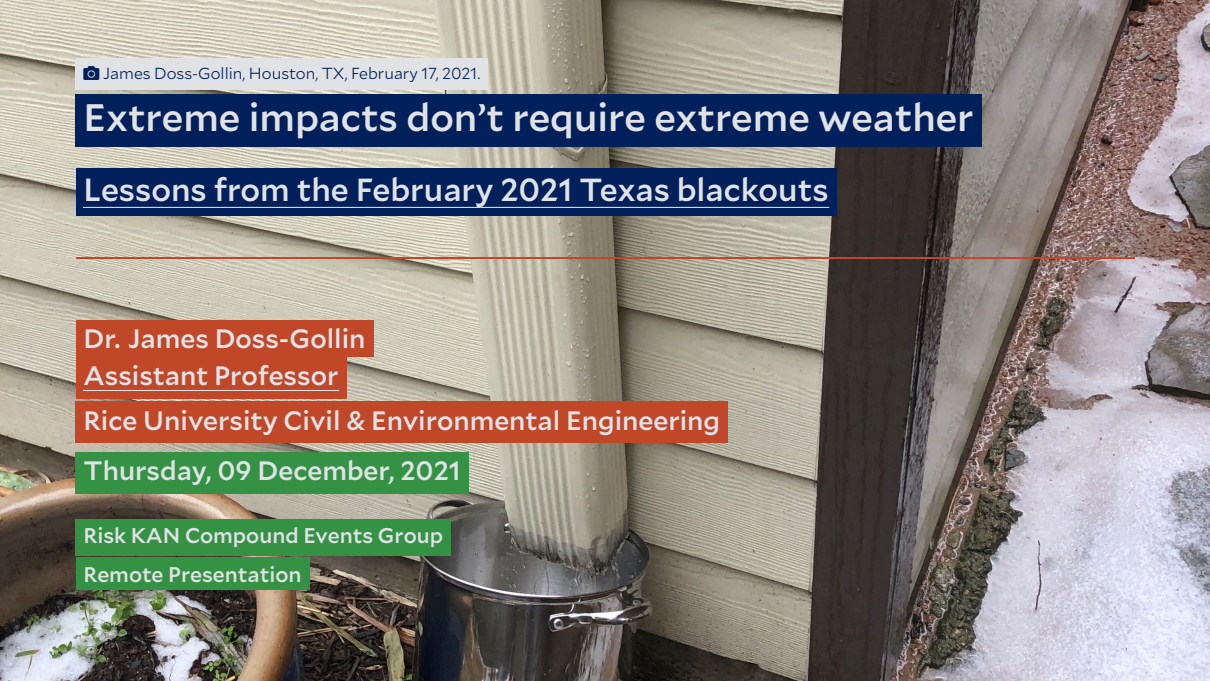

James Doss-Gollin, Houston, TX, February 17, 2021.

# Extreme impacts don't require extreme weather

## Lessons from the February 2021 Texas blackouts


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Assistant Professor
Rice University Civil & Environmental Engineering


