



Integrated Energy Sector Planning

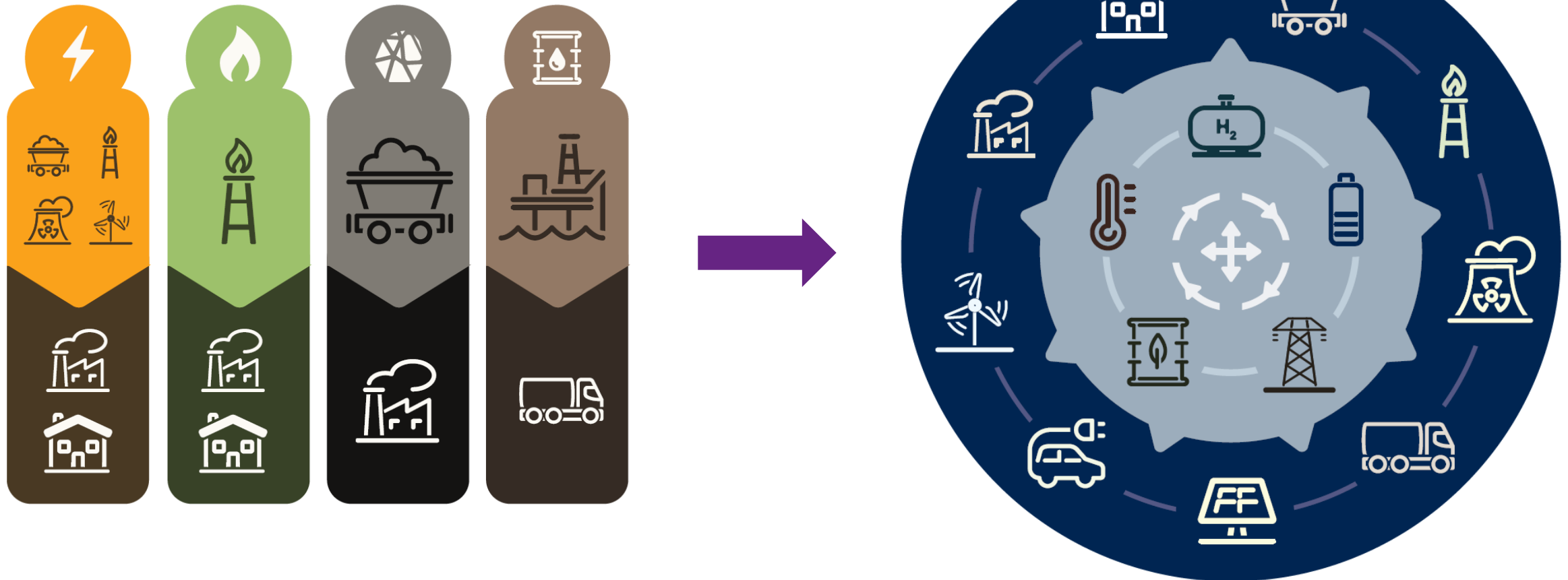
Carlo Brancucci

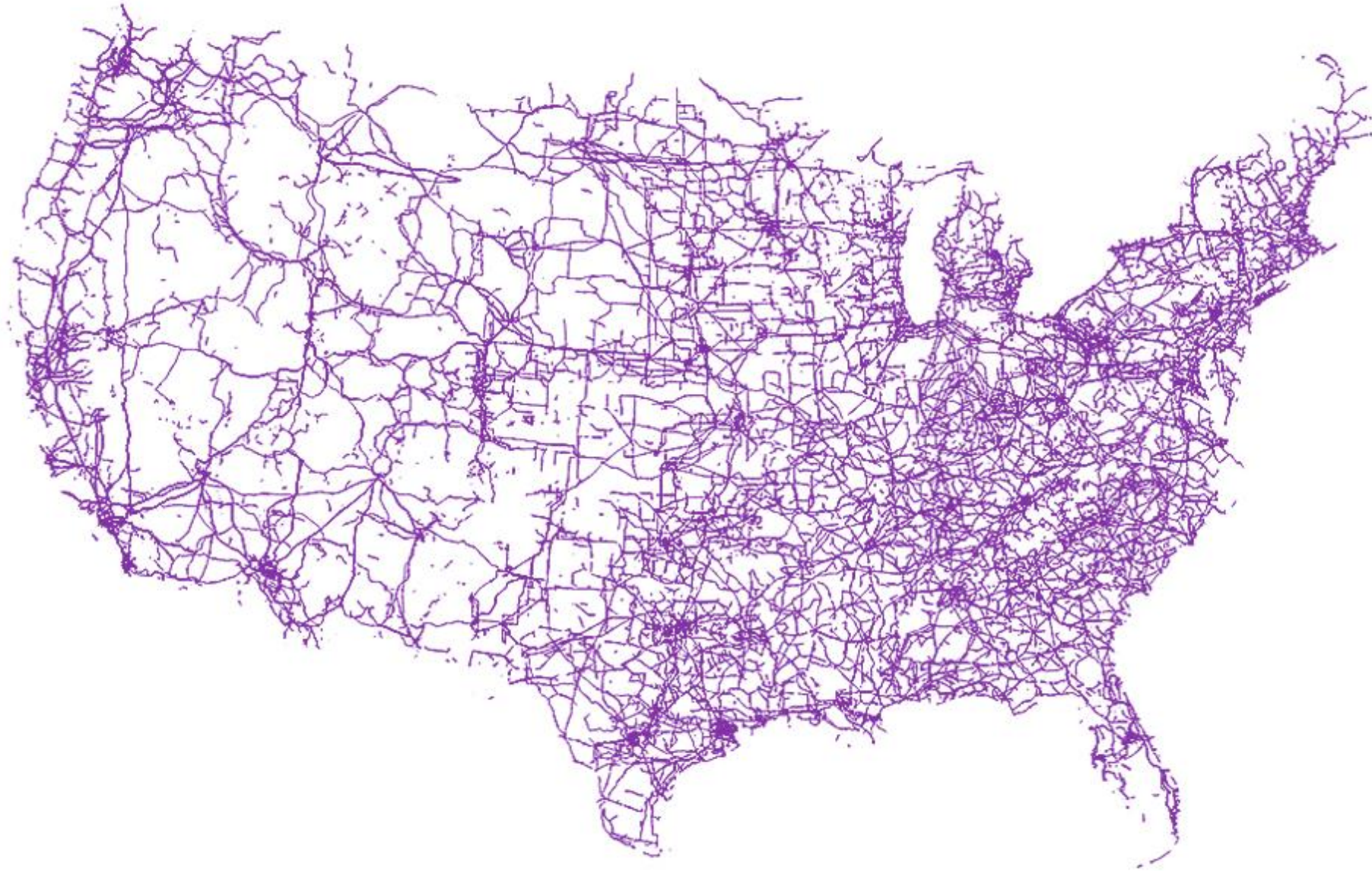
ESIG Workshop – Tucson, AZ

March 29, 2023

