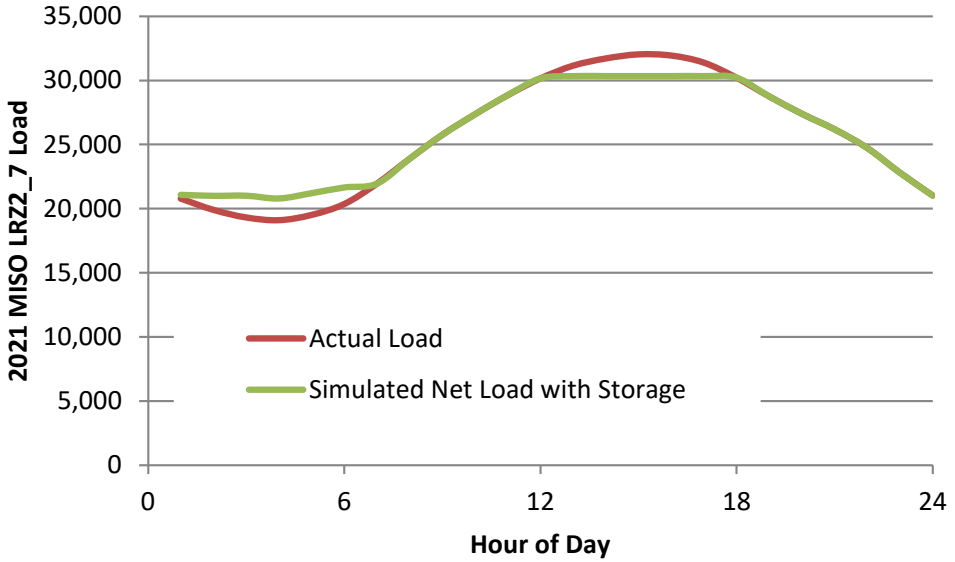
NREL
Transforming ENERGY

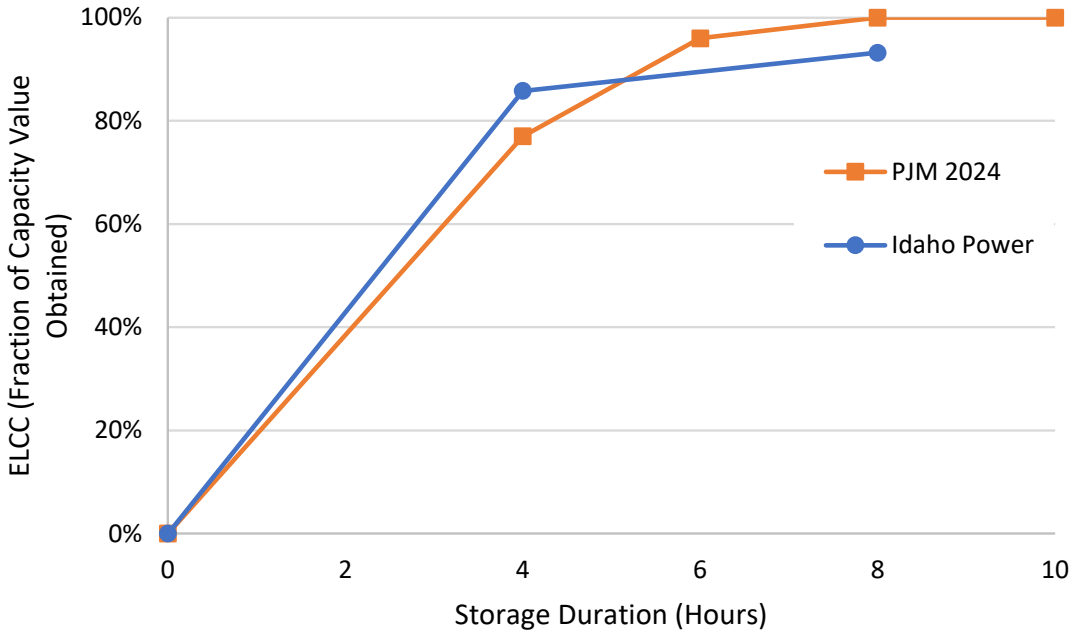
Can Storage Provide Firm Capacity and Replace Retiring Generators?

ESIG Spring Technical Workshop
March 27, 2024
P. Denholm

Yes….

