

COUNTRY CASE STUDY: Australia



AN OVERVIEW

PHYSICAL GEOGRAPHY & CLIMATE

A vast country and continent (32 times the size of the UK) extending from the tropics to temperate regions. Most coastal areas are quite green, but the centre is largely desert, with huge grasslands in between. There's just one significant mountain range (the Snowy Mountains).

Temperature: Summers hot nearly everywhere; winters warm in the north and cool in the south

Rainfall: Moderate in coastal areas, though often seasonal and unreliable; central areas dry

Wind: Moderately windy, with the west generally windier than the east

Sunshine: Most places have very high sunshine year-round

Land use: Agriculture 53%, Forest 16%, Urban 0%, Grassland 16%, Other 15%

Fossil fuel reserves: Large coal, oil and gas reserves

HUMAN GEOGRAPHY

Population: 27,000,000 (3 people per km² - very low density)

Life expectancy: 83

Urbanisation: 90% urban v 10% rural

Country wealth: £44,020 per person, per year (24th richest in the world)

Electricity use: 9.6 MWh per person, per year (UK mean: 4.1 MWh)



Australia **remains heavily reliant on fossil fuels, especially coal**. Despite progress in renewables, it is still **behind other countries** in shifting to cleaner energy.

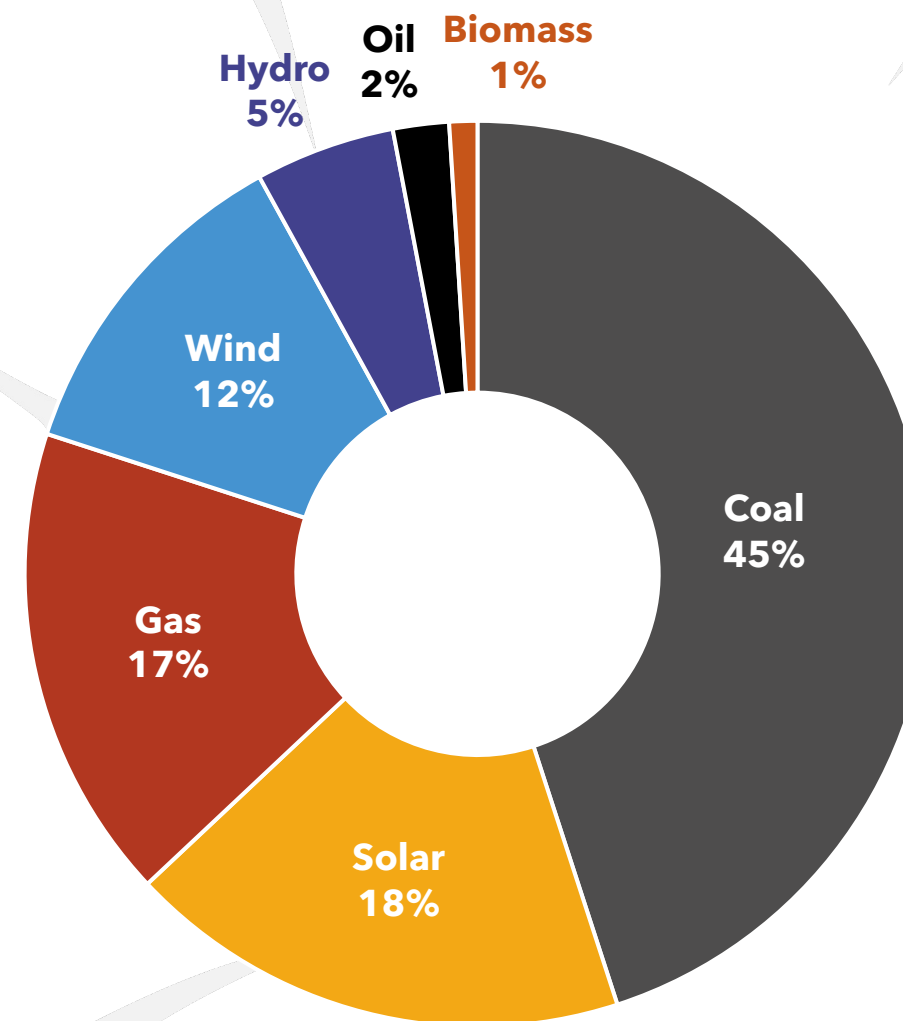
43 POWER 33 IMPACT 24 COST



SEE AUSTRALIA'S
GRID IN MEGAWATT



AUSTRALIA'S ELECTRICITY MIX



TOP CHANGES (SINCE 2023)

GAS (-1.4%)

COAL (-0.9%)

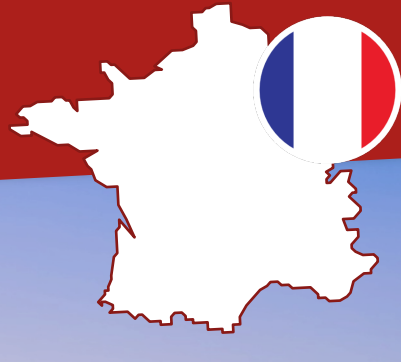
SOLAR (+0.8%)



RATIONALE

- Australia has large **COAL**, **OIL** and **GAS** reserves.
- Australia has no **NUCLEAR** power. Although it has large uranium deposits, nuclear power is banned in every state.
- The east has high rainfall and mountains which supports the deployment of **HYDRO**.
- Coastal regions are windy and so **WIND** power is increasing.
- The centre and north-west are very sunny and good for **SOLAR** energy.

COUNTRY CASE STUDY: France



AN OVERVIEW

PHYSICAL GEOGRAPHY & CLIMATE

France is just over twice the size of the UK, and for the most part farther south, extending from the English Channel down to the Mediterranean. The east and south of the country are generally hilly or mountainous, with the Jura Mountains, the Alps and the Pyrenees marking many of its borders.

Temperature: Winters fairly cold in most places, summers warm to hot

Rainfall: Moderate in most areas, though seasonal in the south

Wind: Moderately windy along the coasts and in some river valleys; generally less so elsewhere

Sunshine: Moderate sunshine, with long summer days; some sun in the south during winter

Land use: Agriculture 52%, Forest 31%, Urban 6%, Other 11%

Fossil fuel reserves: Almost none

HUMAN GEOGRAPHY

Population: 66,000,000 (120 people per km² – high density)

Life expectancy: 83

Urbanisation: 82% urban v 18% rural

Country wealth: £39,900 per person, per year (28th richest in the world)

Electricity use: 7.3 MWh per person, per year (UK mean: 4.1 MWh)



A nuclear disaster in France could **force nuclear reactor shutdowns** for safety reasons. France could then **lose around two thirds (68%)** of its electricity generation.

