



Emerging Hydrogen Superpowers

October 2021 edition

About Us

/Cranmore Partners

Cranmore Partners is a rapidly growing, and increasingly global, financial advisory boutique focusing primarily on the infrastructure and energy sectors. It operates across EMEA and Asia, out of hubs in London, Istanbul, Abu Dhabi and Delhi.

With a strong focus on sustainability and energy transition, Cranmore advises global and regional strategic players, financial investors, governments, and financiers around the world on:

- Securing and optimizing non-recourse debt for their strategic projects;
- Securing and optimizing equity for projects;
- Commercial strategy, structuring and risk management;
- including advisory on offtakes;
- Financial structuring & strategy, including evolution of financing solutions throughout the life cycle of projects and corporates;
- Cutting edge financial modelling, and
- Bid/project management.



Energy Estate's mission is to accelerate the transformation of the energy sector and decarbonisation of industry. Energy Estate is a developer and accelerator and provides commercial, technical and strategic advisory services to a broad range of clients.

Our team has decades of experience and knowledge across the energy value chain coupled with broad and deep relationships globally with producers, developers, traders, utilities, investors, contractors and suppliers, regulatory bodies, NGOs and other stakeholders.

Our HydrogenGrowth platform is accelerating the development of hydrogen, ammonia, green chemicals and e-fuels projects on a global basis. Our pipeline of development projects includes first movers in the Australian market such as Abbot Point Clean Energy Hub, Central Queensland Power and Hunter Hydrogen Network and extends to markets such as the US, UK and New Zealand.

Who We Are

Cranmore is a young award-winning boutique debt advisory firm advising global leaders on their strategic transactions

In the five years since our inception, we have closed a number of first-of-its-kind transactions, including:

- ❖ the first ever wind farm in Saudi Arabia, at world record low tariff;
- ❖ the most-efficient gas-fired IPP globally in 2020, in the UAE;
- ❖ the first ever renewable IPP and PPP in Uzbekistan;
- ❖ the first ever Scaling Solar project to reach financial close.

In 2020, on the back of recent track record, we were awarded the IJGlobal MENA Financial Advisor of the Year and the ESG Award 2020.



Green Hydrogen Leadership

Cranmore today is one of the leading financial advisors globally on green hydrogen project and debt structuring through its involvement in pioneering projects including the HyDeal Ambition, HyDeal Spain, and HyDeal Los Angeles.

THE HYDEAL AMBITION
Aiming to Deliver 95GW Green Hydrogen Across Europe Before 2030

Spain 4GW+ Green Hydrogen Projects

MENA Hydrogen Alliance
An initiative of Dii Desert Energy



Winning and Closing Track Record

Ongoing projects advising preferred bidders:

- ❖ Uzbekistan Scaling Solar II (440MW)
- ❖ Sherabad PV, Uzbekistan (200MW)
- ❖ Ghubrah 3 IWP, Oman (300k m3/d)
- ❖ Qiddiya Utilities Privatisation (c. USD1bn), Saudi Arabia

Recently closed transactions:

Masdar

Nur Navoi Scaling Solar IPP

100MW PV IPP
Uzbekistan

Financial Advisor
USD 111m

First ever closed IPP, PPP and large-scale renewable power plant in Uzbekistan

December 2020

ENERJISA
Energy of Turkey

Enerjisa EUR650m asset portfolio refinancing
3.6 GW 21-asset portfolio

Turkey

Financial Advisor
EUR 650M

First ever green and gender equality linked-loan in a single transaction in Turkey

September 2020

Marubeni

Fujairah 3 IPP

2,400 MW CCGT

UAE

Financial Advisor
USD 1.1B

Largest power plant by capacity to achieve financial close globally in 2020

May 2020

Marubeni

acciona

ALMAR

Shuqaiq 3 IWP

450,000 m3/d reverse osmosis seawater desalination plant
Saudi Arabia

Financial Advisor
USD 575m

Global Water Awards Water Deal of the Year – Distinction

May 2019

Masdar

EDF
renewables

Dumat Al Jandal Wind IPP

400MW Wind IPP Tender

Saudi Arabia

Financial Advisor
USD 400m

First large-scale wind farm in Saudi Arabia. PFI Renewable Deal of the Year MENA.