Thursday, 09 December, 2021

Risk KAN Compound Events Group

Remote Presentation

Follow along: slides at
`https://dossgollin-lab.github.io`

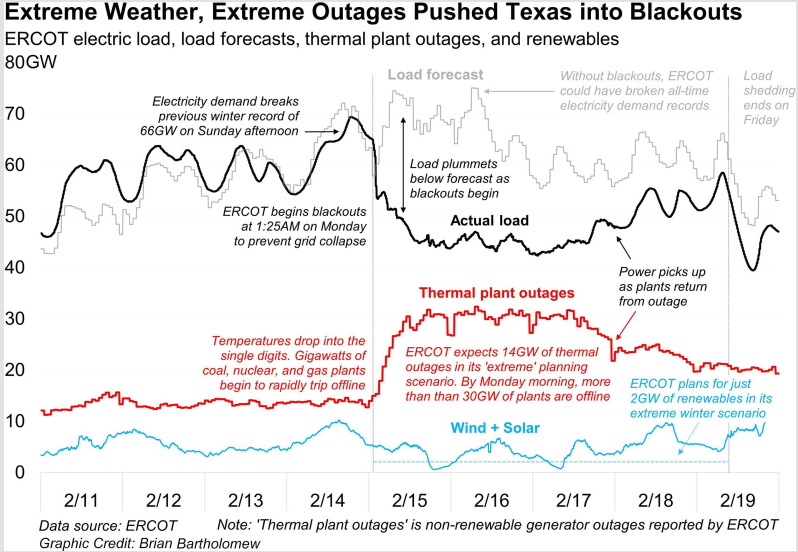
# Outline

1. What happened?

2. Should we have been ready?

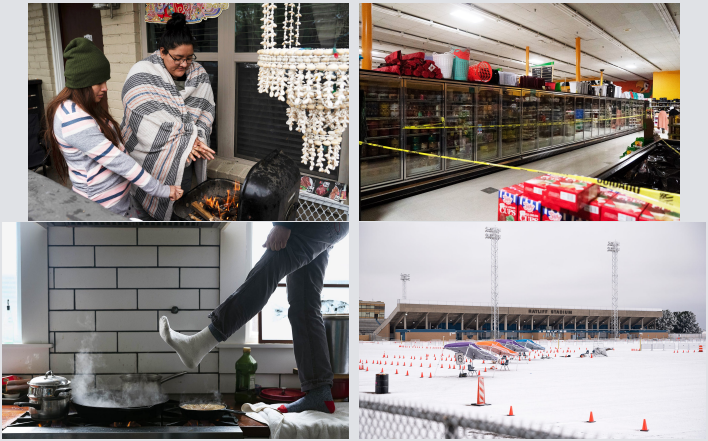
3. How do we get ready?

# What happened?




Data from ERCOT; figure by Brian Bartholomew.

# Human impacts



Uri left over 100 dead, $130 billion direct damages, widespread disruption, pandemic risk, and disproportionate burdens on marginalized communities. 📷: (TL, TR) Nakamura / Getty Images; (BL) Landis / AP; (BR) Odessa / AP.

# Texas wasn't ready

More demand than we prepared for

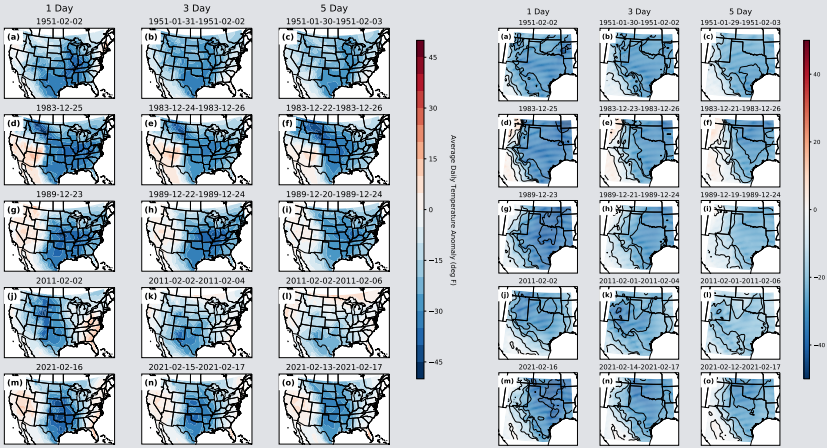
1. SARA (ERCOT, 2020): "Based on the 2011 winter and a revised economic growth forecast…the extreme winter forecast is 67 208 MW"
2. Magness (2021): peak winter 2021 load without shed: 76 819 MW

More outages than we prepared for

1. SARA extreme scenario: at most 14 GW of outages; actually over 30 GW
2. Wind didn't contribute much, but SARA didn't rely on wind
3. Firm generation didn't come through (Busby et al., 2021)