There is clear analytical evidence that ~4-hour storage provides very high capacity credit in summer peaking systems

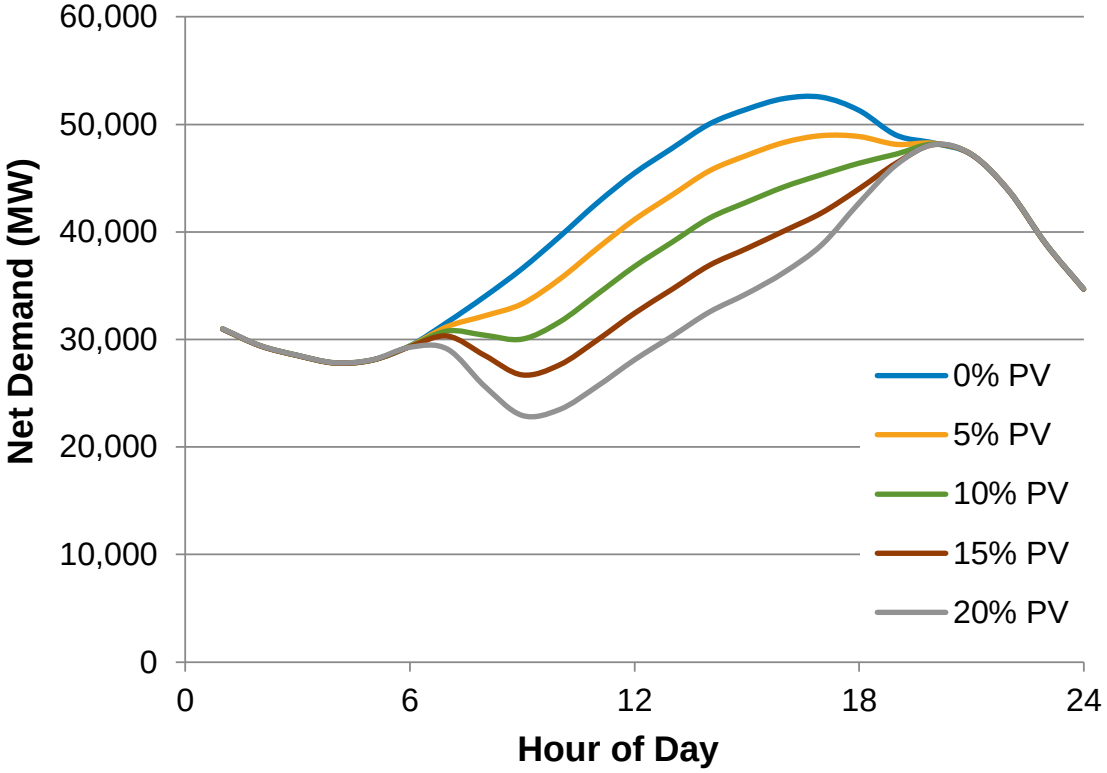


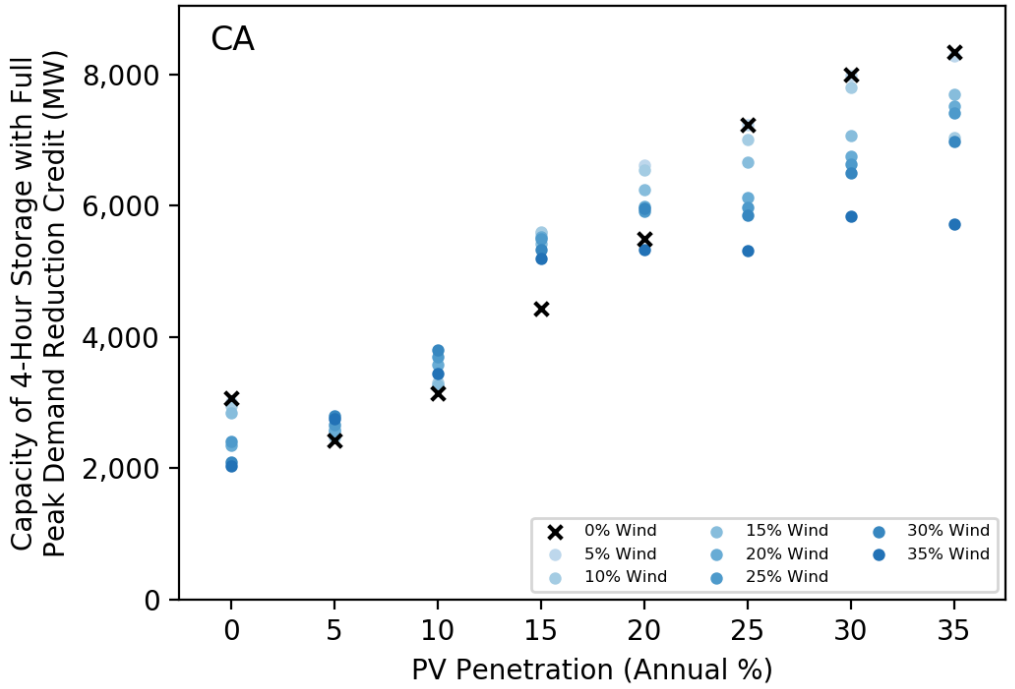


Market Operator	Duration Minimum (hours)
ISO-NE	2
CAISO	4
