Future trends in ENERGY and ELECTROMOBILITY in the South Baltic Region

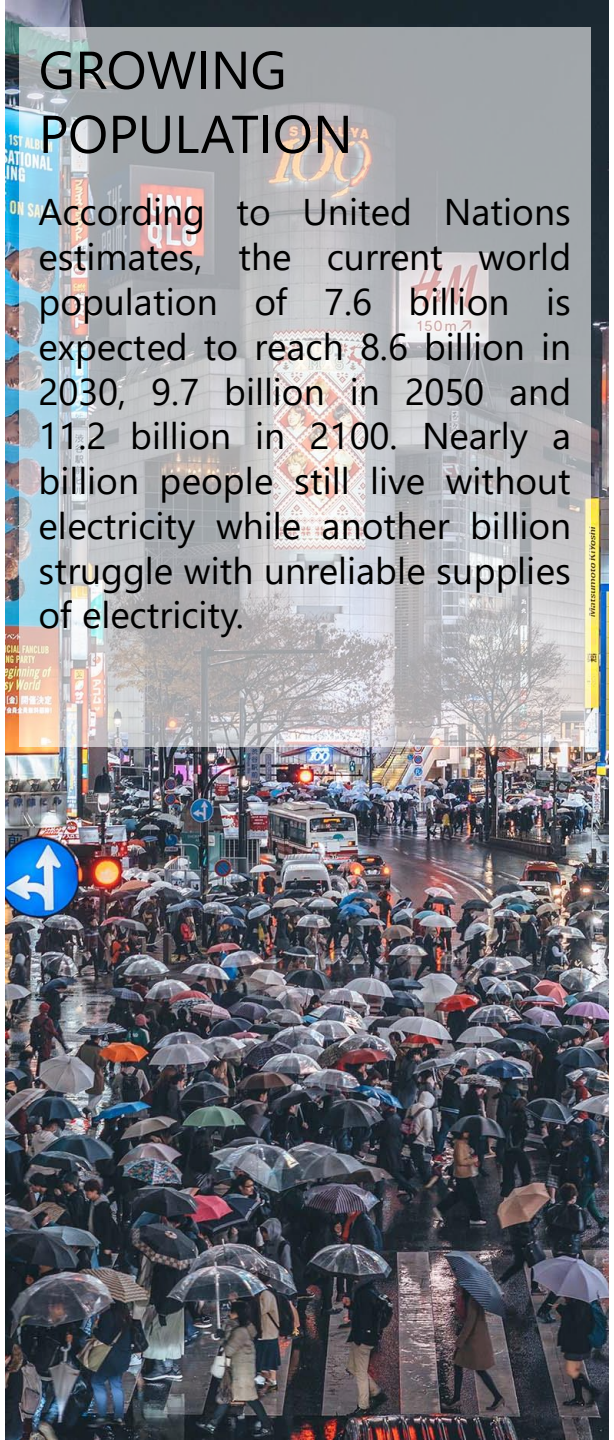
Cross-border Conference with PA panel

25th of October, 2019, Gdansk, Poland

WORLD ENERGY OUTLOOK: LOOKING AHEAD TO 2050

Dr. Tatjana Paulauskiene

Klaipeda University



GROWING POPULATION

According to United Nations estimates, the current world population of 7.6 billion is expected to reach 8.6 billion in 2030, 9.7 billion in 2050 and 11.2 billion in 2100. Nearly a billion people still live without electricity while another billion struggle with unreliable supplies of electricity.

NEED FOR ENERGY SOLUTIONS

By 2070 the world is likely to be using at least 50% more energy than it does today. According to the International Energy Agency (IEA), renewable generation is expected to underpin the growth of electricity from 18% to 50% of energy supply by 2050. The remaining energy demand that is difficult to electrify will still require cleaner solutions.

MITIGATING CLIMATE CHANGE

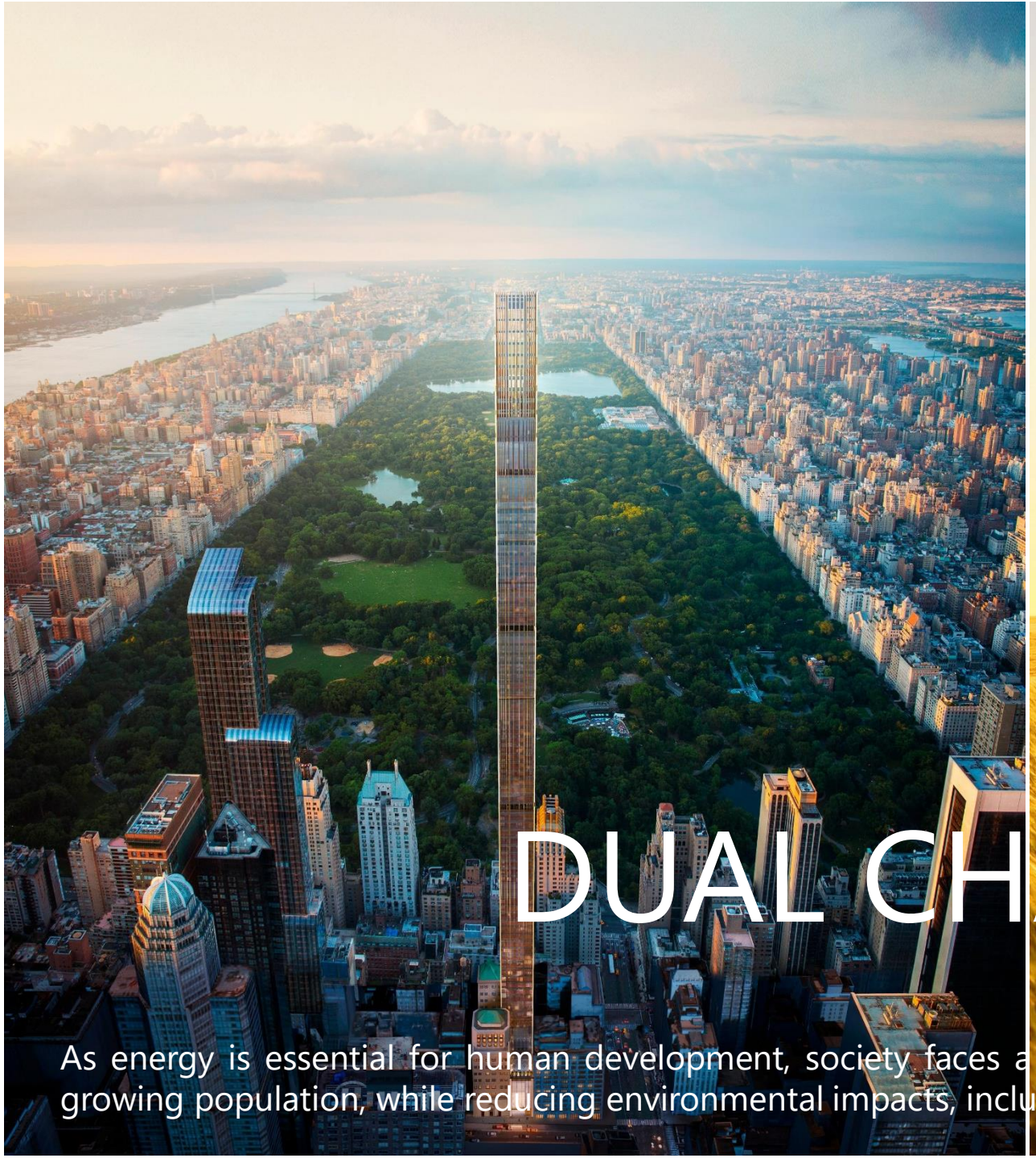
The world currently emits 33 billion tonnes of energy-related CO_2 each year. To limit the rise in global temperature to 2°C, the IEA has calculated that energy related CO_2 emissions need to fall to around 18 billion tonnes a year by 2040. The challenge is not just to reduce emissions, but to do this while providing more reliable energy supplies.

