

NERC

NORTH AMERICAN ELECTRIC
RELIABILITY CORPORATION

Polar Vortex Review

Howard Gugel, Director of Performance Analysis

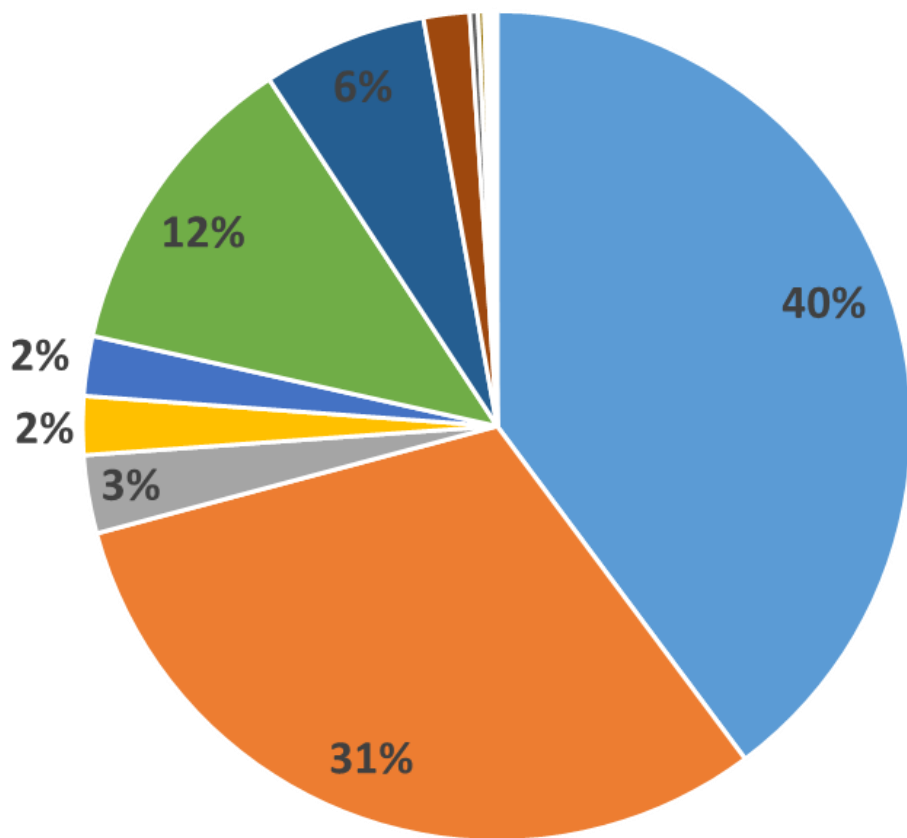
James Merlo, Director of Reliability Risk Management

RELIABILITY | ACCOUNTABILITY

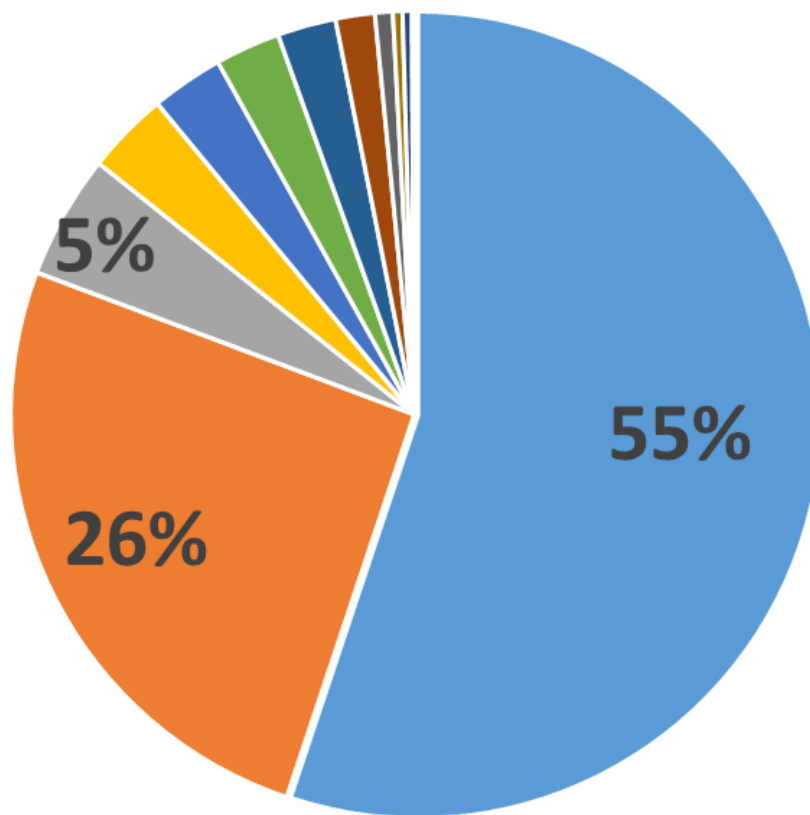


- Polar Vortex was an extreme event that tested resiliency
- Gas availability challenges highlighted in forced outage rates
- Sustain industry winter weather preparedness
- Share lessons learned in both operations and maintenance