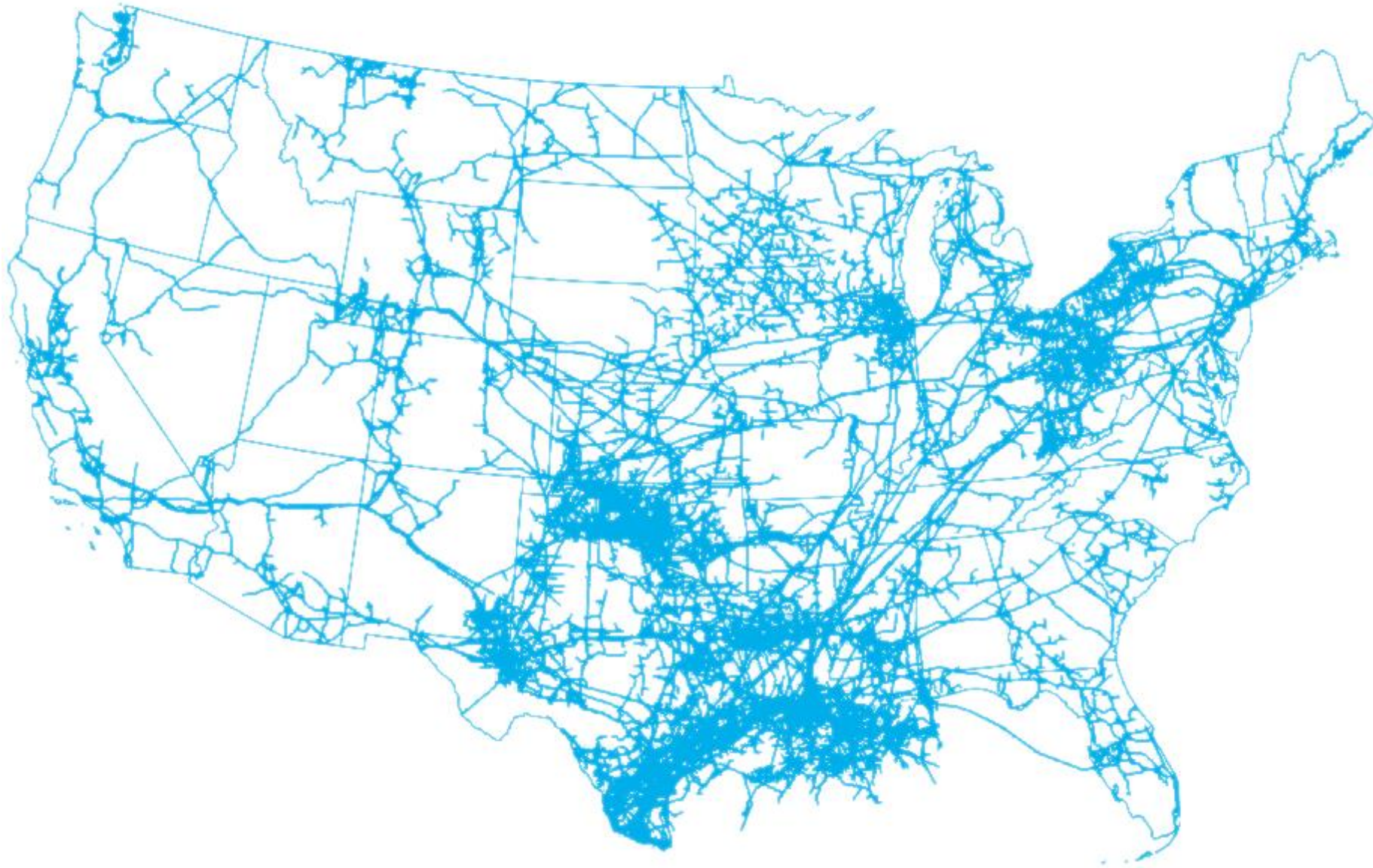


Siloed planning processes challenge the energy transition

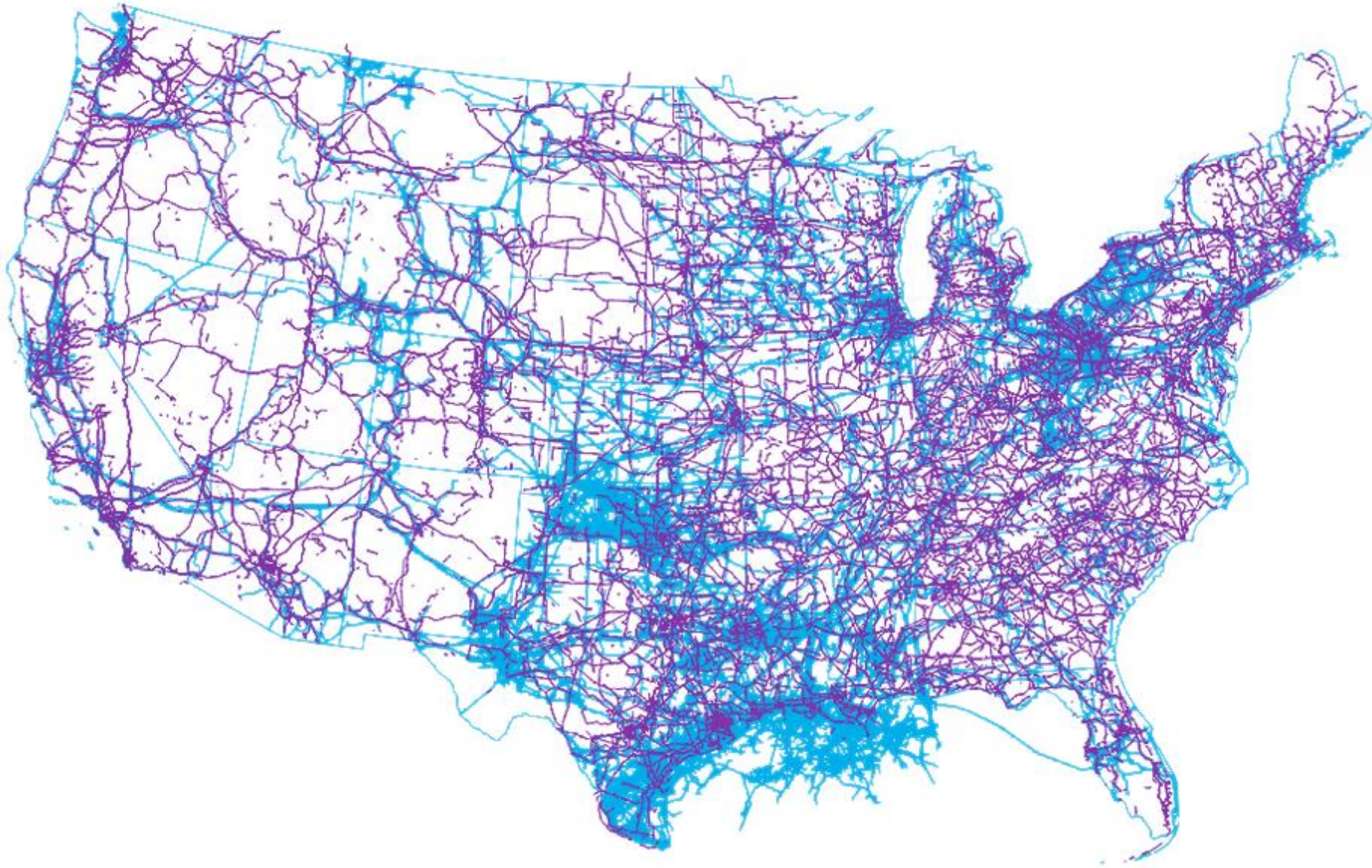




Source: Washington Post

