

Low Carbon Hydrogen Economy in Western Balkans



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THE COLOURS OF HYDROGEN

Grey Hydrogen

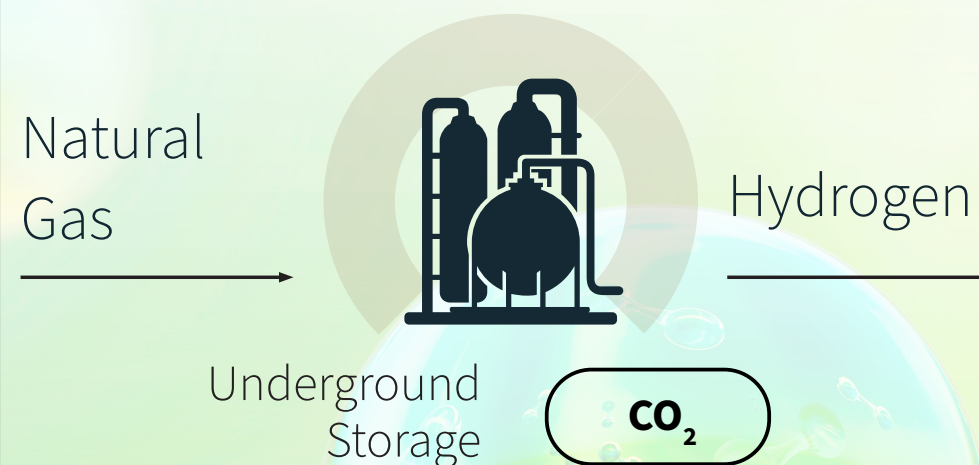
Steam methane reforming (SMR) of natural gas



- Fossil fuels are used as a feedstock and chemically converted to yield hydrogen
- High emissions and uses non-renewable resource

Blue Hydrogen

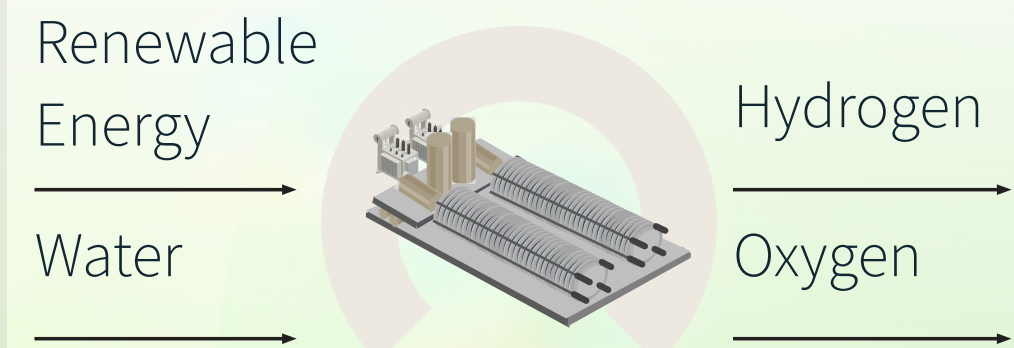
SMR with carbon capture and storage (CCS)



- Similar to grey hydrogen but with capture and storage of CO₂ emissions
- Low Scope 1 and 2 emissions but still uses non-renewable resource

Green Hydrogen

Water Electrolysis



- Uses electrolysis (separation of water into H₂ and O₂) to form hydrogen
- Minimal Scope 1 and 2 emissions

The Western Balkans strengths in developing a low carbon hydrogen economy

Proximity to major gas pipelines and existing hydrogen demand in refining, district heating, and transport

Several major gas pipelines transit through the region (implemented and planned) including the Trans Adriatic pipeline, Trans Anatolian pipeline, Trans Balkan pipeline, TurkStream and other cross-border interconnectors, placing the Western Balkans in a favourable position as the gateway to Europe for hydrogen. Imports could fill existing demand within industry, beginning with production of low-carbon fuels at refineries such as the refinery in Pancevo. Existing district heating systems in Belgrade and carbon intensive transport sector also present an opportunity to incorporate hydrogen.



Access to ports on Adriatic coasts and Danube and Sava rivers

Serbia, with its capital Belgrade, has access to the two largest navigable rivers in the region, the Danube and the Sava. This presents an opportunity to link to projects such as the IPCEI-funded Blue Danube which includes production of green hydrogen and subsequent transport via shipping liquid organic hydrogen carriers (LOHC) to industrial off takers along the Danube. Additionally, other countries in the region such as Albania and Montenegro have sea access with the ports of Durres, Vlore and Bar.