July 2019

neoen
renouvelle l'énergie

Scaling Solar PV

c. 50 MW Scaling Solar PV Project
Zambia

Financial Advisor
USD 50m

First project on Scaling Solar platform to close financing

December 2017

Hydrogen Investability Index: Top 40 Countries

Highlights:

EU and Europe

- Legislated net zero targets
- Carbon pricing & borders supporting local clean hydrogen demand
- Strong national & EU support in funding & procurement framework
- Limited/high cost RE resource

US

- Expectations of \$3/kg green hydrogen ITC/PTC
- World class hybrid wind/solar resource
- Extensive existing H2 pipelines

Australia

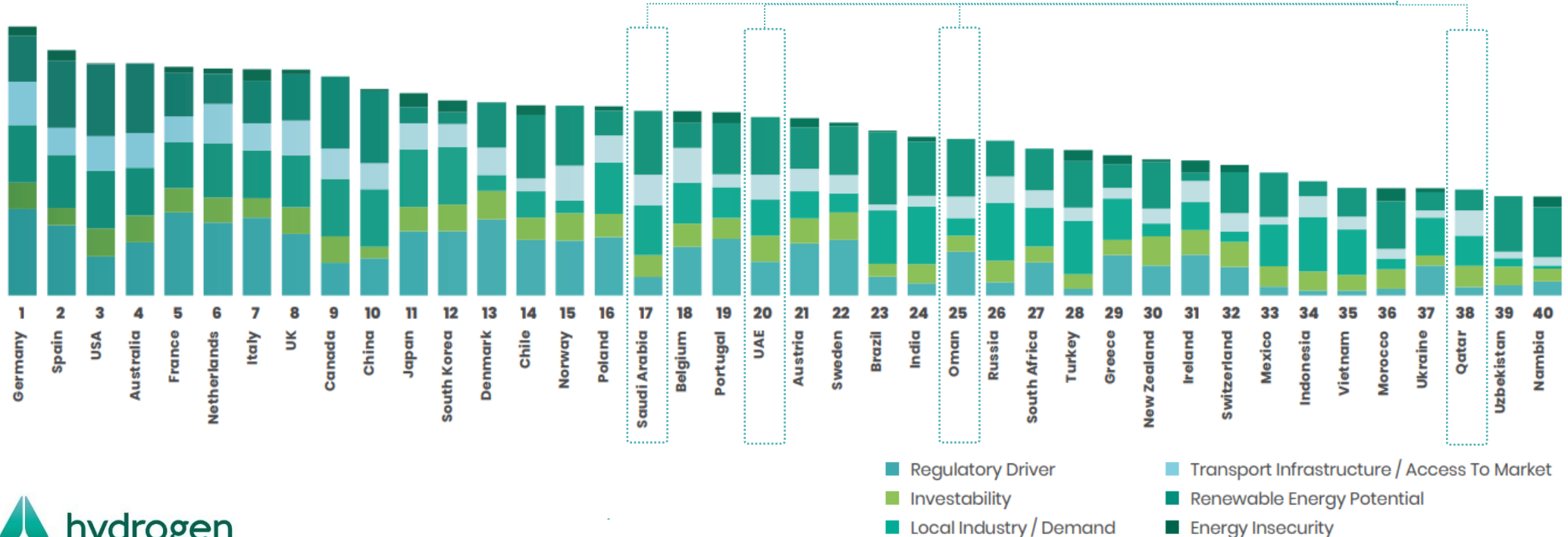
- World class hybrid wind/solar resource
- Strong private sector & state govt. leadership
- Advanced Asia export dialogue

Japan/Korea

- Strong national H₂ funding across value chain
- Leadership in H₂ technologies
- Strong RE installation track record despite high costs
- Long-term import strategy but potential large-scale production possible with ramp-up of offshore wind sector

Middle East

- Strong LCOE advantage against competing countries with similar solar resource from well-structured renewable procurement
- Decades of experience and infrastructure in energy export
- State-driven efforts ongoing but in early stages



