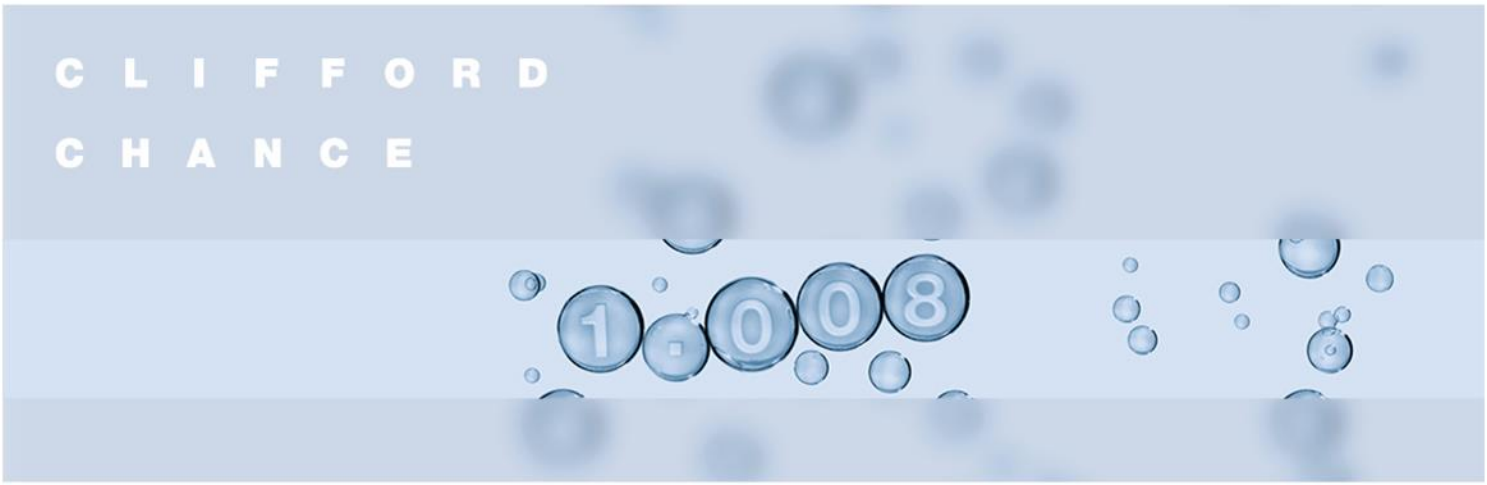

FOCUS ON HYDROGEN: ROMANIA'S HYDROGEN STRATEGY – A KEY COMPONENT OF THE ENERGY TRANSITION ROADMAP

The Ministry of Energy of Romania has published the first draft of its Hydrogen Strategy and Action Plan for 2023-2030**.** This is a positive step for Romania. Implementing the Strategy will require significant investment in hydrogen infrastructure. In this briefing, we consider the key proposals of the Strategy, noting that the draft is out for public consultation and that some changes may be made to reflect market feedback. The deadline for responses was 20 June 2023.

The concepts of "hydrogen" and "H2" are used interchangeably in this briefing.

CONTEXT AND VISION

Green hydrogen is currently seen as an important vector for reaching decarbonisation targets worldwide, and the Strategy, published on 31 May 2023, represents an important commitment by Romania under the National Resilience and Recovery Plan (NRRP) agreed with the EU. Pursuant to the NRRP, Romania undertook to adopt a hydrogen strategy and relevant regulatory framework in the first quarter of 2023. The Strategy envisages the development of a full hydrogen economy in Romania, including all aspects of the hydrogen value chain (production, storage, transport and usage), based primarily on "renewable hydrogen" but also with a specific role for "low-carbon hydrogen". The distinction between these types of hydrogen is explained below.

