DI Analysis

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Danish-Korean Cooperation Towards Reaching Net-Zero

Ambitious targets for renewable energy

In 2021 South Korea passed the Carbon Neutrality Act which enshrines into law South Korea's commitment to become carbon neutral by 2050. Additionally, South Korea is aiming to reduce its greenhouse gas emissions by 40% by 2030 from 2018 levels. Outlined in the latest edition of South Korea's "Basic Plan for Long-Term Electricity Supply and Demand" the country targets 21.6% of electricity generation to come from renewable energy by 2030 and 30.6% by 2036. Nuclear energy is set to continue to play a significant role in South Korea's electricity generation with shares of 32.4% in 2030 and 34.6% in 2036.

Strong bilateral cooperation on the green energy transition

Danish companies are uniquely positioned to capitalize on South Korea's green transition, as Denmark and South Korea have multiple cooperation agreements, including the Energy Governance Partnership. The aim of the various partnerships is to drive decarbonation efforts through political, commercial, technological and research cooperation.

South Korea ranks as the 14th biggest export market for Danish energy technologies

Since 2005, exports of Danish energy technologies to South Korea have increased by 167%. In 2022 alone, Denmark's energy technologies exports to South Korea reached a value of 1.5 billion DKK, placing South Korea as the 14th largest export market for Danish energy technologies.

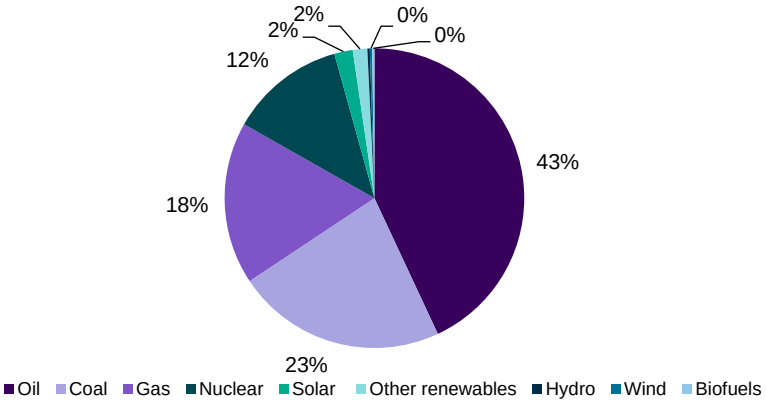
GDP, energy consumption, emissions, and trends

South Korea's energy mix is dominated by fossil fuels accounting for 83% of consumption

The largest share of South Korea's primary energy consumption stems from oil with 43%. South Korea's top three primary energy sources are all fossil fuels and make up 83% of the country's total

energy mix. Renewable energy sources make up 4% of South Korea's energy consumption.

Figure 1. Energy mix of South Korea, 2022

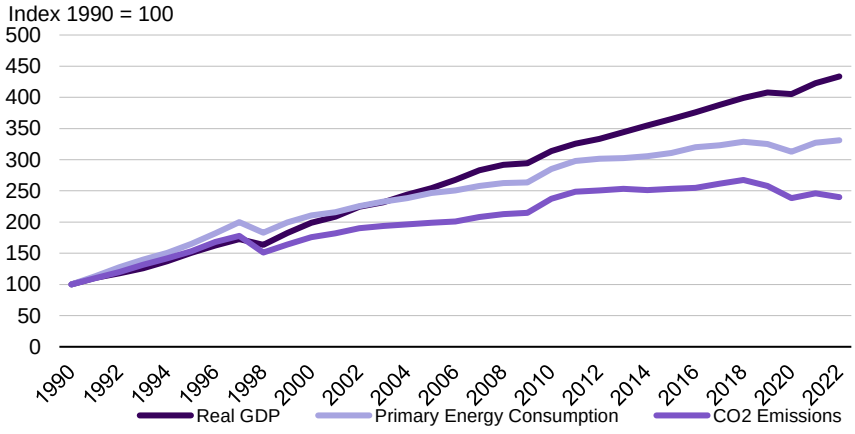


Source: Our World in Data

Real GDP growth is increasingly outpacing growth in primary energy consumption and especially CO2 emissions

Between 1990 and 2022 the real GDP of South Korea has more than quadrupled, while primary energy consumption and CO2 emissions grew by 331% and 240%. respectively. Real GDP growth is increasingly outpacing growth in primary energy consumption and especially CO2 emissions. The decoupling of economic growth from primary energy consumption and CO2 emissions is a positive trend, which South Korea looks to reinforce as the country strives to fulfil it climate targets.

