Institute for Energy Economics and Financial Analysis

Hydrogen and Carbon Capture and Storage (CCS) in Water-Stressed Texas

Proposed projects will require large volumes of water in a state that is facing serious supply challenges

Anika Juhn, Energy Data Analyst

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Photo credit: Woodside Energy

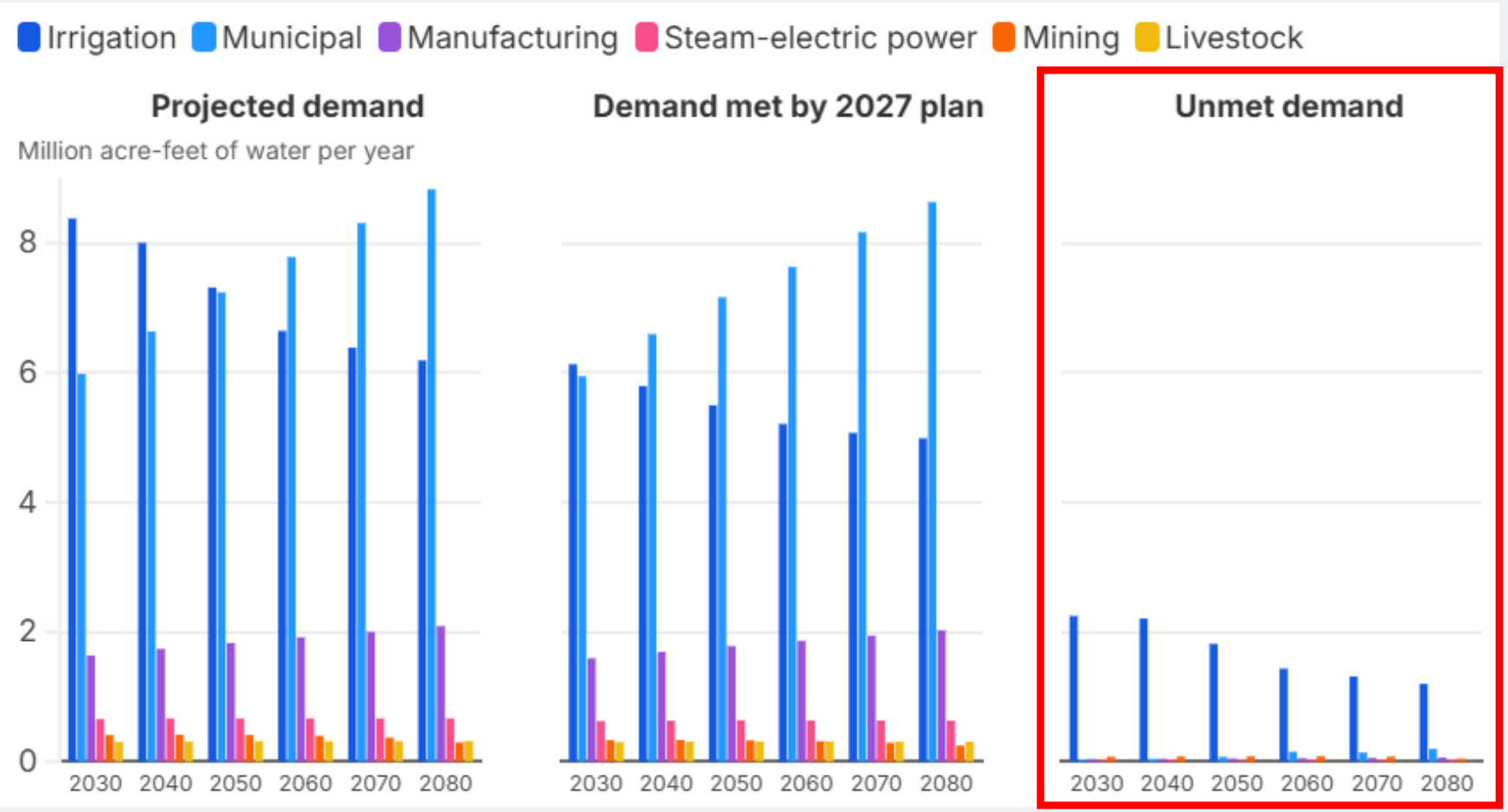
Key Takeaways

Texas is grappling with an existing water supply problem that will make it difficult for the state to meet expected demand in future decades.