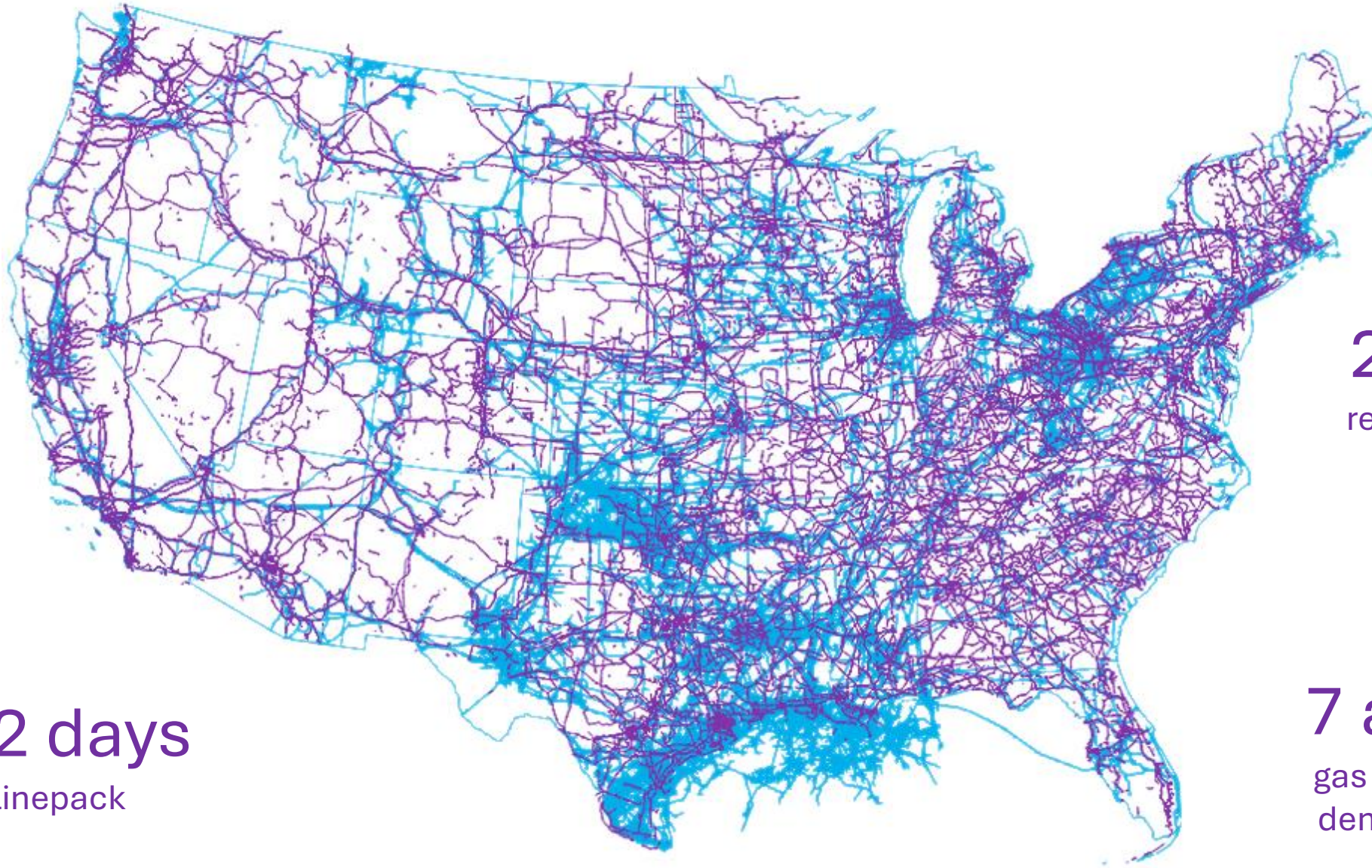


Source: Washington Post



Source: Washington Post

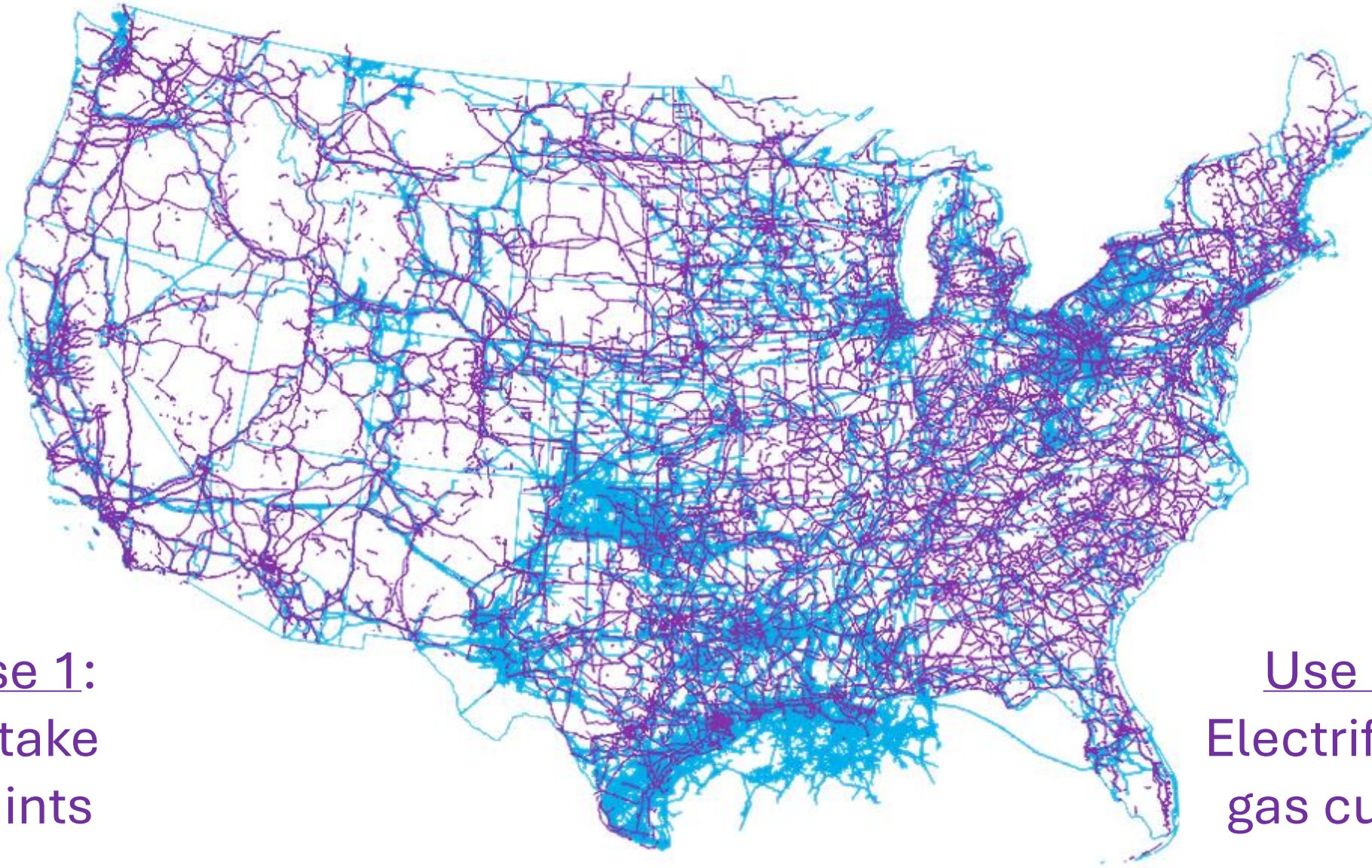
30x
speed



2 visits
reconnect gas
customer

1-2 days
