WECC

Y20 Extreme Heat Assumptions

Jun 5, 2023

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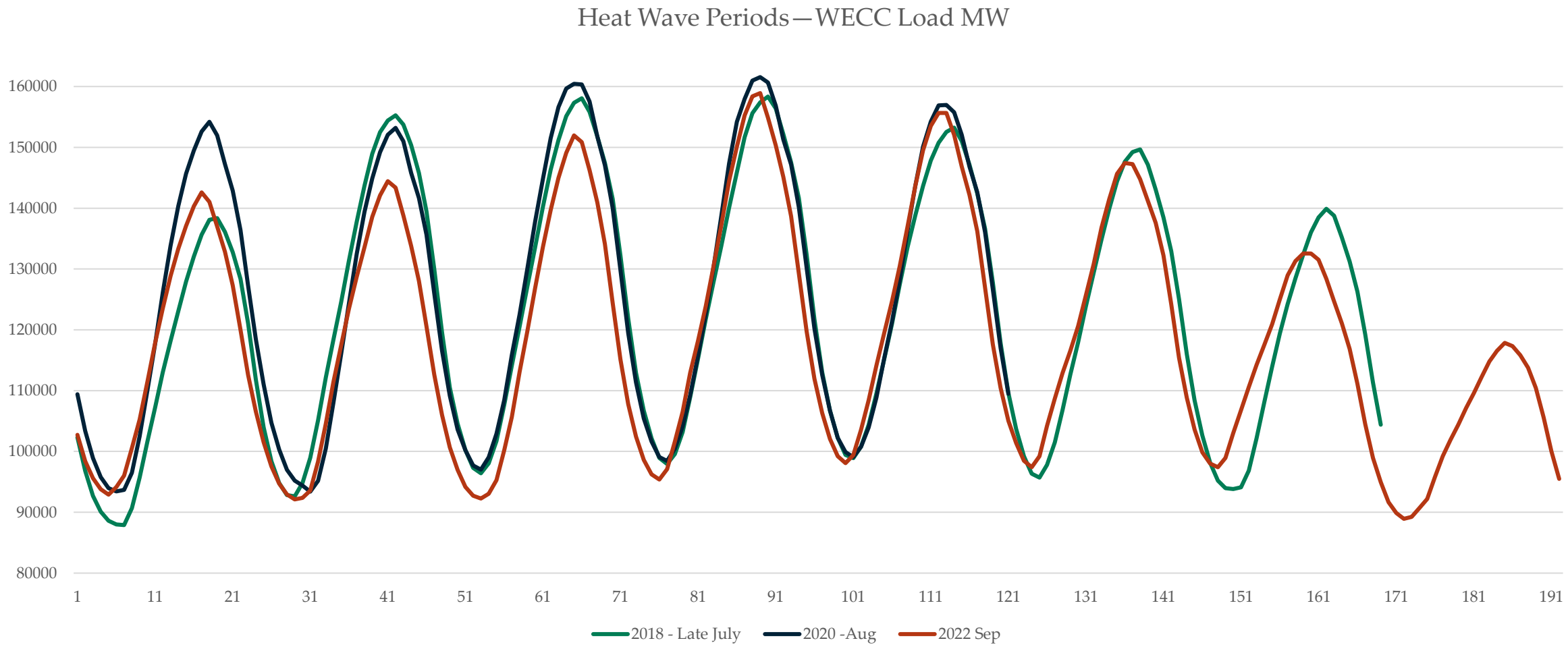
Scope of Work

- Y20 Heat Wave Event:
  - A period of abnormally hot weather generally lasting more than two days.
  - Covers a large area, exposing a high number of people to hazardous heat.
- A heat wave event modeled 20 years out based on a heat wave event in recent years
  - Y20 load and resources—business as usual
  - WECC-wide event during summer months (Jun–Aug) lasting 5–7 days
  - Higher loads than expected
  - Capacity derate during the event—thermal, wind, solar
  - Other consideration—FOR, Transmission derates