Comparison of “Hydrogen Export” Countries

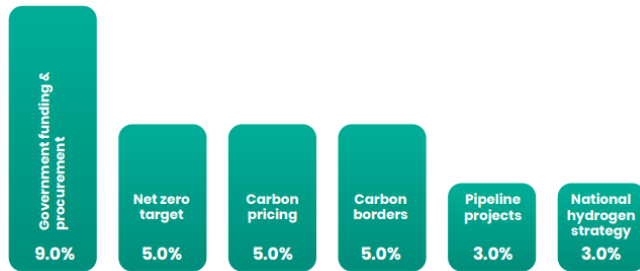
	Middle East	Australia	Chile / Brazil	Europe	Sub-Saharan Africa
Key Countries/ States	UAE, Saudi Arabia, Oman	Strong activity across states	Ceará in Brazil and coastal/port clusters	Northern: Denmark, Norway, Sweden Southern: Spain, Portugal	South Africa, Namibia, Botswana, Bolivia etc.
Renewable resource / LCOE	● <ul style="list-style-type: none"> Lowest cost LCOE globally given strong procurement Less hybrid solar-wind potential 	● <ul style="list-style-type: none"> Excellent solar, wind and hybrid potential 	● <ul style="list-style-type: none"> Excellent solar, wind and hybrid potential 	◐ <ul style="list-style-type: none"> Immense North Sea offshore wind-hydrogen projects Strong Southern Europe solar 	◑ <ul style="list-style-type: none"> Excellent renewable resources but relatively poorer procurement track record
Transportation & storage	◑ <ul style="list-style-type: none"> Saudi: largest ammonia exporter globally by far Long-term prospects for pipeline to EU market 	◑ <ul style="list-style-type: none"> Initial export of green ammonia Ahead on H₂ shipping technology devt. with Japan 	◑ <ul style="list-style-type: none"> No existing ammonia export infrastructure 	● <ul style="list-style-type: none"> European Hydrogen Backbone planned North Sea pipelines + AquaDuctus Denmark-Germany pipeline under study 	◑ <ul style="list-style-type: none"> No existing ammonia export infrastructure (some but limited in SA)
Regulatory drivers	◑ <ul style="list-style-type: none"> Project development government-led to date 	◑ <ul style="list-style-type: none"> Strong state govt. leadership but lack of federal funding support 	◑-◐ <ul style="list-style-type: none"> Lack of govt. funding Chile first H₂ tender held in Sep-21 Brazil active state leadership 	● <ul style="list-style-type: none"> Strong carbon pricing anchoring early offtake Strong EU and national funding 	◑ <ul style="list-style-type: none"> Government interest but no concrete funding/support mechanism to date
Country investability	● <ul style="list-style-type: none"> High 	● <ul style="list-style-type: none"> High 	◑-◐ <ul style="list-style-type: none"> Chile: High Brazil: More challenging 	● <ul style="list-style-type: none"> High 	◑ <ul style="list-style-type: none"> Reliant on DFI support, except SA

Methodology

Regulatory Drivers

Strength of regulatory drivers in the form of direct and indirect support to kick start hydrogen investments across the value chain.

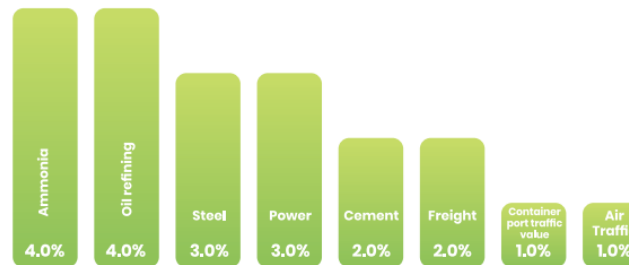
30%



Local Demand

Potential for local demand for clean hydrogen that may incentivize production in the country—particularly while hydrogen transportation costs remain prohibitive or infrastructure undeveloped.

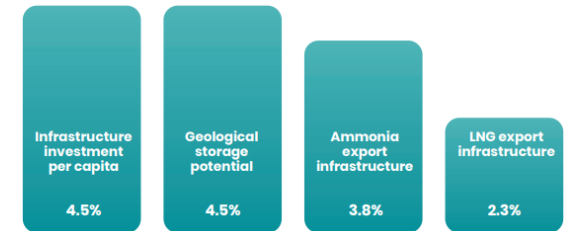
20%



Transportation & Storage

Readiness of countries' hydrogen transportation infrastructure for massive scale up of hydrogen production and use.

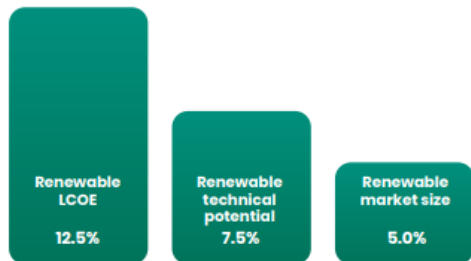
15%



Renewable Resource

Cost and technical potential of onshore and offshore wind and solar. A bonus is given to countries with large existing hydropower resource and hybrid wind/solar potential

25%



Investability

Perceived risk and attractiveness of investment and lending to hydrogen projects.

