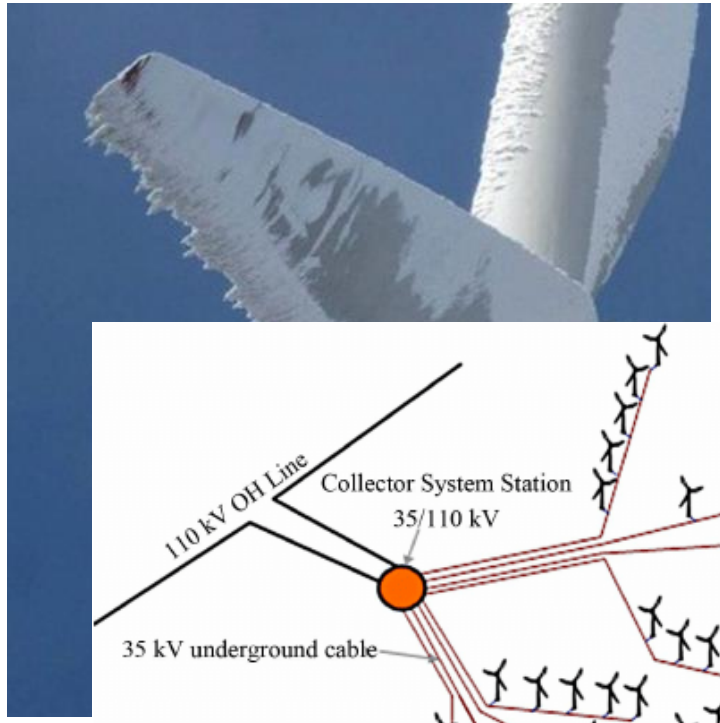
HISTORIC WEATHER EVENT

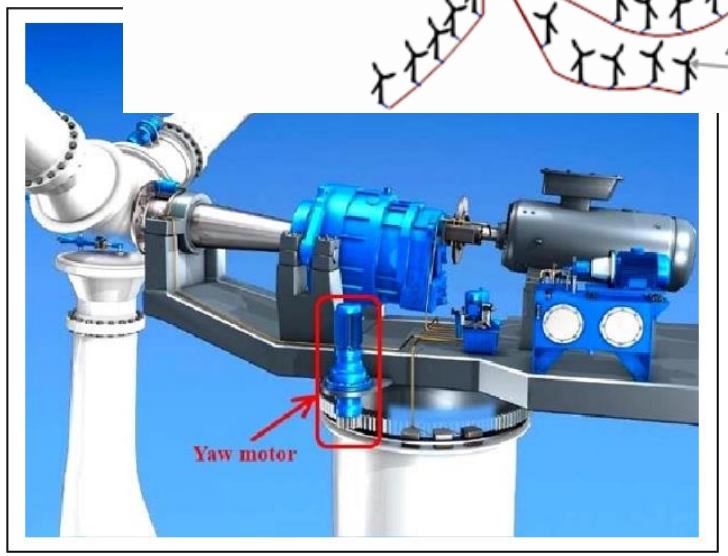
- 73% of mainland U.S. covered in snow [1]
- 3,000 daily and 79 all-time local low temperature records broken [2]
- “Comparable to the historical cold snaps of Feb. 1899 & 1905.“ [3]

1 – National Operating Hydrologic Remote Sensing Center
2 – National Weather Service Weather Prediction Center
3 – National Weather Service Weather Prediction Center