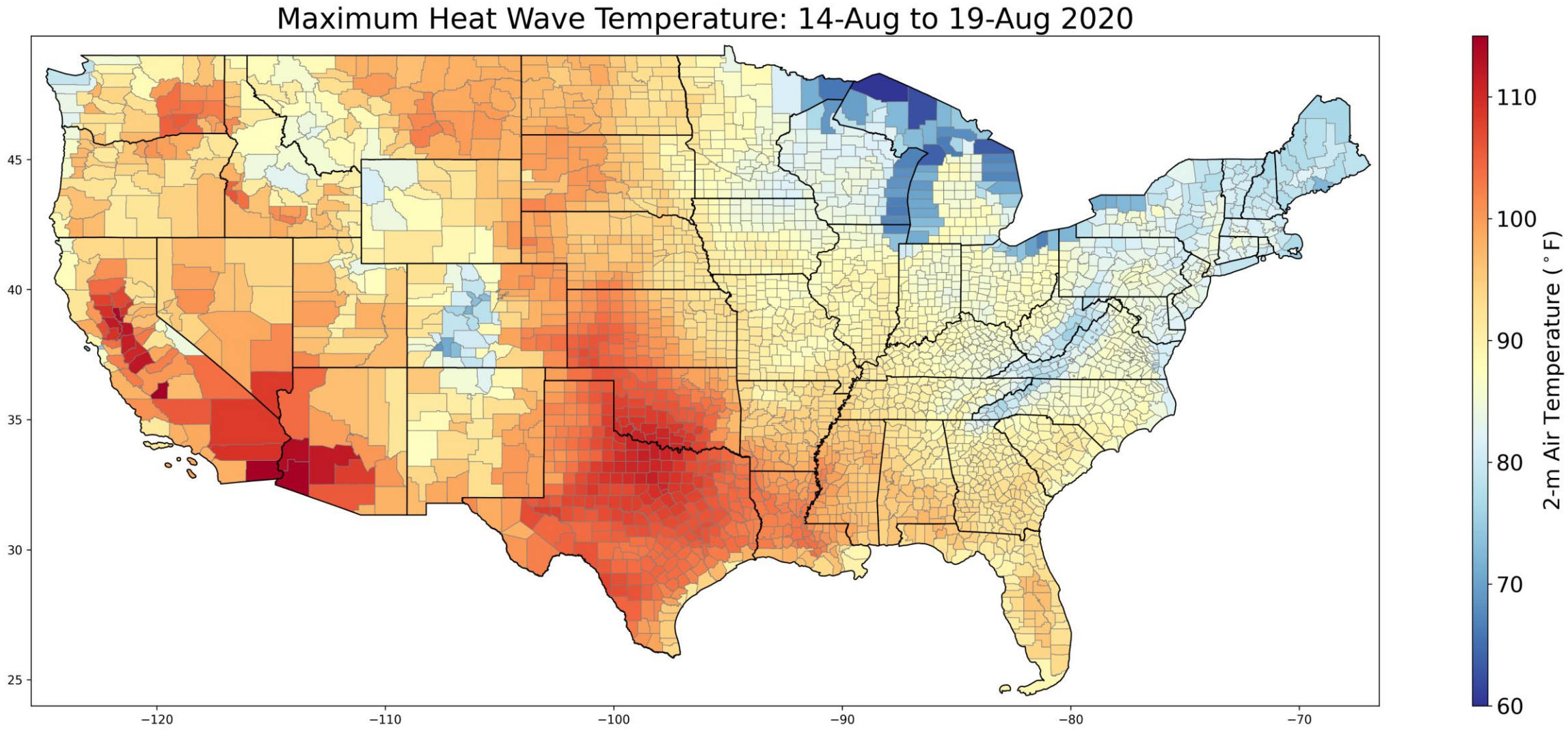
Historic Heat Wave Event

Event Year	Dates	Peak Average WECC temperature (population weighted) (deg F)	Peak Load (MW)
2017	Aug 26–Sep 3	94.6	154,049
2018—Early July	Jul 3–10	92.6	150,342
2018—Late July	July 22–Jul 28	93	158,347
2019	Aug 13–21	91	150,949
2020	Aug 14–19	95.6	161,533
2021	Jun 25–Jul 2	91	149,934
2021	Jul 8–11	92.1	157,083
2022	Sep 1–7	96.3	158,929

