

# Climate impacts of hydrogen systems

Although hydrogen is widely considered a climate “solution,” it creates several climate challenges depending on how it is produced, managed, and used. Fortunately, there are actions we can take to maximize the climate benefits of hydrogen by ensuring it is deployed strategically and effectively.

## Production



### Challenges

99% of current hydrogen production produces **high carbon** emissions.

The climate benefits of “blue” hydrogen can be undermined by **upstream methane leaks** and **insufficient carbon capture and storage**.

“Green” hydrogen may **displace renewable capacity** that could be more efficiently used for direct electrification.

### Recommendations

Prioritize **decarbonizing existing** production.

Require upstream gas to be produced with **methane emissions below 0.2%**.

Require **carbon capture** technology designed to achieve **≥ 95% efficiency** and credibly demonstrated long-term storage

Renewable electricity used to produce green hydrogen should be **additional**, not pulling renewables away from the grid

## Management



Hydrogen is a **small, leak-prone molecule** that when purged/vented/leaked can cause **potent near-term warming** by increasing amounts of short-lived GHGs in the atmosphere through chemical reactions.

Total hydrogen emissions from current systems are **unknown** – the technology capable of measuring small leaks isn’t yet commercially available (monitoring for safety isn’t sufficient).

Depending on how much hydrogen is emitted, anticipated climate benefits can be **severely undercut** in the near-term.

R&D for **sensor equipment** capable of detecting leaks at low levels (e.g. 10 ppb) & fast response times (e.g. every sec).

**Testing** new technology and **participating** in measurement campaigns.

Conduct research to identify leakage mitigation measures and **best practices**.

Require companies to incorporate plans for **Monitoring, Reporting and Verification** and **Leak Detection and Repair** programs early in their project design.

Incorporate hydrogen emissions into **Life Cycle Assessments** and consider GHG impacts over all timescales, not just 100y.

## Usage



Many uses of hydrogen have more energy efficient and cleaner **alternatives**.

Using electricity directly vs. using it to produce hydrogen can provide heat for up to **16x** more homes and power up to **9x** more vehicles.

Deployment of hydrogen can significantly delay when we can meet economy-wide clean energy and climate goals.

Incorporate **risks** of hydrogen leakage and energy intensity considerations in decisions and guidance about where/how to deploy hydrogen and associated incentives

Improve **Life Cycle Assessment** comparisons to direct electrification alternatives by including climate impacts of hydrogen and methane emissions over multiple timescales.

# EDF Better Hubs Project

## Raising the Effectiveness of Hydrogen and other Clean Hubs

EDF launched BetterHubs in 2023, presenting a set of key objectives to help governments, companies, investors, and local communities to be able to work collectively to tackle the tough issues required to ensure that industrial hub projects, including hydrogen projects, are

transparent, accountable, and result in better outcomes for both people and the planet. In short, we seek to raise expectations and results for hub projects by setting robust standards for what clean industrial development should and can look like.

Decarbonizing industry across the global economy will be an enormous challenge. To tackle it, billions of dollars are being invested globally in new industrial “Hubs” designed to cluster clean energy infrastructure and enhance outcomes for the climate and economies. These efforts present an opportunity to create a new paradigm for environmentally conscious and community-centered industrial planning and design. To protect both people and the planet, we can and must do it better than ever before.



**Monitor and mitigate climate pollutant emissions**



**Foster diverse local economic development opportunities**



**Track, minimize, and mitigate local and international environmental impacts**



**Comply with advanced protective regulatory frameworks**



**Responsibly, equitably, and efficiently site and resource hub operations**



**Demonstrate added value and necessity as a clean energy solution**



**Demonstrate safe and effective carbon management from capture to sequestration if applicable**



**Maximize transparency and foster information sharing**



**Deploy rigorous community engagement and partnership**



**Safely transport and store materials and products**