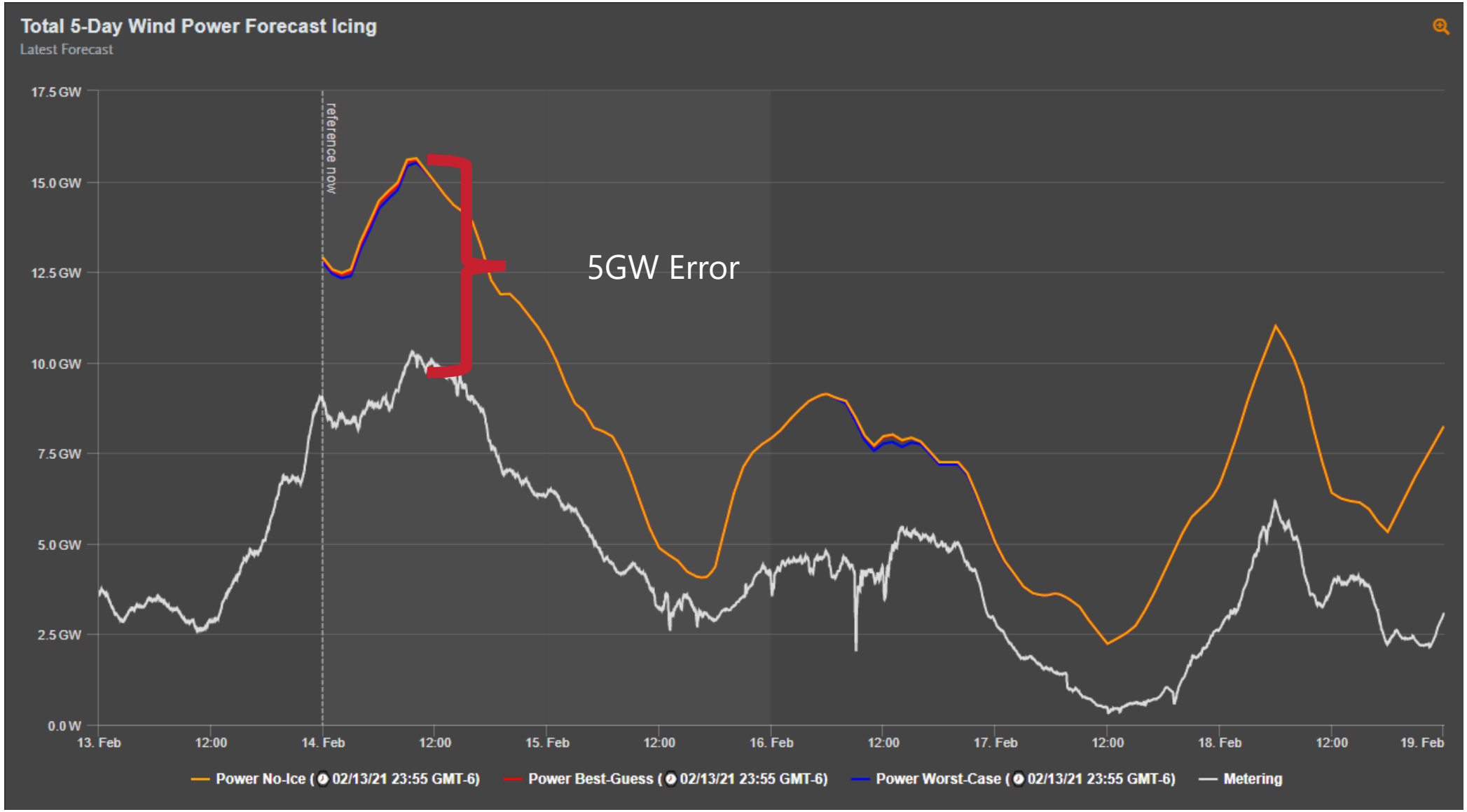
WIND CHALLENGES

- 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.