Historic Heat Wave Event

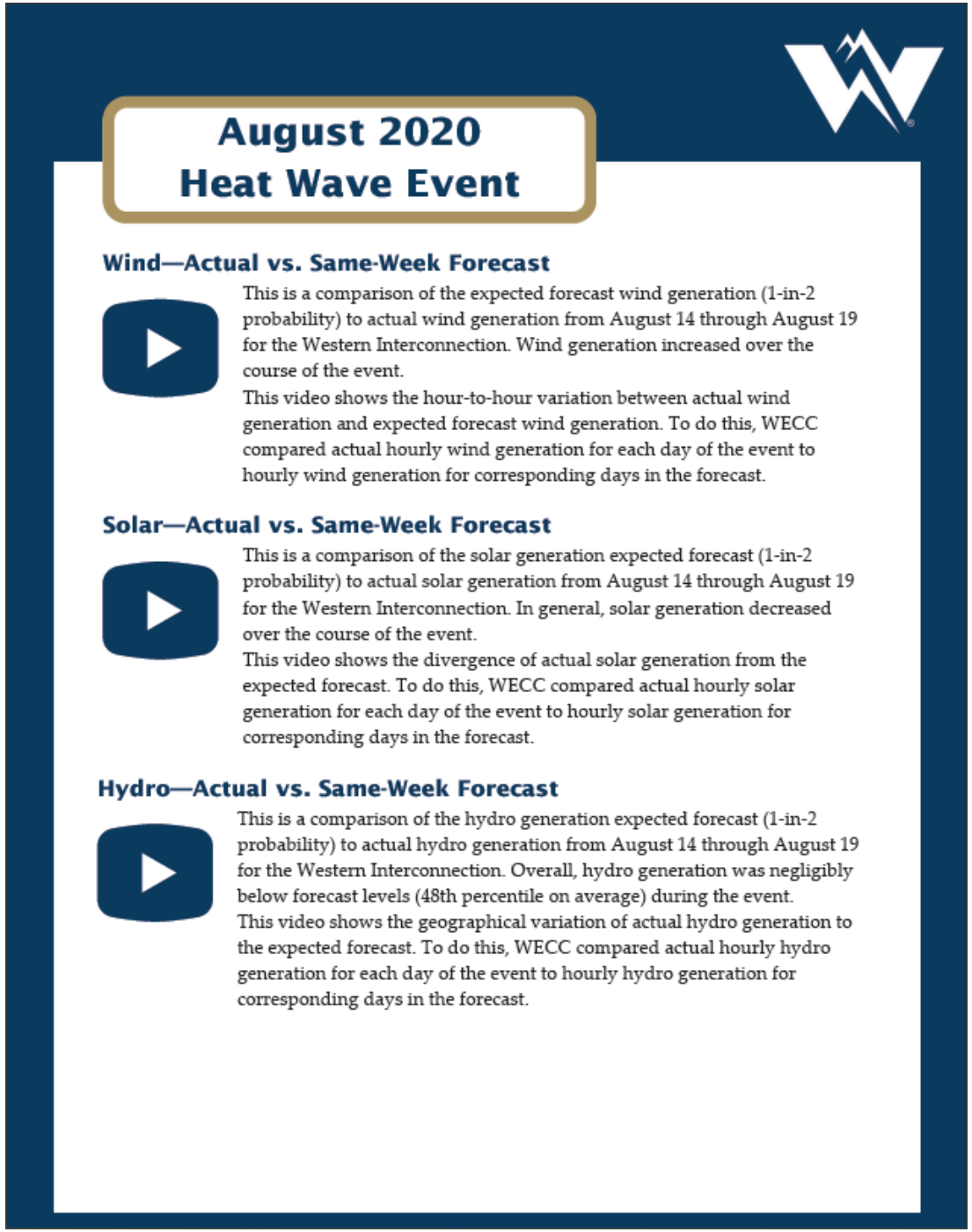


Aug 2020 Heat Wave



Loads

Load modifier for each BA—use 95th percentile of WECC 2023 probabilistic forecast