Large facilities planning to produce low-carbon hydrogen and derived products such as ammonia and methanol are not included in the state's 2027 water plan.

Lack of sufficient water to satisfy new, unanticipated demand represents risks to project viability as well as water security for local residents and other water users.

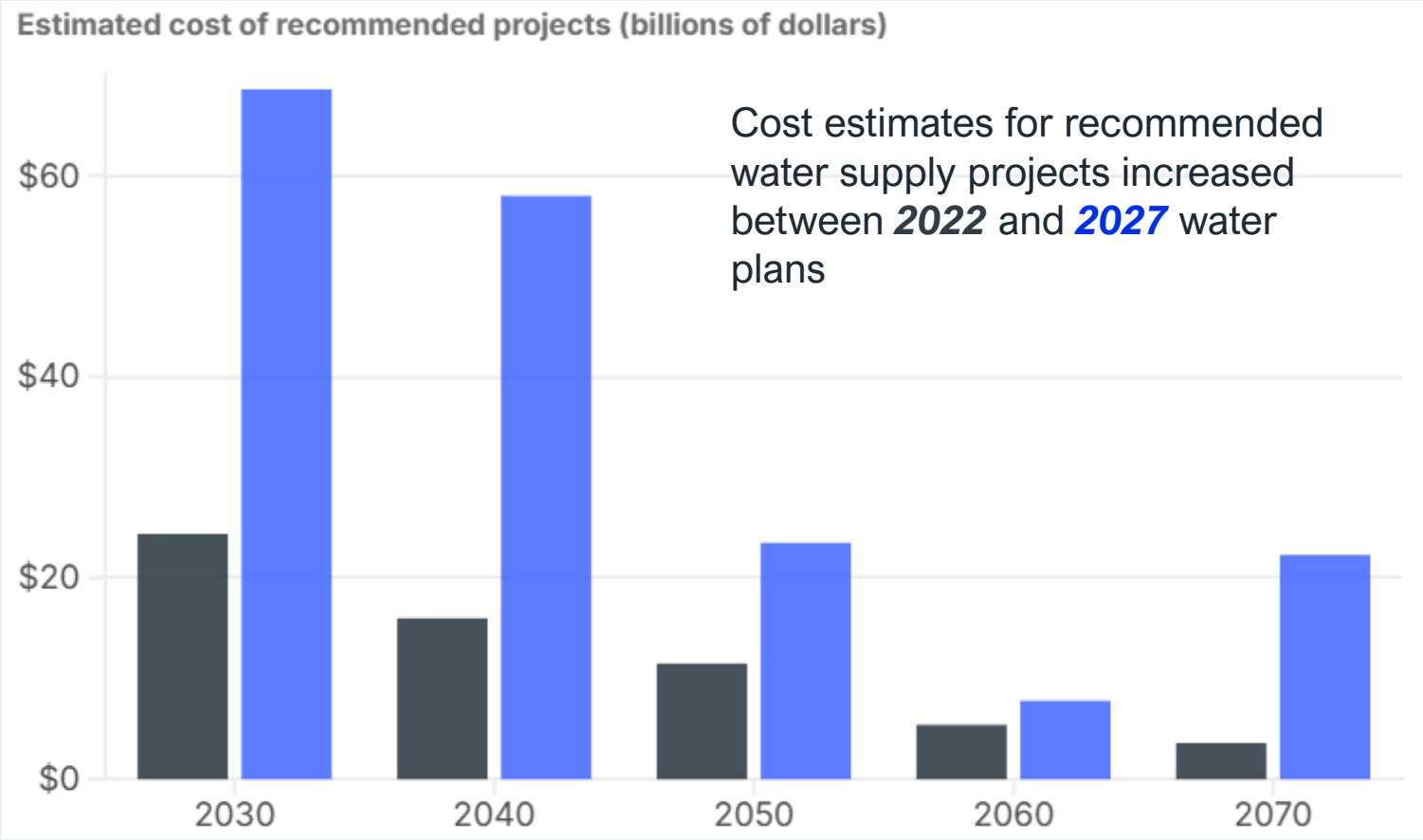
Texas State Water Plan Supply and Demand



