



**HYDROGEN INDUSTRY**  
OUR OVERALL  
SUPPORT OFFER



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ydrogen, which has been used for many years, mostly for industrial applications, is gradually becoming a fundamental element of the 21<sup>st</sup> century.

The hydrogen industry is gradually becoming more structured and developed to offer a replacement solution for fossil fuels. Water electrolysis will soon enable the production of hydrogen with little carbon impact. Associated with renewable electricity, it will even offer a new, totally carbon-free source of energy.

**By the end of this decade dedicated to the energy and ecological transition, the hydrogen industry must meet two challenges:**

- ▀ Produce hydrogen at a competitive cost;
- ▀ Multiply the uses of hydrogen, while controlling the inherent risks.

**The growth and development of the hydrogen industry depend upon the trust that future users have in this new source of energy.**

**At Bureau Veritas, we are already working to build this trust with the industry's stakeholders.**

For several decades, we have been assisting manufacturers to use hydrogen safely in their industrial processes and have recently begun to focus on the development of new uses.

#### OUR GOAL?

**To support the development of hydrogen projects by positioning ourselves as a trusted third party throughout the value chain of this industry.**

## MAKE HYDROGEN A TRUSTED ENERGY

Being well aware of today's energy challenges and society's expectations, Bureau Veritas helps the various stakeholders of the hydrogen industry, both public and private, to design reliable, safe and environmentally-friendly systems, while controlling the associated costs.

Present throughout the value chain of the hydrogen industry to ensure risk anticipation, Bureau Veritas acts at several levels to instil trust:

### 1 | Trust in risk control

In its gaseous form, hydrogen is highly volatile and inflammable. Particular attention must therefore be given to its production, storage and use to ensure control of the inherent risks. Bureau Veritas can help you to qualify and quantify these risks for better control.

### 2 | Trust in compliance with regulations

The systems that produce or use hydrogen must obviously comply with applicable regulations. This compliance must be anticipated from the very earliest stages of the project and throughout its life cycle. Bureau Veritas can help you to identify and comply with these regulatory obligations.

### 3 | Trust in projects

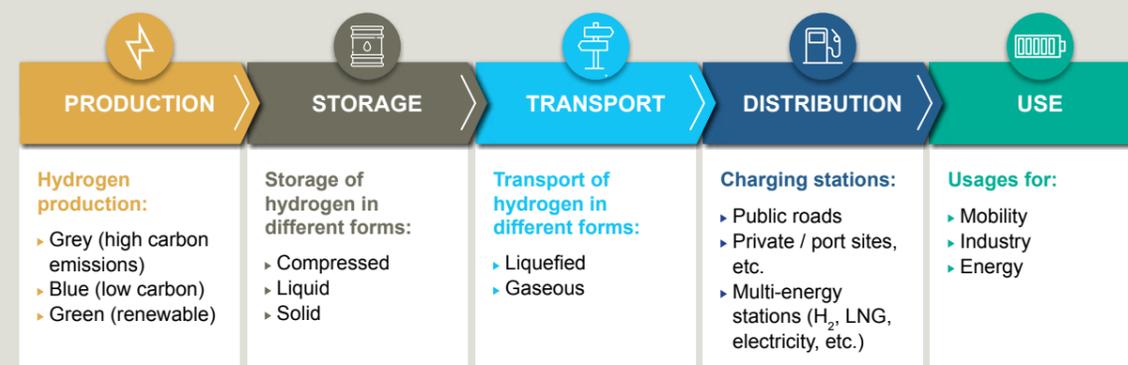
The hydrogen industry plan will enable many projects to be developed. Public authorities will be relying on integrators to meet local needs, and these integrators will be turning to the suppliers of technological bricks (fuel cells, electrolyzers, etc.). Trust is essential for all the parties involved in the project. As an independent trusted third party, Bureau Veritas can audit and evaluate the commitments of the various project contributors.

### 4 | Trust in performance

The success of hydrogen as an energy source will depend upon the good performance of the facilities and controlled costs. Bureau Veritas can help throughout the chain to measure performance levels and propose improvement actions: ratio of electrolyser electricity consumption, monitoring of fugitive emissions, etc.

### BUREAU VERITAS ACTS AT ALL THE DIFFERENT PHASES OF THE HYDROGEN LIFE CYCLE

The particularities of hydrogen must be mastered at every stage.



# REDUCING THE CARBON FOOTPRINT OF HYDROGEN PRODUCTION BY ELECTROLYSIS

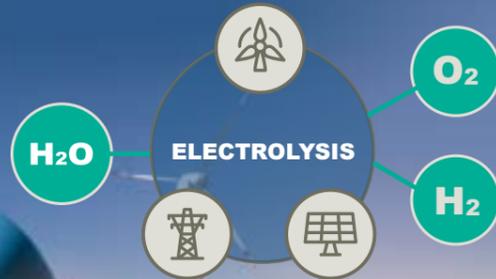
Water electrolysis is a process that breaks down water into dioxygen and hydrogen gas using electricity. If the electricity used is produced using renewable energy, green hydrogen can be produced.

This hydrogen production method is not widely used at present because it is more expensive than other higher-carbon production methods (2-3 times more expensive). However, a more favourable economic and political context means that blue and green hydrogen can now be developed. The hydrogen industry is at the heart of the energy transition. The French government wants the country to become a reference actor of this transition, by investing massively to develop a French electrolysis industry: €7 billion of the #FranceRecovery plan budget will be devoted to the hydrogen industry over the next ten years.