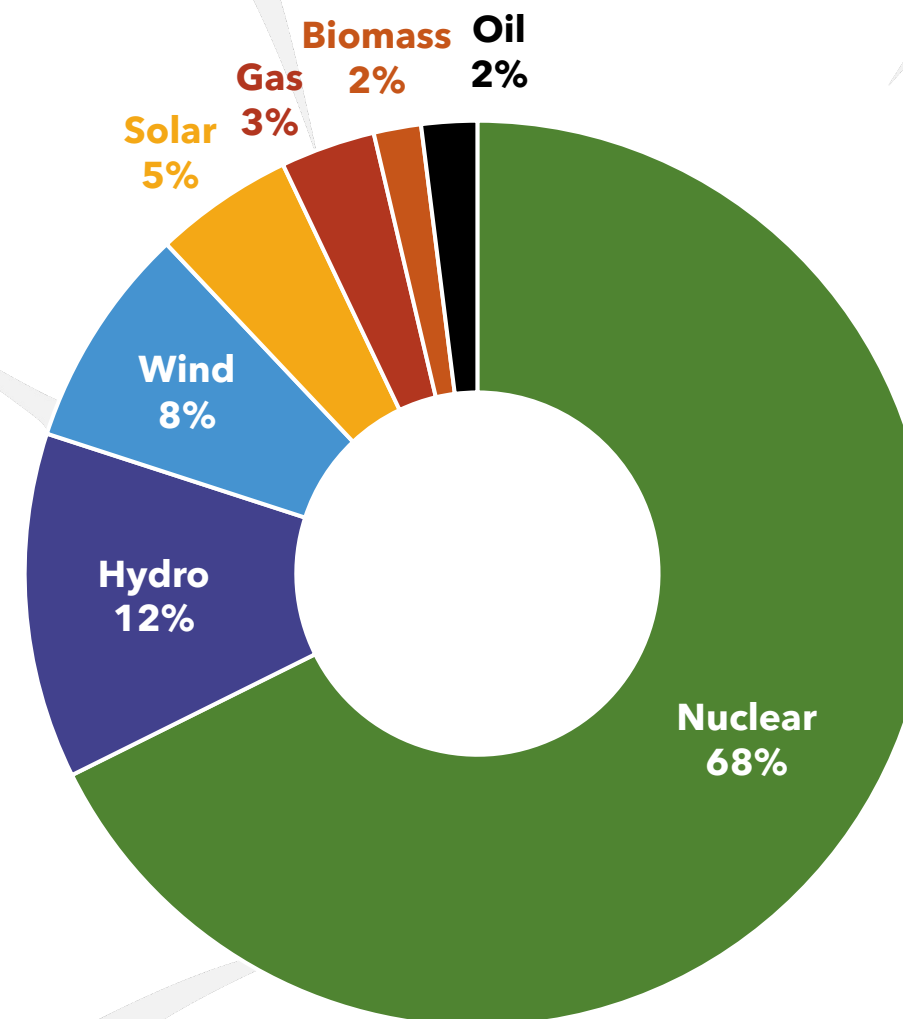
47 POWER 12 IMPACT 42 COST



SEE FRANCE'S
GRID IN MEGAWATT



FRANCE'S ELECTRICITY MIX



TOP CHANGES (SINCE 2023)

NUCLEAR (+2.7%)

GAS (-2.7%)

HYDRO (+2.1%)



RATIONALE

- France has virtually no **COAL**, **OIL** or **GAS** reserves.
- After the oil crisis in the 1970's, France developed and built over 50 **NUCLEAR** power stations between 1980 and 2000.
- France has mountainous areas with good rainfall for **HYDRO** power.
- France is investing more in **SOLAR** energy, and onshore and offshore **WIND** to reduce its dependence on **NUCLEAR** power.

COUNTRY CASE STUDY: China



AN OVERVIEW

PHYSICAL GEOGRAPHY & CLIMATE

China is a huge country (40 times the size of the UK) extending from a border with Russia (Siberia) right down to a tropical south. Eastern China, with a long Pacific coastline, is mainly low-lying, but the west is mountainous, with the Himalayas just the most famous of the various ranges there.

Temperature: Winters cold, except in the far south; summers hot, except in mountainous areas

Rainfall: Moderate to high in the south, much drier elsewhere. Seasonal rains in the summer

Wind: Moderate wind in the west, less wind in the east, except during typhoons

Sunshine: Moderate to high in the west, but often cloudy throughout the year in the south-east

Land use: Agriculture 56%, Forest 22%, Urban 4%, Other 18%

Fossil fuel reserves: Large coal and gas deposits

HUMAN GEOGRAPHY

Population: 1,416,000,000 (145 people per km² – high density)

Life expectancy: 78

Urbanisation: 67% urban v 33% rural

Country wealth: £17,470 per person, per year (73rd richest in the world)

Electricity use: 7.1 MWh per person, per year (UK mean: 4.1 MWh)



China must **phase out coal-fired power stations** to meet **emissions targets**. The scale of this task is **enormous** due to its coal dependance.

