Concept note for OECD webinar on "Certification for facilitating international trade of green hydrogen"

31 January 2023, 9:30 – 13:00 CET

Background

Low-carbon hydrogen and products derived from it will play a key role in achieving net zero emissions. Analysis suggests that hydrogen could represent up to one-fifth of the total global energy demand in 2050 in a scenario aligned with the goals of the Paris Agreement. About two-thirds of this total would be green hydrogen produced from the electrolysis of water with renewable power.

In November 2022, the Organisation for Economic Co-operation and Development (OECD) issued a new working paper titled "*Green hydrogen opportunities for emerging and developing economies: Identifying success factors for market development and building enabling conditions*". The paper highlights the importance of understanding the whole value chain of green hydrogen to create enabling conditions for its development. It emphasises the role of a systemic approach to facilitate international green hydrogen and other low-carbon hydrogen trade. Hydrogen is currently produced and consumed at the same location. The share of traded hydrogen is expected to increase and could amount to a quarter of its total production by 2050.

Countries with low-cost renewable energy potential complemented by an enabling environment are well positioned to produce green hydrogen to decarbonise their energy, industry and/or transportation systems. Moreover, these countries can become major exporters of green hydrogen and its derivatives, such as green ammonia, and help other countries achieve their net zero emission targets. Building consensus on low-carbon hydrogen definition is a precondition to ensure its sustainable production and supply, requiring accounting methodologies for life cycle impacts and carbon content.

Hydrogen standards, regulations, and certifications are in the process of being developed. Certification will be instrumental in the implementation of standards and regulations that should provide the necessary information on the carbon footprint and other environmental impacts of the hydrogen produced.

In support of a better understanding of the role of hydrogen certification, the OECD Clean Energy Finance and Investment Mobilisation (CEFIM)[1] team is organising a webinar through engagement of OECD member countries and other key partners who are expected to develop green hydrogen domestic production and uses, as well as trade partnerships. The objectives of this webinar are:

- Understand the considerations and challenges around certification for international hydrogen trade, including its impact on end-uses.
- Discuss the roles individual governments, private sector and international organisations can play in developing hydrogen certification.
- Provide inputs on priority areas to hydrogen stakeholders for developing certification and in turn facilitate international hydrogen trade.

International hydrogen trade

Developing hydrogen value chains and trade routes between potential low-cost green hydrogen producing and consumption zones calls for international collaboration. Many governments envisage partnerships to establish cross-border hydrogen trade. Many countries that aim to decarbonise their national energy systems through a mix of self-produced and imported hydrogen have initiated bilateral talks with other countries to explore hydrogen imports through international gas pipelines and in the form of hydrogen-derived products. In addition to its role in abating CO_2 emissions, green hydrogen can help to diversify energy sourcing and mitigate geopolitical risks for future importers like Europe.

[1] www.oecd.org/cefim

The increasing number of country partnerships that are being announced hint that, together with domestic use, some emerging and developing economies may become hydrogen exporters. These partnerships could build sufficient demand to create local value chains and contribute to improving the balance of trade of exporting countries. They thereby support sustainable and local development. Partnerships can also create a window of opportunity for technology transfer to exporting countries, which may have limited public resources to create local hydrogen value chains.

The role of certification for international trade of hydrogen

Hydrogen market actors must be able to label the produced hydrogen, for instance with respect to its emission intensity, based on feedstock type and the production route. This requires countries to work together on methodologies for assessing production routes, national regulations that are defined using these metrics and interoperable between countries, and international certifications and tracking systems to verify that projects comply with the respective regulations. Communication between producers and consumers of hydrogen should also be transparent with respect to hydrogen's other environmental impacts, its source, and other sustainability criteria which its value chain should adhere to. Certification can be required to comply with criteria set in legislation of countries. Voluntary systems can also be used which are developed by market participants or non-governmental organisations for reporting and disclosure purposes.

Global progress on hydrogen certification

There are currently six voluntary schemes for renewable hydrogen in place with another five emerging. Several governments, such as the United Kingdom, Australia, South Korea or the United States, are working on the establishment of hydrogen certification schemes. There are also private sector initiatives which look to certify projects that produce low-emission hydrogen.

Consideration and challenges in hydrogen certification

The current global annual production of hydrogen amounts to more than 90 Mt. Nearly all production is from fossil fuels, predominantly from natural gas via the steam methane reforming route. This is referred to as "grey hydrogen". Grey hydrogen is an essential component of many chemical and refining processes. A small share of its production is also used in other industrial plants such as in iron and steel production. Hydrogen may have uses as a fuel in the future as well, for instance in the shipping and power sectors.

Scope / System boundaries

Considering the hydrogen value chain from production and transport to the end use of hydrogen, the scope of certification can address individual or all stages of the hydrogen value chain.

Most stakeholders currently use a somewhat consensual colour code to define hydrogen produced from various technologies/processes and feedstocks. As an example, green hydrogen typically refers to the electrolysis route that uses renewable power and water, whereas blue hydrogen is produced by integrating carbon capture use and storage to the steam methane reforming process.