- Fuel
 - natural gas interruptions: supply injection, compressor outages, and one pipeline explosion
 - fuel oil delivery problems
 - inability to procure gas
 - fuel oil gelling
- Cold weather effects
 - wind turbine low temperature limits
 - hydro icing
 - failed auxiliary equipment
 - stress of extended run times
- Frozen instrumentation
 - drum level sensors
 - control valves
 - flow and pressure sensors



- Gas
- Coal
- Waste Heat
- Distillate Oil
- Oil
- Nuclear
- Water
- Lignite
- Kerosene
- Other - Solid (Tons)
- Other - Gas (Cu. Ft.)
- Wood
- Other - Liquid (BBL)
- Biomass
- JP4 or JP5
- Peat
- Petroleum Coke
- Propane

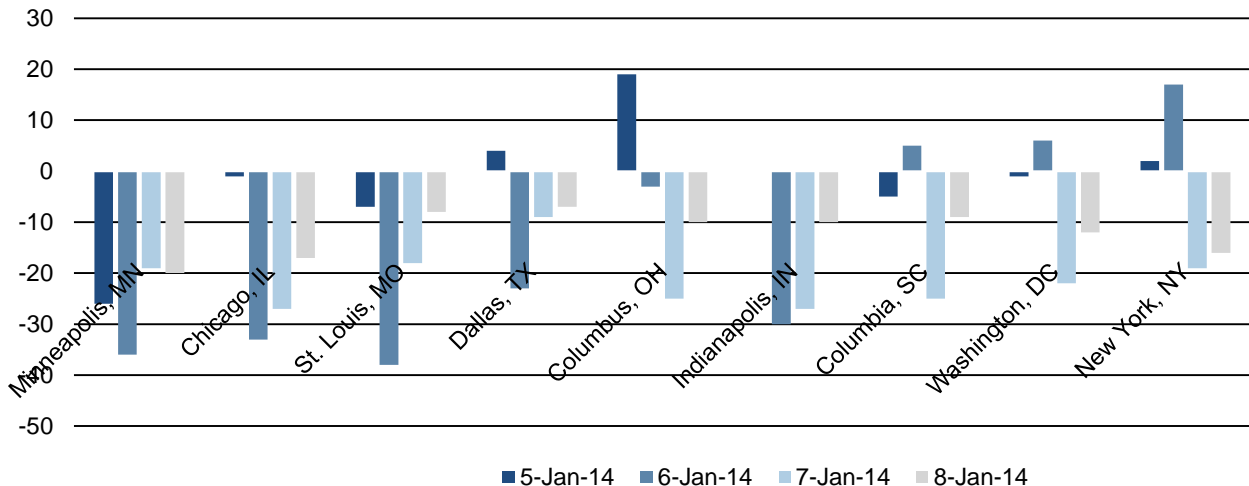


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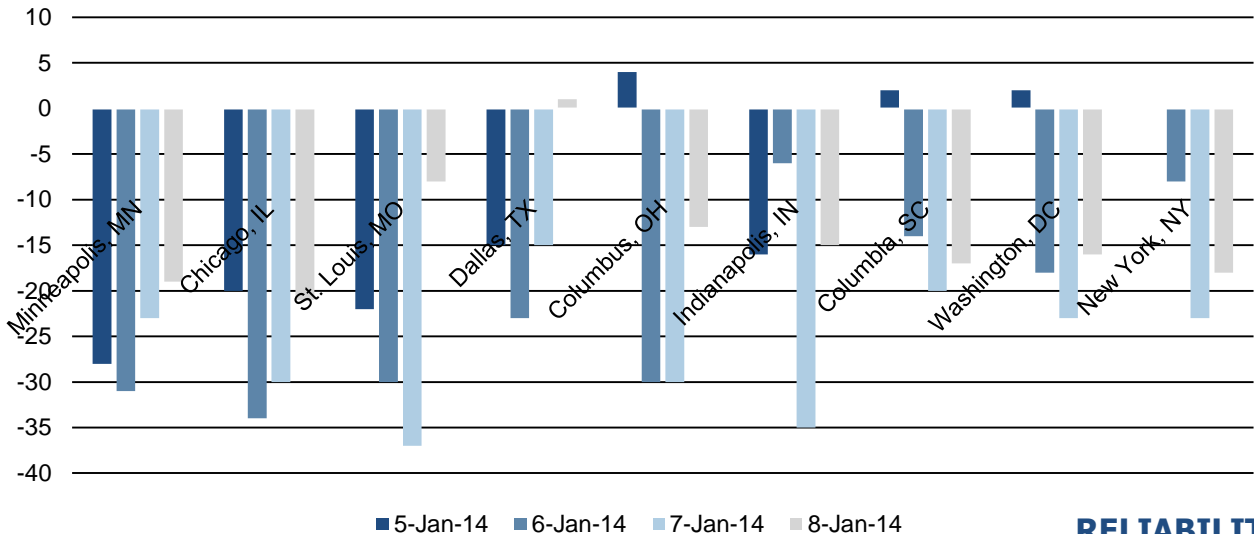
	MISO	ISO-NE	NYISO	PJM	SPP	TVA	VACAR	South-eastern RC	TRE	FRCC
Previous Winter peak (% of previous peak)	99,855	22,818	25,541	136,675	32,635	43,384	42,983	46,259	57,265	36,926
6-Jan-14	109,307 (109.5%)	18,500 (81.1%)	23,197 (90.8%)	131,142 (95.5%)	36,602 (112.2%)	43,277 (99.8%)	50,659 (117.9%)	44,871 (97.0%)	56,031 (97.8%)	30,231 (81.9%)
7-Jan-14	104,746 (104.9%)	21,300 (93.3%)	25,738 (100.8%)	140,510 (103.5%)	36,079 (110.6%)	44,285 (102.1%)	44,654 (103.9%)	48,279 (104.4%)	57,277 (100.0%)	35,638 (96.5%)
8-Jan-14	100,154 (100.3%)	20,800 (91.2%)	24,551 (96.1%)	133,288 (98.1%)	31,944 (97.9%)	39,820 (91.8%)	43,203 (100.5%)	47,005 (101.6%)	45,281 (79.1%)	29,251 (79.2%)