## It is time to go green!

As a trusted Business to Business to Society third party, Bureau Veritas proposes its support to the owners of hydrogen production and distribution projects, as well as integrators and engineering enterprises in France.

What is our goal? To develop trust by controlling risks (hazard studies, HAZOP, etc.), by guaranteeing compliance with regulations (CE compliance: ATEX, pressurised equipment, machines, etc.), in projects (supplier audit) and performance (counting plan).



## BUREAU VERITAS, TRUSTED THIRD PARTY FOR REGULATORY COMPLIANCE

### CUSTOMER REFERENCES

Construction of two plants for the mass production of hydrogen by water electrolysis by a specialist industrial company.



### CUSTOMER REQUIREMENT

Compliance with applicable regulations and control of risks from the design stage onwards.



### THE BUREAU VERITAS SOLUTION

- Completion of hazard studies according to applicable regulations
- Review of process risks (HAZOP study)
- Definition of safety functions



### BUREAU VERITAS ADDED BENEFITS

Perfect knowledge of **regulations combined with expertise** in risk control.



### KEY FIGURES

Production of **28,000 tonnes hydrogen/year**.

# MULTIPLYING THE USAGES OF GREEN HYDROGEN

The recovery plan will enable the growth of carbon-free hydrogen production, at an increasingly competitive cost. To achieve our carbon neutrality objectives by 2050, this growth must be accompanied by the development of new usages: mobility, heat network, industry, etc.

## MOBILITY

The recovery plan encourages the development of heavy mobility running on carbon-free hydrogen.



Bus



Heavy vehicles



Trains



Ships



Aircraft

The distances covered and charging time of hydrogen vehicles are almost the same as those of combustion engine vehicles. But their carbon footprint bears no comparison.

The mobility sector is facing a two-fold development challenge with hydrogen:

- Vehicle development (tanks, technologies, etc.)
- Development of storage and distribution stations

Bureau Veritas acts to ensure that these new vehicles are safe and compliant from the design stage onwards.

Furthermore, Bureau Veritas intervenes as a trusted third party to enable hydrogen production and distribution station projects to be designed, while guaranteeing good control of the associated risks for the public authority.

## BUREAU VERITAS, TRUSTED THIRD PARTY FOR CONTROLLED RISKS

### CUSTOMER REFERENCES

As part of a project for a large French city, an engineering firm is building a bi-pressure (350 and 700 bar) hydrogen distribution station for the city's household waste collection trucks, heavy (buses) and light vehicles.



### CUSTOMER REQUIREMENT

Study of the industrial risks of hydrogen production, compression, storage and distribution facilities.



### THE BUREAU VERITAS SOLUTION

- Inventory of potential hazards
- Preliminary risks analysis
- Modelling and mapping of the effects of the various hazards
- Proposals to reduce the level of risk



### BUREAU VERITAS ADDED BENEFITS

**Third party expertise** provided to the public authority



### KEY FIGURES

Production of more than **500kg hydrogen/day**.

## INDUSTRY & ENERGY

Hydrogen is traditionally used mostly in industrial sectors. One of the main objectives of producing hydrogen by electrolysis is therefore to reduce the carbon impact of its traditional usages, such as the refining of oil products, the production of ammoniac (fertilisers), and even the production of methanol.

**In addition to these conventional usages, hydrogen is starting to be used for new applications.**

The following deserve a mention:



Injection of hydrogen into **natural gas pipes** in an effort to reduce greenhouse gas emissions.



**Stationary fuel cells** designed to provide additional electricity.



**Methanation** to capture CO<sub>2</sub> using hydrogen.

Bureau Veritas helps industries with their carbon reduction projects involving hydrogen, by providing technical expertise for both project definition (preliminary studies) and implementation (risk identification, regulatory compliance, performance measurement).

### BUREAU VERITAS, TRUSTED THIRD PARTY FOR PERFORMANCE

#### CUSTOMER REFERENCES

The goal of this combined cycle gas turbine plant project was to include some hydrogen in the natural gas used in the processes to reduce the facility's overall CO<sub>2</sub> emissions.



#### CUSTOMER REQUIREMENT

In the very early stages of this project, Bureau Veritas was contacted to provide an expert outside opinion on the technical and financial viability of such an infrastructure.



#### THE BUREAU VERITAS SOLUTION

- Creation of a decision-making tool based on CAPEX and OPEX data
- Assessment of the economic viability of the project
- Sizing study of hydrogen production/injection scenarios



#### BUREAU VERITAS ADDED BENEFITS

**Independent analysis** to optimise hydrogen injection



#### KEY FIGURES

Estimation of **15% reduction** in CO<sub>2</sub> emissions.

## WHY CHOOSE BUREAU VERITAS?

### More than 200 years' expertise

Bureau Veritas has been delivering high added value services to its customers since 1828. Our aim is to help you to face the growing challenges related to quality, safety, social responsibility and sustainable development.

To guarantee the best possible support for your hydrogen project, Bureau Veritas proposes the expertise of its 7,500 associates in France, and a team of more than 70 people dedicated to this specific challenge.

Bureau Veritas, a French company belonging to the France Hydrogène association, positions itself as a trusted third party to provide the necessary assurance for developing green hydrogen.



## **FIND OUT MORE**

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## **STAY IN TOUCH**

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Shaping a World of Trust

Bureau Veritas Middle East

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