10%



Energy Insecurity

Energy insecurity of a country – assuming that higher insecurity is a driver for a country to invest in domestic renewable hydrogen production.

5%



Country Tearsheets

Chile

Index rank **# 14** Aggregate score (out of 5) **3.3**

GDP - USD (bn): 253
 GDP per capita - USD: 13,232
 Land area ('000 km2): 744
 Population density (per km²): 25
 Grid emissions factor (gCO₂/kWh): 608

- 3.2 Regulatory commitment**
 - First-ever hydrogen tender successfully launched
 - Existing carbon tax but low
 - Net zero by 2050
- 1.5 Transportation**
 - Existing domestic ammonia infrastructure
- 3.9 "Investability"**
 - Rated A by S&P
 - 59th in WB Ease of Doing Business
- 4.4 RE cost and potential**
 - Best solar irradiation and wind speeds in the world
 - Actual installed capacities low (50W) relative to resource potential
- 2.3 Local demand potential**
 - Opportunity for ammonia import localisation
 - Some refining capacities
- 3.3 Energy insecurity**
 - 65% net energy exporter

Oman

Index rank **# 25** Aggregate score (out of 5) **2.7**

GDP - USD (bn): 76
 GDP per capita - USD: 15,343
 Land area ('000 km2): 310
 Population density (per km²): 16
 Grid emissions factor (gCO₂/kWh): n/a

- 2.5 Regulatory commitment**
 - No net zero commitments
 - No carbon pricing
 - A number of large Government-led pilot projects
- 2.5 Transportation**
 - Existing ammonia and LNG export infrastructure
- 2.7 "Investability"**
 - Rated BB- by S&P
 - 68th in WB Ease of Doing Business
- 4.0 RE cost and potential**
 - World class solar resource
 - Long track record of successfully procuring IPPs with well-developed local IPO market
- 1.6 Local demand potential**
 - Stable ammonia production
 - Some oil refining capacity, soon to increase with Dugm refinery
 - Some shipping volumes
- 0.0 Energy insecurity**
 - Net energy exporter

Sizable govern international in

Green hydrogen as an export is an integral part of Oman's 2040 diversify its economy away from a confluence of low oil prices, reserves and increasing production have strained Oman's fiscal by years, resulting in successive downgrades. The infrastructure nevertheless remains active and banked, with recent renewable attracting strong international investment. A very competitive pricing. The a confidence comes from the Oman record of successful IPP and procurement, the latter of which water supply for the planned projects.

Oman has no carbon pricing in place to support local demand. the focus is likely to be on clean export, or supply to exporting in addition to world class solar resource abundant land, Oman has the advantage of having some ammonia infrastructure, as well as the Q Terminal, the second largest in East after Qatar (albeit far some of Dugm has been identified to of the domestic green hydrogen and key initiatives have been driven, among others, by OQ, a national oil company.

HYPORT Dugm Green Hy
 Belgian contractor DEME Conc have announced plans to build green hydrogen/ammonia plant Special Economic Zone, where land has been dedicated for green projects. In

United Kingdom

Index rank **# 8** Aggregate score (out of 5) **3.9**

GDP - USD (tn): 2.71
 GDP per capita - USD: 40,285
 Land area (km2): 242
 Population density (per km²): 275
 Grid emissions factor (gCO₂/kWh): 277

- 3.6 Regulatory commitment**
 - Net zero 2050
 - Strong UK ETS pricing
 - Diverse instruments providing funding across H2 value chain
- 4.0 Transportation**
 - Access to North Sea pipelines & depleted gas fields
 - Co-sited clusters & offshore wind
 - 9PW salt cavern storage
- 4.6 "Investability"**
 - Rated AA by S&P
 - 8th in WB Ease of Doing Business
- 3.2 RE cost and potential**
 - Excellent onshore/offshore wind
 - Offshore wind higher cost but achieves higher electrolyser load factor
- 4.5 Local demand potential**
 - Sizable oil refining (55m largest) and ammonia sectors (23rd)
 - 3rd highest aviation traffic globally
 - Substantial port traffic
- 1.8 Energy insecurity**
 - 35% net importer

Strong offshore cluster developments and push into home heating

Under its Hydrogen Strategy published in August 2021, the UK is targeting 50GW of low carbon hydrogen production capacity by 2030 with a dual blue-green focus. To achieve its targets, the Government has made available a number of targeted funding instruments totalling more than GBP400m. Hydrogen as a key priority under the UK Ten Point Plan will also have access to the Net Zero Innovation Portfolio, a GBP1bn fund to accelerate commercialisation of low-carbon technologies, and downstream industrial conversion has access to a GBP315m Industrial Energy Transformation Fund.