Rich and only partially tapped renewable energy sources

The Western Balkans' renewable capacity factor is reasonable, however resource is limited due to the region's size. Albania is quoted as having the highest number of sunshine hours per year in Europe, presenting significant potential for development of solar PV for power generation and solar thermal for heating purposes. The wind resource on the west of Bosnia and Herzegovina and north of Serbia appear to be the best in the region with high wind speeds recorded. Existing wind farms, particularly in Bosnia, Serbia and Montenegro include an installed capacity of 385 MW with further capacity planned or in construction. Biomass and hydropower are also developed in the region and contribute to the region's renewable energy mix.



WESTERN BALKANS' LOW CARBON HYDROGEN PRODUCTION COMPETITIVENESS

Green hydrogen production costs

The levelised cost of hydrogen (LCOH) across the Western Balkans has been developed by selecting areas with good renewable resource to calculate a range across the region, including areas in Albania and in Serbia. The lowest cost green hydrogen option would be to combine wind and solar which can increase the load factor in Western Balkans as high as 50%. Overall, the LCOH from combined solar and wind across the Western Balkans is reasonably consistent. The relatively high LCOH compared to other European countries makes it unlikely for the Western Balkans to become major player in the hydrogen economy, thus it is more likely that the hydrogen economy in the Balkans will likely focus on cooperating with other countries to support decarbonisation initiatives.

Regional considerations in Western Balkans'

The lowest cost electrolytic hydrogen in the Western Balkans is likely to come from using grid electricity. The hydrogen produced, however, cannot necessarily be classed as green. The carbon intensity of the grid in Albania, out of the drought period, may mean that the hydrogen produced is classed as low carbon, but this is not the case for other countries in the Western Balkans.

There is also some potential to produce blue hydrogen within the Western Balkans, although with two important caveats. Firstly, whilst CO₂ is currently being captured in Serbia's Rusanda oil fields, the potential scale of the stores across the Western Balkans still needs to be established. Secondly, the appetite of the EU to import blue hydrogen is also highly uncertain, therefore any hydrogen produced may need to be used in-country. A further uncertainty is the acceptable carbon intensity of blue hydrogen if permitted and whether the upstream emissions would allow it to meet that specification.



Green Hydrogen LCOH in EUR/kg (2030)



How low carbon hydrogen can be used in the Western Balkans'

>2,800 MW

Belgrade district heating capacity represents half of the country's capacity

Maximizing Low Carbon Economy Benefits

The refining sector within the Western Balkans, especially with refineries such as the NIS Pancevo refinery in Serbia, represents an opportunity to utilise green or blue hydrogen in the refining sector, helping to decarbonise and further hydrogen ambitions in the region. Though current ammonia production has halted at the Azotara HIP plant in Pancevo, the plant also represents hydrogen demand in the region which can be met by green hydrogen and an opportunity for western Balkans to prepare for the hydrogen economy.



Security of ammonia supply

Low carbon fuels

Poor air quality in the cities, caused by high reliance on fossil fuels in transport and heating, represents a health threat to the local population. Western Balkan cities such as Belgrade, Tirana or Skopje, have some of the highest levels of air pollution and call for an urgent switch to low / zero-emission technologies for both passenger transport and freight. Analysis has suggested it is credible that around 30% of commercial transport is decarbonised via low carbon hydrogen (the remaining 70% is likely to be decarbonised through electrification).



Decarbonising transportation sector

Cooperation with neighbouring countries

Through aligning with hydrogen initiatives in neighbouring countries, a new hydrogen economy can help support national decarbonisation goals in each country, increase energy independence and provide an export opportunity to the EU. This could potentially be via the Danube River, or hydrogen injection into existing natural gas pipelines. From a national decarbonisation perspective, the major focus for these countries (apart from Albania) is likely to be the phase-out of coal for power generation, and replacement by both renewables and natural gas