However, this colour code classification only considers the steps of the value chain until the production of hydrogen. It excludes all subsequent steps to deliver hydrogen from the producer to the end user. This is a complex area since it can potentially involve transport, storage and conversion of hydrogen to different products (e.g. ammonia). A lifecycle approach also needs to consider hydrogen use by the end user, where it is applied as such or converted to another product for use as feedstock and/or fuel.

Climate impacts

Once the system boundaries for the certification are determined greenhouse gas emissions must be assessed to evaluate the climate impact of hydrogen production. There are already standards in place for life cycle assessment and methodologies for estimating greenhouse gas emissions.

The evaluation of the climate impact of hydrogen must account for the flows of greenhouse gases all along the value chain. For instance, during blue hydrogen production, it will be important to understand the share of carbon that is captured, and how long this carbon is stored.

Additionality is another concern for certification. For instance, the production of green hydrogen should be based on investments in new renewable power capacity instead of utilising grid power supplied for other purposes. If the production relies fully or partly on grid-based electricity, guarantees of origin may be needed to demonstrate supply is from low-carbon energy resources. Certification systems will need to cover the technology, geography and temporal factors concerning renewable power use, thereby ensuring full traceability to the origin of supply.

Methodologies should strive to establish ceilings for emissions to limit access of products to markets which do not meet them.

Other sustainability criteria

Besides climate impacts, there can be other quantitative and qualitative criteria that impact the sustainability of hydrogen. For instance, green hydrogen production requires water as a feedstock. Sources of water production and their impacts on resource availability and environment may need to be addressed by certification schemes. Certification may need to cover how hydrogen adheres to environment, social and governance criteria. Equipment safety and conformity may also be covered by certification systems.

Tracking systems

In order to comply with the sustainability requirements of certification, hydrogen producers, traders and consumers will need to trace and connect the information on raw materials, hydrogen production and further steps until the consumption. The method followed for this purpose is called the “chain of custody” and can follow several approaches having specific pros and cons. For instance, a “mass balance” system would follow the product and facilitate the understanding for consumers but requires tracking at each step of the value chain. An alternative approach would be a “book and claim” system based on tradable certificates decoupled from the physical trade. Common good practices should be guaranteed, irrespective of the chosen tracking system.

Governance

To facilitate certification, institutional capacity will be needed to assess various hydrogen process and production methods, issue certifications or guarantees of origin to verify compliance, and track certifications in a transparent and centralised registry. Authorities must be in place to oversee the certification bodies and track the flows of certified hydrogen. Application process and data handling are other issues that fall under certification governance. There is already experience in using certification in the clean energy sector, such as for certifying the sustainability of biofuels and renewable power. This can provide a starting point to set up a sound governance for hydrogen certification.

International outlook

Currently, certification schemes are country/region specific. Most of the mechanisms are voluntary, although several mandatory mechanisms are emerging. As harmonisation, convergence and interoperability between these schemes can support the development of international trade, it will be important to understand how to minimise potential deviations between certification systems that meet different country needs. Ensuring reliability of regulations, standards and certification will be other important aspects to ensure trust of institutional actors.

Questions for discussion with stakeholders

The effort needed to progress on certification and pave the way for international hydrogen trade come with uncertainties. An increasing number of studies are being undertaken to advance on certification by various international organisations such as the International Energy Agency, International Renewable Energy Agency and the World Energy Council as well as industrial or certification companies (e.g. TÜV

Rheinland). Building on this knowledge and the current progress to date, the following questions are proposed for discussion with country stakeholders:

- What are best practices and main limitations in the currently available hydrogen certification systems?
- What are the main considerations that should be considered in developing certification schemes for hydrogen? Do the considerations outlined in this paper cover all, or are there more considerations that should be included?
- What are the current challenges around developing certification systems for hydrogen?
- What are the minimum criteria that should be included in hydrogen certificates? What are the 'good-to-have' criteria? What is the rationale behind including these criteria, as well as the opportunities and risks? How can these impact international harmonisation?
- What are suggestions and solutions to enhance and expand current certification systems?
- How can the governance and institutional capacity around hydrogen certification be developed and strengthened?
- What strategies should be followed for international harmonisation of certification systems?
- Who are the key stakeholders in developing hydrogen certification systems? What are their specific roles?

Plan for stakeholder engagement

The CEFIM programme is organising its first green hydrogen certification webinar for potential future green hydrogen exporting and importing countries in January 2023 to discuss priority areas. At the webinar, following a short presentation of the new OECD working paper, a 3-hour discussion will be organised around three sessions:

(i) Challenges and considerations for hydrogen certification.
(ii) International harmonisation and interoperability.
(iii) Stakeholder roles.

The outcomes will help identify priority areas and can guide further dialogue with the CEFIM partner countries. Following this webinar, specific events/webinars/stakeholder activities can be organised at country level in 2023. Such activities could for instance be embedded in CEFIM's Egypt country programme, or support India during its G20 presidency, where advancing adoption of alternate fuels such as green hydrogen has been identified as a priority issues.