UK has sizable oil refining and ammonia industries to anchor early offtake and the third highest aviation traffic globally. Its Ten Point Plan for industrial transformation further emissions up to 20% hydrogen blending into the gas grid for residential use by 2023 and the government is strongly pushing pilots. Carbon prices are robust under the UK ETS, which launched at GBP50/ton (USD71) in May and has moved broadly within the GBP40-60/ton band. The UK's green hydrogen strategy will be powered by excellent wind resources onshore and offshore—UK is the largest offshore wind market in Europe and some of the cheapest offshore wind in the world today, and there is more than 500GW of fixed bottom potential. The country also has the advantage of homegrown technology players such as ITM's electrolyser gigafactory and Johnson Matthey, a key player in the supply chain, as well as sizable CCS sites around industrial "clusters".

Spain

Index rank **# 2** Aggregate score (out of 5) **4.2**

Hydrogen Drivers Matrix

Primary Energy Mix

- Oil
- NG
- Coal
- Nuclear
- Hydro
- RE

Low-cost renewables and strong industry to te strong early start

as the scale and the solar resource to become a cornerstone supplier of a green hydrogen economy, as well as mestic industry mix suited to rt early demand. Spain has some of ipst renewable energy in Europe, ig tariffs of EUR15.0/MWh for solar EUR20.0/MWh for wind in 2021 i. Its national hydrogen strategy the mobilisation of EUR8.9bn (bn) of investments between 2020-2030: install 4GW of electrolysers and drogen-related infrastructure. In er 2020, MITECO closed a public interest for potential IPCEI projects owered healthy interest in the form of issions, but final selection has yet to e. Spain has earmarked EUR1.5bn of nding under the NextGen EU y program towards green hydrogen 2023, but to date has not yet d projects for disbursement. There r not yet been discussions of a ized support scheme like a CID. Any ig-term schemes would need to e investors with respect to their sustainability, after the retroactive T cuts in the past, and the current n renewable generators to prevent l profits' from rising wholesale

Heavy transport decarbonization

Spain has one of the largest transportation sectors in Europe – the 2nd highest container port traffic, 3rd highest air traffic, and 2nd highest freight volumes. If the proposed REDIII draft is adopted, 25% of all energy use in its transportation sector must be renewable by 2030. Iberdrola is planning the Y Basque Green Hydrogen plants for a transport corridor connecting the logistical centres of Vizcaya/Jundiz, Bilbao and Pasaja.

Strong project pipeline

Spain has a number of ambitious projects under development pending funding, such as: Endeasa's EUR9.9bn portfolio of 340MW electrolysers plus 20MW of renewable energy, an alliance between Iberdrola and Ferberbia to build 800MW of green hydrogen capacity over seven years for ammonia production (20MW electrolyser/100MW PV pilot already in construction); plans to deploy a fully functioning hydrogen ecosystem in Mallorca to turn the island into the first hydrogen hub in Southern Europe. Cummins has also partnered up with Iberdrola to build a 500MW PEM electrolyser manufacturing plant.

Japan

Index rank **# 11** Aggregate score (out of 5) **3.5**

Primary Energy Mix

- Oil
- NG
- Coal
- Nuclear
- Hydro
- RE

Import hydrogen,

a hydrogen supply chain and nand, and USD630m to scale up drogen projects.

Leading hydrogen shipping
 e companies are leading in 1 shipping technologies. i unveiled the world's first hydrogen carrier in May this 1 90-ton capacity and is working 300-ton second generation 1. In January this year, it d the 180-ton Kobe LH2 L the world's first liquefied 1 receiving terminal. First ts are expected in spring 2022.

se-Australian H2 road
 e and Australian companies lated numerous joint ventures in loping blue/green hydrogen e between the two countries. Japan's largest hydrogen and Australian state electricity / Stanwell are leading a y study for export of up to 3GW hydrogen from Central and (FID expected 2022, first s 2026). Sumitomo and Rio n to start construction of a pilot plant in Queenstand in 2022.

ional partnerships
 INPEX, JERA and JOGMEC ith ADNOC (UAE) to explore the stal potential of a clean ammonia on the UAE. Last September, the rst blue ammonia shipment left abia for Japan. A Dutch, e hydrogen development tip has also been signed.