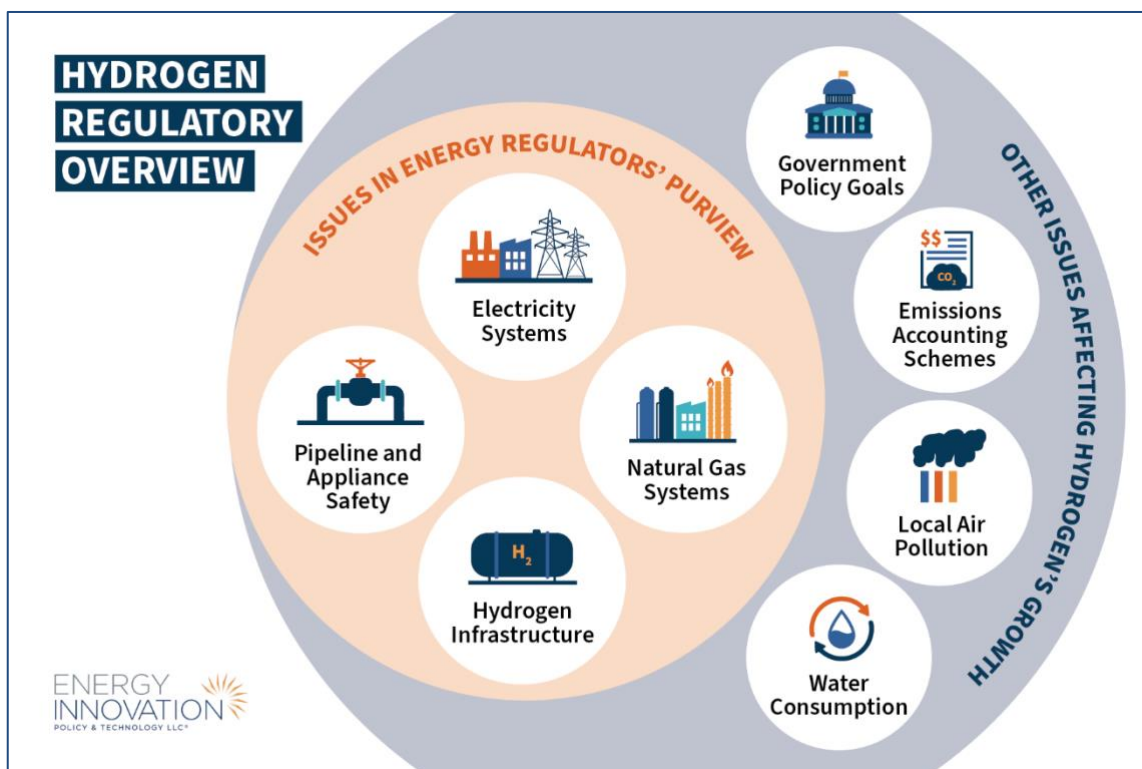


# Energy regulators can manage hydrogen uncertainty with wide lens of awareness

## HYDROGEN UNCERTAINTY AFFECTS ENERGY SYSTEM AFFORDABILITY, RELIABILITY, AND SAFETY

At least 74 countries have released national hydrogen strategies or roadmaps, often with ambitious goals. These plans recognize that low-emissions hydrogen—a gaseous molecule produced in a manner that emits relatively little climate pollution—is important for solving climate change while also bringing industrial competitiveness and energy security value. Energy regulators—those regulators who oversee electricity and natural gas networks and markets—are today being asked to make decisions that affect low-emissions hydrogen development. They are also going to see the impact of hydrogen’s production and use on their regulated electricity and gas sectors.

However, the magnitude, breadth, and pace of the hydrogen industry’s development are highly uncertain, with forecasts varying dramatically by organization and year. This has created a quandary for energy regulators in jurisdictions with ambitious hydrogen policy: regulators risk approving investments that will likely be stranded and saddling customers with the bill if they are too bullish, but they can also stifle needed growth in hydrogen development if they are too reactive. Regulators should seek to understand the technological, economic, and policy fundamentals that will drive the hydrogen industry’s development over the coming decades, including by widening their aperture of awareness beyond their core jurisdictional purview. Such proactive insight and collaboration will help cut through uncertainty to illuminate least-regrets paths forward that support regulators’ core mandate of ensuring affordable, reliable, and safe energy services as well as progress toward policy goals.