IMPROVING AIR QUALITY

Updated World Health Organization (WHO) estimates reveal an alarming death toll of 7 million people every year caused by outdoor and household air pollution. According to WHO, global air pollution is linked to inefficient energy use in every sector of human activity including coal-fired power plants, industry, agriculture and transport.

THE ENERGY CHALENGE

Shell LNG Outlook 2019



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DUAL CHALLENGE

As energy is essential for human development, society faces a dual challenge: to provide reliable and affordable energy to a growing population, while reducing environmental impacts, including the risks of climate change

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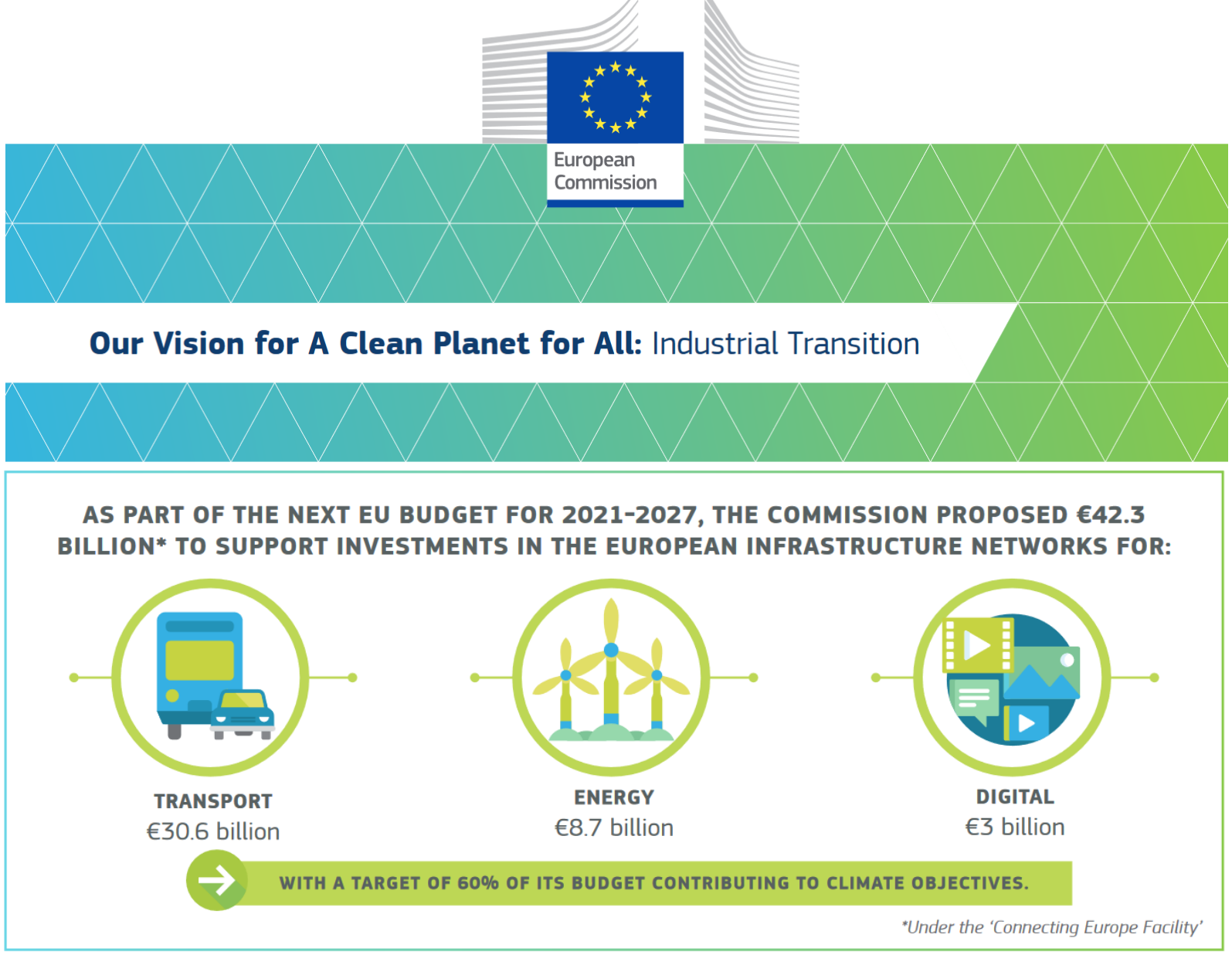
„We see $13.3 trillion invested in new power generation assets over the 31 years to 2050. Of this, 77% goes to renewables. Wind attracts $5.3 trillion and solar $4.2 trillion, and another $843 billion goes to batteries. Investments in new fossil fuel plants doesn't exceeded $2 trillion.