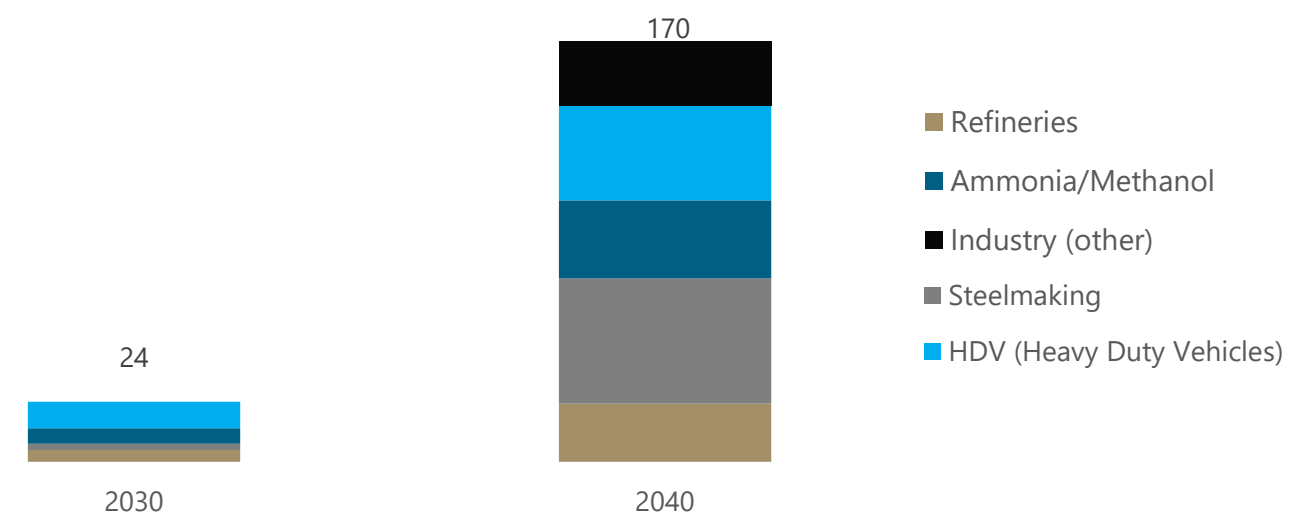


Advancement of decarbonisation goals



District heating as a hydrogen "sink"