NYISO	4
SPP	4
MISO	4
PJM	ELCC based

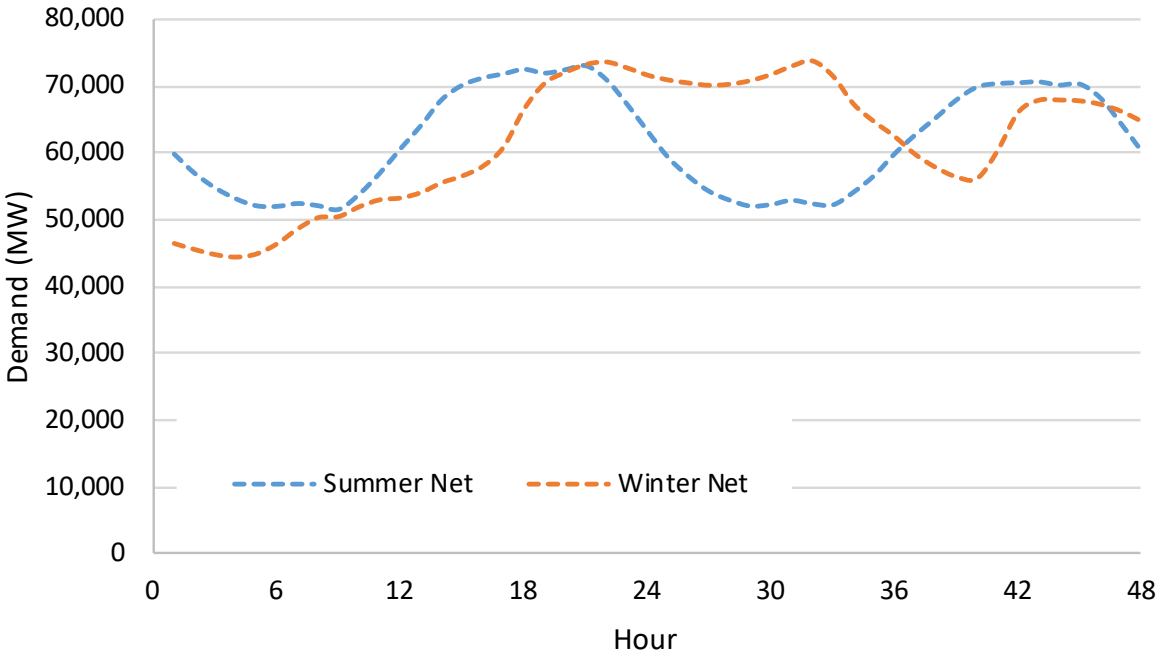
And it gets better……..

The opportunities increase with solar deployment. So there is 100+ GW of peaking capacity that could be replaced with relatively shot duration storage