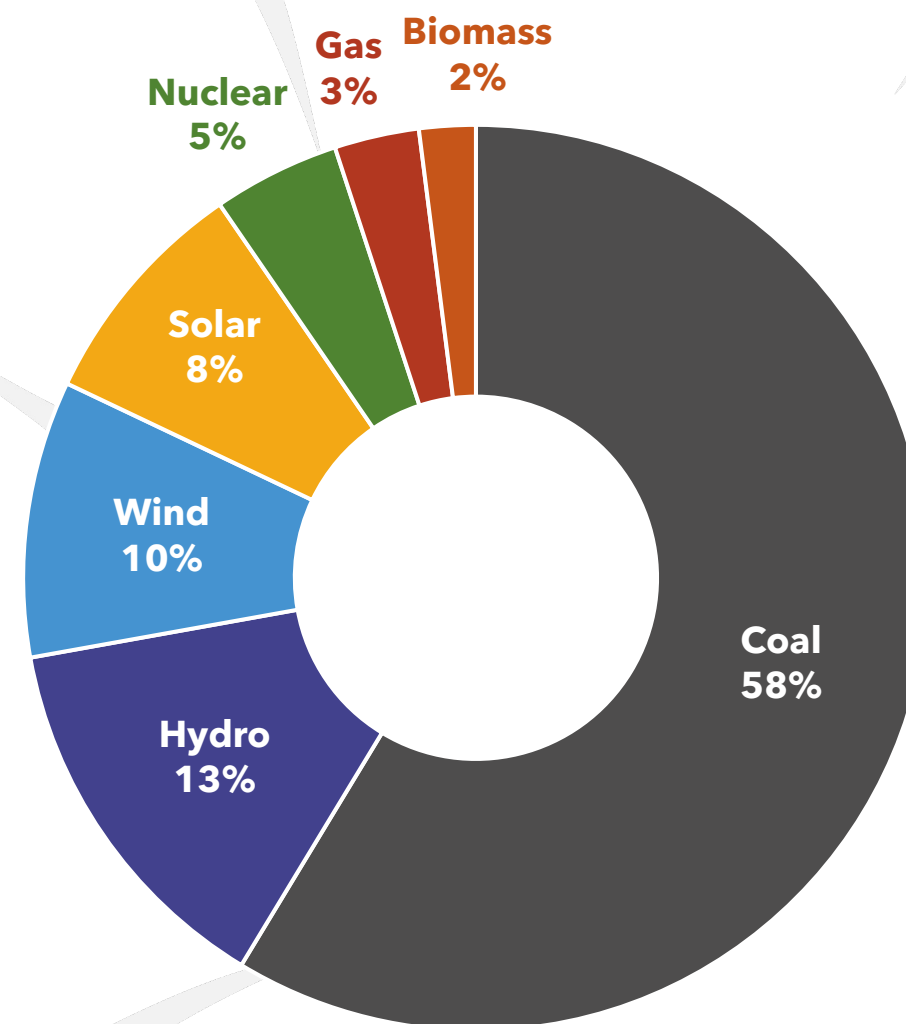
60 POWER 45 IMPACT 38 COST



SEE CHINA'S
GRID IN MEGAWATT



CHINA'S ELECTRICITY MIX



TOP CHANGES (SINCE 2023)

SOLAR (+2.1%)

COAL (-2.5%)

WIND (+0.4%)



RATIONALE

- China is the largest **COAL** producer in the world. Coal is a reliable energy resource for powering China's enormous manufacturing industry.
- China has invested heavily in **HYDRO** by using huge rivers that flow hundreds of miles from the mountains to the China Sea.
- China has windy coastal areas and high plains. **WIND** power is set to grow much bigger in China.
- NUCLEAR** power is set to double every ten years for several decades.

COUNTRY CASE STUDY: United Kingdom



AN OVERVIEW

PHYSICAL GEOGRAPHY & CLIMATE

Although it's not a large country, as an island nation, the UK has a very long coastline, and nowhere is far from the sea. There are a lot of hills, some quite high, in the north and west, especially in Scotland and Wales.

Temperature: Winters moderately cold, summers generally warm

Rainfall: Moderate in the south and east, high in the north and west; occurs year-round

Wind: Fairly windy everywhere, very windy in most coastal areas

Sunshine: Summer days long, with reasonable sunshine; winter days short and generally dull

Land use: Agriculture 69%, Forest 13%, Urban 7%, Other 11%

Fossil fuel reserves: Coal, and some oil and gas

HUMAN GEOGRAPHY

Population: 69,000,000 (280 people per km² - very high density)

Life expectancy: 82

Urbanisation: 84% urban v 16% rural

Country wealth: £38,475 per person, per year (31st richest in the world)

Electricity use: 4.1 MWh per person, per year (EU mean: 6.1 MWh)



The UK could be short of electricity during **calm weather** in the **winter months when demand for electricity is highest**. Natural gas will need to be **phased out to meet emission targets**.

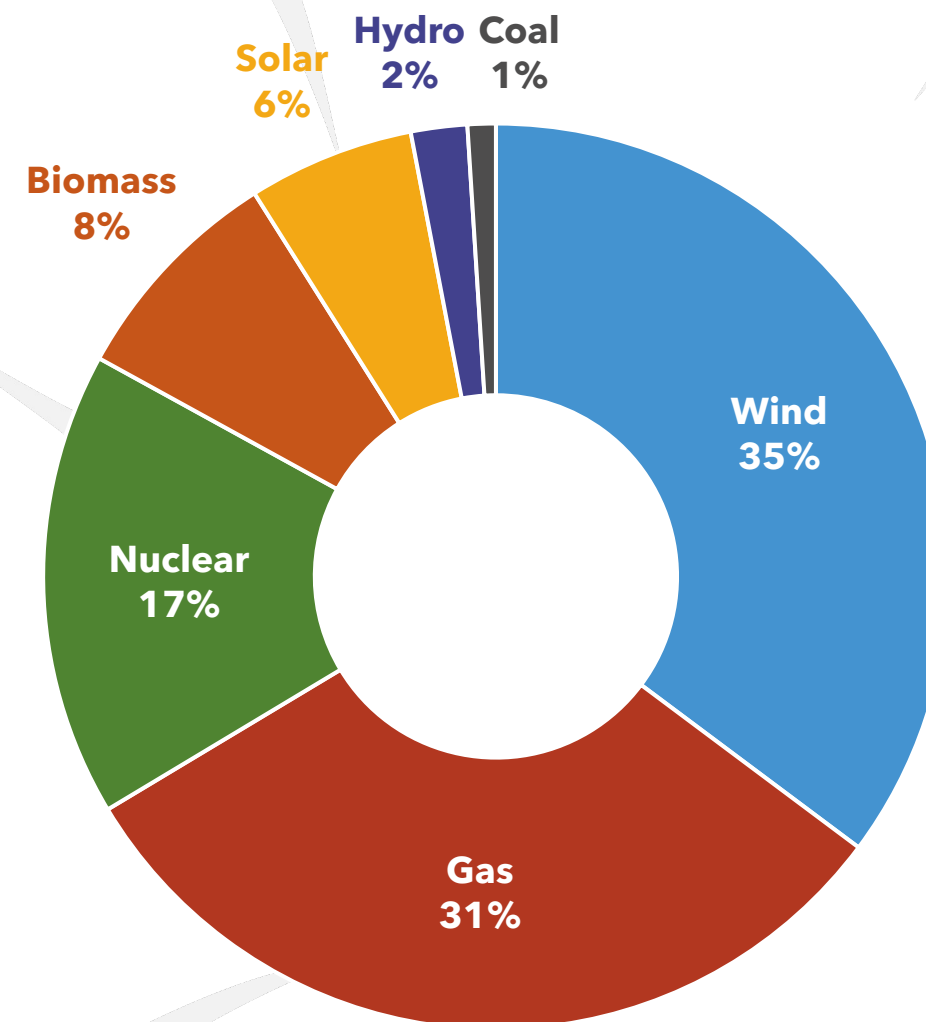
43 POWER 23 IMPACT 25 COST



SEE THE UK'S
GRID IN MEGAWATT



UNITED KINGDOM'S ELECTRICITY MIX



TOP CHANGES (SINCE 2023)