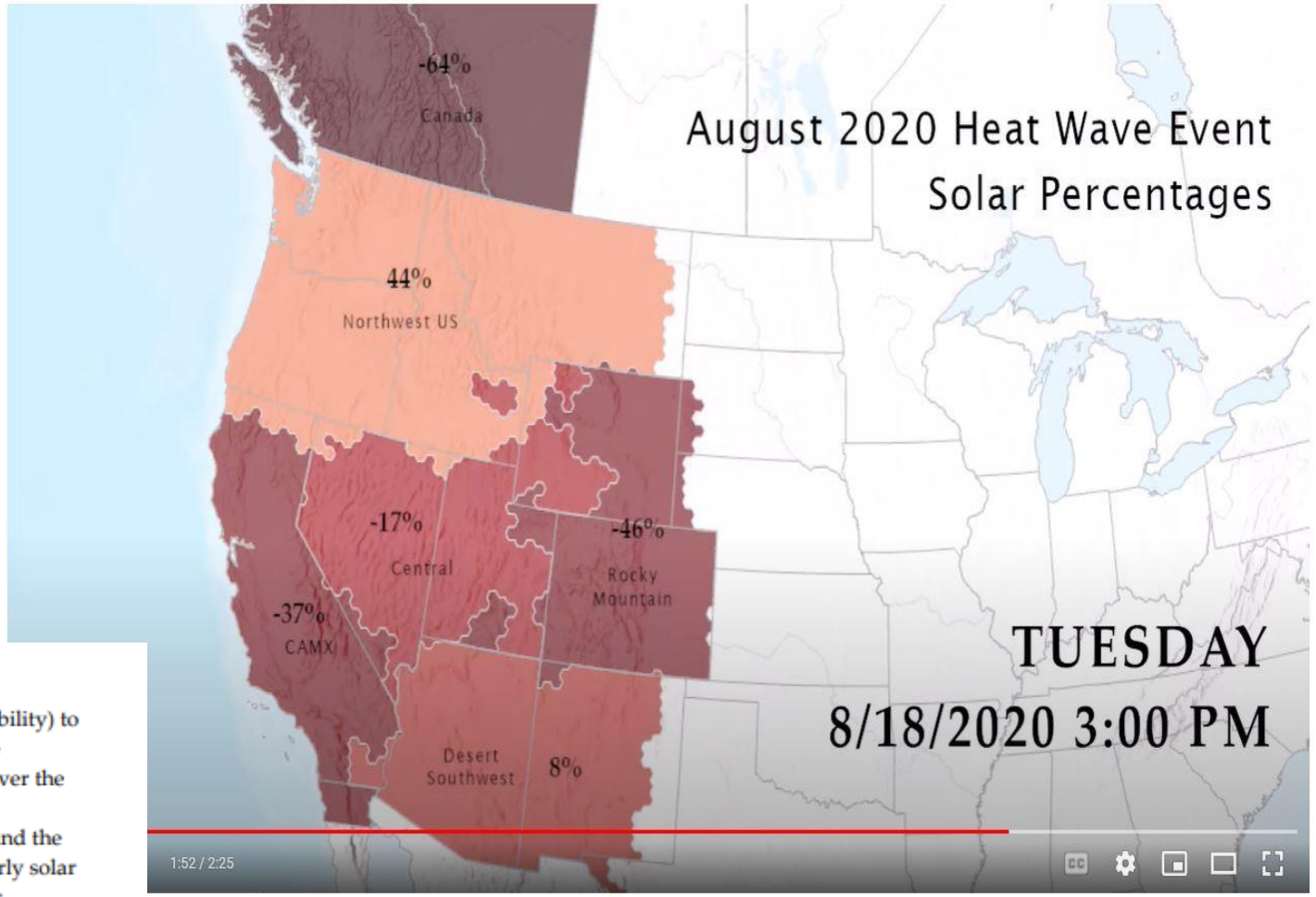


https://www.wecc.org/EventAnalysisSituationalAwareness/Pages/default.aspx#August2020HeatwaveEvent

<Public>

Solar

Solar modifier for Regions—by comparing actual 2020 solar generation during the event to expected generation for the same period in 2020.