- State water planning is on a cycle
- 2027 plan anticipates zero excess supply in any sector
- Demand projections are based on historical data and trends – do not reflect recent announcements of hydrogen, CCS, nuclear, or data center projects
- Water use based on contracted / reported as of 2021

Water Analysis of Hydrogen and CCS-Based Projects

- State water plans estimates for cost of developing new water supply (not fixing or maintaining existing supply) increased dramatically between 2022 and 2027 plans
- Plan estimates $174 billion will be needed to implement projects through 2080 (2023 dollars)
- Cost of construction and inclusion of projects not completed earlier were part of increase
- Need to develop increasingly marginal (and more costly) supplies was flagged as a key cost driver



Water Analysis of Hydrogen and CCS-Based Projects

Projects included in analysis

- Oil and Gas Watch CCUS database project list
- Hydrogen and hydrogen-derived products (ammonia and methanol)
- Green and blue hydrogen projects (omitted LNG, natural gas processing, etc.)
- Culled cancelled, stalled and unlikely to resume, and omitted those planning to use seawater or treated brackish water

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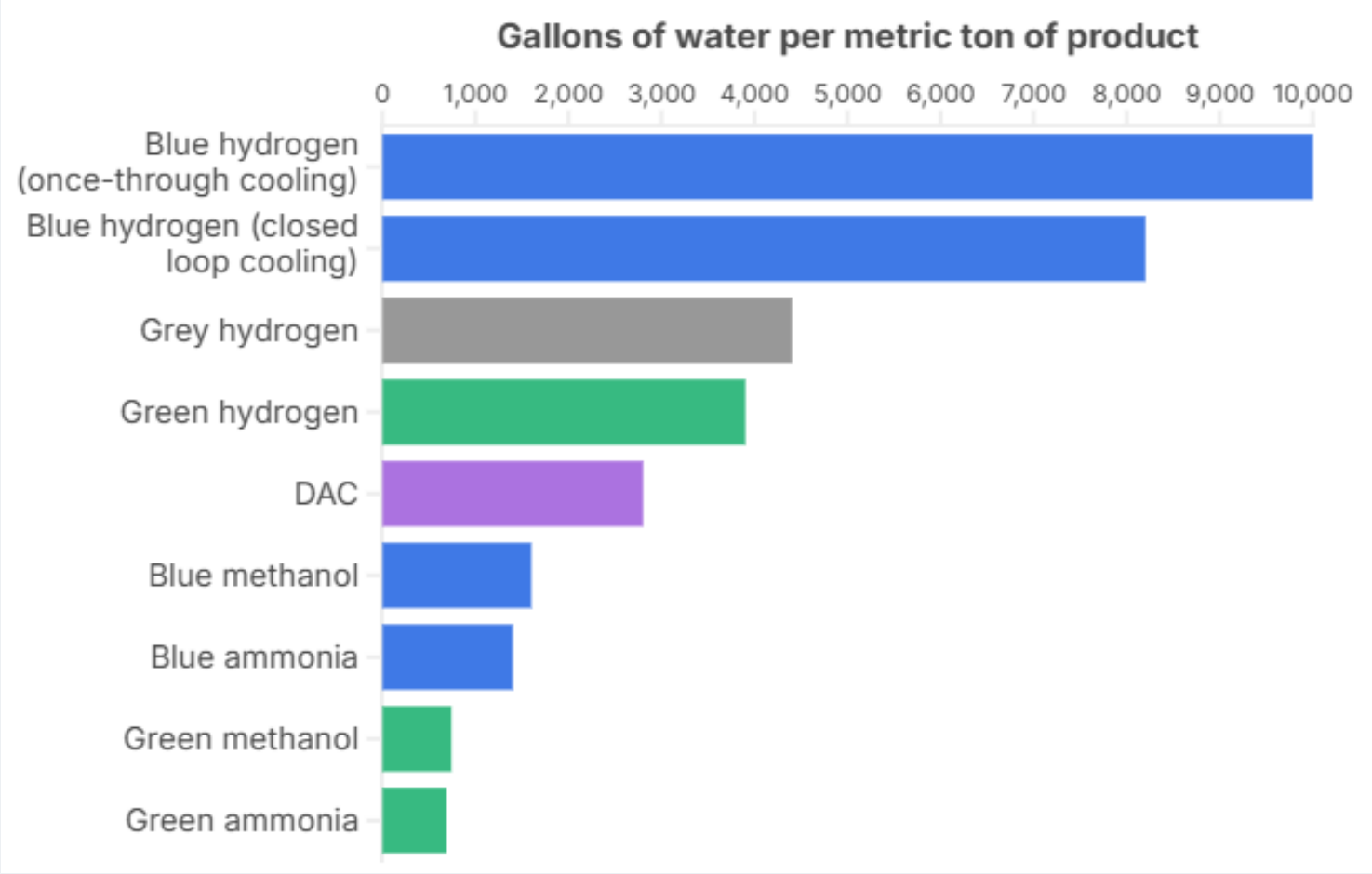
Water demand requirements

