

# Hydrogen Market's Three Biggest Challenges

What Needs to be Done?



04/04/2025



*Bill Thomas and Scott Muster*

The hydrogen industry is at a turning point. It has grand ambitions but substantial obstacles that must be overcome before widespread adoption can become a reality. As industry players and policymakers push for a hydrogen-powered future, three major challenges stand in the way of progress. Understanding these barriers is essential for stakeholders developing a viable hydrogen ecosystem.

## 1. The Cost and Complexity of Hydrogen Production

One of the biggest hurdles facing the hydrogen economy is the **cost of production**. While hydrogen is abundant, extracting and refining it into a usable fuel source remains expensive and resource-intensive. The dominant method today—steam methane reforming (SMR)—relies on natural gas, producing carbon emissions in the process. Cleaner alternatives such as electrolysis remain prohibitively expensive due to high energy demands and infrastructure limitations.

The reality is that without **substantial government investment in grants, tax incentives, and low-interest loans**, the hydrogen market may struggle to compete with traditional fuels. The Inflation Reduction Act and various state-level initiatives are attempting to bridge this gap, but the market still requires **long-term financial commitments** to make green hydrogen cost-competitive.

## 2. The Green Transition and Its Infrastructure Challenges

Transitioning to **green hydrogen**—produced via electrolysis powered by renewable energy—is an industry-wide goal, but the shift is fraught with technical and logistical challenges. Building the necessary **wind and solar farms**, upgrading grid connections, and developing hydrogen storage and transportation networks require massive infrastructure investments.

Additionally, hydrogen's unique properties—its low energy density per volume and high flammability—create additional hurdles. Compression, liquefaction, and transportation solutions must be refined to improve efficiency and safety. Until technology and logistics catch up with ambition, green hydrogen will remain an **expensive and geographically limited** option.

# Hydrogen Market's Three Biggest Challenges

What Needs to be Done?



04/04/2025



## 3. Heavy-Haul Trucks and Buses: The First Tier of Hydrogen Infrastructure

The initial phase of hydrogen infrastructure development is heavily focused on **commercial and municipal fleets**, such as **heavy-haul trucks and transit buses**. This is a logical first step, as these vehicles require centralized refueling infrastructure, making hydrogen adoption more manageable than private passenger cars. However, even within this targeted rollout, the industry faces **significant headwinds**:

- **Refueling Infrastructure Gaps:** The U.S. has only a handful of hydrogen refueling stations for heavy-duty vehicles, most concentrated in **California**. Scaling to a nationwide hydrogen corridor will require **billions in investment and regulatory approvals**.
- **Truck and Bus Availability:** Hydrogen fuel cell vehicles (FCEVs) for heavy-haul applications are still in their early stages. Limited model availability and high upfront costs make widespread fleet adoption slow and challenging.
- **Fueling Speed & Station Uptime:** While hydrogen refueling is faster than battery-electric charging, it is crucial to ensure **consistent station uptime** and high-flow dispensing capabilities. Many existing hydrogen stations suffer from maintenance issues that disrupt fleet operations.
- **Hydrogen Supply Chain Bottlenecks:** Even if stations are built, **hydrogen production and delivery must scale alongside** to meet demand. The industry needs **regional hydrogen hubs** to distribute fuel efficiently to high-use locations.

## Moving Forward: What Needs to Be Done?

To build a **reliable and scalable hydrogen fueling network** for heavy-haul and transit applications, **stakeholders must align on key initiatives**. First, federal and state-level funding must be **strategically allocated** to high-impact locations, such as **major freight corridors and urban transit centers**. Prioritizing these hubs will allow hydrogen infrastructure to **develop efficiently and with immediate commercial demand**.

Second, industry partnerships must drive innovation in **station design, fuel production, and vehicle technology**. Truck manufacturers, fuel providers, and fleet operators must collaborate to develop **standardized refueling protocols**, create **long-term fuel supply agreements**, and implement **cost-sharing models** that make hydrogen adoption more practical.

If the industry addresses these fundamental challenges head-on, hydrogen will transform heavy-haul and transit operations. **Collaboration, investment, and technological refinement** will determine whether hydrogen becomes a dominant clean fuel source or remains a niche solution struggling to gain traction.