

FINDING THE WORKFORCE SKILLS NEEDED FOR THE **GLOBAL HYDROGEN ECONOMY**

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INTRODUCTION

The TA’ZIZ Industrial Chemicals Zone, in Abu Dhabi’s Al Ruways industrial city, looks like a potent symbol of the fossil fuel age. Located near massive Abu Dhabi National Oil Company refining and gas processing facilities, the site is well placed to use fossil fuel feedstocks.

Yet many of the firms attracted to the zone are there on a low-carbon mission. In January 2022, the zone’s developer, the Abu Dhabi Chemicals Derivatives Co, agreed to build a low-carbon ammonia plant with Fertiglobe, GS Energy and Mitsui.¹ A methanol plant, for shipping, is also in the works.²

Similar transformations are underway in other fossil fuel strongholds around the world, with the U.S. Gulf of Mexico pivoting to carbon capture and storage even as traditional hydrocarbon extraction continues.³

Yet the star of fossil fuel’s low-carbon makeover is a molecule called hydrogen, large-scale production of which “depends on the ability to attract and develop new skills,” says Patrick Henry, head of the Sustainable Business Group at the international development company DAI.



A VERSATILE ENERGY CARRIER

The need to avert the worst impacts of climate change has spurred interest in molecular fuels that can replace coal, oil and gas.

Hydrogen has emerged as a frontrunner among potential fossil fuel replacements thanks to its role as an energy carrier that could be made through a range of low-carbon pathways, even though most of the industrial supply produced today comes with a significant greenhouse gas footprint.

Low-carbon hydrogen is of particular interest as a fuel or feedstock for industrial sectors and processes that cannot be decarbonized through electrification.

According to the International Energy Agency (IEA), these could include long-haul transport, chemicals and iron and steel production.

“Hydrogen can also support the integration of variable renewables in the electricity system, being one of the few options for storing energy over days, weeks or months,” says the IEA.⁴

The potential for low-carbon hydrogen to replace fossil fuels in several global industries has led to mounting interest in developing projects. The IEA expects to see investment in low-carbon hydrogen rising from \$1.4 billion in 2023 to \$12 billion by 2030, under a Stated Policies Scenario.

Increased ambition in line with the IEA's Net Zero Emissions Scenario could see investment rising to \$112 billion, the agency says.⁵



THE SKILLS NEEDED FOR HYDROGEN

The emerging hydrogen economy could generate up to 30 million jobs a year around the world by 2050, according to research body CIC energiGUNE.⁶ This is about five times the workforce directly employed by the petroleum industry, according to the International Labour Organization.⁷

In Europe, a strategy document published by industry group Green Skills for Hydrogen notes that the sector could require a million workers by 2030.⁸ Meanwhile, national estimates of hydrogen workforce requirements have been made for:

- The Netherlands, where between 1,800 and 4,700 people might be needed for the construction of hydrogen distribution systems by 2030, and 4,200 to 12,500 for operations and maintenance.⁹
- Australia, where there is a forecast need for between 13,150 and 16,050 full-time employees, across 46 job roles, by 2030.¹⁰
- Germany, where 61,000 people would need to be recruited by 2045.¹¹

There is an expectation that many oil and gas jobs could ultimately migrate to clean energy, with offshore wind providing an example of this transition in action.

And handling low-carbon hydrogen, a flammable, volatile energy carrier and feedstock, might seem like a good fit for companies that currently produce, process and distribute natural gas.

Indeed, one of the two main pathways for low-carbon hydrogen production, which involves steam methane reforming coupled with carbon capture and storage, uses processes and technologies that are already used at scale within the oil and gas sector.

However, this pathway—which yields so-called blue hydrogen—will only account for around 28% of total production come 2050, according to the assurance and risk management firm DNV.¹²

Most of the rest is expected to come from huge electrolysis plants that will split water into hydrogen and oxygen, using renewable electricity to create ‘green hydrogen’.



SOURCING THE WORKFORCE

Industrial-scale electrolysis is still in its infancy, with electrolyzer vendors touting a wide range of technologies and processes. This means there is little consistency in the technologies being used across projects, and even less real-life experience of electrolyzer operations.

Furthermore, there would seem to be little overlap in the skills required for green and blue hydrogen production. This could be a problem for workforce development, says Henry at DAI. "If you look at oil and gas, the technology that everybody's using is broadly similar," he says.