 New all-time winter peak

Deviation from Normal Highs (Fahrenheit)



Deviation from Normal Lows (Fahrenheit)





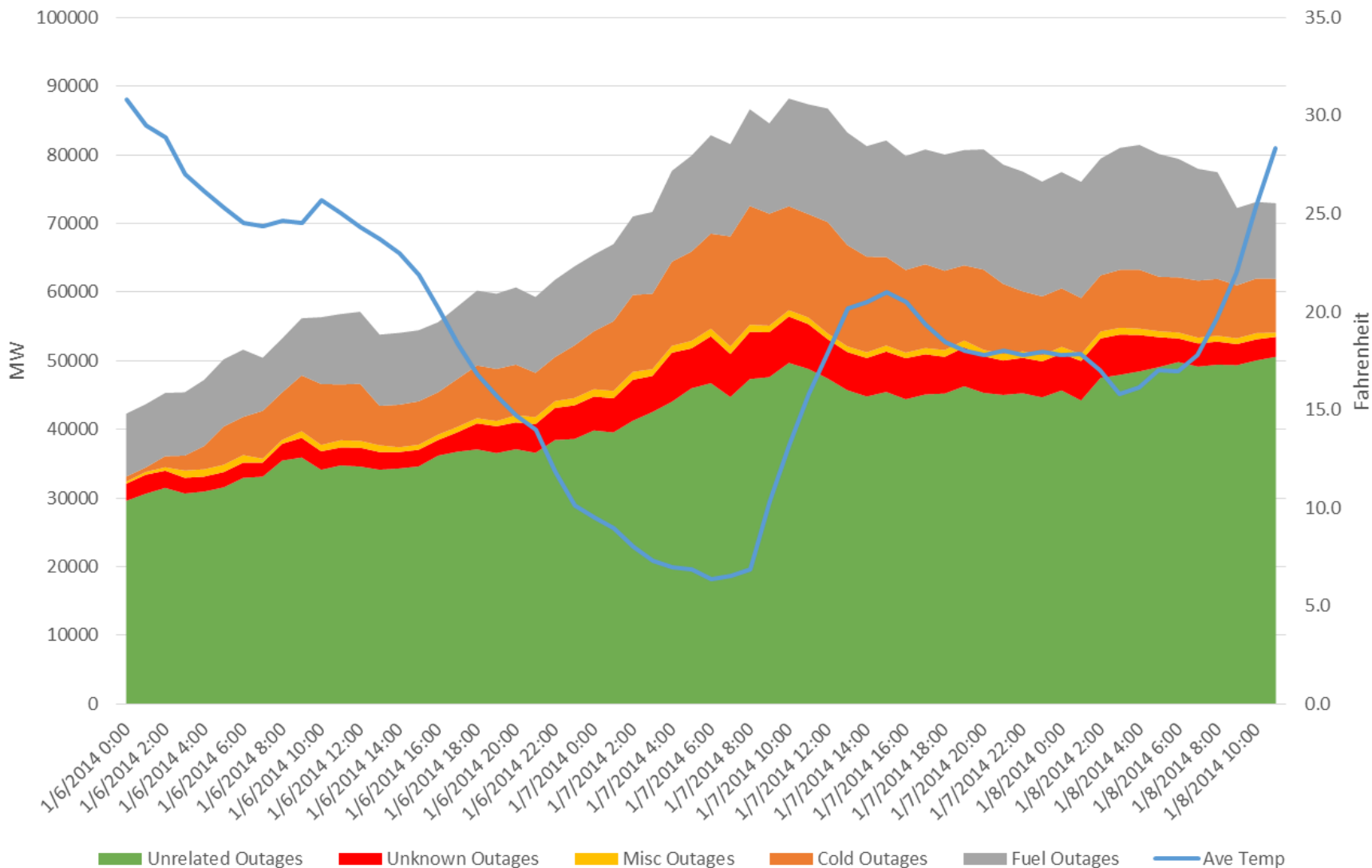
Questions and Answers

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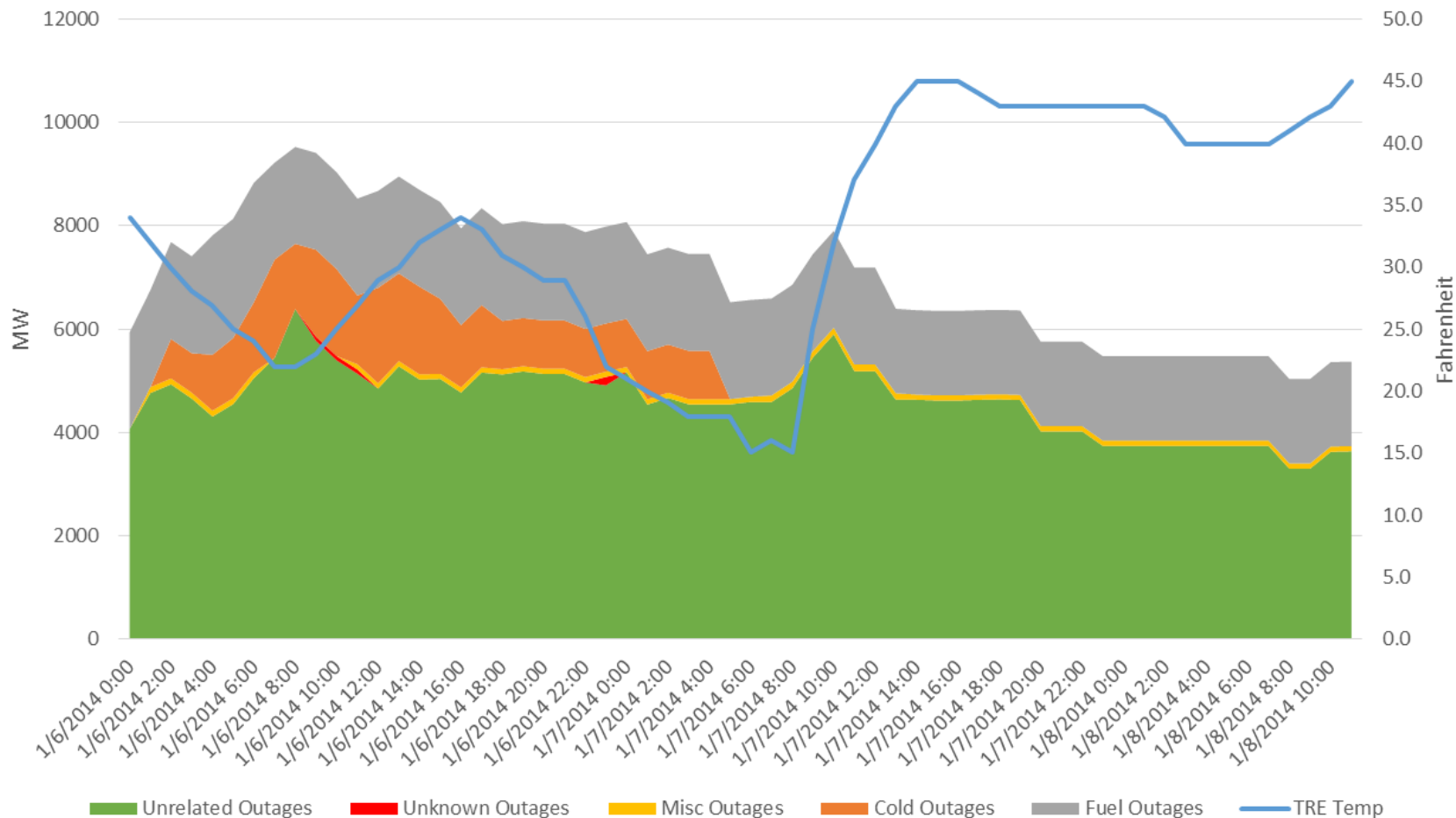
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Backup Slides