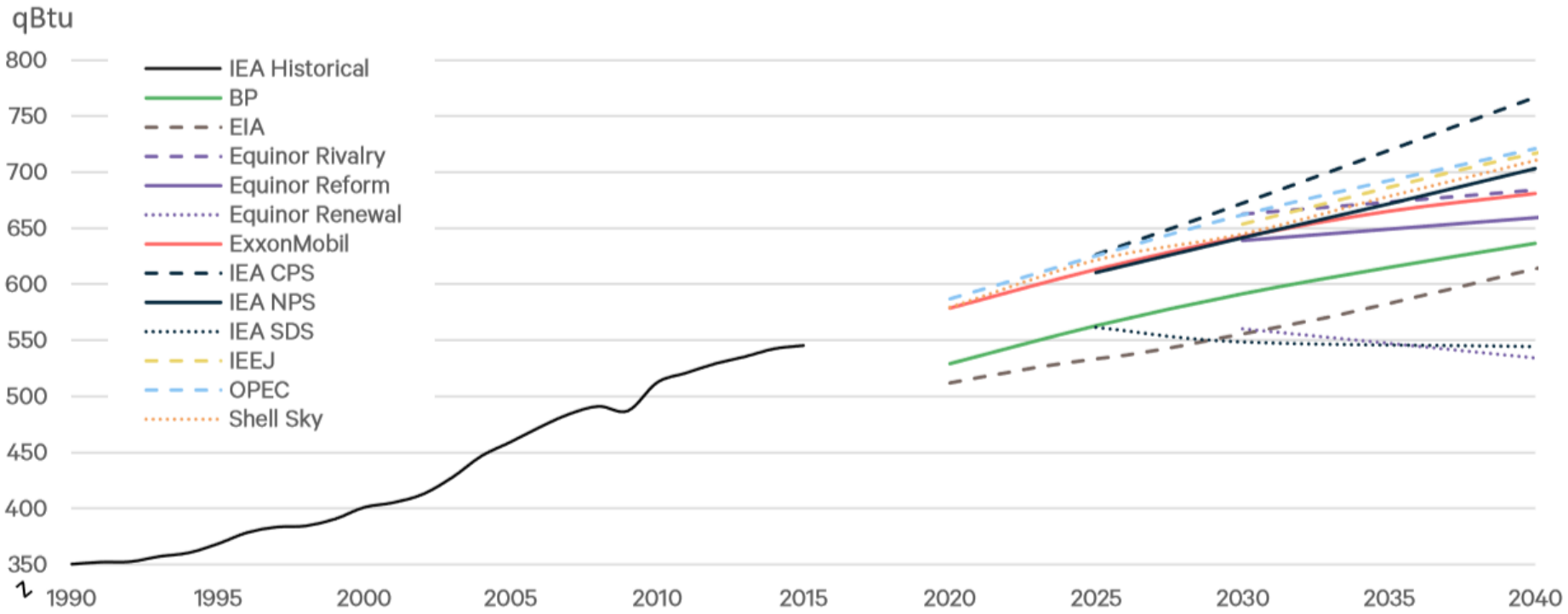
This investment total funds 15,145GW of new power plants between 2019 and 2050, of which 80% is zero carbon“.

BloombergNEF



Moreover the Commission proposed to have 25% of the next EU budget (2021-2027) contributing to climate objectives; and established a dedicated financial support for sustainable infrastructure investments through the "InvestEU" programme.