linepack

7 am
gas peak
demand

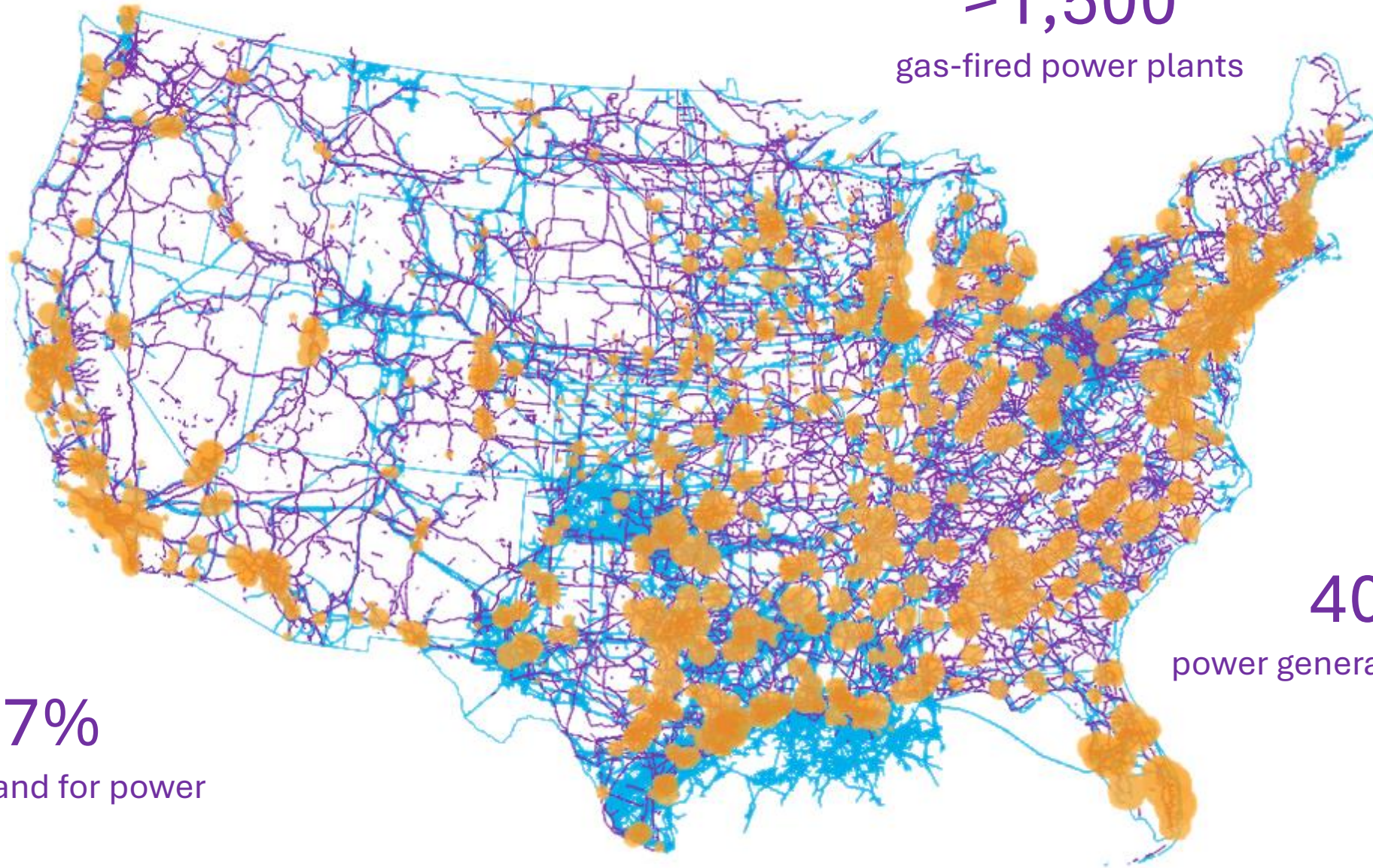


Use case 1:
Gas-offtake
constraints

Use case 2:
Electrification of
gas customers

>1,500

gas-fired power plants