WIND (+6.4%)

BIOMASS (-4%)

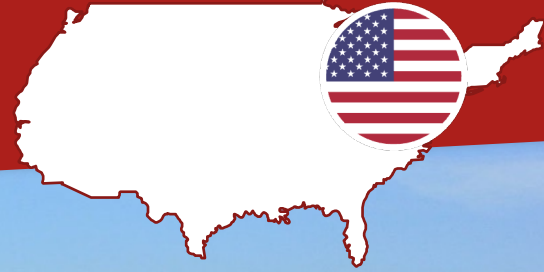
GAS (-3.9%)



RATIONALE

- WIND** recently overtook **GAS** as the UK's largest energy source. Offshore wind alone is planned to reach around 40% of the UK's electricity mix.
- COAL** has been rapidly phased out of the UK's energy mix. In 2012, it generated 40% of the UK's electricity.
- Some old **COAL** fired power stations have been converted to burn biomass pellets, increasing **BIOMASS** electricity to 8%.
- Four of the five remaining **NUCLEAR** power stations are set to close by 2028. To address this, the UK is building more nuclear power stations.

COUNTRY CASE STUDY: United States



AN OVERVIEW

PHYSICAL GEOGRAPHY & CLIMATE

The USA is a huge country spanning a continent from the Atlantic to the Pacific, from the Canadian border to the sub-tropical south. In the west, there are long chains of high mountains such as the Rockies, in the east the moderately high Appalachians. Most other areas are generally quite flat.

Temperature: Cold winter and hot summers in most parts; warm or hot year-round in the south

Rainfall: The north-west and south-east wet; many western areas very dry; otherwise, moderate

Wind: Central areas and certain mountain ranges are very windy, some coastal areas less so

Sunshine: Most areas very sunny year-round, though northern areas a little less so in the winter

Land use: Agriculture 44%, Forest 33%, Urban 3%, Other 19%

Fossil fuel reserves: Large reserves of coal, oil and gas

HUMAN GEOGRAPHY

Population: 341,000,000 (37 people per km² - low density)

Life Expectancy: 78

Urbanisation: 83% urban v 17% rural

Country wealth: £55,307 per person, per year (10th richest in the world)

Electricity use: 11.5 MWh per person per year (UK mean: 4.1MWh)



Aging infrastructure and increasing **weather extremes** can lead to damage to electricity transmission, **potentially causing disruptions and blackouts** that impact energy security.

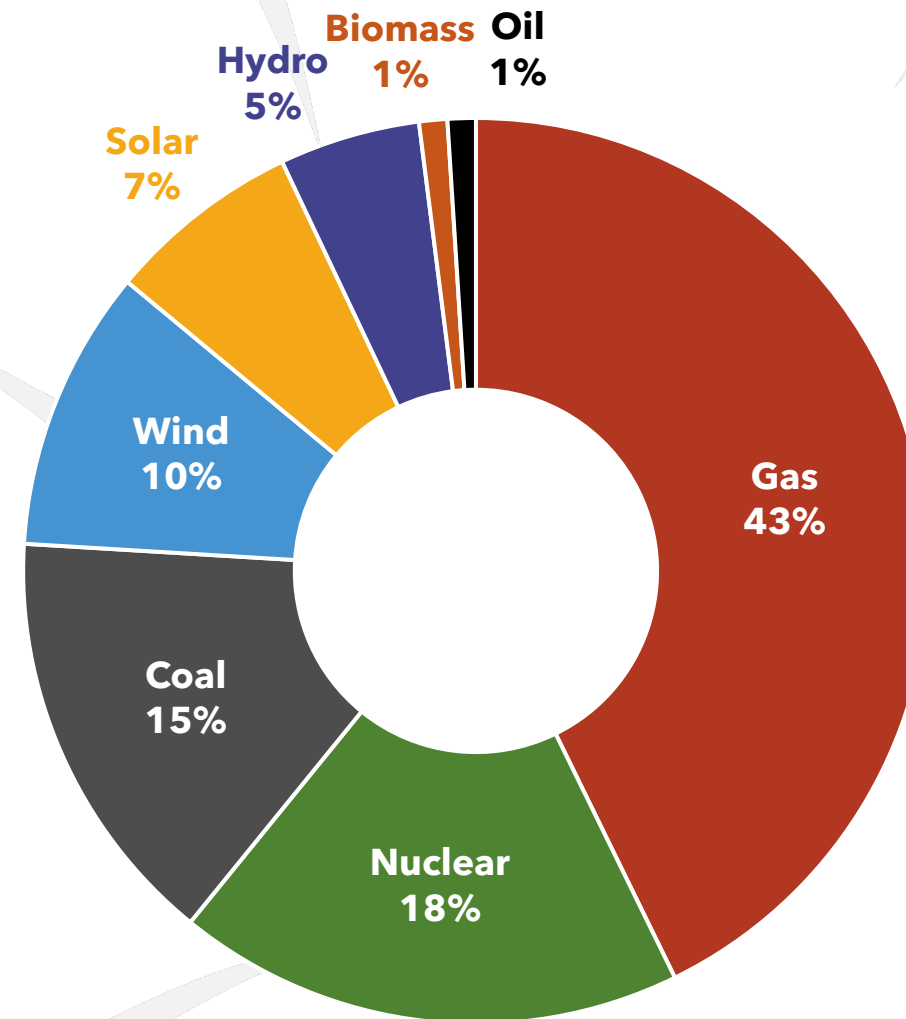
53 POWER 33 IMPACT 33 COST



SEE THE U.S.
GRID IN MEGAWATT



UNITED STATES' ELECTRICITY MIX



TOP CHANGES (SINCE 2023)

SOLAR (+1.3%)

COAL (-1%)

NUCLEAR (-0.4%)



RATIONALE

- Fossil fuels are plentiful in the United States leading to a large proportion of electricity generated from **GAS** and **COAL**.
- NUCLEAR** power development mostly halted after the Three Mile Island accident of 1980. The accident led to public pressure to halt development.
- Electricity generation from **SOLAR** and **WIND** is now growing quickly. The United States was slow to move to renewable energy resources because of a strong influence from fossil fuel producers on government policy.