Figure 2. Real GDP, energy consumption, and CO_2 emissions

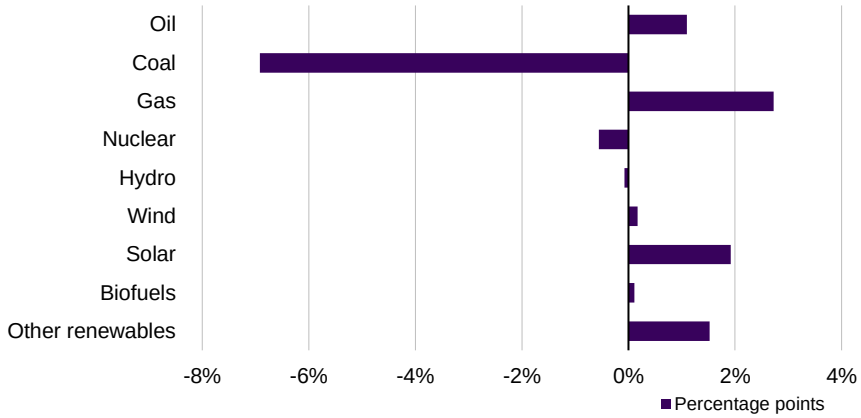


Source: Our World in Data and the World Bank

Gradual progress in South Korea's energy transition

From 2010 to 2022 the share of fossil fuel sources in South Korea's energy consumption fell from 86% to 83%. This shift is almost entirely accounted for by increases in 'other renewable energy' and solar energy which now make up 2% and 1.6%, respectively, of the energy mix. 'Other renewables' cover sources such as geothermal energy and biomass energy. Coal saw the biggest drop during the period with a 7-percentage point decrease in its share of primary energy consumption.

Figure 3. 2010-to-2022 change in primary energy consumption by source



Source: Our World in Data

Denmark–South Korea relations

Energy Governance Partnership

Central to Denmark and South Korea reaching their ambitious 2030-targets for decarbonization is the efficient rollout of renewable energy. Consequently, Danish and South Korean authorities have entered an Energy Governance Partnership, as both countries have recognized the potential of collaboration.

Cooperation improves the regulatory framework of the Korean offshore wind industry

The focus of the partnership is on improving the regulatory framework of the offshore wind industry, as South Korea is set to massively build out its offshore wind capacity in the coming years. By drawing upon Danish authorities' knowledge on regulatory barriers, South Korea looks to create a transparent and favourable regulatory environment for the development of offshore wind.

Potential for knowledge sharing in the hydrogen sector

The hydrogen sector is another area with potential for beneficial knowledge exchanges, as South Korea is a pioneering economy within the development of hydrogen projects. In 2019, South Korea presented its ambitious 'Hydrogen Economy Roadmap' towards

2040. The experience gained from the implementation of the roadmap could provide valuable insights for Danish authorities, as Denmark aims to grow its own green hydrogen sector.

Other bilateral cooperation agreements include the Green Growth Alliance and the Danish-Korean Hydrogen Alliance. In 2011 Denmark and South Korea established the Green Growth Alliance with the goal of driving forward green growth by fostering bilateral cooperation across political, private, and public sectors.

Offshore wind

A key objective of the Energy Governance Partnership is the advancement of the offshore wind industry in South Korea. As South Korea strives to increase its share of renewable energy in electricity generation to 21.6% by 2030, wind energy is set to make the second biggest contribution the energy transition, only behind solar power.

South Korea targets to have 14.3 GW installed offshore wind capacity by 2030

Despite its 2.400-kilometer-long coastline, offshore wind power accounts for only a small percentage of South Korea's electricity generation today. The big appeal of the wind energy market in South Korea, however, is exactly this untapped potential. At the end of 2022, South Korea had in total just over 1.6 GW installed wind capacity, while the government of South Korea targets to have 14.3 GW installed offshore wind capacity by 2030. This represents an almost 9-fold increase in capacity.

Strong domestic supply chains

Another attractive feature of the South Korean wind energy market is the strong domestic supply chains which includes some of the world's largest shipping and steel companies. Meanwhile, limited grid availability and port capacity remain challenges for the development of the sector, as well as a less streamlined permitting system. With support from the Energy Governance Partnership South Korea is actively working towards streamlining regulations by implementing a Korean version of the one-stop shop for wind project licenses, which Danish Energy Authorities employ.