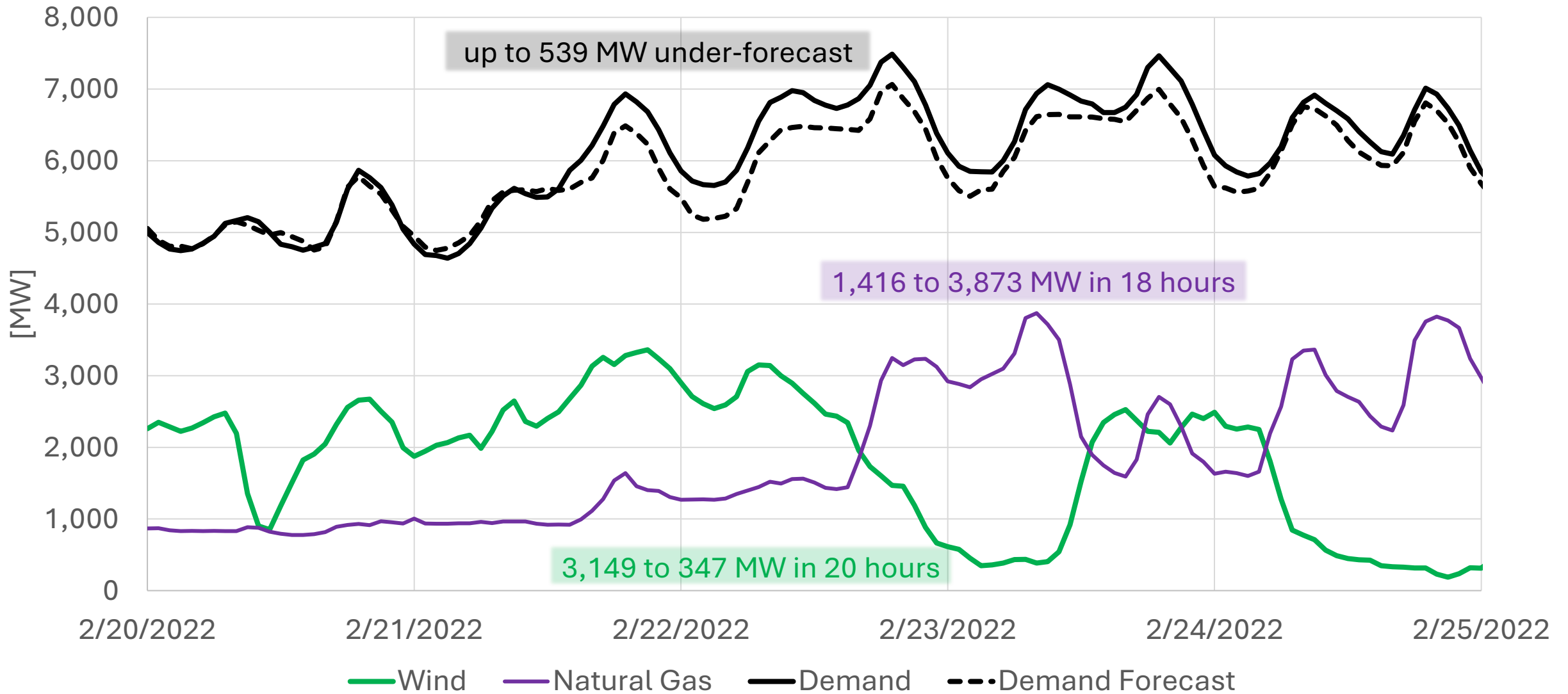
37%

gas demand for power

40%

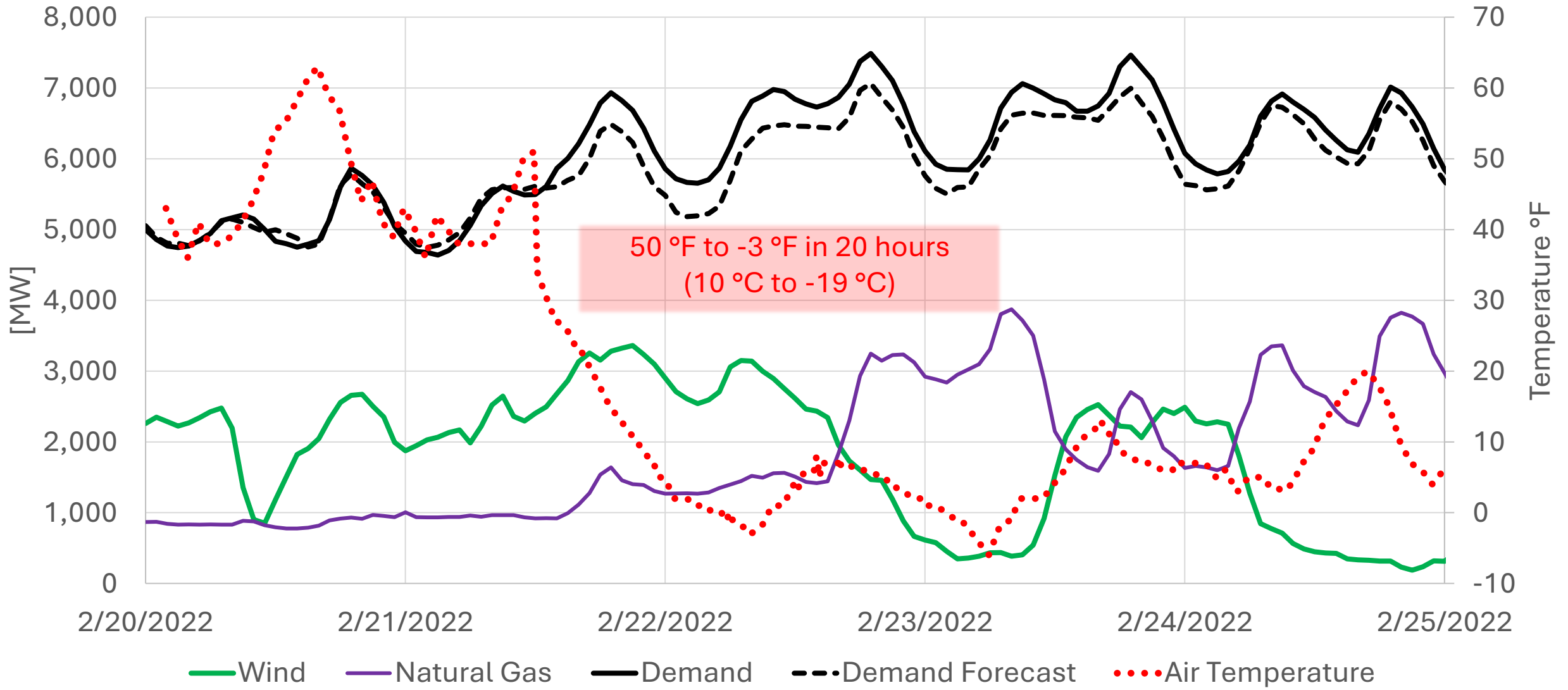
power generation from gas

PSCO (February 2022)