TARGETS

In the most optimistic scenario, the Strategy estimates that, by 2030, Romania will need to build 3,985 MW of electrolyser capacity, to be operated using approximately 8 GW of additional renewable energy capacity, strictly dedicated to H2. The production of H2 is expected to reach 288.8 kt per year by 2030. Interestingly, the Strategy concludes that the amount of water required to produce the renewable hydrogen that will be needed by 2030 will not be significant – the equivalent of a medium-depth river in Romania.

Key issues

- By 2030, **3,985 MW of electrolyser** capacity supported by approximately **8 GW of renewable energy** dedicated to H2 will be needed to reach the goal of **288.8 kt of H2** per year
- Only green/renewable H2 and H2 produced by nuclear energy are considered low-carbon hydrogen
- By 2030, priority uses of renewable/low-carbon H2 are: (i) replacing current H2 production in the refining, fertilisers and chemicals industries; (ii) developing the green steel industry; and (iii) fuel or feedstock for clean transport (heavy road, aviation, maritime transport)
- Feedback from the market expected until **20 June 2023**

COLOURS OF HYDROGEN

The Strategy uses the international convention for colour-coding hydrogen to define the various types, depending on the production process and their impact on the environment:

- **Grey H2** – hydrogen produced by steam reforming of methane without capturing greenhouse gases (GHG). This is the most common method of producing hydrogen at present and produces GHG emissions.
- **Blue H2** – hydrogen produced by steam reforming of methane with carbon capture and storage (CCS) capacity installed in the production process.
- **Turquoise H2** – hydrogen produced by pyrolysis of methane which results in hydrogen and solid carbon as a by-product. This is not frequently used at the moment, but there is some potential for commercialising the solid carbon.
- **Pink H2** – hydrogen produced by water electrolysis using electricity generated by nuclear sources. This process does not lead to GHG emissions, although there is some nuclear waste from the generation of electricity in the nuclear power plant.
- **Green H2** – hydrogen produced by water electrolysis using electricity generated by renewable energy sources – onshore wind, solar and hydro. Although offshore wind energy would also qualify as renewable energy for the purpose of producing renewable H2, the Strategy concludes that it is unlikely that offshore wind capacity will be developed in Romania before 2030.

In addition, the Strategy also defines a category of "low-carbon hydrogen" – being hydrogen produced from various sources which ensure at least a 70% reduction in GHG emissions. While this follows the concept defined by the European taxonomy rules, which consider both blue and pink hydrogen to be "low-carbon" technologies, the Strategy takes the view that, for Romania, only pink H2 produced using nuclear energy should fall under the category of "low-carbon hydrogen".

HYDROGEN VALUE CHAIN

The Strategy analyses in detail each segment of the value chain, including a SWOT analysis for each segment. We have considered a few points from each segment below:

Production

- The majority of the H2 currently produced in Romania is grey H2, which is used in refineries and chemicals industries. The main producers and consumers are Azomureş, Chimcomplex, Linde Gaz, OMV Petrom, Otel Inox, Liberty Galati, Petrotel-Lukoil and Rompetrol. The aim of the Strategy is that, by 2030, the H2 demand of the above industries will be supplied solely by renewable and low-carbon hydrogen.
- Apart from the existing uses of H2, significant additional renewable H2 production will be needed to reach the decarbonisation goal – approximately **288.8 kt** per year by 2030.
- Romania's strength is its potential to scale up solar and wind energy production, given its natural geographical position, as well as its plans to expand nuclear energy capacity.

- One weakness to be addressed is the uncompetitive price of renewable and low-carbon H2 compared to grey H2. For example, the Strategy expects renewable H2 to reach a levelized cost of production (**LCOH**) of EUR 3.33/kg by 2030 (from a currently estimated LCOH of EUR 5.40/kg) Grey H2 is expected to reach an LCOH of EUR 2.35/kg by 2030 (from a current LCOH of EUR 2.68/kg).