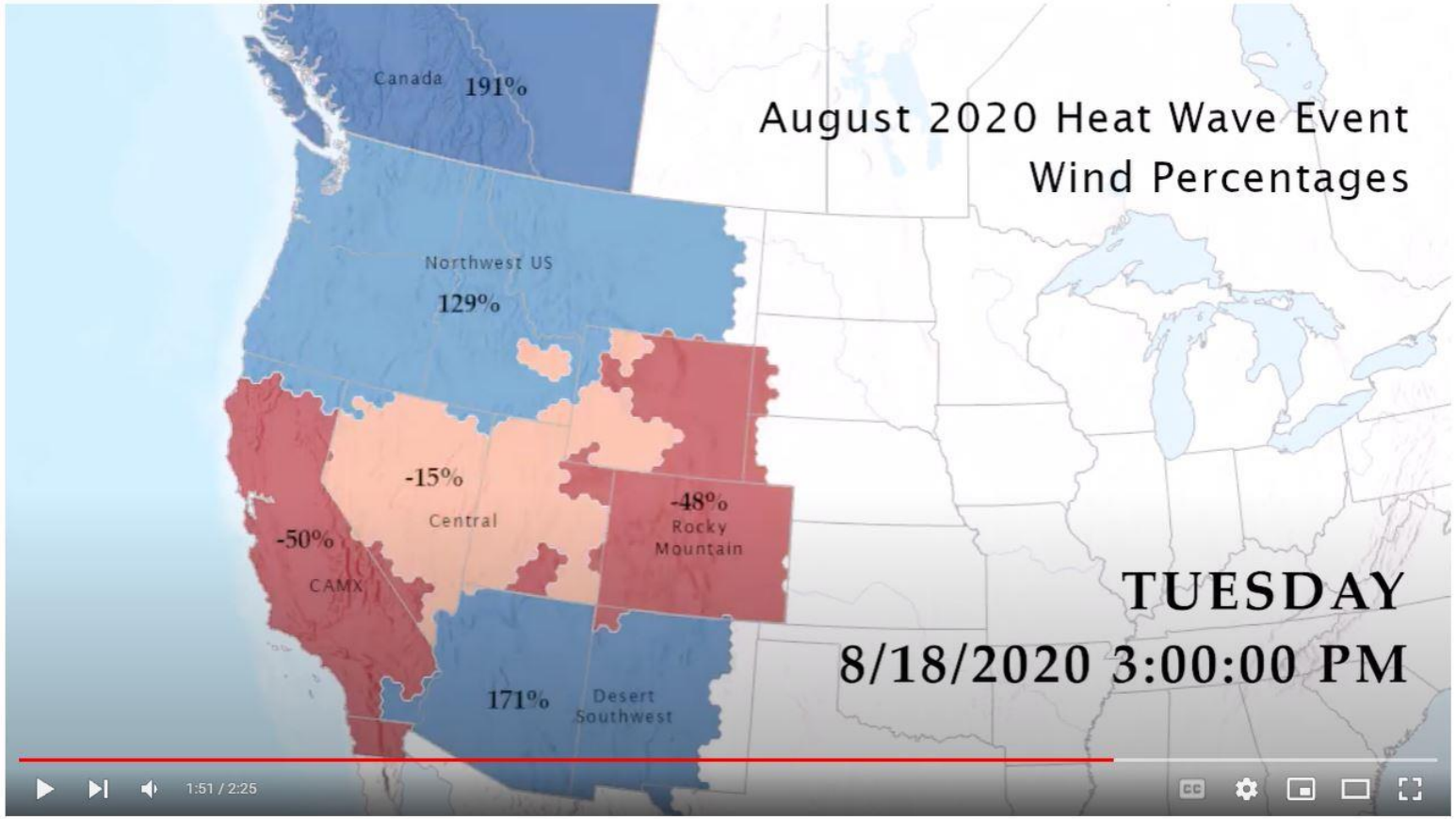
Solar—Actual vs. Same-Week Forecast

This is a comparison of the solar generation forecast (1-in-2 probability) to actual solar generation from August 14 through August 19 for the Western Interconnection. In general, solar generation decreased over the course of the event.

This video shows the difference between actual solar generation and the solar generation forecast. To do this, WECC compared actual hourly solar generation for each day of the event to hourly solar generation for corresponding days in the forecast.

Wind

Wind modifier for Regions—by comparing actual 2020 wind generation during the event to expected generation for the same period in 2020.

