Denmark

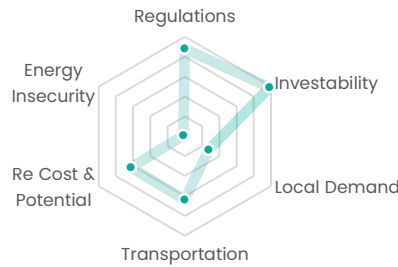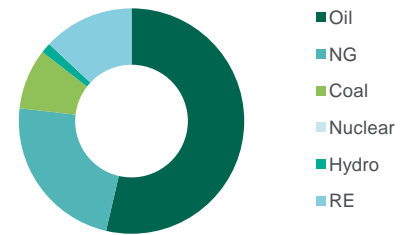**Index rank** # **13**   **Aggregate score (out of 5)** **3.4**

GDP - USD (bn): **355**

GDP per capita - USD: **60,909**

Land area ('000 km2): **40**

Population density (per km²): **145**

Grid emissions factor (gCO₂/kWh): **209**

Hydrogen Drivers Matrix

Regulations · Investability · Local Demand · Transportation · Re Cost & Potential · Energy Insecurity

Primary Energy Mix

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

4.4 **Regulatory commitment**
- Further O&G exploration cancelled
- Committed to net zero by 2050
- Massive offshore wind-green fuels PPP being tendered

3.2 **Transportation**
- Danish-German hydrogen pipeline under study
- Vast salt cavern storage potential

4.9 **"Investability"**
- Rated AAA by S&P
- 4th in WB Ease of Doing Business

3.1 **RE cost and potential**
- Vast offshore wind potential
- World class onshore wind resources

1.4 **Local demand potential**
- Primarily transport & residential
- Some industry but below average industrialization vs. western Europe

0.1 **Energy insecurity**
- New O&G exploration licensing cancelled

Offshore wind leadership for hydrogen and green fuels export

Denmark's renewables story has to date revolved around wind, which, within the last ten years, has tripled from supplying 20% of the grid, to 60% today, directly displacing coal and gas. The focus through to 2030 will be on offshore wind, including two energy islands totaling 10GW, being championed by the Government. Unlike its Nordic neighbours, Denmark has a relatively low share of energy intensive industries - a hydrogen strategy would therefore likely place stronger emphasis on export and focus on decarbonising the domestic transport and residential sectors. Furthermore, while Denmark is the largest oil producer in the EU, it has cancelled all future oil and gas extraction licensing rounds and will phase out all extraction by 2050 in line with net zero goals, creating a potential supply gap. Denmark is also home to energy and industry giants such as Orsted and Maersk, as well as electrolyser manufacturer Green Hydrogen Systems, which should unlock strong Government support. In August this year, the Government launched a consultation with industry on future green hydrogen pricing scenarios in order to plan for with the base scenario at EUR2/kg by 2030. A national hydrogen strategy is expected by year end.

2x5GW offshore energy and green fuel hubs

The Danish Government has reached agreement with a consortium of Danish companies to build, under a public-private partnership, two artificial offshore island energy hubs of initially 5GW each, 80km from shore, powered by offshore wind farms. The USD34bn project would produce electricity for export and green fuel for transport, district heating and heavy industry. The project will be state-owned and the largest construction project in Danish history.

Export to Germany

Energinet, the Danish network operator, has completed a pre-feasibility study for a Danish-German 340km pipeline, running from Esbjerg to Hamburg, with initial capacity of up to 2.5GWh/h[1]. Assuming 50-60% of existing gas pipelines to be repurposed, the 2.5GWh/h[2] retrofit would cost a mere EUR390m. Denmark also sits on a very large salt cavern storage potential of c.7.5PWh, half of which is located onshore.

1GW Esbjerg plant for mobility

H2 Energy Europe, a consortium including Hyundai, is planning a 1GW offshore wind-powered electrolyser to supply trucks and other heavy transport refuelling stations, set to commission in 2024. The Danish Government will partner with the developer to build out the domestic pipeline network, which is predominantly polyethylene-based and can be converted to transport hydrogen at relatively low cost.

Sustainable fuels project

Copenhagen Airports, A.P. Moller-Maersk, DSV Panalpina, DFDS, SAS and Ørsted have formed a partnership to develop a sustainable fuel production facility. The 10MW Phase 1 targets commissioning by 2023 producing fuel for buses and trucks. Phase 2 plans for a 250MW electrolyser plant by 2027, powered by offshore wind, and Phase 3 targets 1.3GW capacity (or 250ktpa) that would displace 30% of fossil fuel use at Copenhagen Airport.

hydrogen investability index

Cranmore Partners   energy estate.