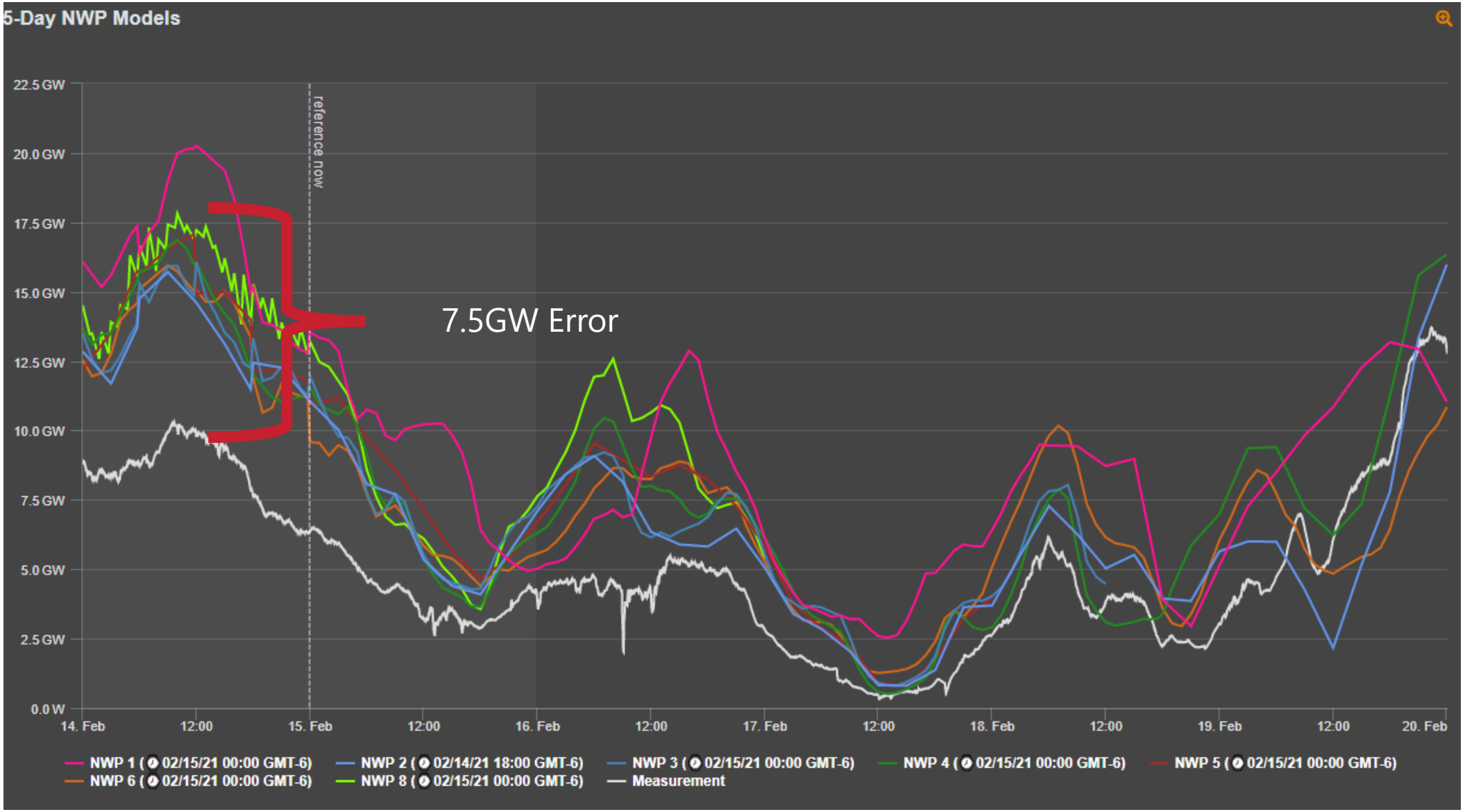




WIND ICING FORECAST



WIND NWP FORECAST



SOLAR CHALLENGS

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