COUNTRY CASE STUDY: Canada



AN OVERVIEW

PHYSICAL GEOGRAPHY & CLIMATE

One of the world's largest countries, 40 times the size of the UK, Canada extends from the Arctic down to more populated temperate regions. It has long coastlines on three different oceans. Most of it is quite flat, but there are high mountains in the west (including the Rockies).

Temperature: Winters very cold virtually everywhere; summers mild to hot in most areas

Rainfall: Moderate, but very wet on the northern Pacific coast, and dry in the centre and north

Wind: Moderately windy in most coastal and a few central areas

Sunshine: Long summer days, with reasonable sunshine; short winter days with weak sunshine

Land use: Agriculture 7%, Forest 34%, Urban 1%, Barren 19%, Other 39%

Fossil fuel reserves: Abundant reserves of oil and natural gas

HUMAN GEOGRAPHY

Population: 41,000,000 (4 people per km² - very low density)

Life Expectancy: 82

Urbanisation: 82% urban v 18% rural

Country wealth: £41,533 per person, per year (26th richest in the world)

Electricity use: 15.8 MWh per person per year (one of the highest in the world)



The **vast size** of Canada presents challenges in **maintaining a secure electricity grid**, especially for integrating **renewable energy sources built in remote regions**.

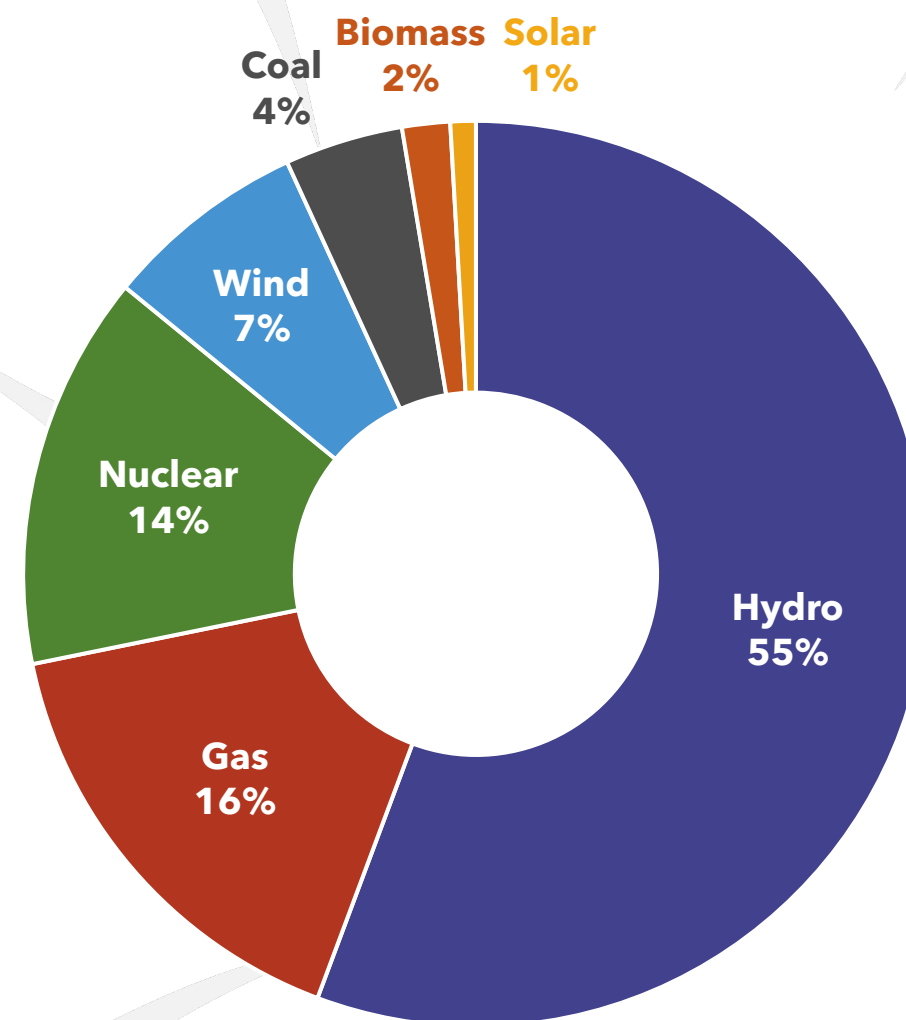
36 POWER 15 IMPACT 24 COST



SEE CANADA'S
GRID IN MEGAWATT



CANADA'S ELECTRICITY MIX



TOP CHANGES (SINCE 2023)

HYDRO (-2.3%)

GAS (+1.3%)

WIND (+1.2%)



RATIONALE

- Abundant fossil fuel resources and vast mountain ranges have significantly influenced the energy mix in Canada.
- Vast geography creates regional variations in energy sources. **HYDRO** dominates in Quebec and Manitoba, **COAL** and **GAS** are more prominent in Alberta and Saskatchewan, while **NUCLEAR** is focused in the Ontario province.
- SOLAR** potential in Canada is limited due to its climate and latitude, but **WIND** power is steadily growing.

COUNTRY CASE STUDY: Mexico



AN OVERVIEW

PHYSICAL GEOGRAPHY & CLIMATE

Mexico is a large country, 8 times the size of the UK, its territory either in the tropics or fairly close. It has two long coastlines and a great range of landscapes, from desert to rain forest. There are mountain ranges running down much of the centre.

