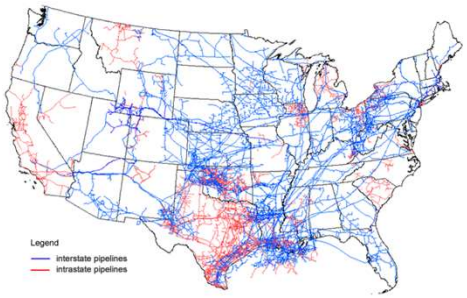
Erin Blanton
Center on Global Energy Policy
emt2014@Columbia.edu

Why should we invest in the US gas pipeline system?

Investing in natural gas pipelines will aid the journey towards net-zero by preparing existing infrastructure for future clean fuels and, in the meantime, reducing methane leaks

How stakeholders talk about the issue:

- Stranded assets
- Locking in a fossil fuel future
- Electrification should be the focus

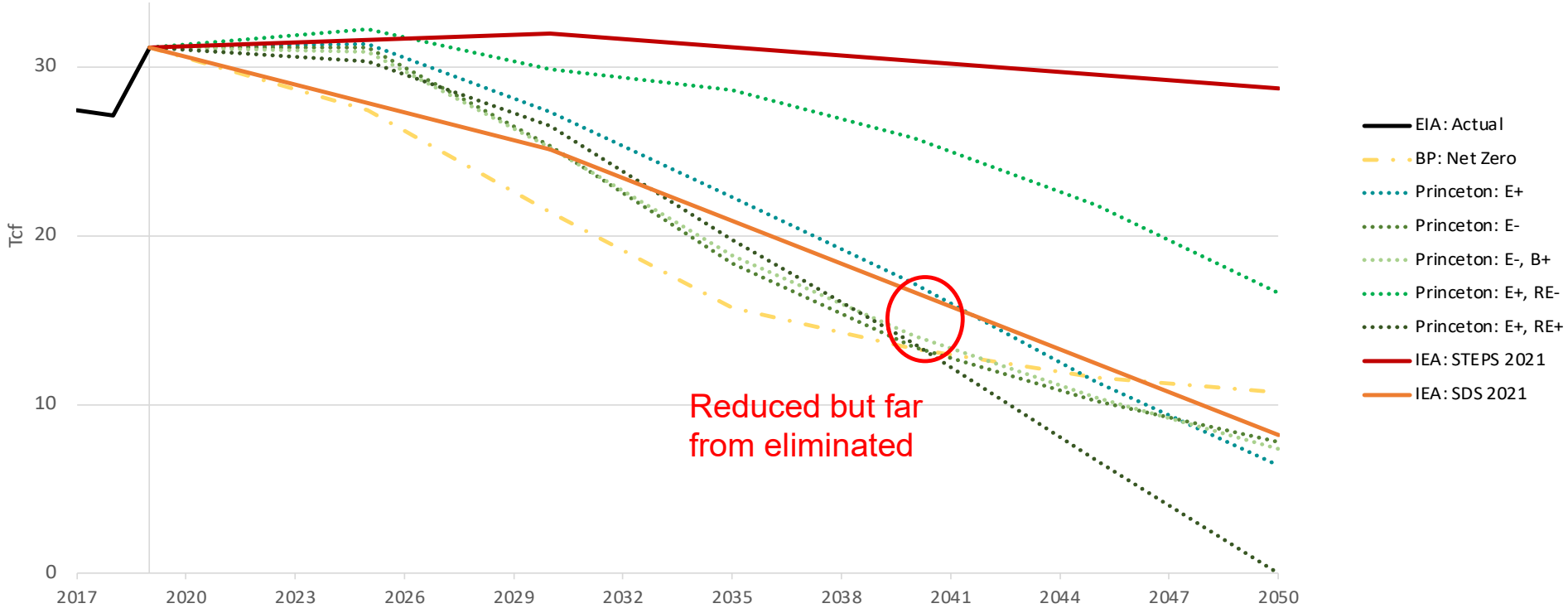


How they should: Reuse and recycle

1. We will need to make **large investments** in new infrastructure in order to transition to a net-zero economy
2. This is **not a choice** between natural gas and electrification or between fossil fuels and zero-carbon fuels
3. The natural gas grid should be viewed as a way **to enable** increasingly low-carbon molecules to be transported

In 2040, there is still at least 13 to 17 TCF of natural gas flowing through the system, 50 percent of current volumes

Total US natural gas consumption under the IEA, BP Net Zero, and Princeton Net Zero scenarios



Source: U.S. EIA 2020; IEA 2021; BP 2020, Princeton 2021

All deep decarbonization scenarios rely on the deployment of CCS/CCUS and reduced methane flaring and leakage

Carbon Capture, Utilization and Storage

- CCS opportunities exist at large coal and natural gas-fired plants, major industrial sources such as cement plants and synthetic fuel plants, and fossil-based hydrogen production facilities
- Existing CCS technology can capture approximately 80-90 percent of CO_2 produced during power generation
- Some newer systems produce pure CO_2 streams ready for use or permanent geological disposal that would effectively result in 100 percent CO_2 capture rates

Key challenges

- **Geographic limits:** Requires dedicated CO2 storage sites
- **Infrastructure limits:** Many existing plants are not near pipelines, and many of the existing pipelines are at full capacity
- **Financing:** Since CCS does not create new generation (it reduces emissions and actually reduces the amount of electricity that is produced per unit of fuel burned), conventional power project financing does not support CCS retrofits

Using the existing natural gas system could accelerate wider adoption of hydrogen over time

Costs

- To achieve cost parity with natural gas, hydrogen must be produced at roughly $0.3 per kilogram.
- The most cost-effective way to transport hydrogen is via pipeline.

Type	Cost ($ per kilogram)
Gray (from $3.50/MMBtu gas)	*$1.00–$1.50*
Blue (at 60-90 percent CO_2 capture rates)	*$1.40–$2.10*
Green (from zero-carbon electricity)	*$4.50–$8.50*

Technical considerations

- Relatively low concentrations of hydrogen (5–20 percent by volume) appear to be feasible with very few modifications
- A number of pilot projects are testing how hydrogen interacts with existing pipeline materials
- Recent research has shown hydrogen leak rates are similar to that of natural gas
- Polyethylene (PE)—the most common plastic in use today—pipes have been shown to be compatible with hydrogen

Other potential future uses include biomethane and synthetic methane

Biomethane

- Biogas can also be upgraded into biomethane or renewable natural gas (RNG) by removing the CO_2 and other contaminants, and can be injected into the pipeline grid interchangeably with natural gas
- The key limit for biogas is supply, followed by cost. Even with greatly expanded production, biogas generation could provide only up to 3 to 5 percent of the total domestic natural gas market at a cost of $5–6/MMBtu by 2040

Synthetic methane

- The cost estimations of synthetic methane, also known as substitute natural gas (SNG), or synthetic natural gas, vary significantly but remain considerably higher than biomethane or hydrogen alone: for 2030 around $23-110/MMBtu and for 2050 around $15-60/MMBtu
- If SNG costs come down and projects scale up, its similarity to natural gas would make it particularly suited for use in the current US pipeline network.