GLOBAL PRIMARY ENERGY CONSUMPTION



IEA - The International Energy Agency

BP - The British Petroleum

OPEC - Organization of Petroleum Exporting Countries

IEEJ - The Institute of Electrical Engineers of Japan

CPS - Current Policies

NPS - New Policies

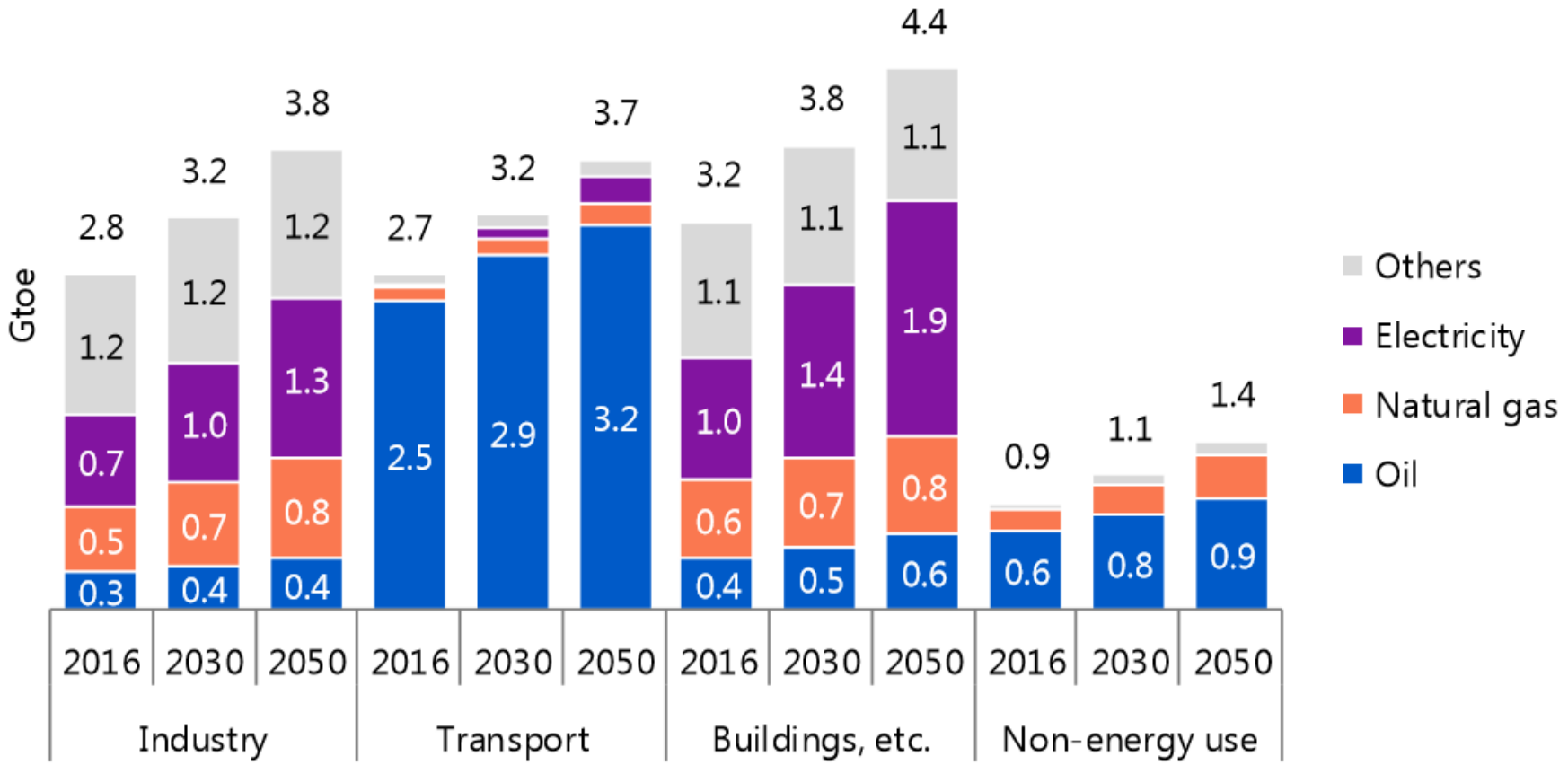
SDS - Sustainable Development

qBTU - quadrillion (10^{15}) British Termal Unit

„Global primary energy consumption has grown rapidly over the past 25 years, reaching 546 quadrillion Btu (qBtu) in 2015, more than 190 qBtu higher than 1990 levels. Over the next 25 years, growth is projected to slow, increasing by roughly 110 to 160 qBtu in Evolving Policies scenarios, and declining by as much as 4 qBtu under Ambitious Climate scenarios".

Source: Global Energy Outlook 2019: The Next Generation of Energy

WORLD END-USE ENERGY CONSUMPTION

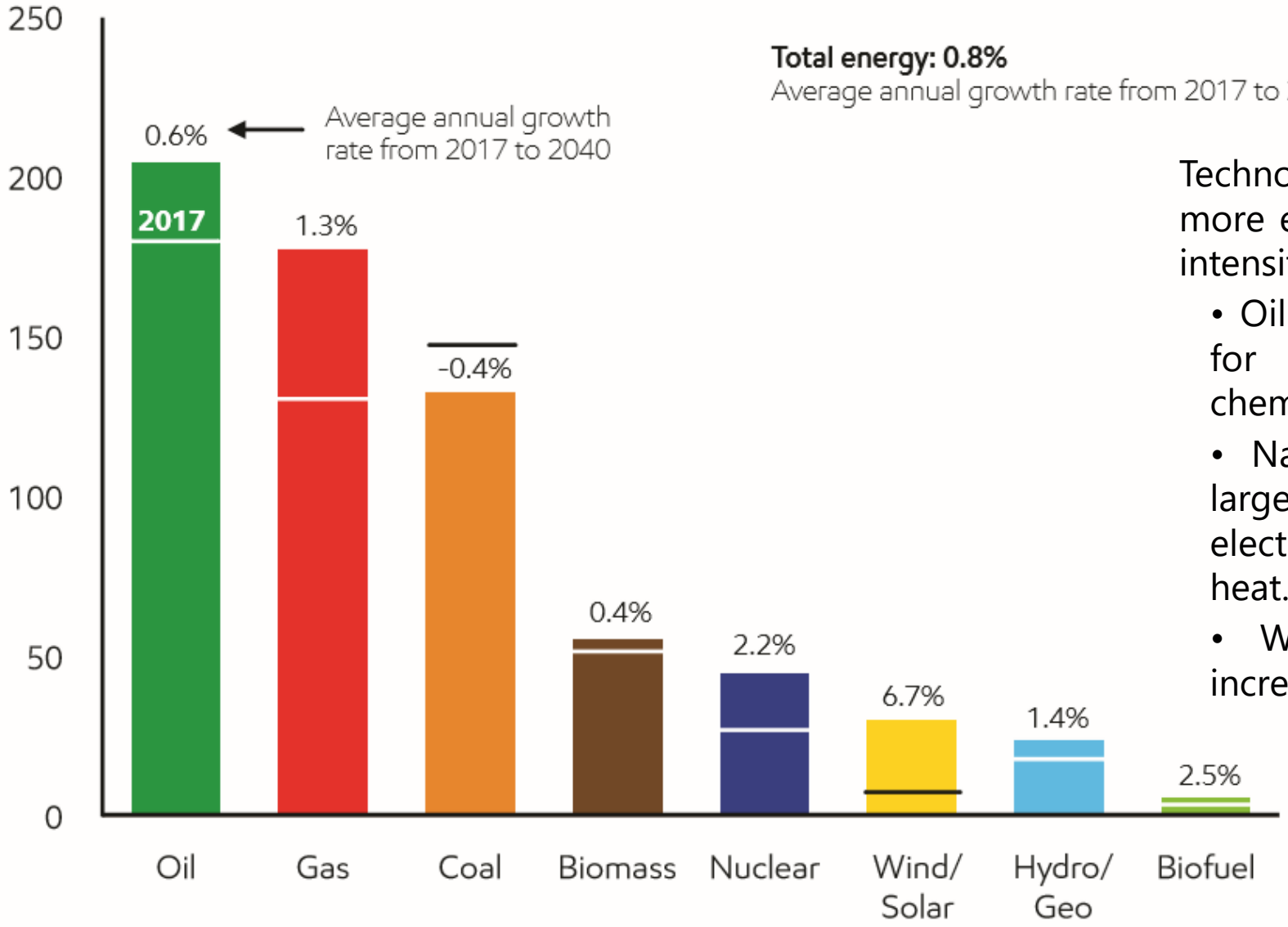


*Almost half of the world's energy use is dedicated to industrial activity. World end-use energy consumption will reach **13.3 Gtoe by 2050**, up to 39% from the current 9.6 Gtoe. The increases are more or less 1 Gtoe in industry and transportation, and 1.2 Gtoe in the buildings sector. Most of these increments are derived from non-OECD consumption. Oil will continue to be the most consumed energy source, but its share will fall from the current 41% to 38% in 2050.*