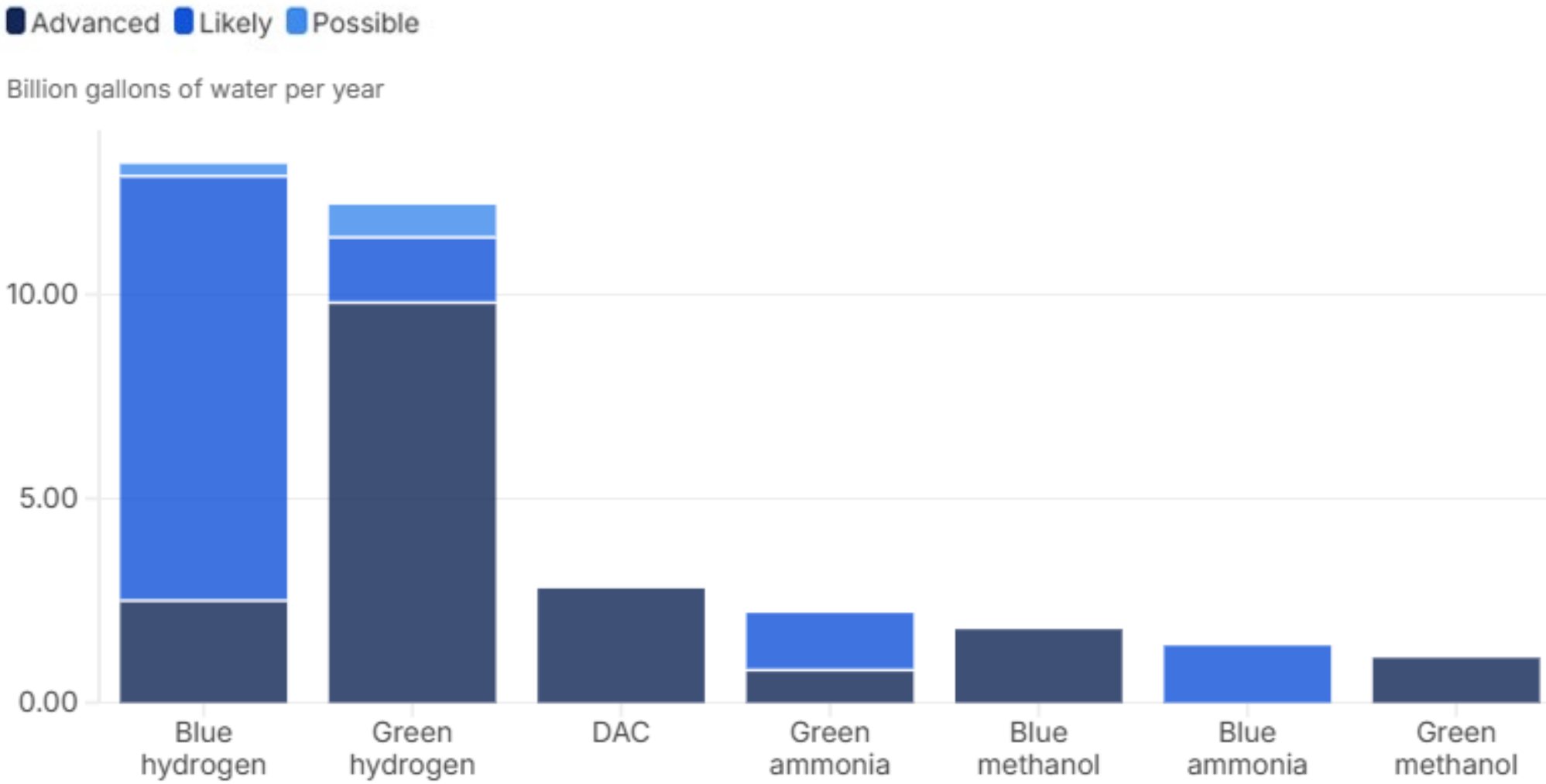
- Focused on withdrawal needs (demand) not consumptive use
- Calculated demand in terms of gallons of water per metric ton of product
- Conservative estimates do **not** reflect:
  - Estimates of excess water demand due to high heat / humidity
  - Estimates of excess water required for projects planning to treat water before use

