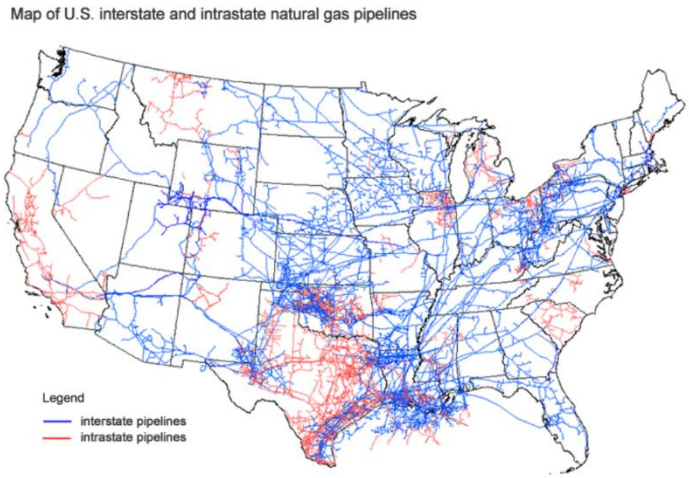
Using Existing Infrastructure in a Low-Carbon Future

Leveraging existing infrastructure can be a cost-effective way to reduce greenhouse gas emissions in the near term, supporting the transition to a low-carbon future.

North America's natural gas infrastructure is a highly integrated network that can transport and distribute resources throughout the country. There are roughly three million miles of natural gas distribution mains and pipelines that connect natural gas production and storage facilities with consumers.[1] Instead of building out costly new infrastructure, this existing infrastructure can be used to distribute low-to-zero carbon fuels to reduce greenhouse gas emissions in the near-term. Additionally, technologies such as combined heat and power are helping avoid significant amounts of greenhouse gas emissions, while enabling the deployment of renewable energy technologies.

Blending Hydrogen and Renewable Natural Gas

Renewable natural gas (RNG) made from capturing and refining biogas, and hydrogen are two clean fuels that can be blended into our pipeline infrastructure. RNG is fully compatible with current natural gas infrastructure and can be injected immediately into pipelines to begin reducing greenhouse gas emissions. RNG production could be enough to cover 93 percent of residential or 59 percent of industrial demand.[2] Additionally, surplus renewable energy can be used to produce zero-carbon hydrogen, also referred to as green hydrogen. While hydrogen blends are currently limited to 30% due to the design and conditions of our current pipelines, The U.S. Department of Energy has a dedicated HyBlend program, addressing the technical barriers to blending higher concentrations of hydrogen in natural gas pipelines.[3]



Source: U.S. EIA, "Natural Gas Explained"

Modernizing Gas Distribution Infrastructure

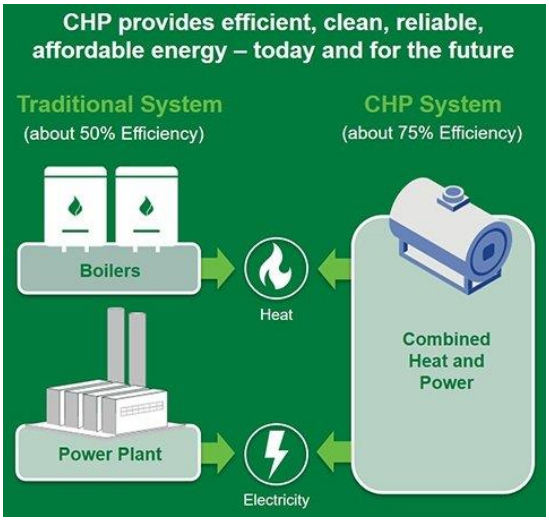
Existing distribution infrastructure can be upgraded and modernized in a way that minimizes upstream methane emissions. Upstream methane emissions can be greatly reduced by eliminating flaring and venting, plugging natural gas well heads, and by implementing modern storage practices that can detect and stop methane leaks. Gas producers that have taken steps to reduce their methane emissions can be certified as producing Responsibly Sourced Gas (RSG). RSG is essentially conventional natural gas that has been certified by a third party to verify that its procurement meets a set of environmental criteria, including reduce emissions.[4] The most common certifications for RSG are MiQ, EO100, and TrustWell, which use different

[1] U.S. EIA, *Natural Gas Explained*, 2021
[2] American Gas Foundation, *Renewable Sources of Natural Gas: Supply and Emissions Reduction Assessment*, 2019
[3] U.S. DOE, *HyBlend: Opportunities for Hydrogen Blending in Natural Gas Pipelines*, 2021
[4] Wood Mackenzie, *Responsibly Sourced Gas (RSG): A Primer*, 2021

processes to quantify and monitor methane emissions. These certifications help organizations ensure their gas is sourced with minimal environmental and societal impacts.

Combined Heat and Power Systems to Reduce Emissions

Combined heat and power (CHP) systems, also known as cogeneration, are a widely deployed technology that can be leveraged today to reduce greenhouse gas emissions. CHP systems are capable of producing both electric power and useful thermal energy from a single source, which makes them significantly more efficient than separate heat and power systems. The improved efficiency of CHP systems compared to conventional boilers and power plants means they require less fuel for the same level of energy output, allowing these systems to reduce greenhouse gas emissions.



Source: DOE, "Combined Heat and Power Basics"

There are currently 4,718 CHP sites across the United States, totaling 81,677 MW of capacity. Additionally, CHP systems have capacity factors that can reach as a high as 96%.[5] These high capacity factors allow CHP systems to displace high-emitting marginal grid resources, which also leads to greenhouse gas emission reductions. These systems can also operate on low-to-zero carbon fuels with little to no modifications. These systems can incorporate RNG without any modifications, and most CHP manufacturers are aiming to have CHP systems that can operate on 100% hydrogen by 2030.[6]

In almost all regions of the U.S., CHP systems installed through 2030 are expected to cause a net reduction in carbon emissions over their lifetime.[7]

Flexible Grid Resources and Carbon Capture, Utilization, and Storage

Fuel-based resources such as combined cycle natural gas power plants and CHP systems can help balance the variable energy output of renewables by providing a baseload source of power when renewable resources are not generating power. The emissions footprint of these fuel-based resources can be significantly improved by equipping them with carbon capture, utilization, and storage (CCUS) technology. CCUS is technology that can capture CO_2 from large point sources, which is then compressed and transported to be used as a feedstock for industrial processes or injected and stored underground in deep geologic formations. As of 2020, about half the worlds' operational CCUS sites were located in the U.S.[8] CCUS technology can enable fuel-based resources such as CHP and other flexible gas plants to continue operating in a decarbonized future.

[5] CHP Alliance, *CHP and a Changing Climate: Reducing Emissions and Improving Resilience*, 2021
[6] U.S. DOE, *Packaged CHP Accelerator Webinar CHP and Hydrogen*, 2021
[7] ICF, *Combined Heat and Power Potential for Carbon Emission Reductions*, 2020
[8] Congressional Research Service, *Carbon Capture and Sequestration in the United States*, 2021