## ENERGY REGULATORS CAN TAKE A PROACTIVE, HOLISTIC APPROACH TO MANAGE UNCERTAINTY

Four issues are most likely to directly affect energy regulators or fall within their decision-making purview—though different regulators’ interaction with these issues will vary depending on their mandates and contexts:

- **Electricity systems** will likely encounter hydrogen as a source of new electricity demand via electrolytic hydrogen production, as well as potentially as a source of demand flexibility and seasonal energy storage that collectively complement wind and solar generation. Regulators will want to consider electricity pricing schemes that encourage electrolyzers to operate flexibly while ensuring large consumers pay their fair share. They will also benefit from weighing hydrogen against competing options for dispatchable power.
- **Natural gas systems** are also likely to interact with hydrogen. Hydrogen production can affect natural gas demand and therefore prices. Some natural gas companies envision hydrogen as an energy carrier to provide heat to buildings and industries; however, overwhelming technical evidence suggests hydrogen’s opportunity to decarbonize low-temperature heat is extremely limited, especially via blending into existing gas distribution networks. Finally, hydrogen transportation raises questions around the technical viability, cost, and appropriateness of repurposing natural gas pipelines to carry hydrogen.
- **Hydrogen pipeline and distribution networks** may develop in such a way that they require direct regulation, similar to other energy networks. In most jurisdictions, the hydrogen industry is far from exhibiting characteristics such as customer harm or natural monopoly today. However, regulators may benefit from beginning to think through the market structure that will best serve customers, such as the appropriate limits for regulated electric and gas companies to own and operate hydrogen infrastructure.
- **Safety** risks arise from hydrogen’s unique chemical properties, which make it more challenging to manage compared with methane. Chemicals industries have safely handled hydrogen with purpose-built infrastructure for decades, so presumably these challenges can be overcome. However, regulators must be attuned to safety risks and gas quality considerations to prevent energy company proposals to use or repurpose natural gas infrastructure for hydrogen from endangering people or harming equipment.

Regulators will have difficulty developing a proactive strategy for regulating hydrogen or managing its impacts on electricity and natural gas systems unless they keep in mind other policy areas that affect hydrogen’s viability:

- **Government policy goals** are intended to spur growth in low-emissions hydrogen production or use, but their achievement is far from certain given rapidly changing policy, technology, and economic outlooks. Regulators can share their technical perspective on these policy decisions at an early stage to inform wise target-setting while developing a realistic, proactive approach that supports growth while minimizing risk.
- **Emissions accounting schemes** determine what counts as “low-emissions” hydrogen. They will affect the quantity and price of hydrogen, the credibility of the “low-emissions” qualifier, the technologies deployed to supply the hydrogen, the demands that hydrogen production places on electricity and natural gas supply, the operational profile of electrolyzers, and the markets to which hydrogen has access.
- **Local air pollution** can arise from fossil fuel-derived hydrogen as well as from hydrogen combustion, as both processes generally result in the emissions of nitrogen oxide (NO<sub>x</sub>)—an air pollutant that harms the respiratory system. Depending on a jurisdiction’s environmental regulations, these NO<sub>x</sub> challenges can complicate or defeat certain methods of producing or combusting hydrogen.
- **Water usage** is implicated in hydrogen production directly (e.g., water for electrolysis or steam), indirectly (e.g., cooling processes), and upstream (e.g., water treatment). While the total water requirement is quite small, a given region’s lack of available freshwater—or the costs of desalination and brine management—may limit hydrogen production, with implications for the industry’s growth trajectory.

For more hydrogen context and detailed overviews of these issues, as well as recommendations for specific regulatory questions and priorities, see our full [“Regulating Hydrogen: A Primer for Energy Regulators”](#) paper.