# Should we have been ready?

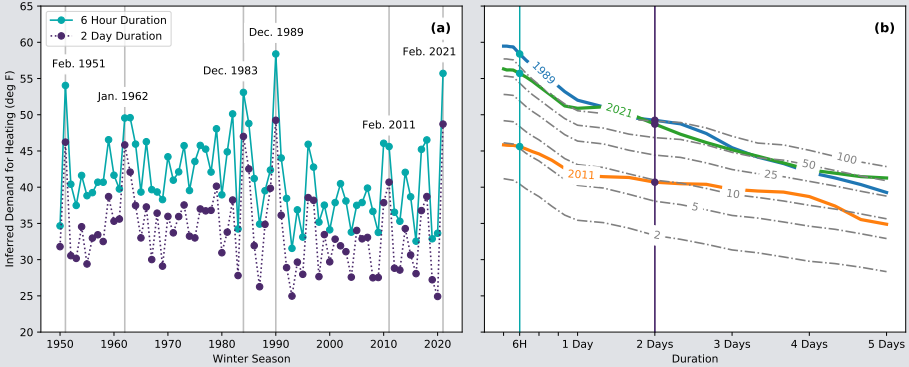
# Qualitatively similar cold snaps in recent decades




Doss-Gollin et al. (2021), fig. 1 and S2

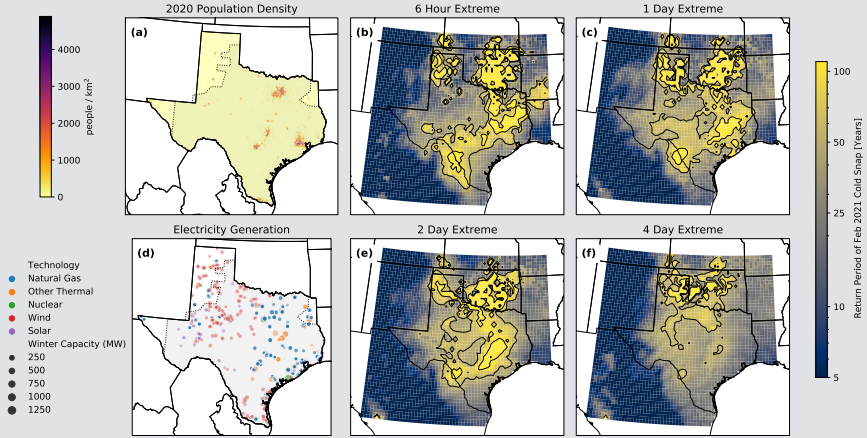
# 1989 weather + 2020 population would have driven higher peak demand

Gridded Temperature ➔ Heating Degree Hours (to 65 °F) ➔
Integrate, weighting each pixel by 2020 Population




Doss-Gollin et al. (2021), fig. 2

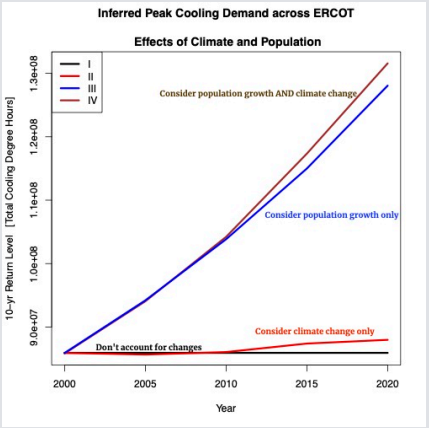
# Return period $\ll$ 100 years in most of Texas




Doss-Gollin et al. (2021)