Source: IEEJ Outlook 2019

Energy supply evolves to meet demand projections

2040 global demand by fuel – quadrillion BTUs



Total energy: 0.8%

Average annual growth rate from 2017 to 2040

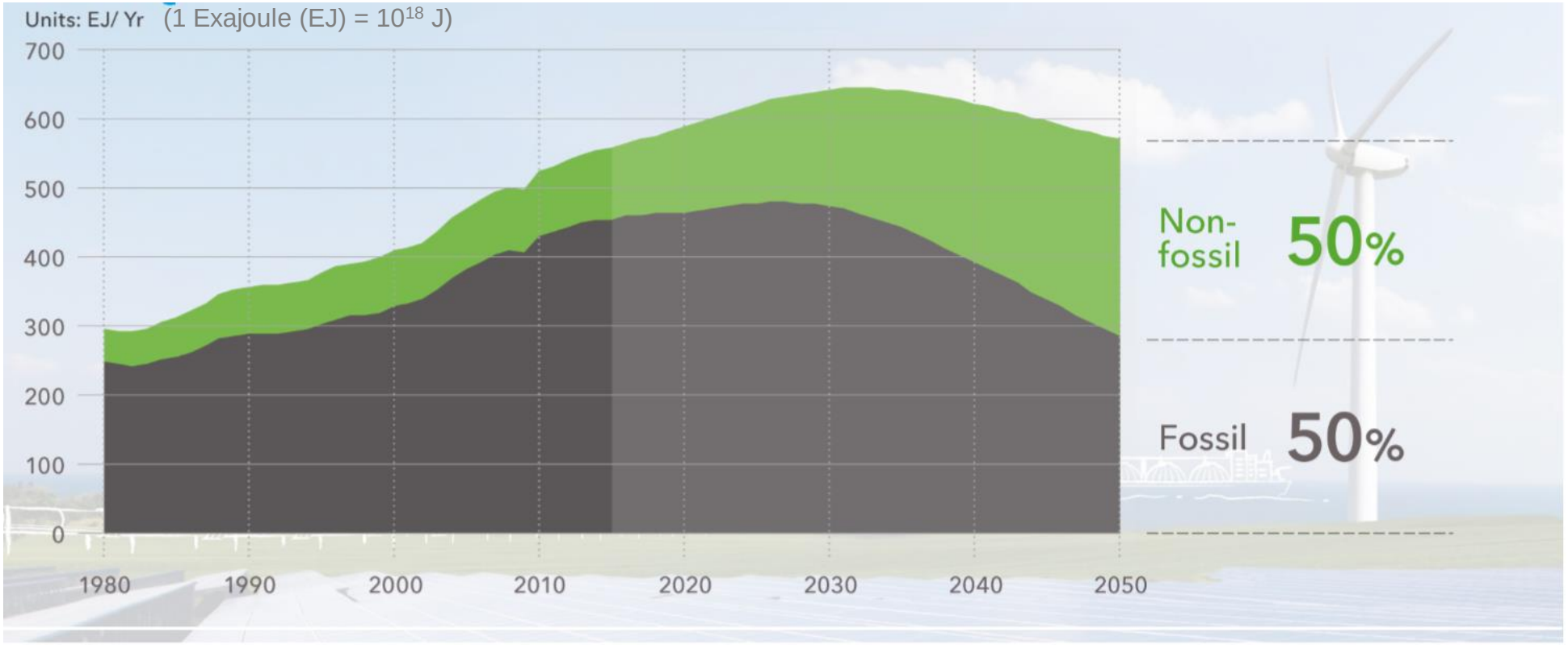
Technology improvements help achieve more efficient fuel use and lower emissions intensity across all sources of supply:

- Oil remains the largest source; essential for commercial transportation and chemicals
- Natural gas demand rises the most, largely to help meet increasing needs for electricity and lower-carbon industrial heat.
- Wind/solar, biofuels and nuclear - increase at the fastest pace.

