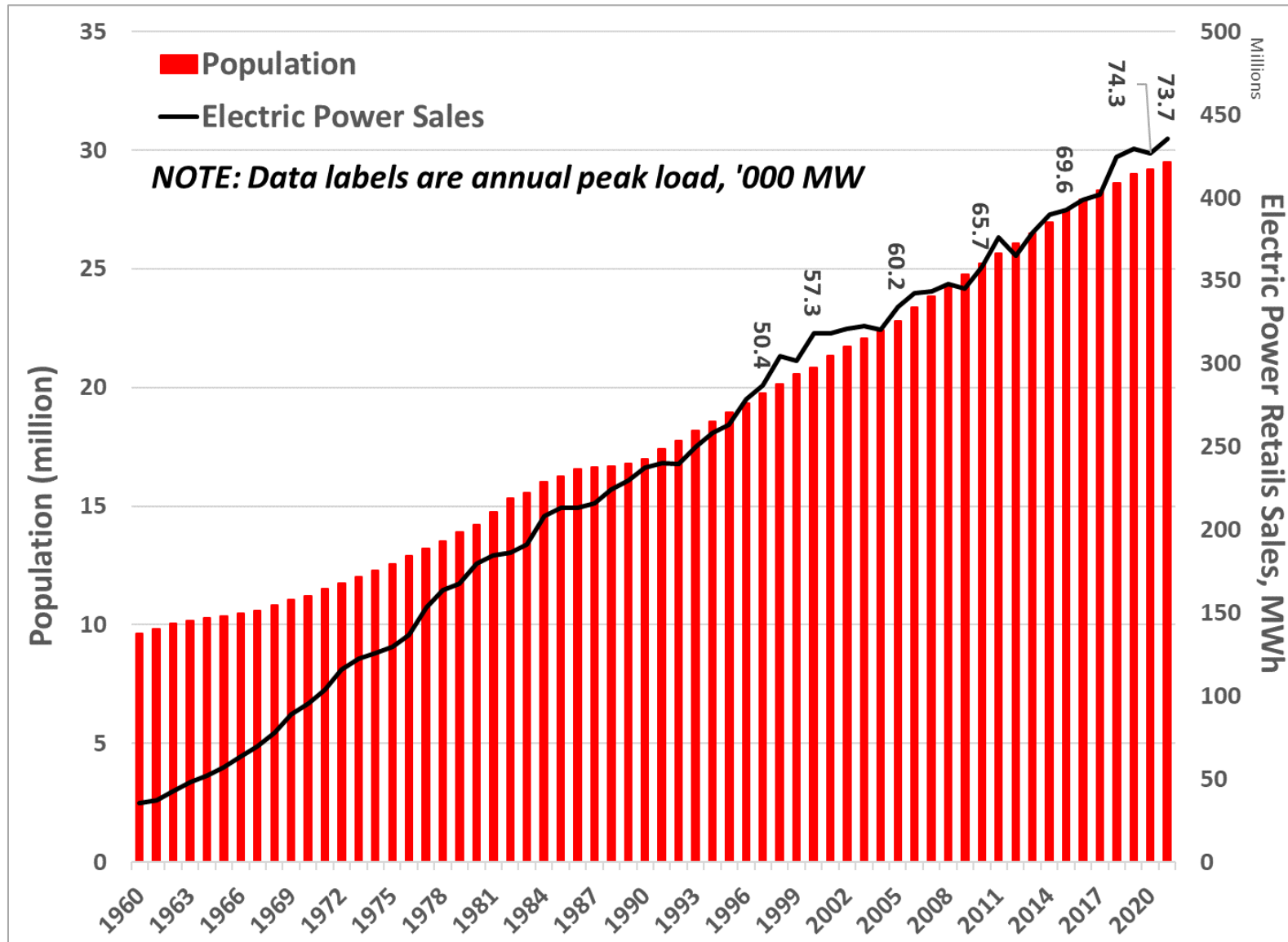


Life in ERCOT

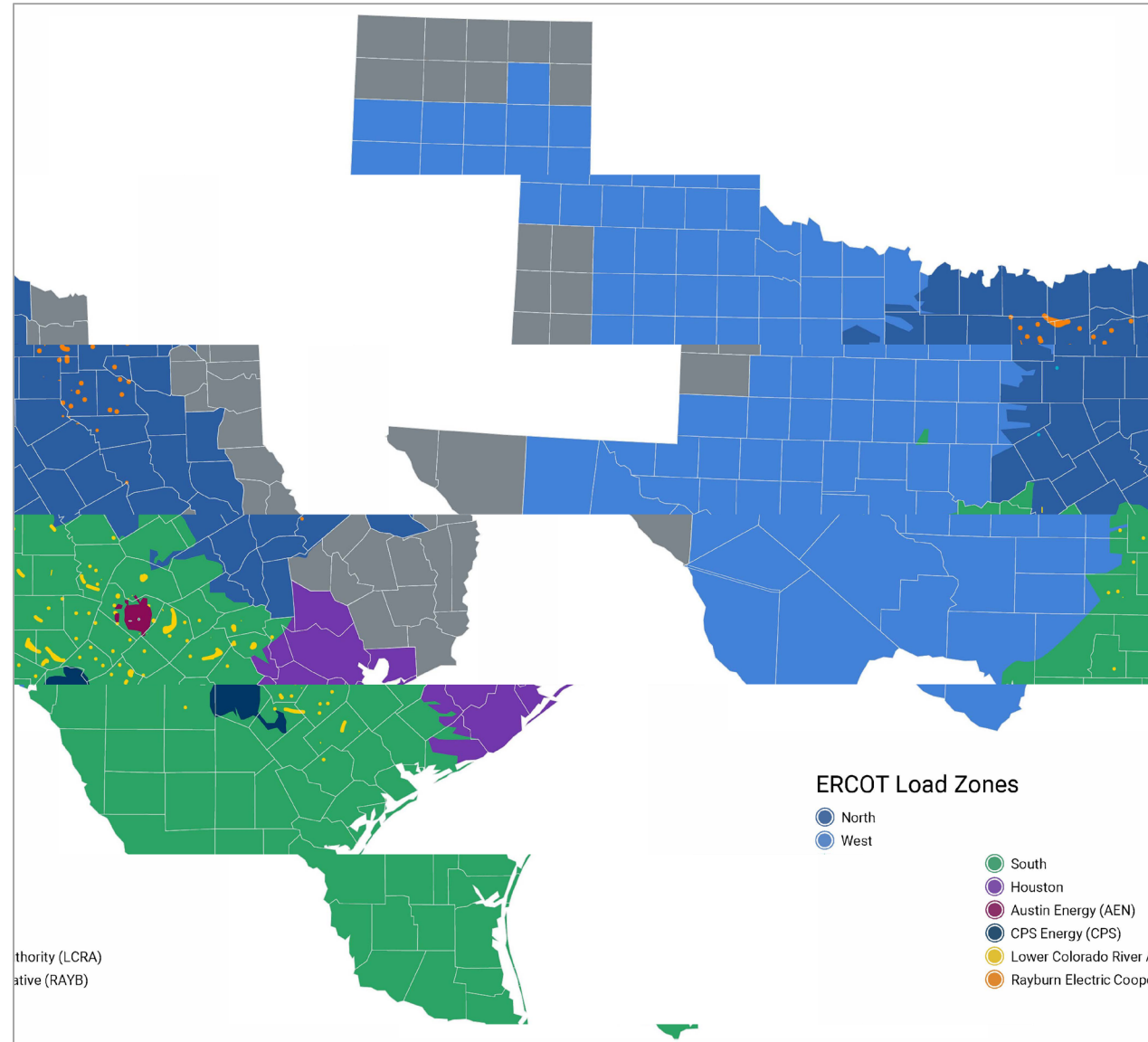


Michelle Michot Foss, Ph.D.
CES Fellow in Energy, Minerals & Materials
EPRINC Electricity Roundtable, August 2, 2024