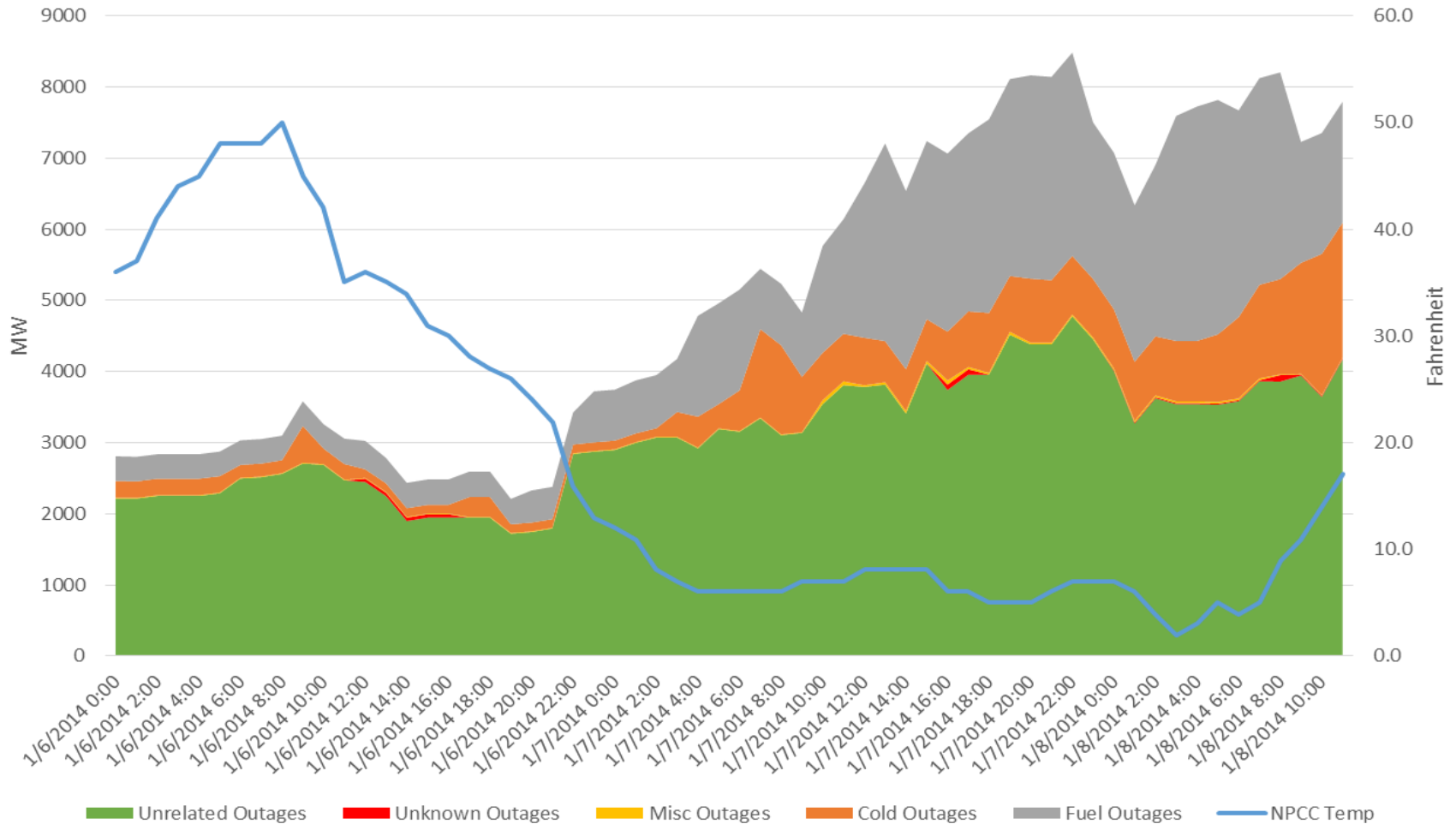
NERC (No WECC): Cumulative Impact of Outage Type vs Temperature (F)