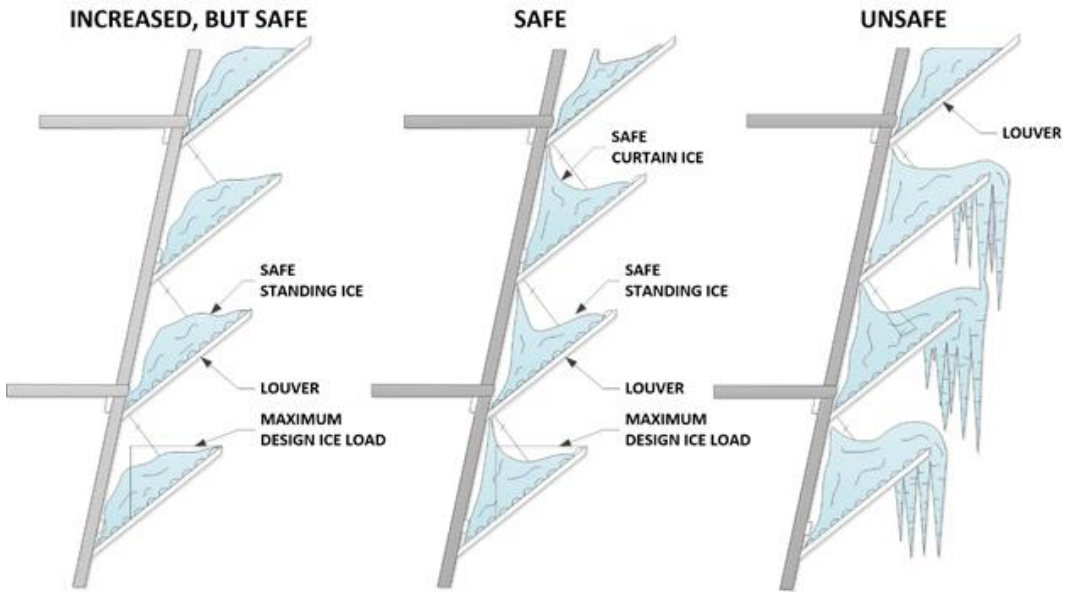
Fixed Axis

Single Axis Tracking

BTM Solar

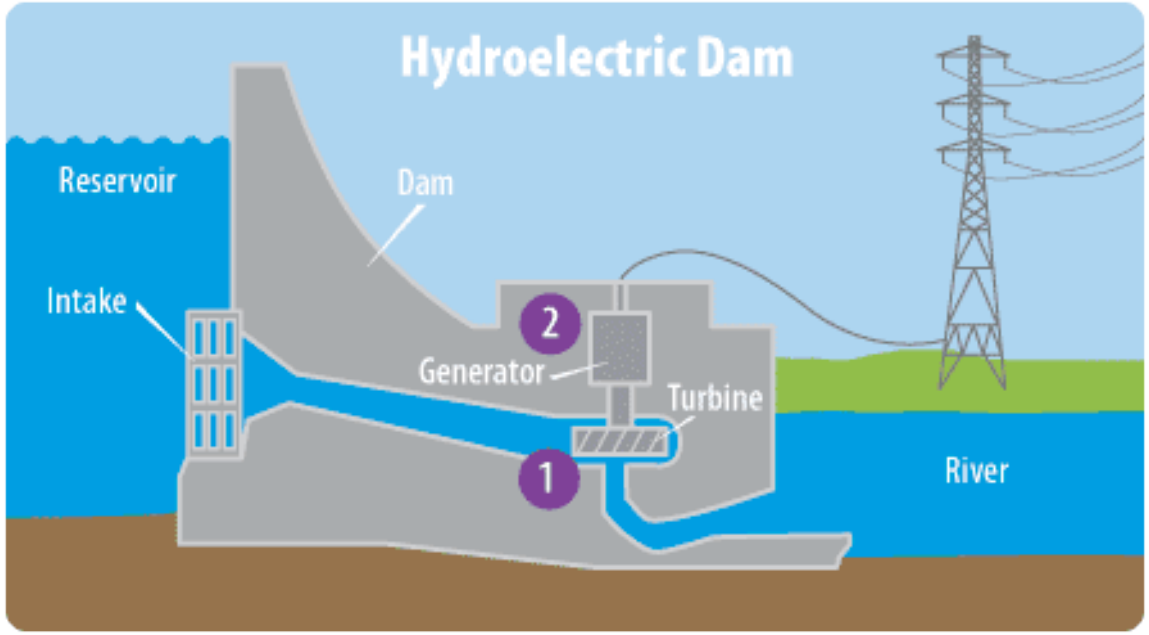
NUCLEAR CHALLENGES

- 