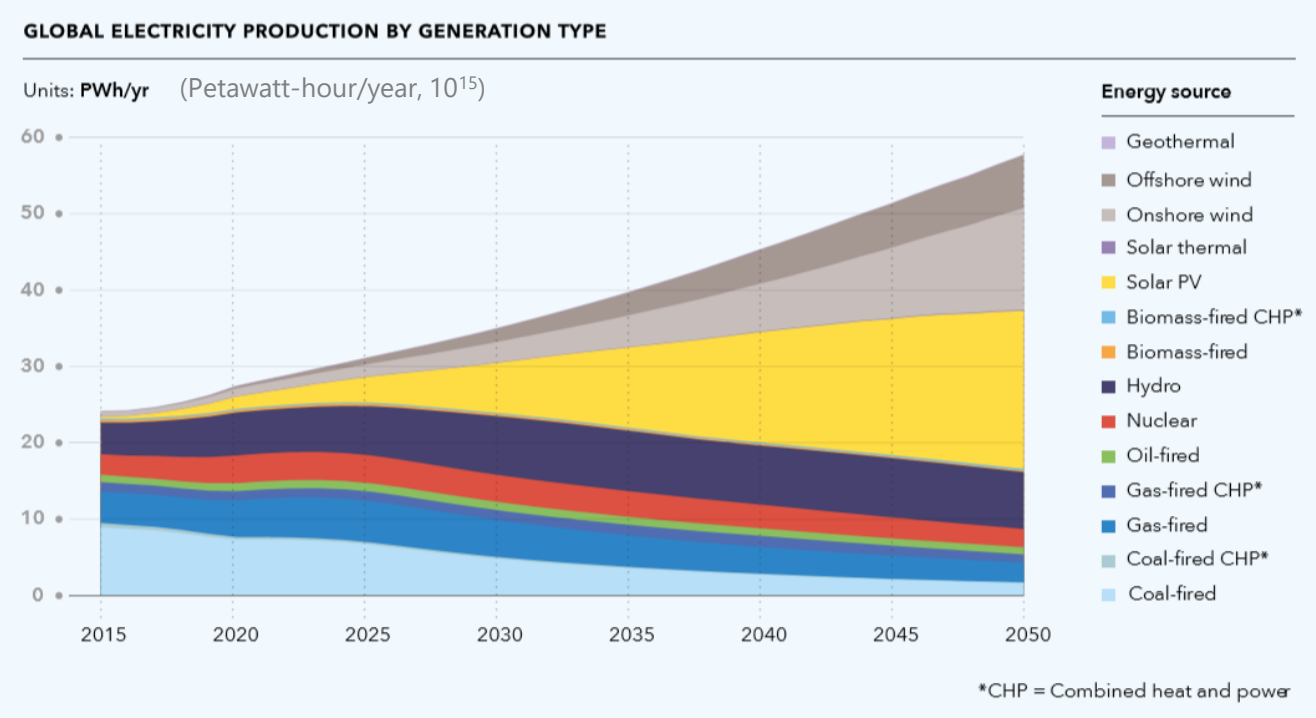
ExxonMobil

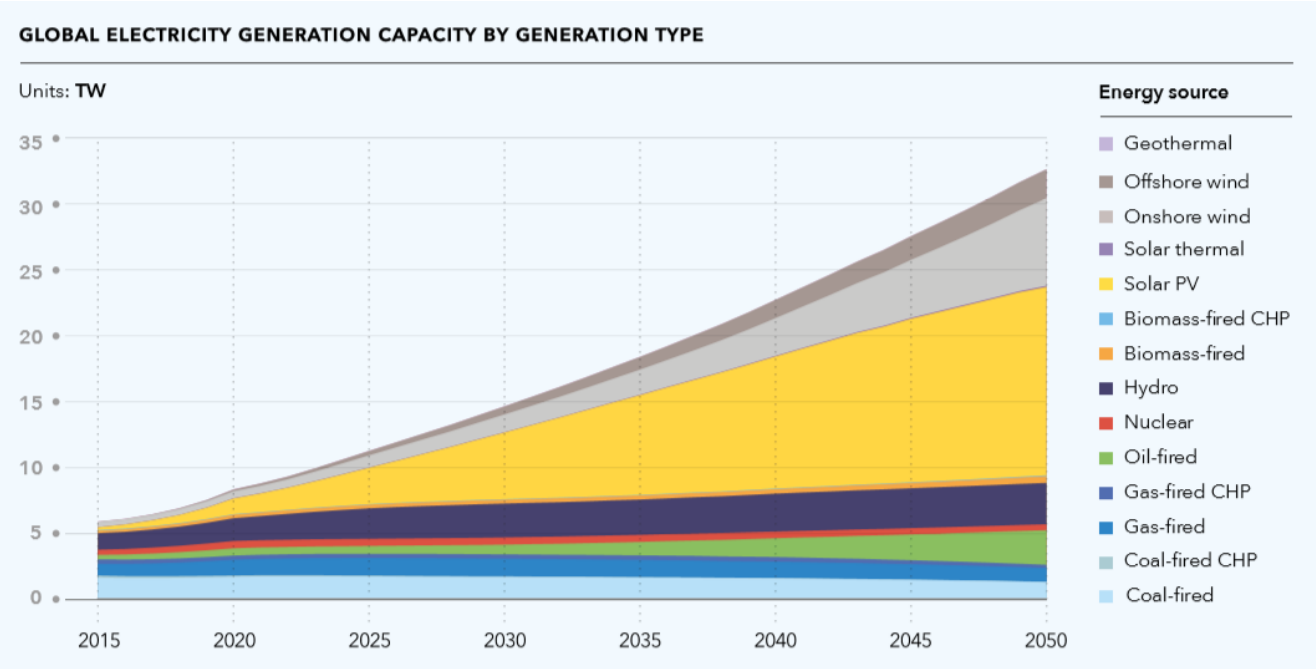
2019 OUTLOOK FOR ENERGY

AN EQUAL SPLIT BY 2050



Source: Oil and gas forecast to 2050, DNV GL





„The new renewable generation sources will not be located near to the plants they replace, but many will be near where the electricity will be consumed. They will be more distributed, smaller, though larger in total capacity, and will cause major changes to power flows across electricity networks. The changing consumption patterns will also contribute to this, resulting in new demands on electricity networks".

Source: Renewables, Power and Energy Use Forecast to 2050 (DNV GL)

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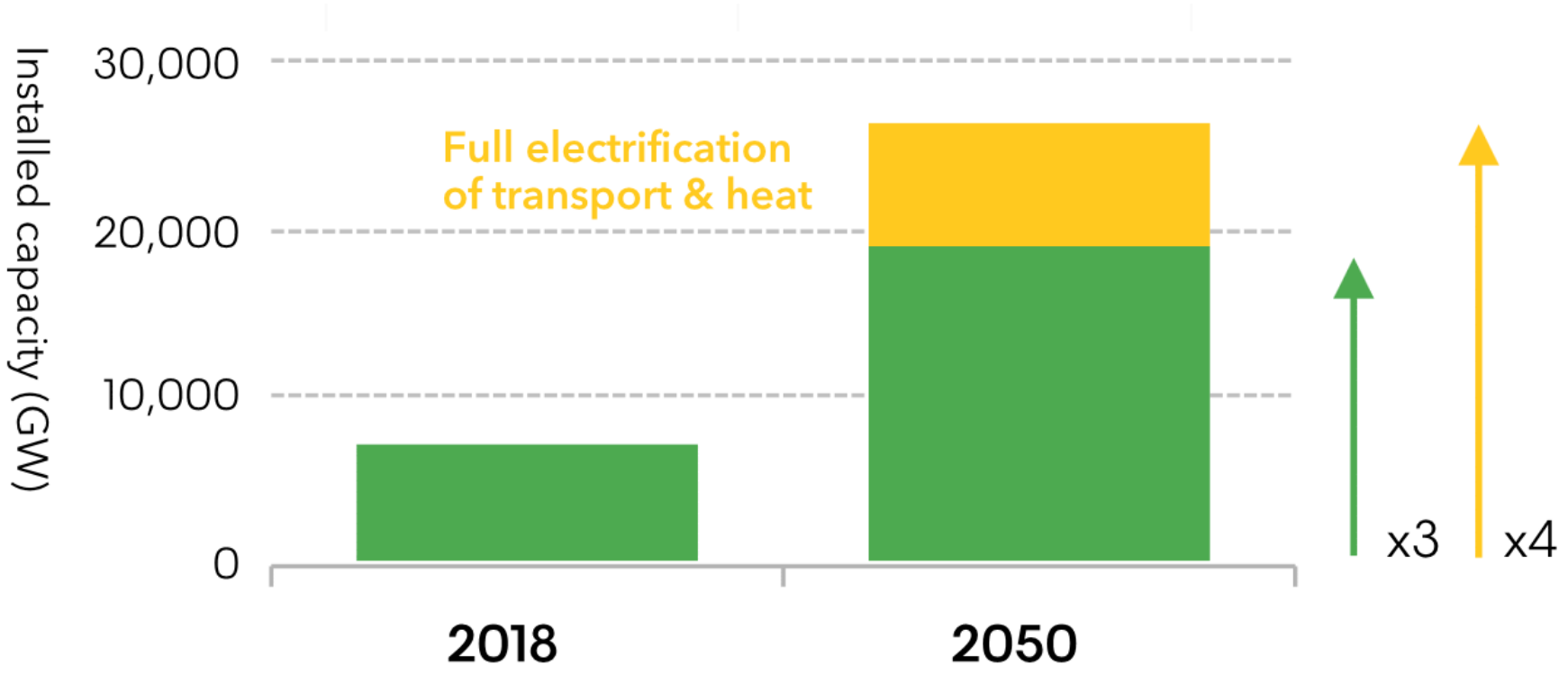
ADDITIONAL CAPACITY NEEDED



"Electrification of road transport and residential heat by 2050 would more than double electricity demand from today's level. This increase in electricity demand needs over three times more generating capacity than is currently installed worldwide".