Water Demand Estimates

- Key assumption in calculations of total water demand is that projects will use closed-loop cooling systems
- Estimates include water required for feedstock, process, and cooling
- There is a wide range of water demand, depending on product
- Methanol and ammonia appear to have relatively low water demand because producing the hydrogen required is what is water-intensive

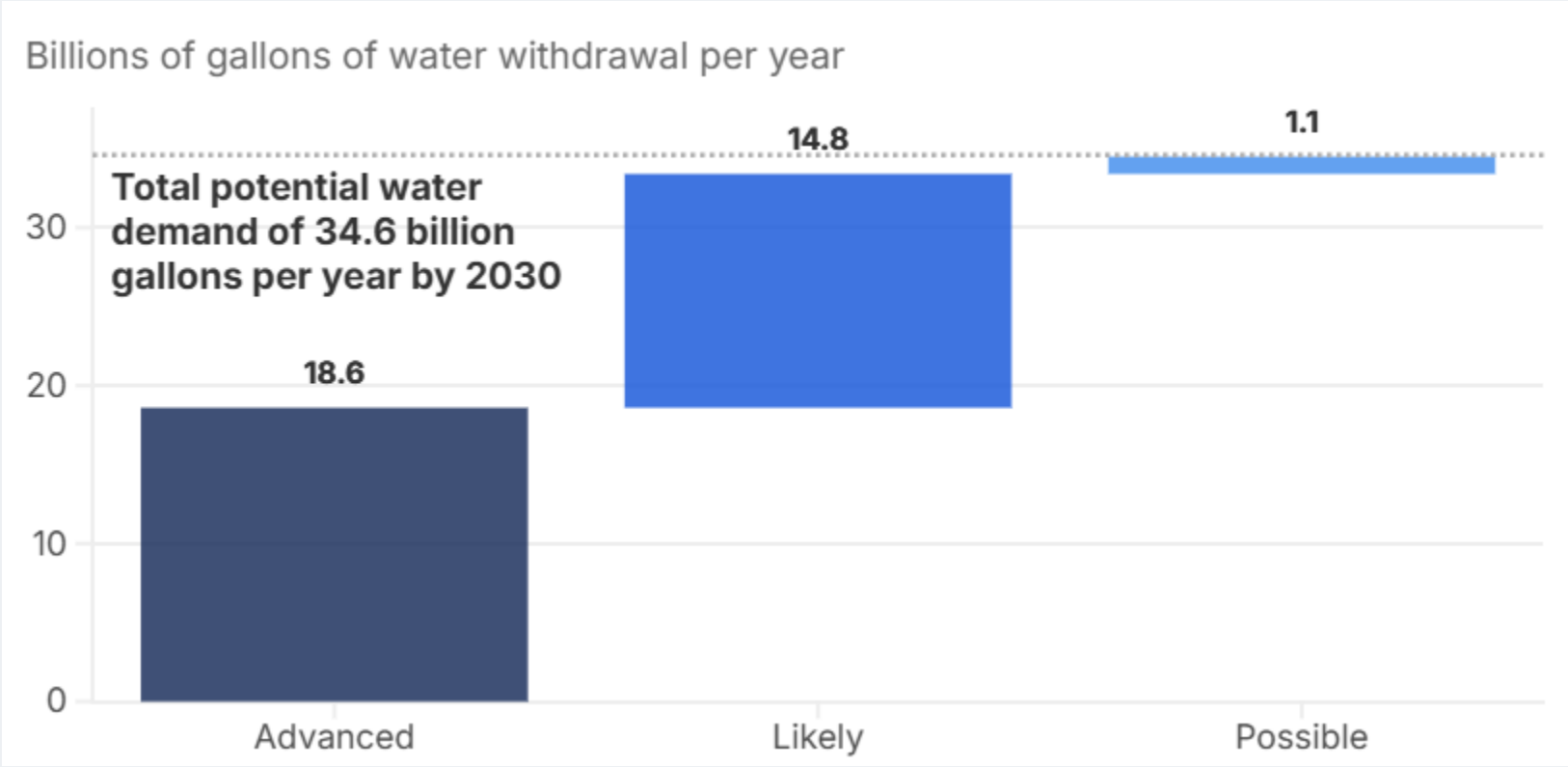