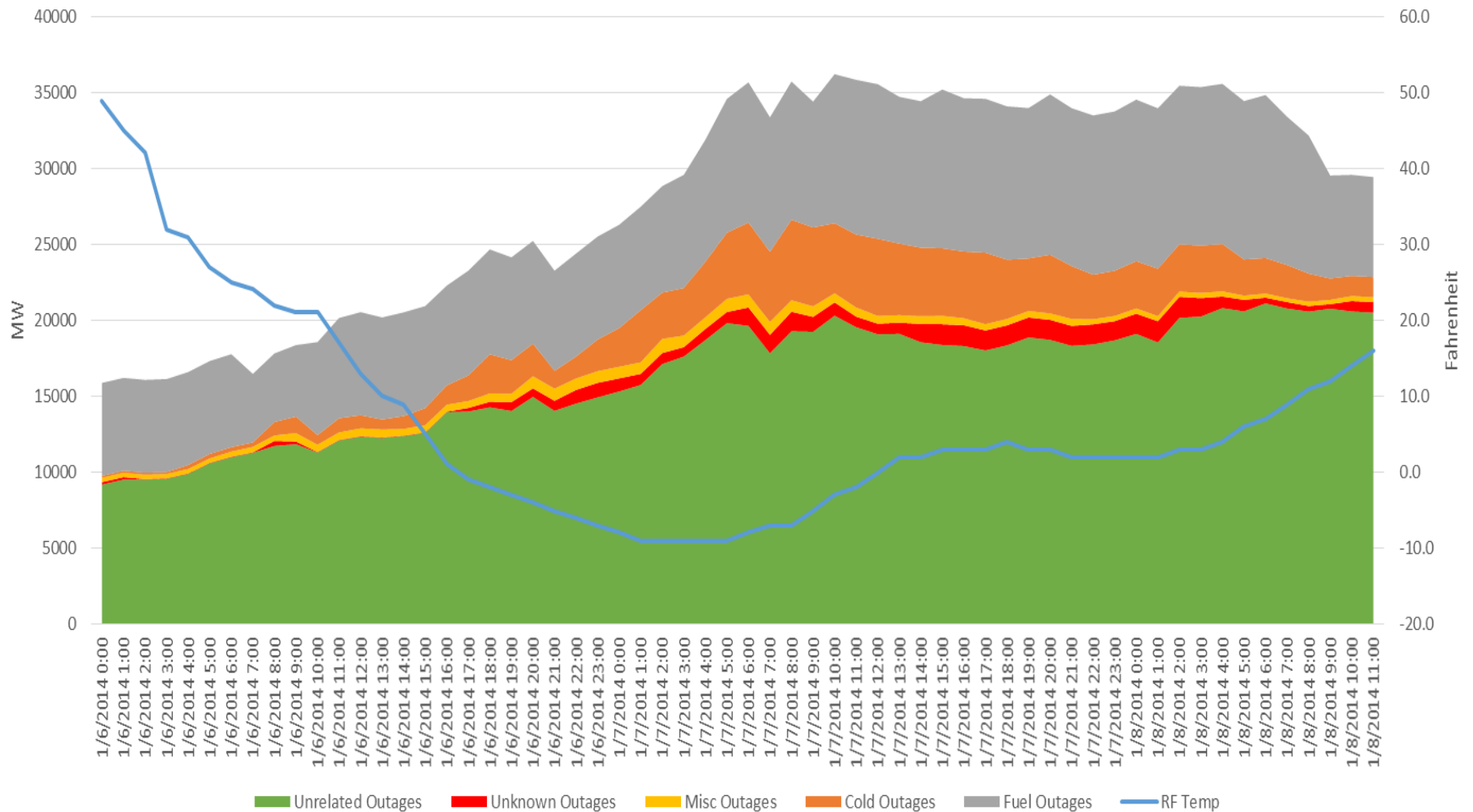
TRE: Cumulative Impact of Outage Type vs Temperature (F)