BloombergNEF

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European Commission

Our Vision for A Clean Planet for All: Industrial Transition

November 2018

EU's energy import dependence will be massively reduced by 2050.

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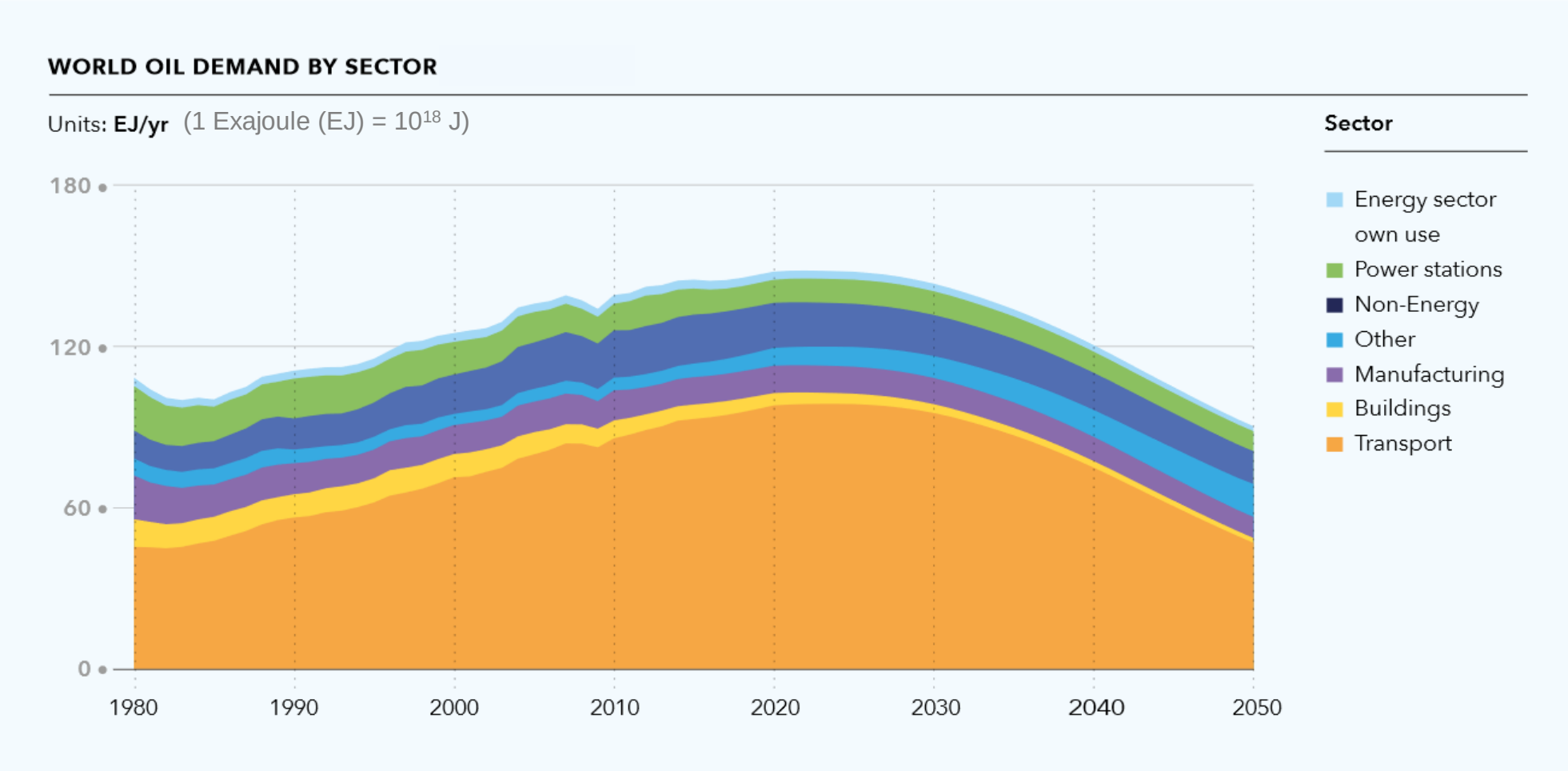
OIL

„We forecast oil and gas to account for 44% of the world's primary energy supply in 2050, down from 53% today."

OIL AND GAS FORECAST TO 2050, DNV GL



„Transport remains the main source of oil demand throughout the period. The growing use of electric vehicles will influence this significantly. Direct oil demand in manufacturing and buildings is relatively small, but is expected to reduce somewhat in both those sectors over the forecast period, reaching 9EJ/yr (manufacturing) and 2EJ/yr (buildings). The power sector will also demand around 8EJ/yr of oil, down from 10EJ/yr today".