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



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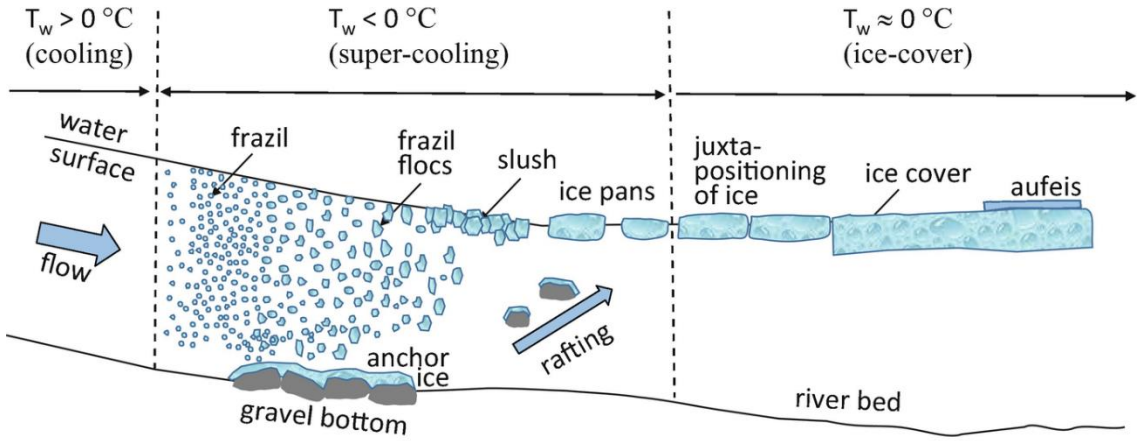
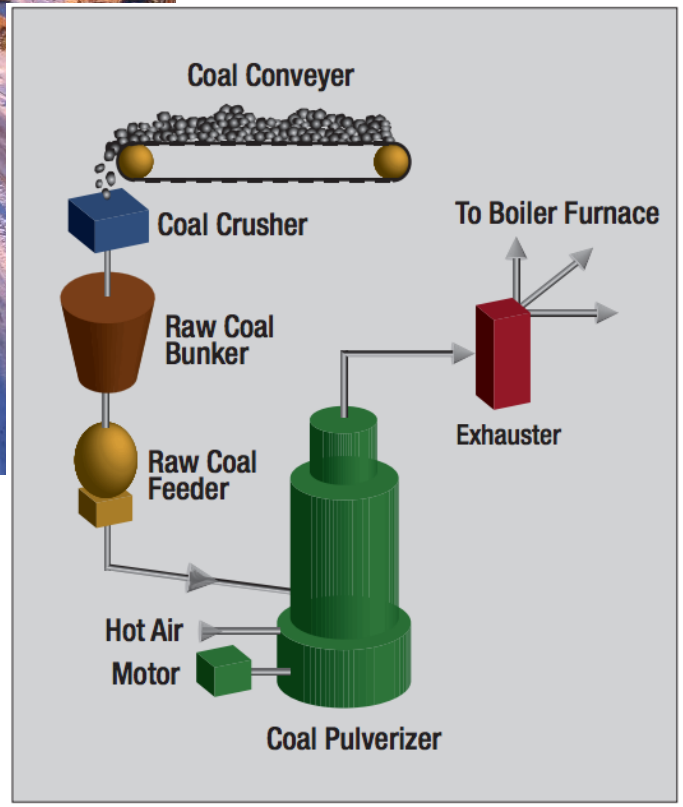