Storage, transport and distribution

- There is a need to create significant H2 storage capacity. Options for storage include: (i) underground storage in depleted gas reservoirs or salt caverns, which Romania has and can use, subject to geological studies; (ii) storage in gas pipes; (iii) storage as liquid H2 in tanks; or (iv) conversion into ammonia.
- One advantage of building H2 storage facilities is the huge support this would give to the expansion of renewable energy capacity, including both wind and solar, which is currently limited by its natural intermittency and grid capacity.
- Romania's existing gas network is also a strength: the Strategy estimates that a considerable part of the gas network can be made hydrogen-ready (i.e. compatible for blending H2 with natural gas in certain percentages) with reasonable investment.

Main uses of hydrogen

Industry

As mentioned above, hydrogen is currently used in the refining, chemicals and fertiliser industries, which are all well represented in Romania. The aim is that these industries will use only renewable or low-carbon H2 in their processes by 2030.

Green Steel

In order to reach decarbonisation goals, new industry sectors have been considered for the use of green H2, but given the infancy of the technology, the Strategy appreciates that steel production is the only new industrial use of H2 that can be implemented in Romania by 2030.

Transportation

Hydrogen can play a key role in the future of clean fuels for heavy-duty road transportation and the rail, marine and aviation industries. However, the Strategy anticipates that the demand for hydrogen in the transportation industry will increase significantly only after 2027, given the time needed for fuel cell technology to mature.

Combined Cycle Power Plant projects

The Strategy contemplates 1,600 MW of new CCGT capacity which will utilise 50% renewable hydrogen blended with natural gas by 2030.

Residential heating

While the Strategy mentions that hydrogen can be blended with natural gas to be used in urban heating systems for residential heating, it is not clear if this use is a priority or whether it is recommended by the Strategy – the position on this topic remains to be clarified during the consultation period.

HYDROGEN VALLEYS

The Strategy also proposes the concept of "hydrogen ecosystems" or "H2 valleys" – geographical areas which can incorporate the whole H2 value chain – and identifies five potential hydrogen valleys for Romania:

1. Bucuresti – Ploiesti – Targoviste – Pitesti
2. Constanta – Medgidia – Calarasi – Slobozia
3. Cluj – Targu Mures – Sighisoara – Sibiu – Sebes
4. Galati – Braila – Tulcea
5. Craiova – Slatina – Targu Jiu

The criteria used to select the proposed H2 valleys in Romania included the presence in the same geographical area of large potential consumers of H2, the natural potential for wind and/or solar energy, the capacity of the grid and available water sources.

LEGAL FRAMEWORK

The Strategy analyses at a very high level the principal non-exhaustive changes to the legal framework that will be needed. It concludes that while hydrogen is already contemplated by primary legislation (Law 123/2012 regarding electricity and natural gas), more regulatory efforts are still needed at the level of secondary legislation, especially in the following areas:

- blending of hydrogen with natural gas in the natural gas networks;
- storage of hydrogen either as gas or as liquid fuel; and
- expanding regulations on hydrogen vehicles and fuelling stations infrastructure.

In addition, the European legal framework for hydrogen is still under development as the major next steps are yet to occur – the revision of the ETS Directive and the ETS Directive for Aviation as well as the draft revision of the RED II Directive.

OUTLOOK

The publishing of the Strategy is a positive step for Romania. However, its implementation will require major financial investment to develop the hydrogen infrastructure which will, in turn, require significant Government support. This should include: (i) policies to stimulate demand and production; (ii) attracting EU funds from various available sources dedicated to hydrogen; (iii) state guarantees and state loans; (iv) fiscal incentives for renewable hydrogen; and (v) adopting a CfD scheme dedicated to hydrogen production.

It remains to be seen what the final form of the Strategy will look like following consultation with the market. Given Romania's commitment to decarbonisation, we expect to see positive and constructive market feedback and timely implementation of the hydrogen roadmap.

ABOUT

Focus on Hydrogen is a Clifford Chance briefing series covering hydrogen-related developments globally. 1.008 is the standard atomic weight of hydrogen.

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