Annual Water Withdrawal Requirements for Projects



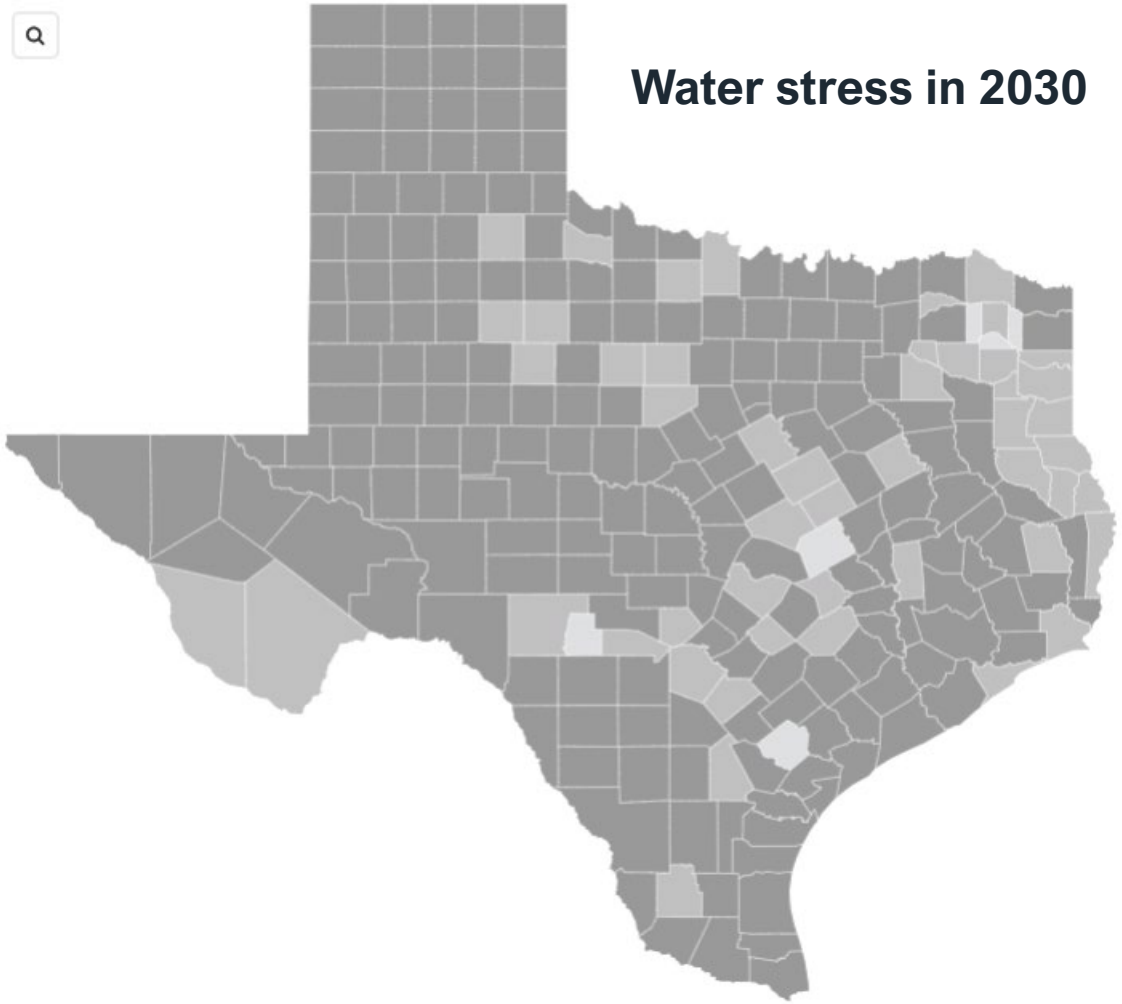
Annual Water Withdrawal Requirements for Projects

- Texas hydrogen and CCS projects in the development pipeline could demand 34.6 billion gallons per year of water by 2030
- Annual water withdrawal is about the same as residential use by 677,000 people (population of El Paso)
- Totals represent 6% of the amount projected for consumption in the manufacturing sector in 2030