ASCE

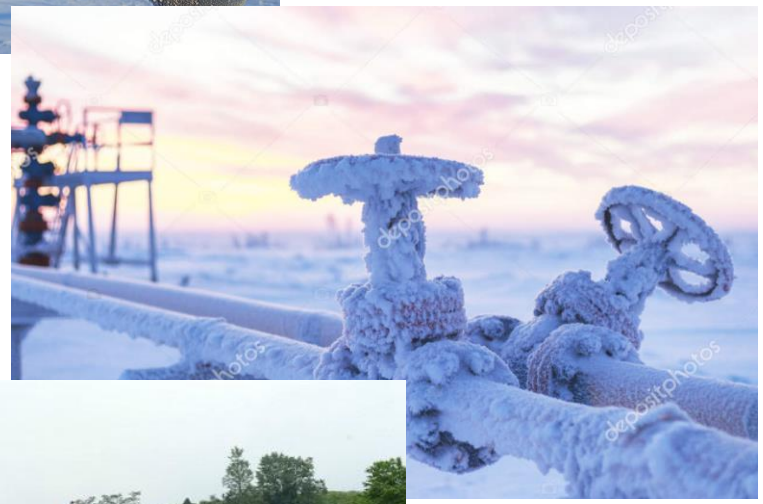
COAL CHALLENGES

- Train bins frozen
- Conveyer 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

