

Green Proof for the Hydrogen Value Chain – Digital Solutions for Green Hydrogen Certificates

In Brazil and two other emerging or developing countries

The challenge

Developments in the market ramp-up of green hydrogen and the emergence of a global hydrogen economy are becoming increasingly dynamic. Developing and emerging countries need targeted support to identify economic production and use paths same as project opportunities along the value chain.

This also includes the development of H₂ business models and the improvement of the regulatory framework for green H₂ and its derived products.

An essential element for the success of the hydrogen economy is the issue of certification. Certificates can be used to prove that the hydrogen or hydrogen derivative produced and later purchased by the end consumer is really green or what its CO₂ intensity actually is. This gives companies along the hydrogen value chain the necessary security for national and international trade across national borders, and at the same time the sustainability of the hydrogen produced can be proven. Figure 1 below provides an overview of the complex hydrogen value chain:



Fig. 1 How PtX works

Green hydrogen (GH₂) and its derivatives, called Power-to-X (PtX) products, are new products that are not yet traded on an industrial scale on the world market. Accordingly, the certification of GH₂/PtX is also a new process for which only few or no long-term empirical values are available so far. In addition, there is a lack of generally applicable or mutually compatible certification criteria.

The solution

However, the previous processes and procedures for the certification of green electricity, biofuels and also the first approaches for the certification of green hydrogen have procedural weaknesses. For example, the current processes and certificates tend to be susceptible to falsification or fraud (e.g. through double counting of the same certificate), as they are partly based on manual and analogue readouts or evaluations. This makes the processes less transparent, not always traceable and cost-intensive. The analogue and manual processes stand in the way of a simple and efficient exchange of information along the value chain and thus also a corresponding upscaling.

One solution for closing these procedural weaknesses can be the digitalization of the certification process. By providing digital solutions for the certification of green hydrogen, the certification process can be made more transparent, tamper-proof, automated and cost-efficient.

Blockchain technology or other cloud-based business networks, for example, represent an innovative approach. They can be used to exchange and evaluate data between all participants in a certification system in an automated and tamper-proof manner. By mapping the produced hydrogen in a digital twin, the so-called digital "tokenization" of hydrogen and its derivatives, a traceable proof of origin can be made possible even in the complex hydrogen value chain.

Our services

Within the framework of the public-private partnership between SAP and GIZ proposed here, the digitalization potential of the certification processes for green hydrogen and PtX along the entire value chain is to be investigated and then a digital pilot solution adapted to the Brazilian context is to be provided and tested. An expansion and replication in two other emerging and/or developing countries is envisaged.

Roadmap

The project is divided into two phases:

Phase 1: Theoretical phase

Step 1: Determination of certification requirements

- Investigation of the requirements/criteria of various relevant certification schemes from Brazil and the EU, with a focus on schemes commonly used in Germany.
- Investigation of which data from which sources must be available in which form for the certification process, as well as how the various process participants should be able to access this data.
- Investigation of the digitalization potential for certification systems and processes.

Step 2: Solution development for the certification requirements

- Translation of the findings from step 1 into functional requirements for the software
- If required, development/adaptation of software solutions
- Demonstration of the functionality of the software through simulations for various theoretical use cases and H₂/PtX products.

A midterm review is due at the end of phase 1. The midterm review shall include a description of the results achieved so far since the start of the project and an assessment of the feasibility of developing a customized digital solution. The midterm review will serve as the basis for the BMWK to decide on a commitment for the implementation of phase 2 described below.

Phase 2: Practical phase and rollout

- Pilot application of the developed software on real customer data for at least three Brazilian projects, involving other stakeholders of a certification scheme.
- Review the possibility and necessity of creating an integrated tool for access to data for process participants.
- Investigation of the optimization potential and digital implementation of the possible adjustments for optimization

- Scaling up the application of the software to different PtX projects and at least two additional country contexts
- Implementation of capacity development measures to build knowledge and skills - on the one hand on IT-specific knowledge, on the other hand on the topic of certification of green H₂ and PtX in general.

Impacts and results

The aim of the project is the theoretical development as well as the practical testing of an interoperable digital solution for the proof of origin, which allows mass balancing and the exchange of certificates along the value chain of green hydrogen.

The capacity development measures are carried out, for example, in cooperation with the Brazilian service provider for industrial education and training (SENAI) and Brazilian universities. The target groups are not only IT companies and those involved in the process of a certification system, but also Brazilian students and universities.

The digitalization potential of the entire certification system with all stakeholders, including trade, will be explored and software-independent approaches for creating digital solutions for certification will be developed and made available to other technology companies. Local capacities will also be developed for a faster approach in the market ramp-up of green hydrogen and Brazil's position in the global hydrogen market will be strengthened by the project.

At a glance

Duration	05/2023 – 12/2025
Country	Brazil and two further emerging / developing countries
Objective	The project aims to develop a digital solution for mapping the certification of green hydrogen.
Partners	All relevant stakeholders for certification

The International Hydrogen Ramp-up Programme (H2Uppp) of the German Federal Ministry for Economic Affairs and Climate Action (BMWK) promotes projects and market development for green hydrogen in selected developing and emerging countries as part of the National Hydrogen Strategy.

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