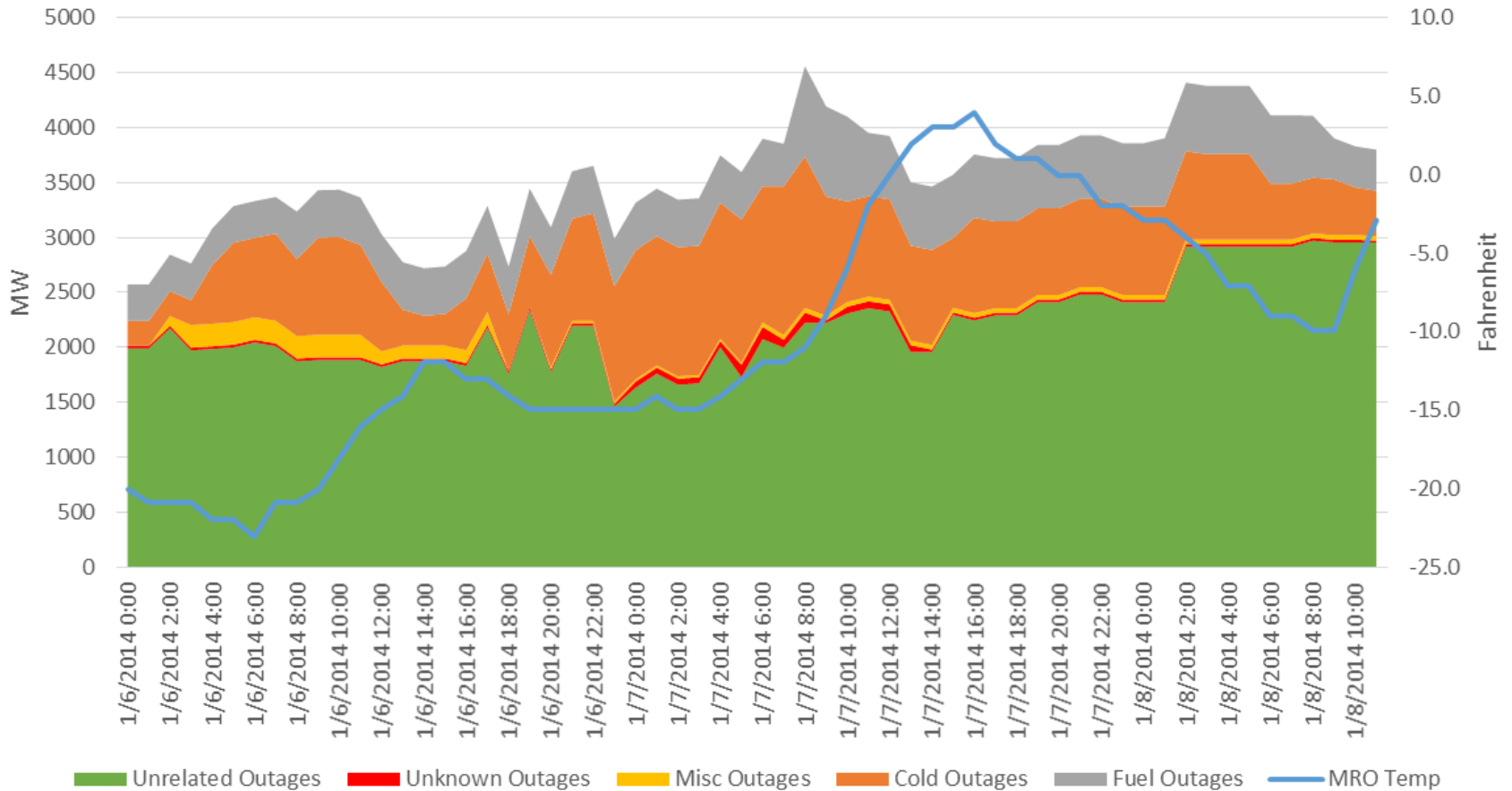
NPCC: Cumulative Impact of Outage Type vs Temperature (F)