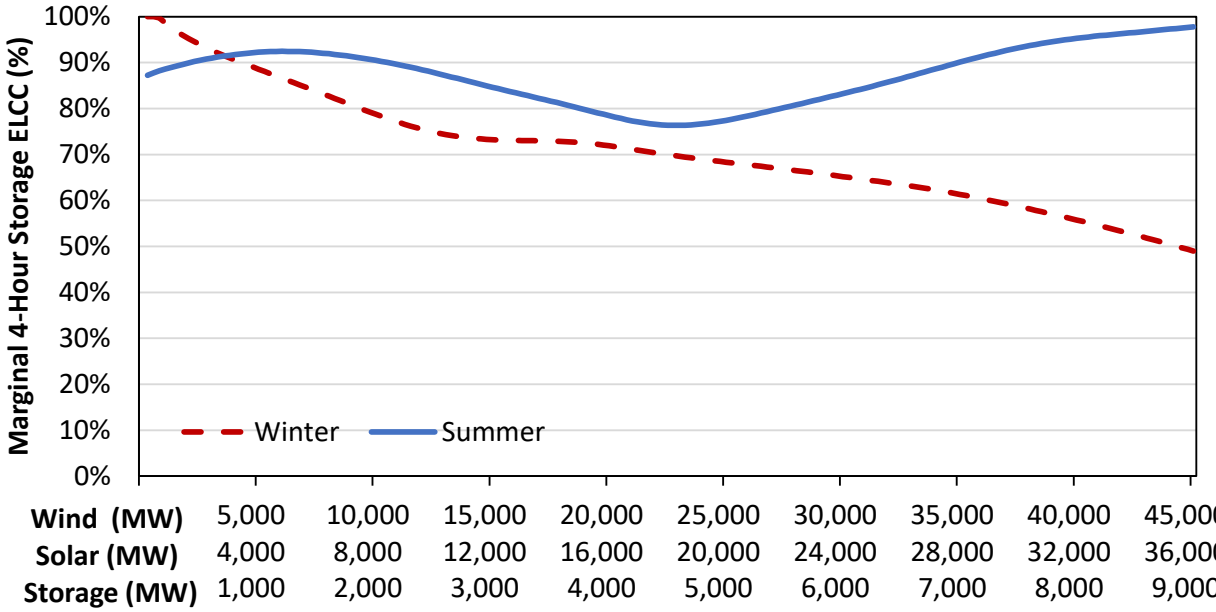


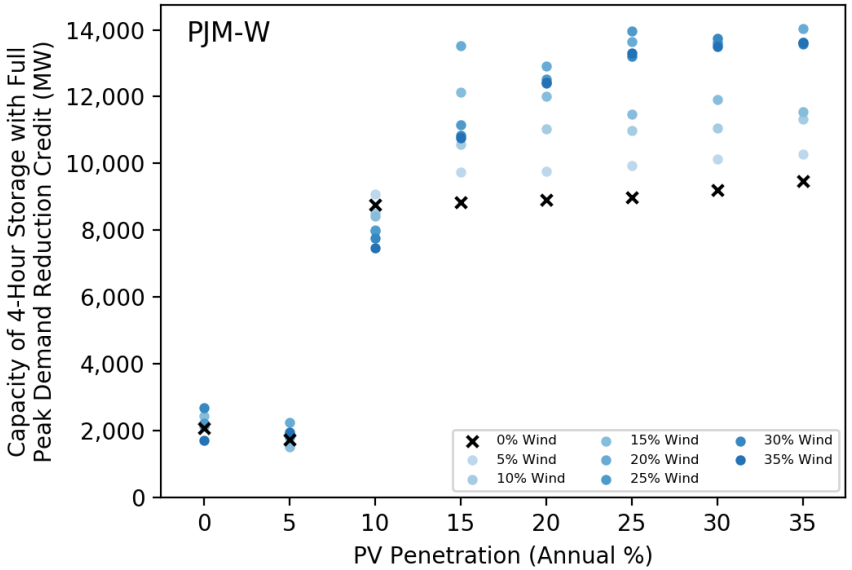
But…As net load shifts to winter longer duration (more $) is required