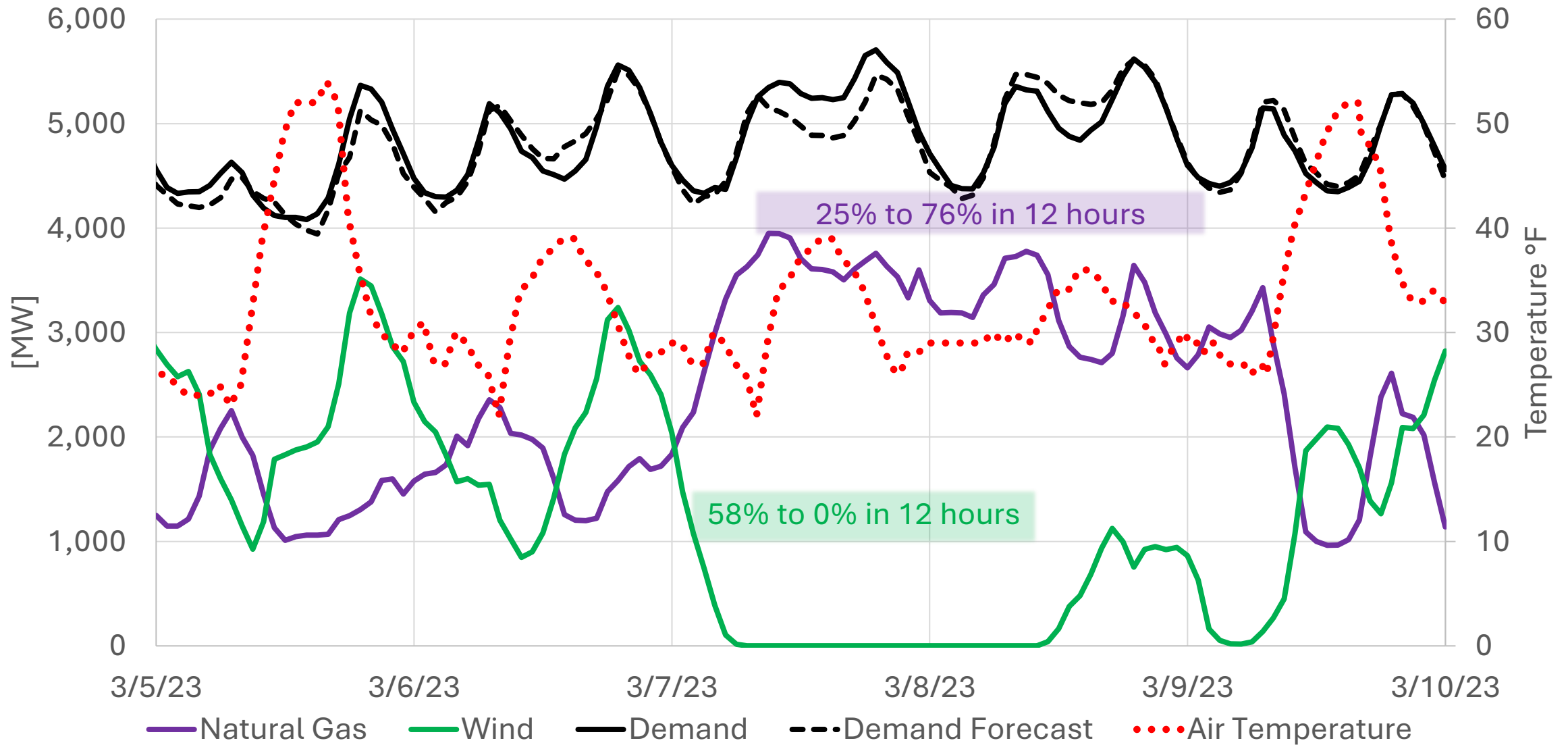
Source: US EIA

PSCO (February 2022)



Source: US EIA

PSCO (March 2023)



Source: US EIA

Integrated planning



Integrated planning



Stakeholders

ISO / electric TSO / BA

Pipeline company / gas TSO

Integrated planning



Stakeholders

ISO / electric TSO / BA

Pipeline company / gas TSO

Step 1: Import data & build models.