"A worker can freely move from ConocoPhillips to BP, whereas the hydrogen technology is still being settled. That's

an issue that complicates your workforce. It's all a bit specific, company by company."

A further challenge is that low-carbon hydrogen is just one of a wide range of energy transition sectors looking to scale up its workforce. In markets such as the U.S., the energy transition is seen as a lever for job creation, with local content requirements attached to finance and project development.¹³

This means low-carbon hydrogen project developers will likely be competing for talent with a host of other cleantech sectors, from established industries such as solar and wind to emerging segments including electric vehicle charging and battery manufacturing.



A SHORTAGE OF SKILLS

A cleantech jobs bonanza is just what many policymakers want from the energy transition.

However, much of the job creation potential of clean technologies is limited to people with skills in science, technology, engineering and mathematics (STEM)—all fields where there is already a dearth of workers.

Research in 2021 found a third of U.S. workers lack the digital skills needed to succeed in today's economy.¹⁴

And the consulting firm Korn Ferry estimated in 2018 that up to 85 million jobs could go unfilled around the world by 2030 because of skills shortages, with technology and manufacturing among the hardest-hit sectors.¹⁵

Specifically related to the energy transition, the IEA predicts a need for 30 million jobs by 2030, a level that could signal a major skills shortage.¹⁶

OPTIONS FOR PLUGGING THE SKILLS GAP

Louise Flynn, a Director in the Sustainable Business Group at DAI, says studies show a need for hydrogen engineers but also people to fill roles in areas as diverse as sales, marketing, project management, Earth sciences, process control and finance. "This is going to be a challenge," she says.

On the plus side, she notes, it is possible that a large proportion of the hydrogen workforce could be retrained from areas such as chemicals and heavy industry. And hydrogen companies may find it easier to attract recruits than some other industrial players.

For example, says Flynn: "People don't want to consider careers in oil and gas, but green hydrogen may be more appealing to the new generation. It's a branding issue."

Some markets may have greater access to skills than others, with China set to produce more than 77,000 STEM PhD graduates by 2025, almost double the number of the United States.¹⁷

However, the extent to which hydrogen companies will be able to recruit from abroad will vary, since some markets—with the U.S. as a prime example—are attaching energy transition incentives to local content and job creation.

THE ROLE OF GOVERNMENT

In the U.S., up to \$3 trillion in renewable energy investment could be mobilized by a single piece of legislation, the Inflation Reduction Act, with "a transformative effect on domestic supply chains and workforces," according to a report from DAI.¹⁸

Both the IRA and the European Union's Green Deal Industrial Plan are focused on local job creation, underscoring the

need for government support in helping to create workforce readiness for the hydrogen economy.

With the fuel potentially penetrating sectors as varied as long-distance transport and residential heating, the transition to a hydrogen economy is "a whole-of-society-type change," says Flynn.

THE OUTLOOK FOR HYDROGEN SKILLS

As hydrogen becomes an increasingly key part of the energy transition, it is clear there will be a growing need for a well-equipped, competent workforce not only to produce the gas but also to enable its use throughout other sectors.

Industrial leaders are starting to wake up to the need for skills as other cleantech sectors also scale up their demand for workers.

In this context, hydrogen benefits from overlaps with sectors such as chemicals and oil and gas, plus awareness among policymakers of the potential for hydrogen-related job creation.

In October 2023, for example, five union leaders called for the UK government to back hydrogen or “risk losing major businesses and the highly skilled jobs that come with them.”¹⁹

This does not mean hydrogen project developers can afford to be complacent about workforce skills. Instead, DAI recommends that industrial players should work with each other and with government on initiatives including:

- Internal training programs for work with hydrogen technologies, safety protocols and equipment maintenance.
- Collaborations with educational institutions such as technical schools and vocational training centers.
- Certification programs for formal skills recognition.
- Simulations and practical training.
- Continuous learning platforms.

Examples of best practice are already emerging in this space, with industrial leader Siemens Energy launching a hydrogen apprenticeship scheme with project developer GeoPura in February 2024.²⁰

Meanwhile, organizations such as DAI are helping hydrogen-related companies assess their current and potential workforce and secure the workers they need in a competitive market. “We can help you transition your workforce to reduce risk and position for the opportunities ahead,” is Henry’s message.



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