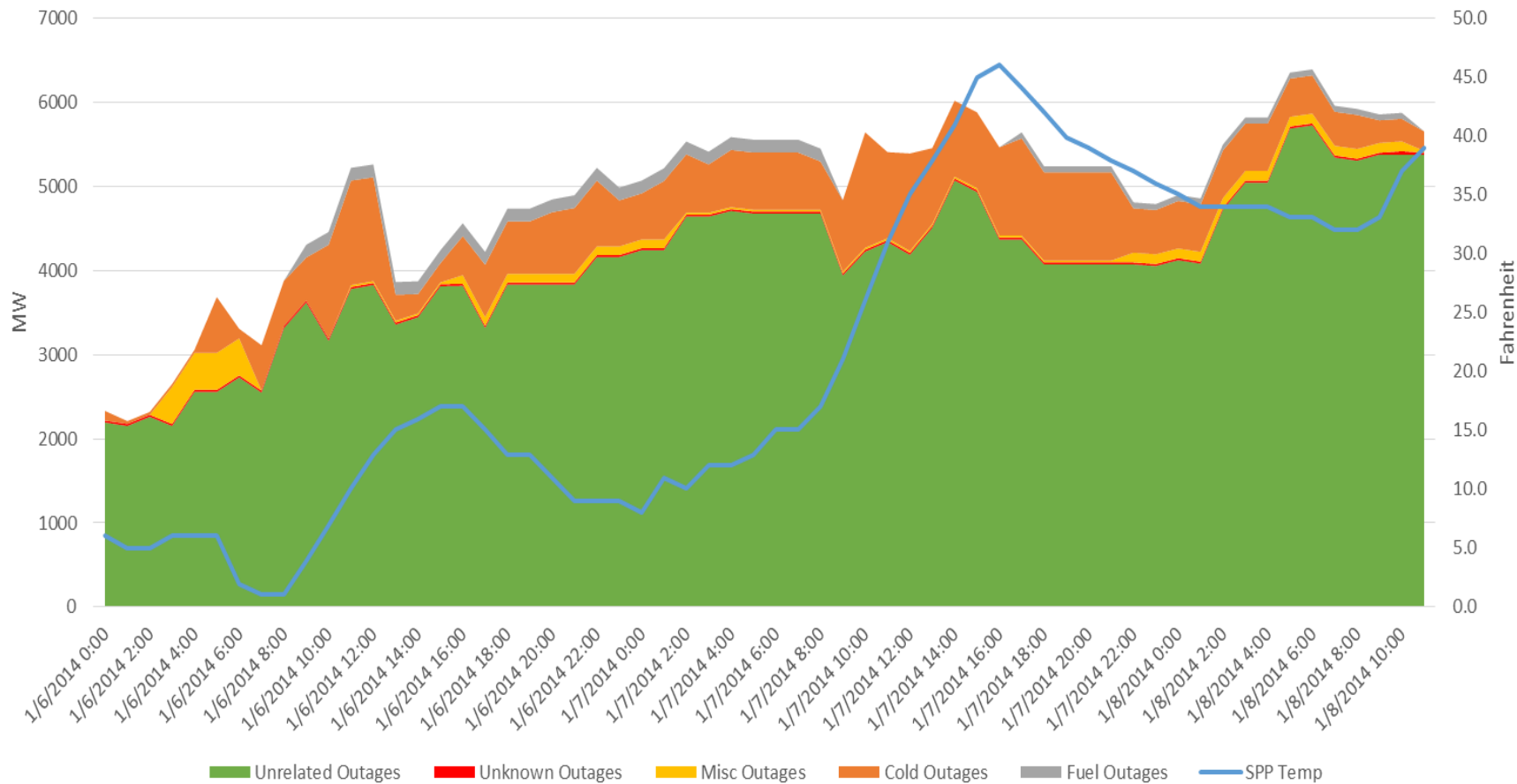
RF: Cumulative Impact of Outage Type vs Temperature (F)