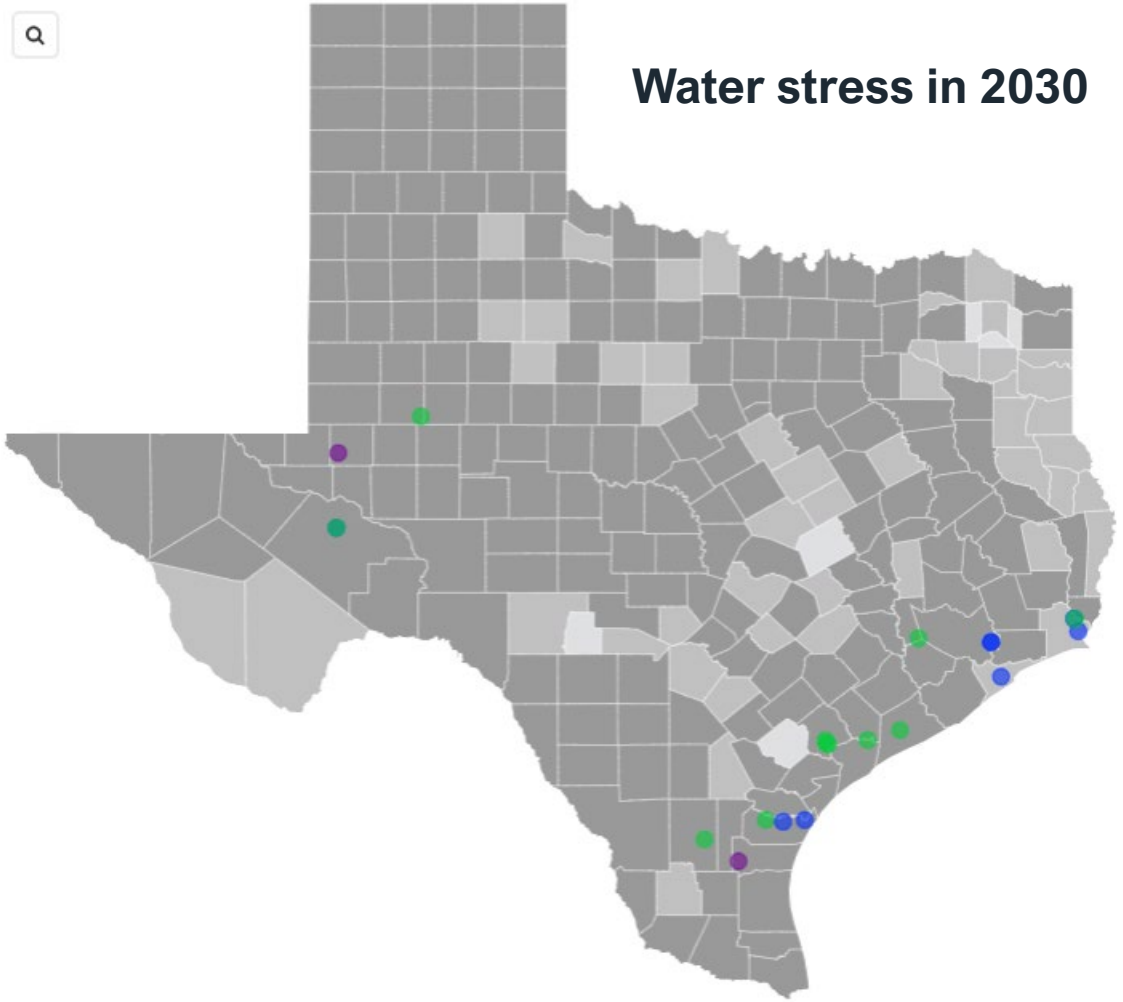
Annual Water Withdrawal Requirements for Projects

- State Water Plan highlights water stress or scarcity at the state level
- Local conditions can vary widely
- Overall, the state is facing water stress
- By 2030, according the State Water Plan, 78% of counties (dark grey) will have demand that accounts for 80% or more of supply
- “Extreme water stress”



Annual Water Withdrawal Requirements for Projects

- The 21 projects included in this water analysis are shown on the map
- Blue = blue hydrogen / ammonia / methanol
- Green = green hydrogen / ammonia / methanol
- Purple = DAC
- All but 4 projects fall in counties that are expected to have “extreme water stress” by 2030
- It is unclear how supply could be developed to meet this potential demand



Conclusions

1) Water-stressed Texas counties are struggling to meet projected demand, are targeting increasingly marginal resources, and billions of dollars will be needed to develop supply sufficient to meet expected demand.

2) State estimates of expected demand do not include water-intensive projects such as hydrogen and CCS-based facilities (or data centers and nuclear), calling into question the feasibility of developing water-intensive projects.

3) It is not clear how local agencies will be able to accommodate new, large-scale demand under existing state law and water management practices.

4) Water risk is double-sided: industry faces investment risk and the state faces serious water supply challenges.

https://insideclimatenews.org/news/28062025/texas-battery-storage-solar-reduces-summer-blackout-risk/

Questions?

More information: https://ieefa.org/topic/ccs

Contact: Anika Juhn, ajuhn@ieefa.org

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