Temperature: Most places warm to hot year-round; mountain areas cooler

Rainfall: Seasonal rains in summer; increases from dry in the north-west to wet in the south-east

Wind: Not very windy, except around a few coastlines in the east

Sunshine: Most areas very sunny year-round

Land use: Agriculture 55%, Forest 34%, Urban 1%, Other 10%

Fossil fuel reserves: Significant oil and natural gas reserves

HUMAN GEOGRAPHY

Population: 132,000,000 (66 people per km² – medium density)

Life Expectancy: 75

Urbanisation: 82% urban v 18% rural

Country wealth: £16,141 per person, per year (76th richest in the world)

Electricity use: 2.8 MWh per person, per year (UK mean: 4.1 MWh)



Reliance on gas for a large portion of electricity generation could leave Mexico **vulnerable to price fluctuations and supply disruptions.**

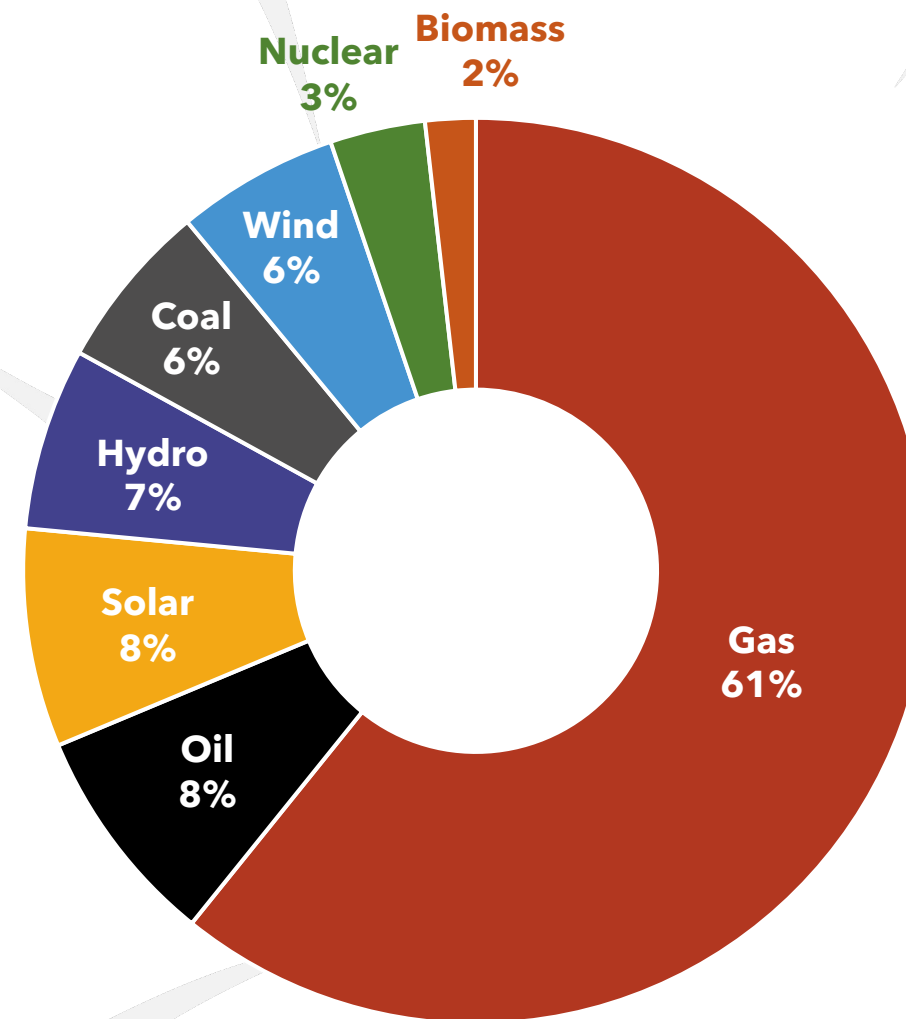
42 POWER 34 IMPACT 25 COST



SEE MEXICO'S
GRID IN MEGAWATT



MEXICO'S ELECTRICITY MIX



TOP CHANGES (SINCE 2023)

COAL (-3.6%)

GAS (+2.8%)

SOLAR (+1.6%)



RATIONALE

- Fossil fuels dominate Mexico's electricity generation, accounting for 75% of the total, with **GAS** as the primary source of electricity.
- HYDRO** remains a largely untapped potential for clean energy in Mexico, with lots of mountains and extensive river systems.
- There is a growing emphasis on renewable energy sources like **WIND** and **SOLAR** to meet rising electricity demand and reduce reliance on fossil fuels.

COUNTRY CASE STUDY: Germany



AN OVERVIEW

PHYSICAL GEOGRAPHY & CLIMATE

Germany is a little larger than the UK and occupies roughly the same latitudes. The north of the country – which has two coastlines – is quite flat, while the centre and most of the south are hilly, with high mountains (the Alps) just on the southern border.

Temperature: Winters a little colder than in the UK, summers similar or a little warmer

Rainfall: Moderate in all areas; occurs year-round

Wind: Coastal areas fairly windy, but inland areas generally get less wind

Sunshine: Long summer days, with reasonable sunshine; winter days short and generally dull

Land use: Agriculture 48%, Forest 33%, Urban 8%, Other 11%

Fossil fuel reserves: Modest coal reserves, little oil and gas

HUMAN GEOGRAPHY

Population: 84,000,000 (235 people per km² - very high density)

Life Expectancy: 81

Urbanisation: 78% urban v 22% rural

Country wealth: £46,030 per person, per year (21st richest in the world)

Electricity use: 5.6 MWh per person, per year (UK mean: 4.1 MWh)



Germany's **reliance on wind and solar** makes its **vulnerable to the weather**.