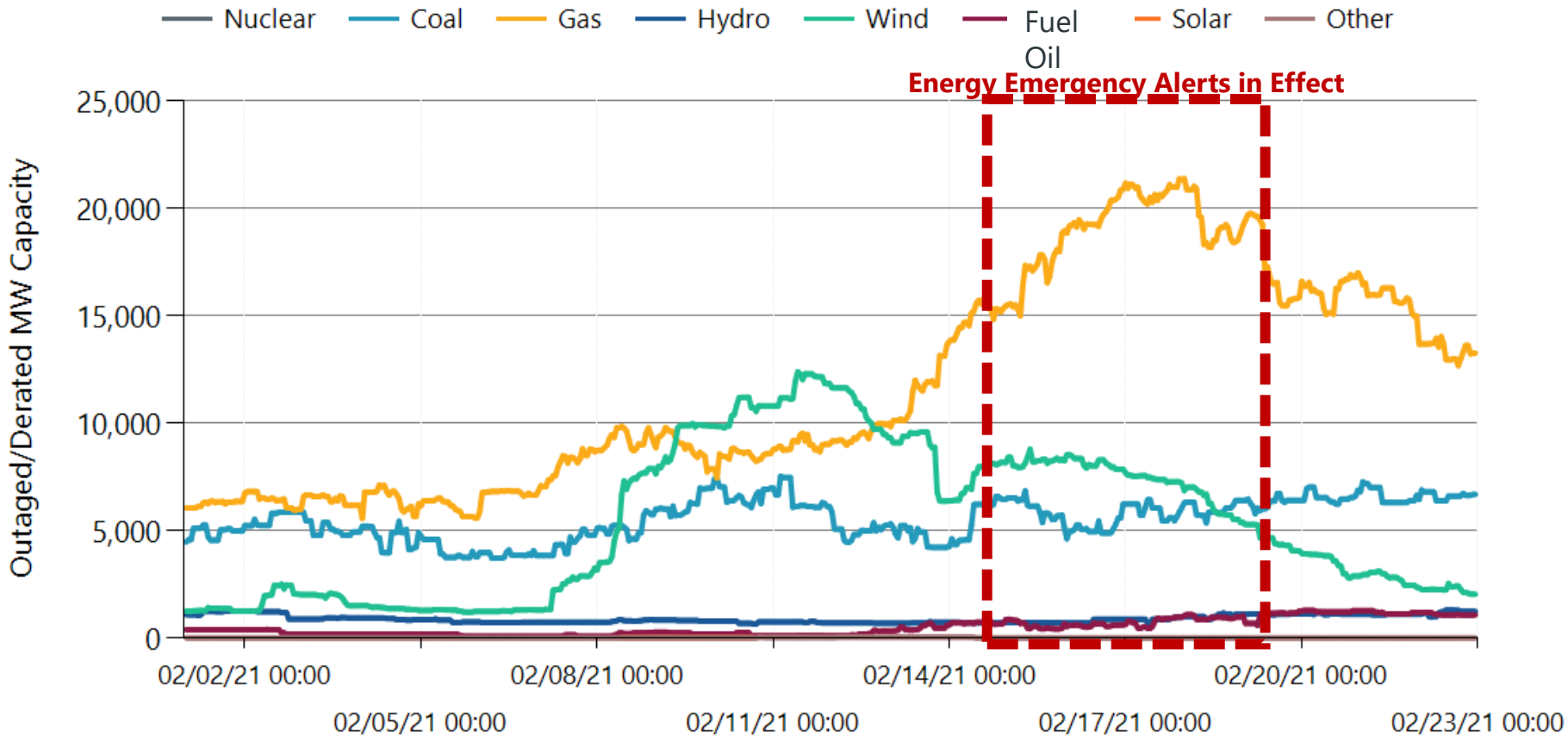


DIESEL PROBLEMS

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

GENERATING CAPACITY OUTAGES

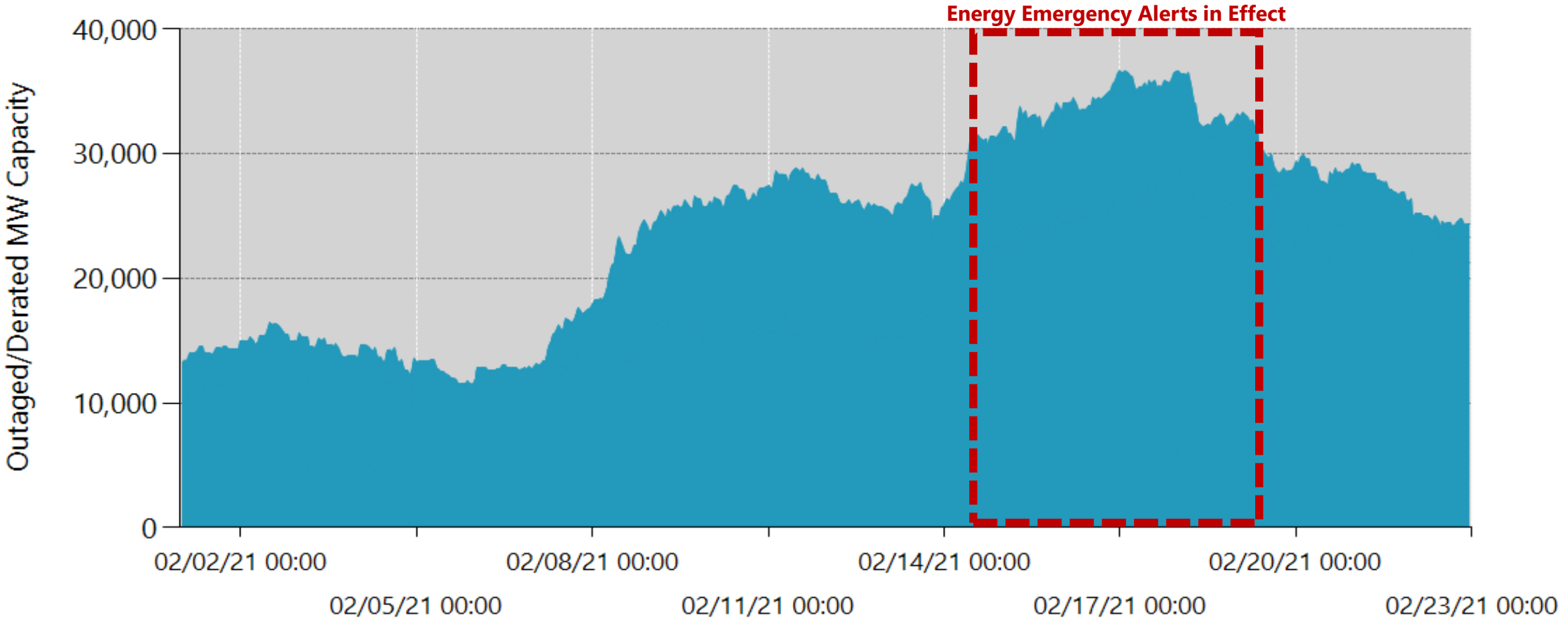
- 42% of Total nameplate gen available
- Wind 15% of nameplate
- Gas 35% of nameplate
- Coal 80% of nameplate



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.