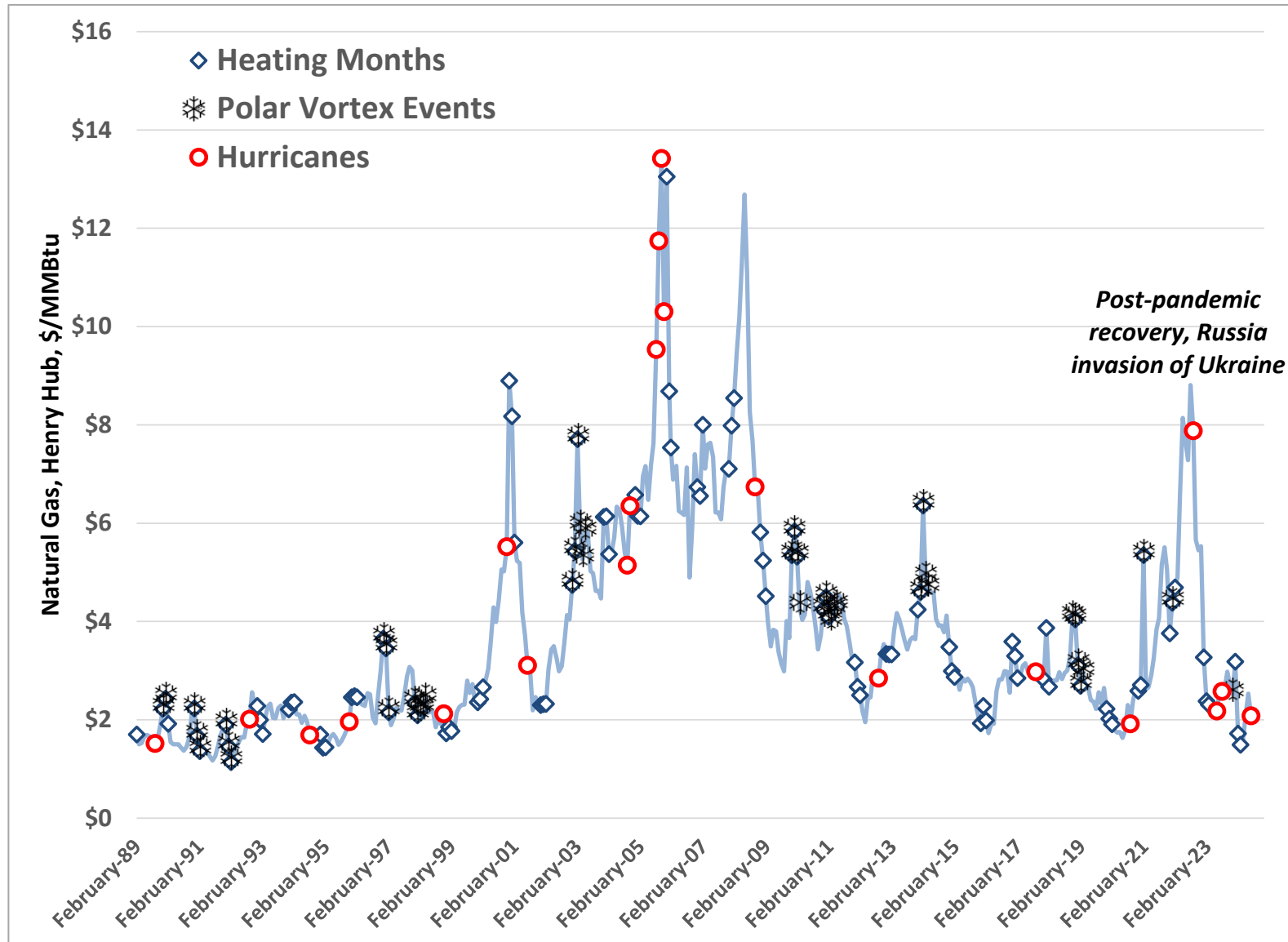
Welcome to the Republic of Texas



U.S. Census Bureau, EIA, and ERCOT, <https://www.ercot.com/static-assets/data/news/Content/a-peak-demand/records-yearly-archive.htm>.