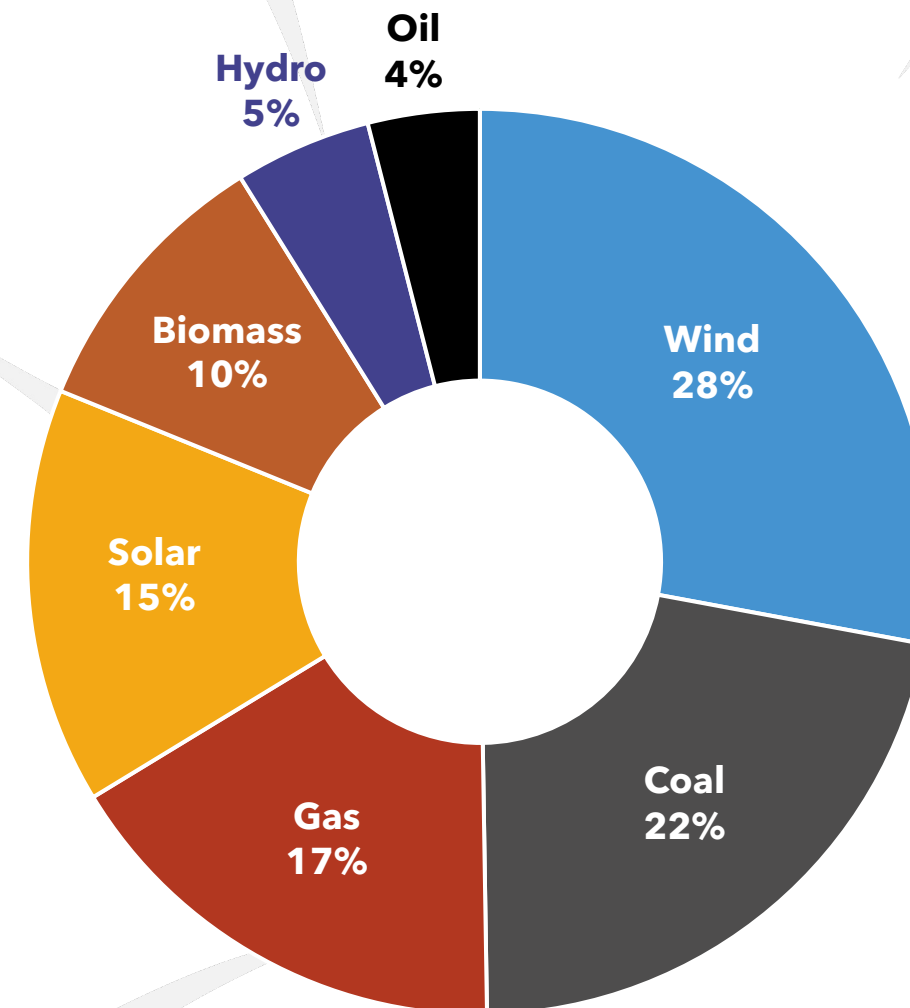
During periods of low wind and sunlight, the country may need **to import more electricity or rely on fossil fuels**, increasing costs and emissions.

SEE GERMANY'S
GRID IN MEGAWATT

49 POWER 32 IMPACT 27 COST



GERMANY'S ELECTRICITY MIX



TOP CHANGES (SINCE 2023)

COAL (-4.9%)
SOLAR (+2.7%)
GAS (+1.5%)



RATIONALE

- Germany began phasing out **NUCLEAR** after the 2011 Fukushima disaster in Japan, with the last plants closing in 2023.
- COAL** still plays a significant role in Germany's electricity mix, despite attempts to reduce its use as part of the "Energiewende" (energy transition) policy to combat climate change.
- Germany has invested heavily in **WIND** and **SOLAR**, which now account for a substantial portion of electricity generation.

COUNTRY CASE STUDY: Brazil



AN OVERVIEW

PHYSICAL GEOGRAPHY & CLIMATE

Brazil is a giant country, 35 times the size of the UK, occupying much of the east of the South American continent, most of it in the tropics. It has a long Atlantic coastline. While it lacks large mountain ranges, there are plenty of peaks in different areas nearly 3,000 metres above sea level.

Temperature: Most places hot year-round; winters a little cooler in the south

Rainfall: Generally high, except in the north-east

Wind: Not especially windy, with very little wind in central areas, some wind on the north-east coast

Sunshine: Most places quite sunny year-round, though much less so in the Amazon basin

Land use: Forest 59%, Agriculture 31%, Urban 1%, Other 9%

Fossil fuel reserves: Large offshore oil reserves, some gas reserves

HUMAN GEOGRAPHY

Population: 212,000,000 (25 people per km² - low density)

Life Expectancy: 76

Urbanisation: 87% urban v 13% rural

Country wealth: £14,394 per person, per year (81st richest in the world)

Electricity use: 3.5 MWh per person, per year (UK mean: 4.1 MWh)



Brazil's **high dependence on hydro** makes its **vulnerable to droughts**.

Extended dry periods could force the country to rely more on **fossil fuels** or **face electricity shortages**.

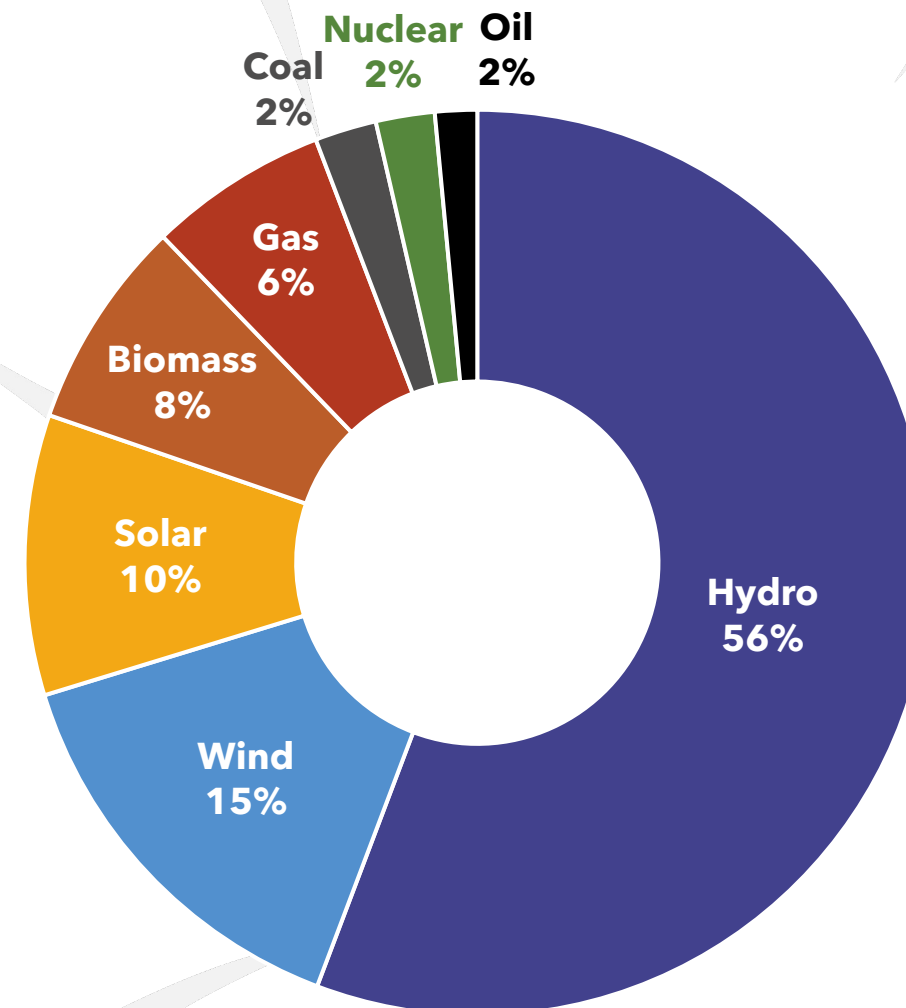
38 POWER 17 IMPACT 23 COST



SEE BRAZIL'S
GRID IN MEGAWATT



BRAZIL'S ELECTRICITY MIX



TOP CHANGES (SINCE 2023)