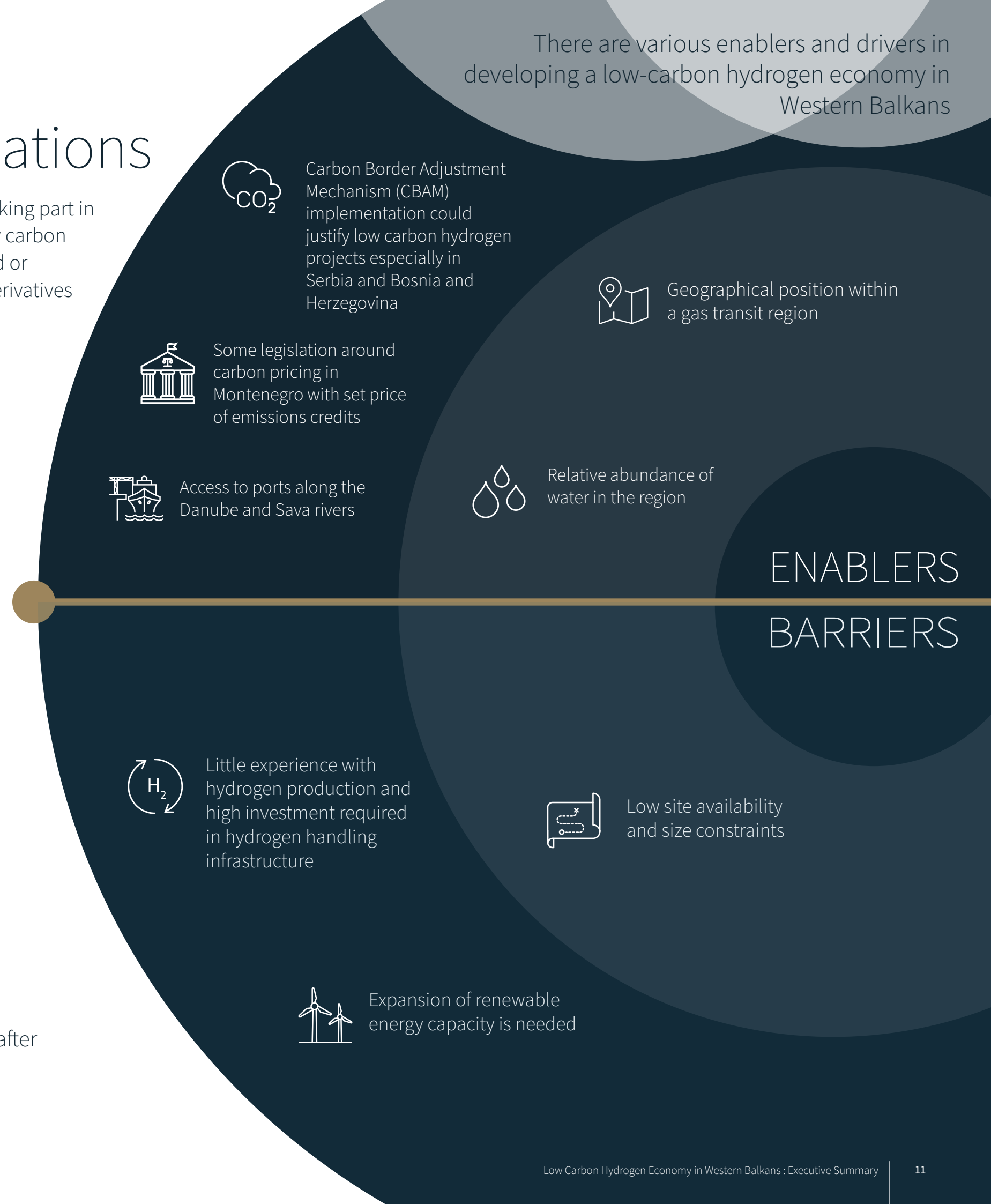
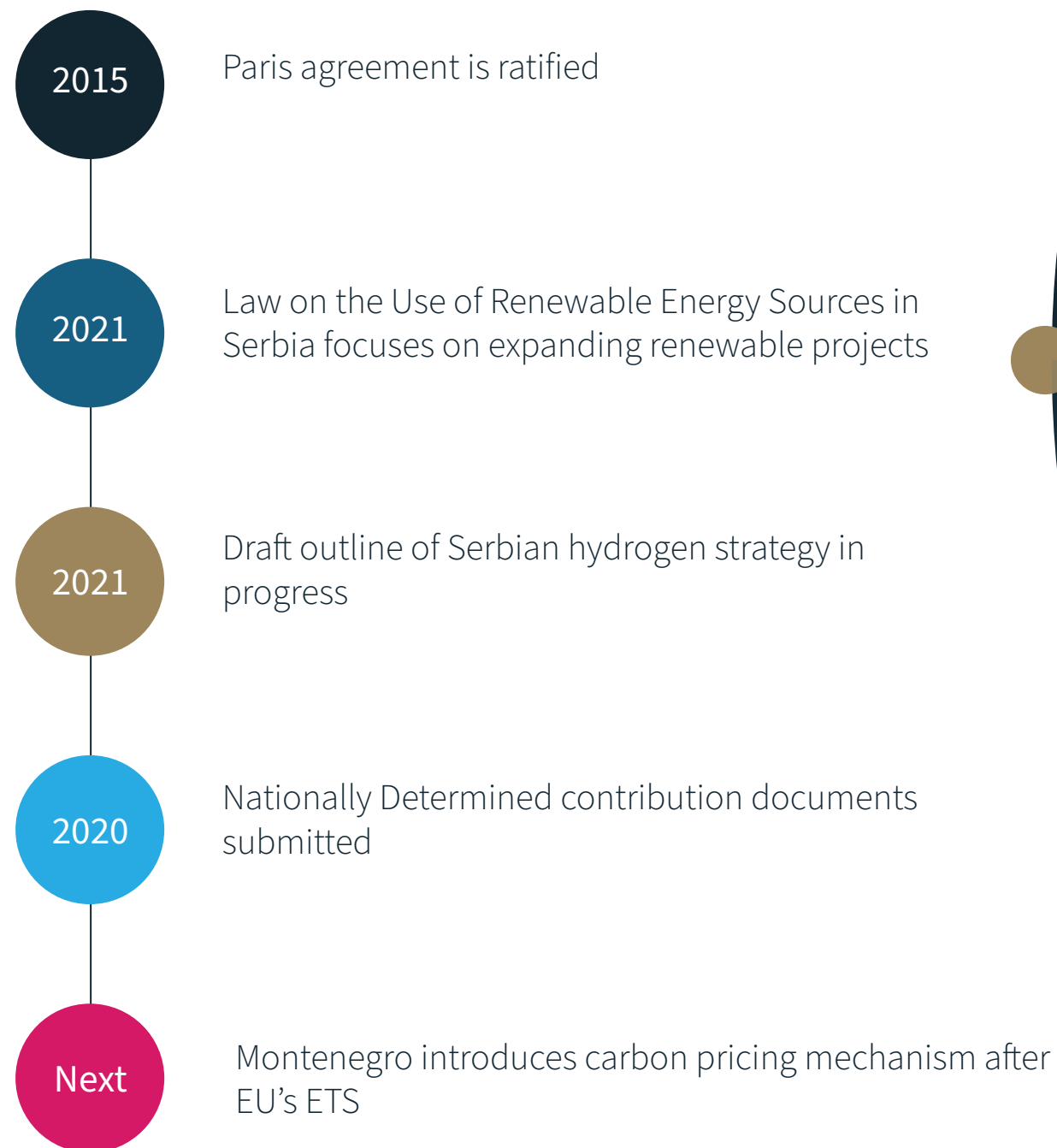
District heating systems are widely used in the Western Balkans region. The City of Belgrade's district heating is the largest in Serbia and one of the largest in Europe. In principle, this represents a large potential "sink" for hydrogen heating, although the demand is highly seasonal, and biomass is an attractive alternative option for decarbonisation of energy supply. The Belgrade system is currently almost exclusively heated using imported natural gas.