Weather Happens



By author using CME Nymex (EIA), NOAA NWS

Figure 6 — Wind Generation in ERCOT, 15-Minute Intervals, Jan. 1, 2009–Nov. 30, 2023

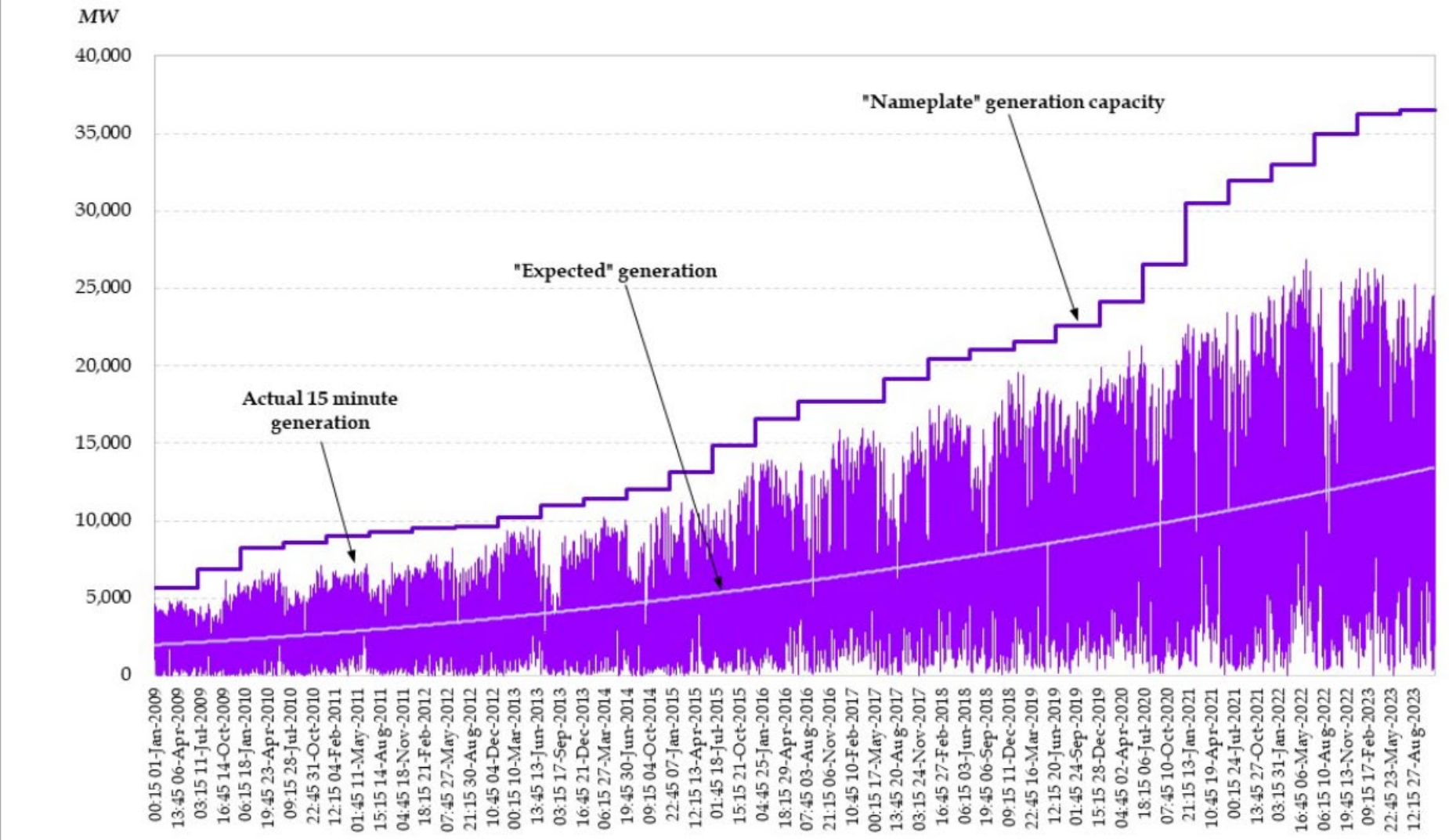


Figure 7 — Solar Generation in ERCOT, 15-Minute Intervals, July 1, 2011–Nov. 30, 2023