HYDRO (-4.8%)

SOLAR (+2.8%)

WIND (+1.1%)



RATIONALE

- Brazil's electricity mix is dominated by **HYDRO** power, thanks to its extensive river systems and favourable geography.
- BIOMASS** in Brazil comes mainly from sugarcane, playing a significant role in generating electricity as well as in transport.
- Brazil has been increasing its investment in **WIND** energy, especially in the northeast region where wind speeds are high.
- SOLAR** has seen significant expansion, with 147 new solar farms created in 2024 alone.
- Despite having significant fossil fuel reserves, Brazil's use of **OIL** and **GAS** is relatively limited compared to other large countries.

COUNTRY CASE STUDY: Japan



AN OVERVIEW

PHYSICAL GEOGRAPHY & CLIMATE

Japan is an island nation, about 50% larger than the UK, and not as far from the Equator. It's mainly mountainous, with most of its people living in lower-lying coastal areas.

Temperature: Winters moderately cold, very cold in the north; summers generally hot

Rainfall: Moderate to high in most areas

Wind: Moderate in most areas; some coastlines quite windy

Sunshine: Moderate, but cloudy skies quite common throughout the year

Land use: Forest 68%, Agriculture 12%, Urban 4%, Other 16%

Fossil fuel reserves: Very limited oil, coal and gas reserves

HUMAN GEOGRAPHY

Population: 124,000,000 (328 people per km² - extremely high density)

Life expectancy: 85

Urbanisation: 92% urban v 8% rural

Country wealth: £33,771 per person, per year (38th richest in the world)

Electricity use: 8.2 MWh per person, per year (UK mean: 4.1 MWh)



Japan relies on **imported fossil fuels** which are **vulnerable to price changes** and supply disruptions. Natural disasters, like **earthquakes or tsunamis**, pose risks to all types of power plants, **particularly nuclear facilities**.

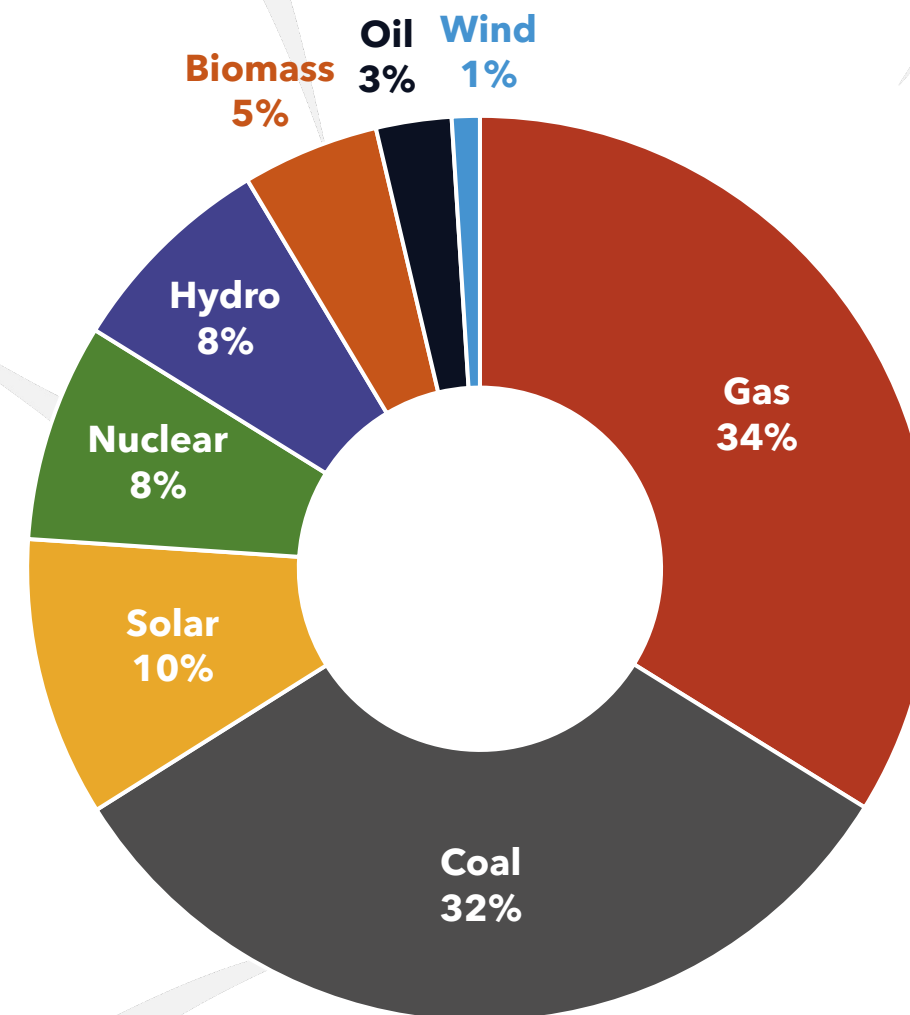
48 POWER 34 IMPACT 29 COST



SEE JAPAN'S
GRID IN MEGAWATT



JAPAN'S ELECTRICITY MIX



TOP CHANGES (SINCE 2023)

GAS (+1.1%)
SOLAR (-0.8%)
NUCLEAR (-0.7%)



RATIONALE

- The 2011 Fukushima disaster led Japan to temporarily shut down all its **NUCLEAR** plants. While some have since reopened, **NUCLEAR**'s share of electricity remains much lower than its peak of 29% in 2009.
- Japan has limited fossil fuel resources, making it very reliant on imported **COAL**, **OIL**, and **GAS** for energy security.
- Despite its high population density and extensive forests, Japan has been investing in renewable energy like **SOLAR** and offshore **WIND** to diversify its energy mix and reduce carbon emissions.