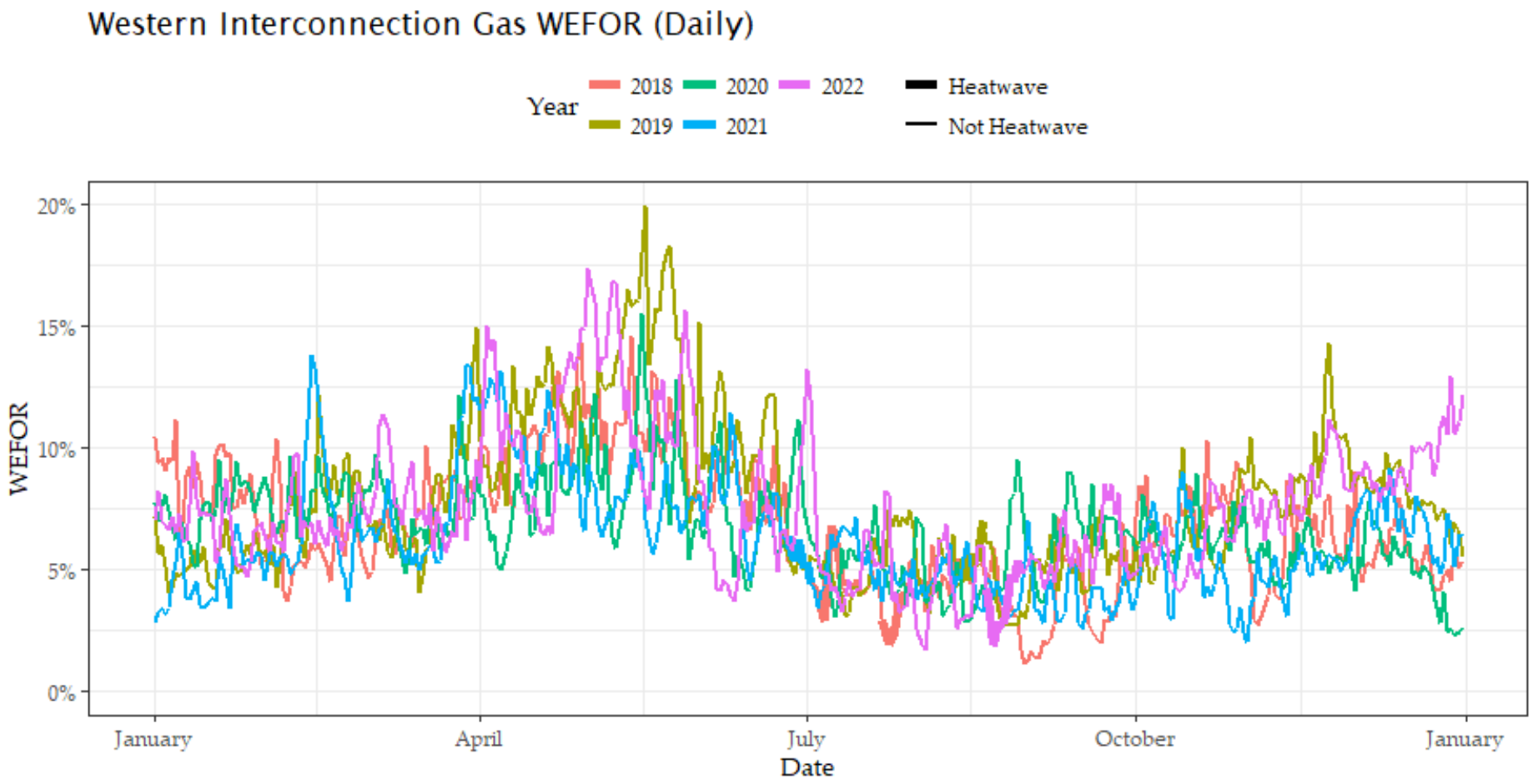


Thermal Capacity Derates

- Derates depended on ambient temperature, humidity and turbine type, cooling technology
- Generalized derate assumption derived from Wartsila and CPCU proposal from 5 to 10% for all thermal units in the Western Interconnection:
  - 5% capacity reduction in areas with lower temperature during historic heat wave event
  - 10% capacity reduction in areas with highest temperatures during historical heat wave event
- Reference:
  - https://www.wartsila.com/energy/learn-more/technical-comparisons/combustion-engine-vs-gas-turbine-derating-due-to-ambient-temperature
  - https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M501/K282/501282461.PDF

Forced Outage Rates

No change in FOR assumed for extreme heat assessment from Y20 foundational case



Transmission Derate

- Only few BAs submit both summer and winter transmission line ratings. Temperature operational limits for these ratings are not known
- Generalized assumption:

> Bartos el al. "By mid-century, average transmission capacity reductions range from 1.9%–3.9% under the lowest carbon concentration scenario (RCP 2.6) to 2.2%–4.3% under the medium carbon concentration scenario (RCP 4.5), to 3.6%–5.8% under the highest carbon concentration scenario (RCP 8.5)."

- Further discussions are in progress

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Electric Reliability and Security for the West

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