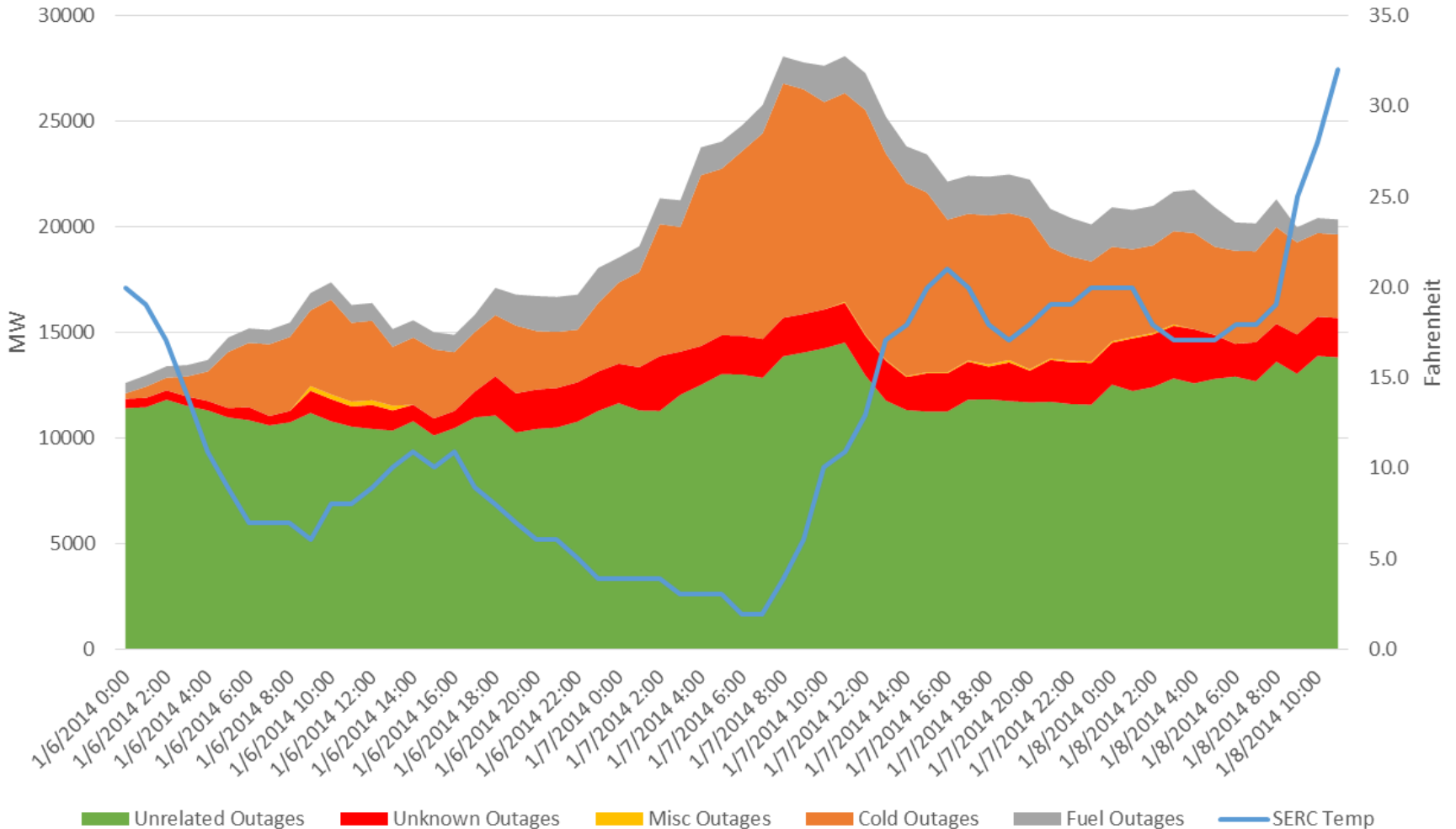
MRO: Cumulative Impact of Outage Type vs Temperature (F)



SPP: Cumulative Impact of Outage Type vs Temperature (F)



SERC: Cumulative Impact of Outage Type vs Temperature (F)



FRCC: Cumulative Impact of Outage Type vs Temperature (F)