Step 2: Benchmarking of models.

Step 3: Define coupling between models (gas-fired power plants).

Step 4: Run production cost model → gas-offtakes.

Step 5: Run dynamic gas hydraulic simulation → pressure-driven gas-offtake constraints.

Step 6: Re-run production cost model to redispatch (coordination strategy).

Integrated planning



Stakeholders

ISO / electric TSO / BA

Pipeline company / gas TSO

Additional:

- Run combined (optimal) power flow simulation with dynamic gas hydraulic simulation to capture bi-directional coupling.



OUR COMMITMENT

Net-Zero Energy Provider by 2050

We aim to power your life with energy that has net-zero emissions.

[View Our Progress](#)



Source: <https://co.my.xcelenergy.com/s/our-commitment/carbon-reduction-plan>

Integrated planning



Stakeholders

electric utility / DSO

gas utility / DSO

Step 1: Import data & build models.

Step 2: Benchmarking of models.

Step 3: Define coupling between models (customers).

Step 4: Run gas hydraulic simulation → gas customers that meet criteria for electrification.

Step 5: Run power flow simulation → reinforcement costs.

Step 6: Prioritize & define planning cycle.

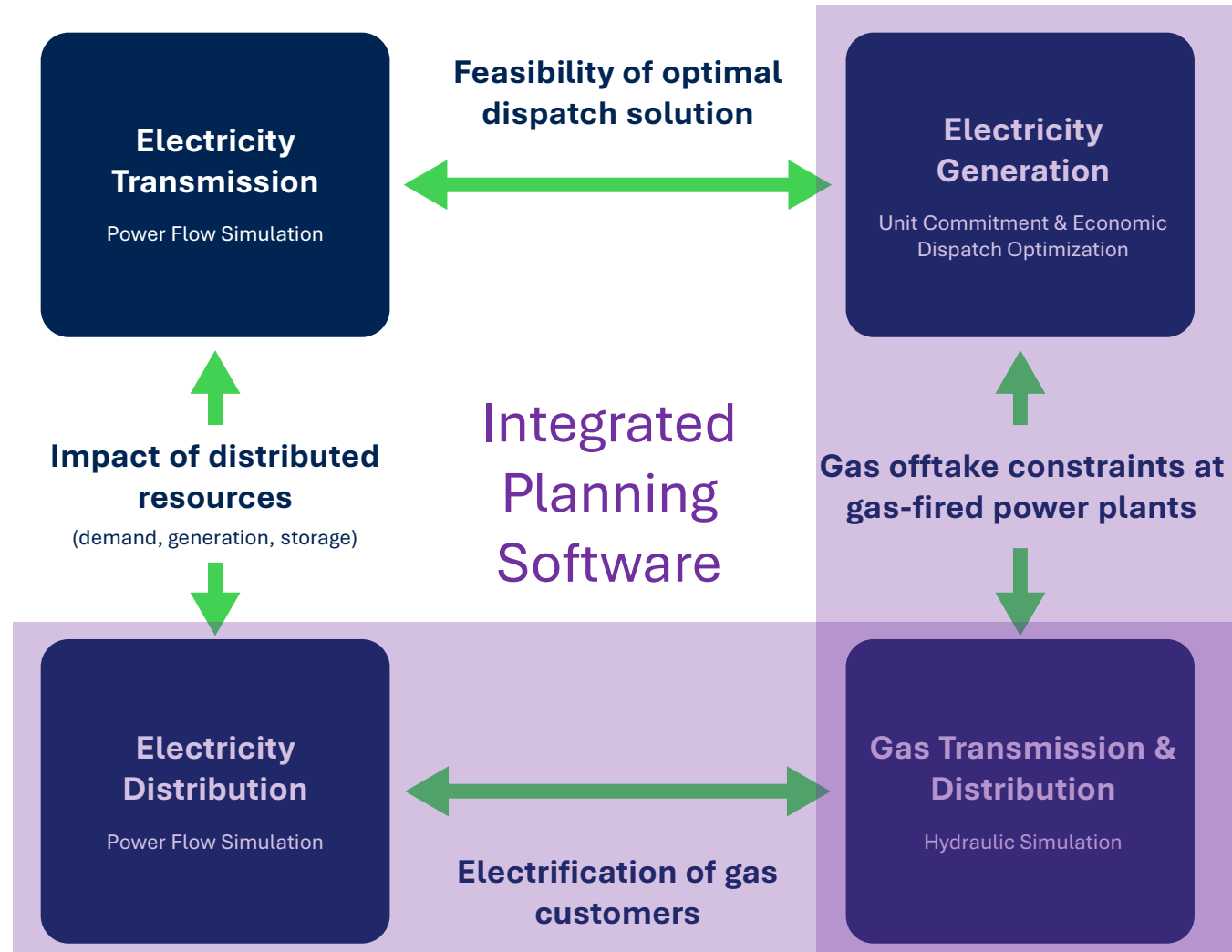
Integrated planning



Additional:

- Run power flow simulation of the transmission network to evaluate upstream impacts.
- Run power system production cost model to quantify economic and emission impacts of additional generation to meet the new electric demand.

The future of energy planning



encord

Thank you!