Winter peaks are longer and flatter

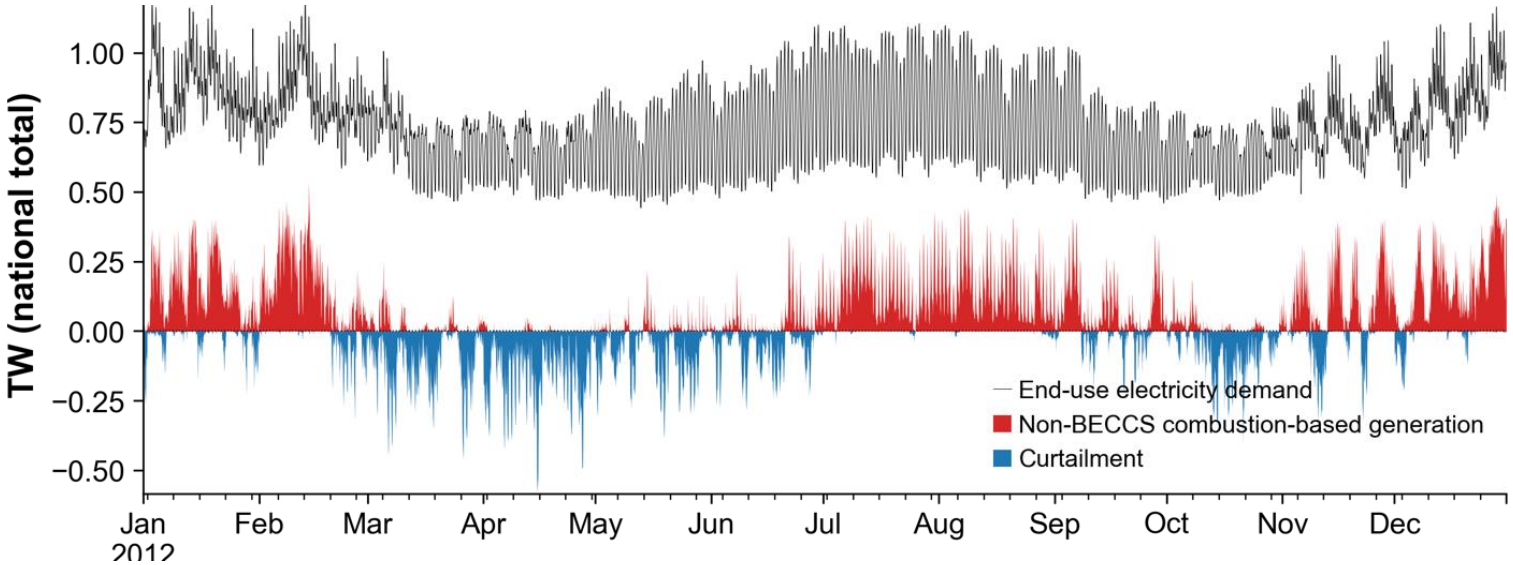
2022 ERCOT load data – net winter peak with PV



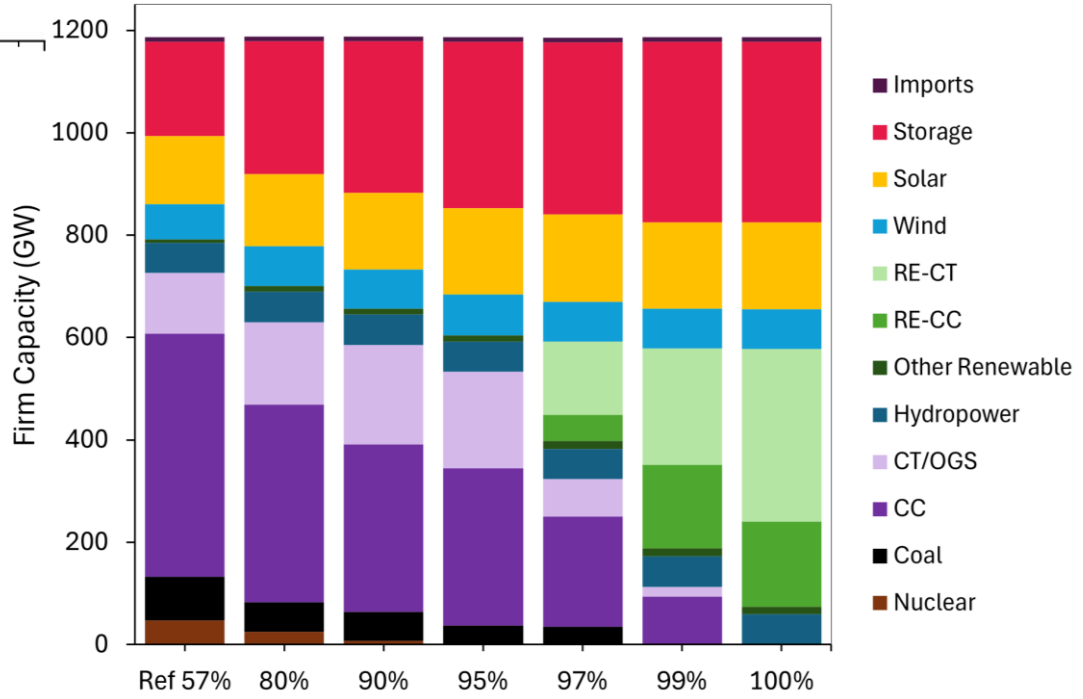


This could be accelerated and made worse with electrification

And ultimately multi-day to seasonal storage is required



Mix of resources providing firm capacity from NREL standard scenarios



The seasonal mismatch problem in 100% clean energy systems

Ultimately we still need a lot **(hundreds of GW)** of something that basically looks like a peaking plant

Thank you

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