Figure 4. Promotion areas for offshore wind development

Source: COWI

South Korea's ambitious plans for hydrogen offer significant potential for Danish companies

Hydrogen and Power-to-X

In 2019, South Korea presented its 'Hydrogen Economy Roadmap' which serves as a guiding framework for the country's efforts to transition to a hydrogen-based economy, with the aim of reducing carbon emissions and fostering sustainable economic growth. Some of the targets detailed in the roadmap include by 2040 growing the number of hydrogen powered cars to 5.9m and establishing a network of 1200 hydrogen refueling stations. Furthermore, South Korea aims to substantially ramp-up the installed capacity of residential and utility-scale fuel cells by 2040, with targets of 2.1GW and 15GW and respectively.

South Korea's ambitious plans for the development of a hydrogen-based economy is set to increase demand significantly which presents interesting business opportunities for Danish suppliers of hydrogen related technology. Danish companies specializing in electrolysis, storage technology, e-fuels, and carbon capture, usage and storage (CCUS) offer attractive solutions on the supply side, which could help South Korea realize its transition to a hydrogen-based economy.

Energy efficiency

25% improvement in energy efficiency by 2027

In 2023 the Energy Governance Partnership between South Korea and Denmark was expanded to also include energy efficiency. Through collaborative exchanges of regulatory insights and experiences with support schemes, Denmark and South Korea are actively striving to enhance energy efficiency.

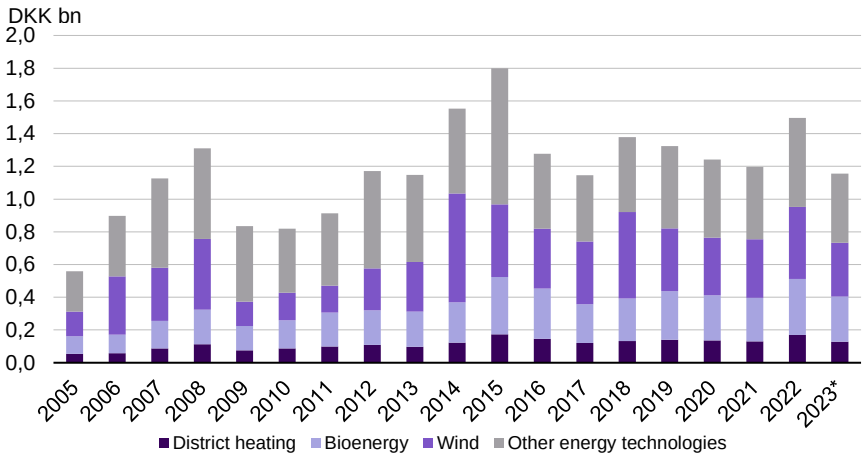
South Korea is currently the world's 8th biggest consumer of primary energy and aims to improve energy efficiency by 25% by 2027, as part of their plan to slash greenhouse gas emissions by 40% by 2030. Denmark's long focus on energy efficiency has fostered leading companies within the field, who offer attractive solutions to the Korean market.

Exports of energy technologies

Danish exports of energy technologies to South Korea have increased by 167% since 2005.

From 2005 to 2022 Danish exports of energy technologies to South Korea increased from around 600 million to 1.5 billion DKK. The largest category of exports is 'other energy technologies' which covers various types of components and equipment. Since 2016, exports have been fairly evenly split between wind energy bioenergy and 'other energy technologies.

Figure 5. Danish exports of energy technologies



**Preliminary data for 2023 without December*
Source: Eurostat and calculations by Danish Energy Industries

Commercial activity between the two countries is set to increase in the coming years, as Danish companies have increasingly identified the potential of closer commercial ties between the two countries.

In recent years, several Danish wind project developer companies have engaged and established their presence in South Korea with both CIP and Ørsted in leading positions on offshore wind – drawing further Danish expertise and company engagement with them to engage in offshore wind and related activities in South Korea.

South Korean businesses also recognize the potential of the capabilities Danish companies hold. In 2023 the Korean company CS Wind acquired the Danish-based Bladt Industries, which manufactures substructures for off-shore wind turbines. CS Wind is the world biggest manufacturer of wind turbine towers.