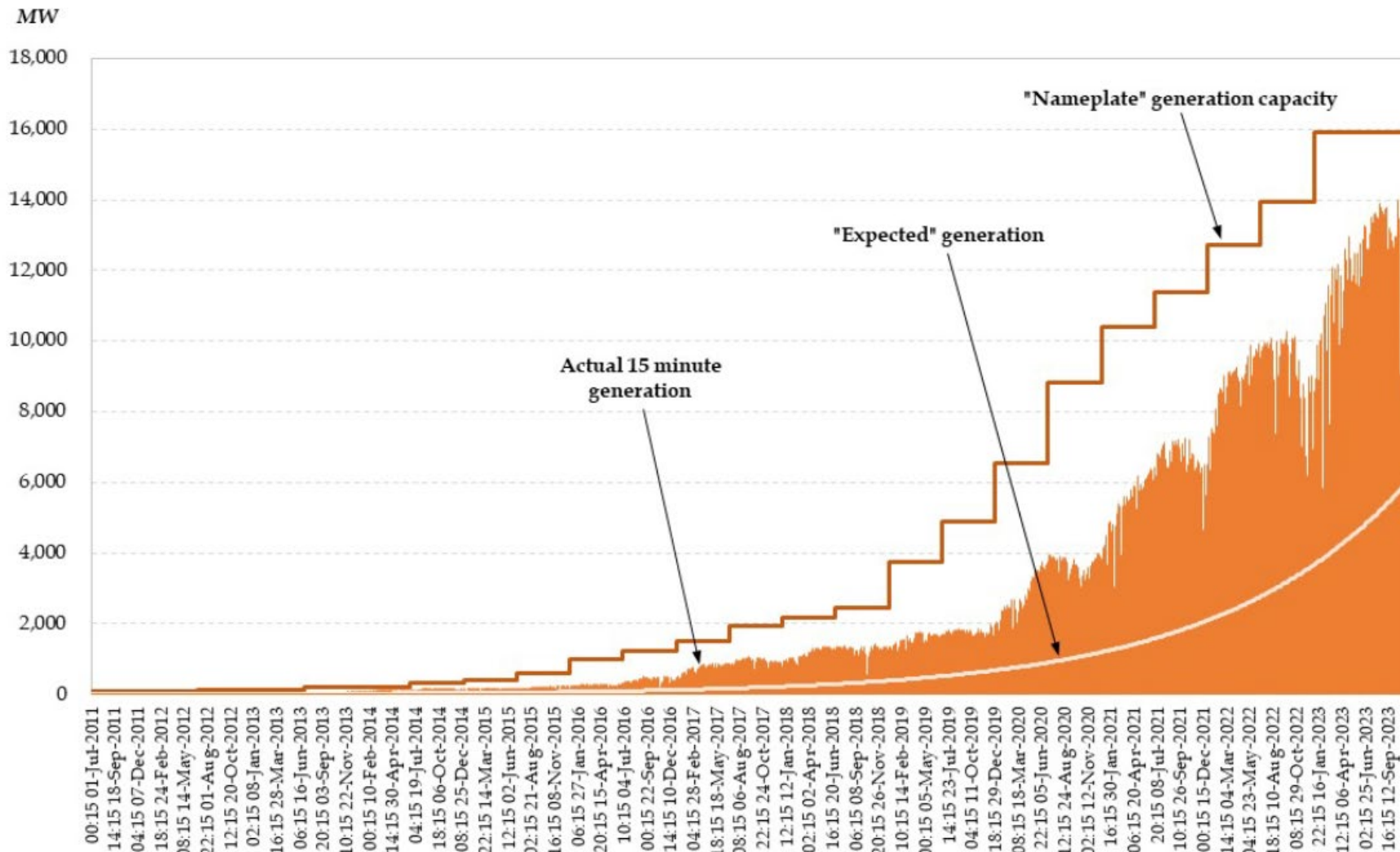