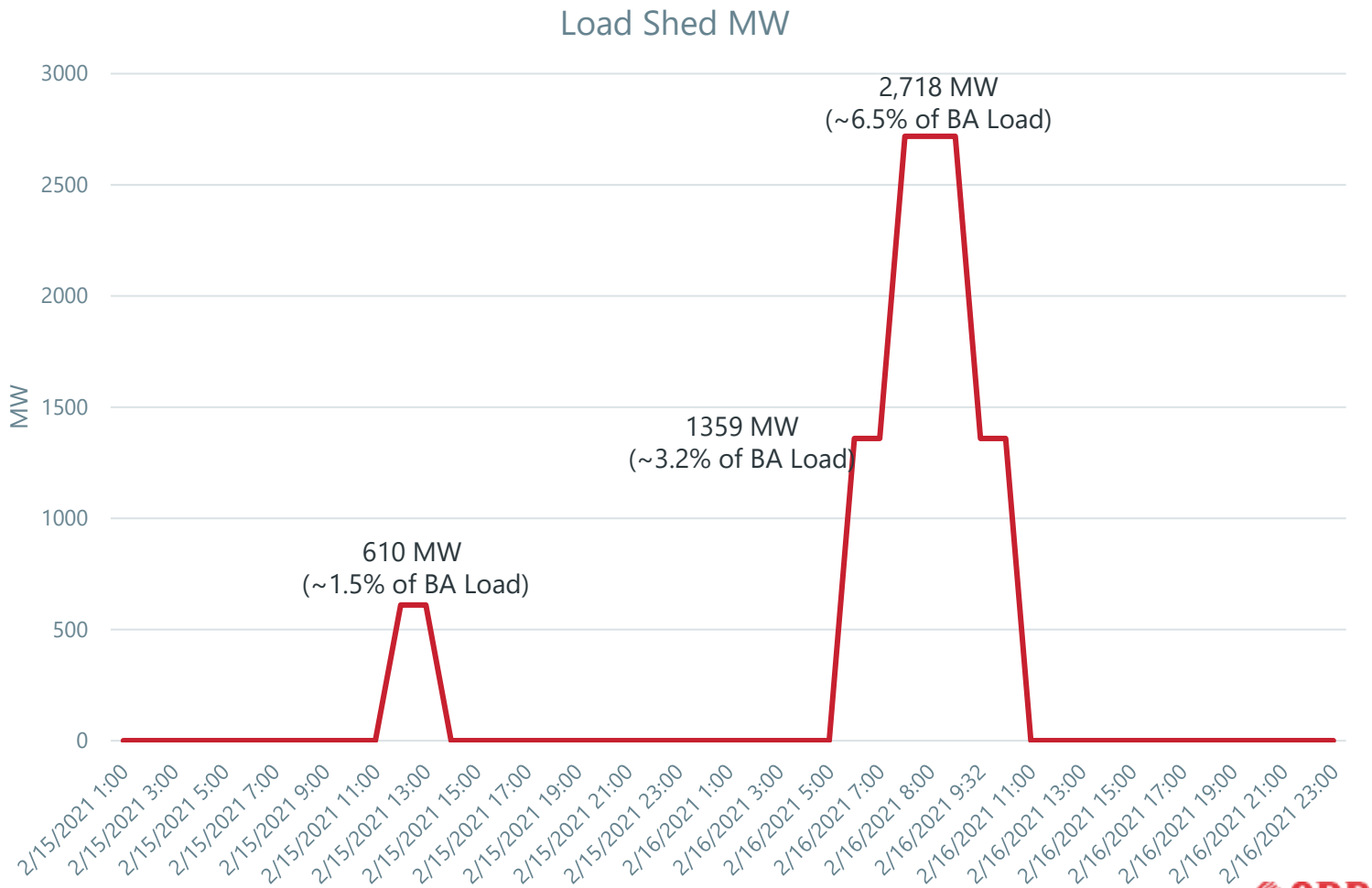


INTERRUPTIONS BY ENTITY

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
SPP Total	**100%**

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