Potential hydrogen demand in Western Balkans (kilotonnes per annum)

Relevant Policy & Regulations

The countries of the Western Balkans have ambitious plans for taking part in the green hydrogen economy. The countries are investing in a low carbon hydrogen economy with relevant policies and task forces planned or implemented to develop the future of hydrogen and hydrogen derivatives.



There are various enablers and drivers in developing a low-carbon hydrogen economy in Western Balkans

What the Western Balkans' need to build a low carbon hydrogen economy

Western Balkan Government Actions

A national hydrogen strategy is needed to develop a roadmap to scale up hydrogen across the Western Balkan, with emphasis on meeting current hydrogen demand in refining and ammonia in the short-term along with a strategic investment in relevant infrastructure such as major power transmission connections and future-proofing natural gas infrastructure investment for the transition to hydrogen, including new LNG terminals (Albania, Montenegro), connections to major pipelines such as TAP and to those being developed in Greece, and for new natural gas distributions such as planned for North Macedonia.

Tangible financial support and legislation to promote the energy transition is needed. Plans to increase tax revenues, cut the fiscal deficit, and introduce a carbon tax system in the region should be coupled with an implementation strategy for such policies to ensure short-term competitiveness and support as the hydrogen economy is established, whilst planning long-term revenue generation within the Western Balkans.

An expansion of the electricity grid in line with future demand along with upgrading existing infrastructure is also needed to address energy poverty within the Western Balkans along with expediting renewable electricity expansion.



Clear hydrogen roadmap and commitment to infrastructure

Financial Incentives and legislation

Expansion of electricity grid

Focus on phasing out fossil fuels and defining areas for hydrogen use

The Western Balkan region should consider how hydrogen can ultimately phase-out the use of natural gas, after the transition away from coal working to decarbonise existing assets in refining, ammonia and steel industries. Industry players and government agencies should also take into account deployment of hydrogen-powered vehicles as a mean to support transport sector decarbonisation, especially in the context of urban transport and the planned extension of Comprehensive and Core Networks within the Trans-European transport network (TEN-T). This includes roads, rail, ports and airports

Opportunities for synergy between the large-scale hydrogen production and the district heating sector should also be explored.

Maximizing Low Carbon Economy Benefit

There is very little history of electrolytic hydrogen production in the Western Balkans – it is therefore necessary to have a coordinated ramp-up of the supply chain and upskill the workforce. Added to this, there is at least a one-year lead time for electrolyzers; the increase in demand for electrolyzers will only start to be met once production facilities known as “gigafactories” become fully operational.



Decarbonise assets
Focus on transport sector and existing synergies



Ramp up supply chain
Upskill work force



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