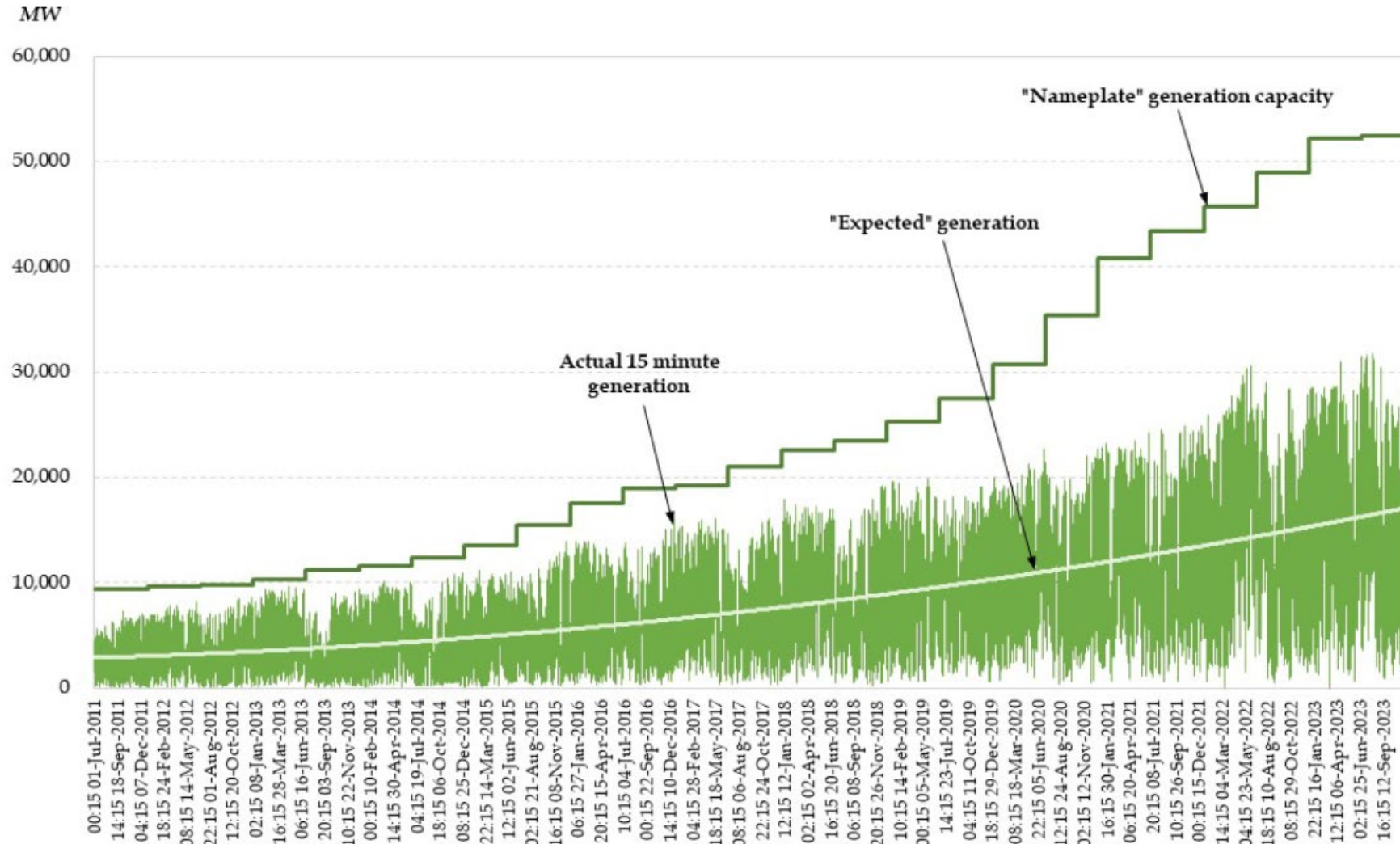