# How do we get ready?

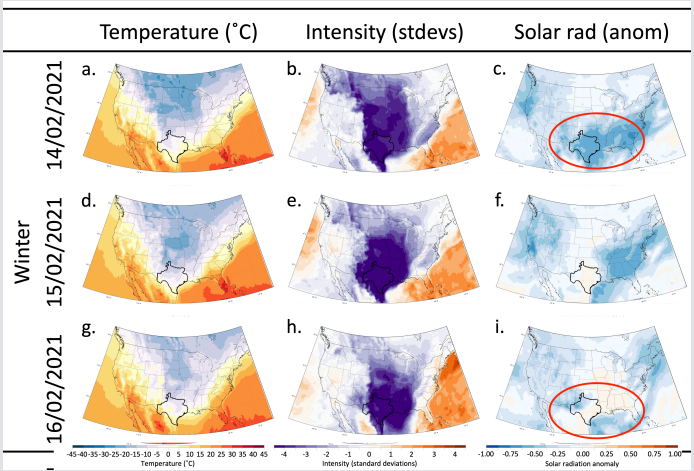
# Adapt or perish




Amonkar, Yash, D. Farnham, J. Doss-Gollin, and U. Lall, in prep.

1. Climate change
   - 1.1 fewer/weaker cold snaps in long term, possibly worse next 2-3 decades (Cohen et al., 2021)
   - 1.2 lots of other electricity-relevant impacts (wind, heat, drought, floods, etc.)
2. Growing demand
   - 2.1 Population growth (Texas Water Development Board, 2012, says 40% 2020-2050)
   - 2.2 Electrification of heating, transport, etc.

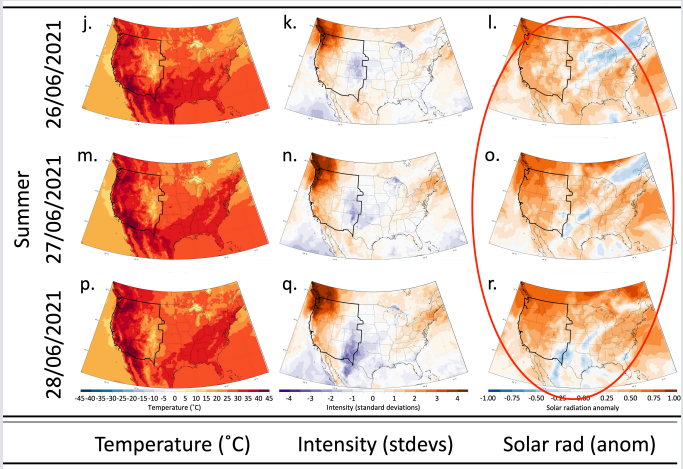
# Design for extremes I




Where was there solar potential energy during the February cold snap?

Rogers, Cassandra, E. Coffel, J. Doss-Gollin, and D. Singh, in prep.

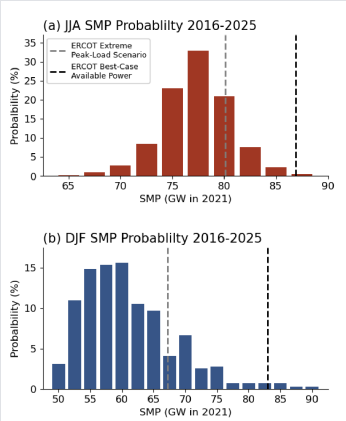
# Design for extremes II




Where was there solar potential energy during the PNW heat wave?

Rogers, Cassandra, E. Coffel, J. Doss-Gollin, and D. Singh, in prep.

# Look beyond the recent historical record




Lee and Dessler (2021) fig. 5. **AGU: A45I-1948**.

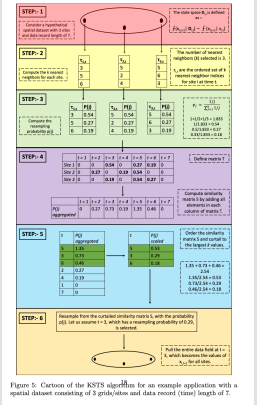



Figure 5: Cartoon of the KSTS algorithm for an example application with a spatial dataset consisting of 3 grids/sites and data record (time) length of 7.

Amonkar, Yash, D. Farnham, and U. Lall, in prep..
**AGU: H45V-1463**.

# Key Points

1. The February 2021 freeze was severe, but had multiple historical precedents
2. Population and electrification necessitate investment; this is an opportunity
3. Net zero plans must consider extreme weather


https://dossgollin-lab.github.io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