Figure 8 — Wind *Plus* Solar Generation in ERCOT, 15-Minute Intervals, July 1, 2011–Nov. 30, 2023



Getting Real on LCOE - LFSCOPE

Table 4

Levelized full system costs of electricity.

Technology	Germany		Texas	
	LFSCOPE-100 [USD/MWh]	LFSCOPE-95 [USD/MWh]	LFSCOPE-100 [USD/MWh]	LFSCOPE-95 [USD/MWh]
Biomass	103	90	117	95
Coal	78	69	90	72
Natural Gas CC	35	31	40	32
Natural Gas CT	39	36	42	37
Nuclear	105	90	122	96
Solar	1380	749	413	177
Wind	483	243	291	131
Wind & Solar	442	192	225	97

LFSCOPE-95: For computational reasons, storage is not an option for dispatchable technologies anymore. Given that only at most 2% of electricity was dispatched from storage (see Table 3), this restriction does not distort the results. Minimal generation requirements for thermal generation are not violated — as displayed in Table 5 in Appendix A.4, the minimal capacity factor increases compared to the standard LFSCOPE.

<https://www.sciencedirect.com/science/article/pii/S0360544222018035?via%3Dihub>

Getting Real on CFs

Table 8

Average Annual Effective Capacity factor.

Technology	LCOE	Germany		Texas	
		LFSCOPE	[min,max]	LFSCOPE	[min,max]
Biomass	83%	76.0%	[72.0%,81.2%]	76.0%	[70.9%,80.6%]
Coal	85%	73.7%	[68.8%,81.2%]	68.9%	[61.0%,73.5%]
NGCC	87%	69.9%	[65.5%,73.8%]	58.2%	[55.9%,64.8%]
NGCT	30%	69.6%	[65.5%,73.5%]	58.1%	[55.6%,64.4%]
Nuclear	90%	79.9%	[74.6%,84.8%]	76.9%	[70.9%,81.8%]
Solar	29%	1.5%	[1.2%,2.0%]	10.4%	[5.0%,12.9%]
Wind	40%	5.9%	[3.7%,7.5%]	7.8%	[6.5%,9.6%]
Wind & Solar	–	6.5%	[4.5%,7.7%]	10.9%	[9.0%,12.4%]

Capacity factors for LCOE taken from [2], where the table displays the capacity factors for onshore wind. The capacity factor for Wind & Solar is derived by dividing the sum of the demand by the sum of the installed capacity.

<https://www.sciencedirect.com/science/article/pii/S0360544222018035?via%3Dihub>

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Gabriel Collins and Michelle Michot Foss, [The Global Energy Transition’s Looming Valley of Death](#), CES/EMM Report, January 27, 2022 (See Table 1, capex estimates for 24-h duration battery for wind and solar, and Table 2 , CFs for reaching 50% wind, solar).

Peter R. Hartley, Kenneth B. Medlock III, Shih Yu (Elsie) Hung, [ERCOT and the Future of Electric Reliability in Texas](#), CES Report, February 7, 2024.

Robert Idel, [Levelized Full System Costs of Electricity](#), Energy, Volume 259, 2022.

Other useful links:

<https://www.ferc.gov/news-events/news/final-report-february-2021-freeze-underscores-winterization-recommendations>

https://www.naesb.org/pdf4/geh_final_report_072823.pdf