Source: Oil and gas forecast to 2050, DNV GL

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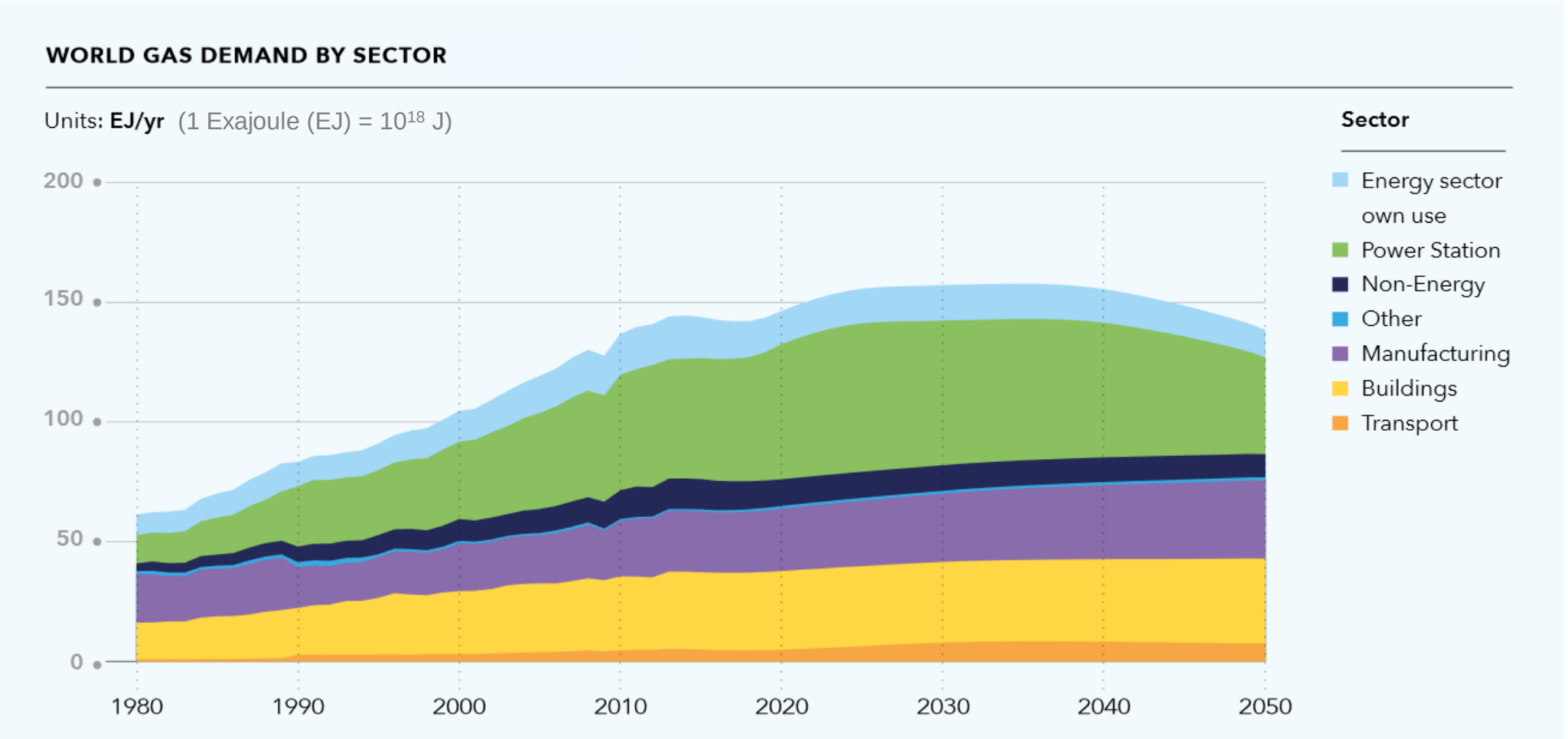
NATURAL GAS

"Gas-fired power grows just 0.6% per year to 2050, supplying system back-up and flexibility rather than bulk electricity in most market. Gas generating capacity doubles by 2050. We expect a 37% rise in combined-cycle gas turbines as 506GW are added, and a 350% increase in peaking gas plants, which account for over 1TW of capacity by 2050".

BloombergNEF



"Global demand for gas has more than doubled in the past 30 years. It will increase for another two decades peaking in 2035. Thereafter, gas consumption will go into moderate decline. The power generation sector will be the principal consumer of gas in most regions. Gas use in power generation will increase sharply over the next 15 years. However, global gas consumption for the buildings sector remains stable and in manufacturing increases slightly over the forecast period. Gas use in transport will increase, notably in shipping, where gas use will represent 30% of all energy use in 2050".

Source: Oil and gas forecast to 2050, DNV GL

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COAL

"Coal collapses everywhere in the world, except in Asia, and peaks globally in 2026. Growth in China, India and Southeast Asia fails to offset rapid decline in Europe and the U.S. Carbon pricing and mandated phase-out plans in Europe and cheap natural gas in the U.S. force coal out of the mix.

By 2050, coal-fired generation is down 51%, supplying just 12% of world electricity, from 27% today".

BloombergNEF

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RENEWABLES

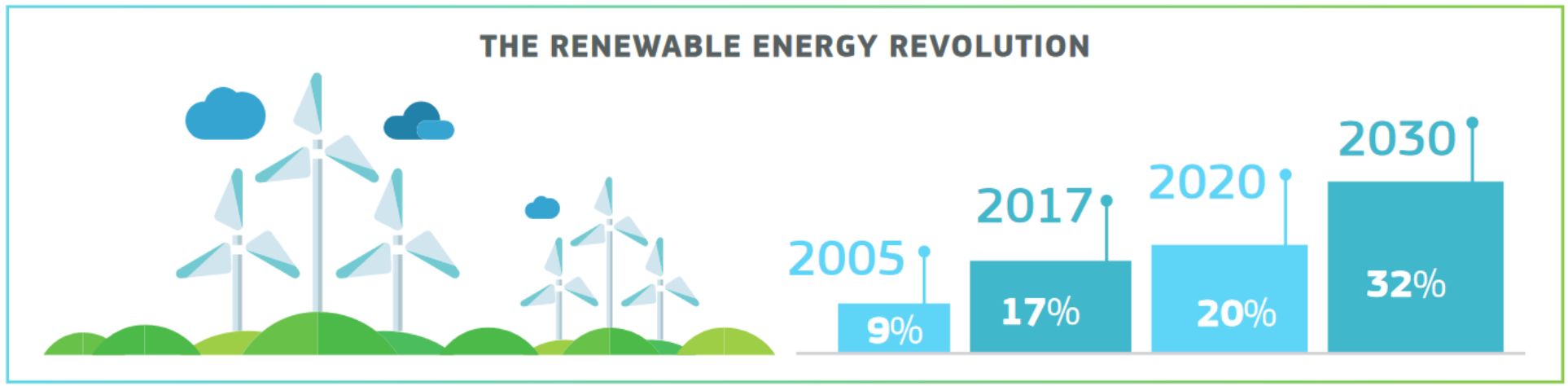
"Europe will decarbonize its grid the fastest with 92% of its electricity supplied by renewables in 2050. Major Western European economies in particular are already on a trajectory to significantly decarbonize thanks to carbon pricing and strong policy support".

BloombergNEF

European Commission

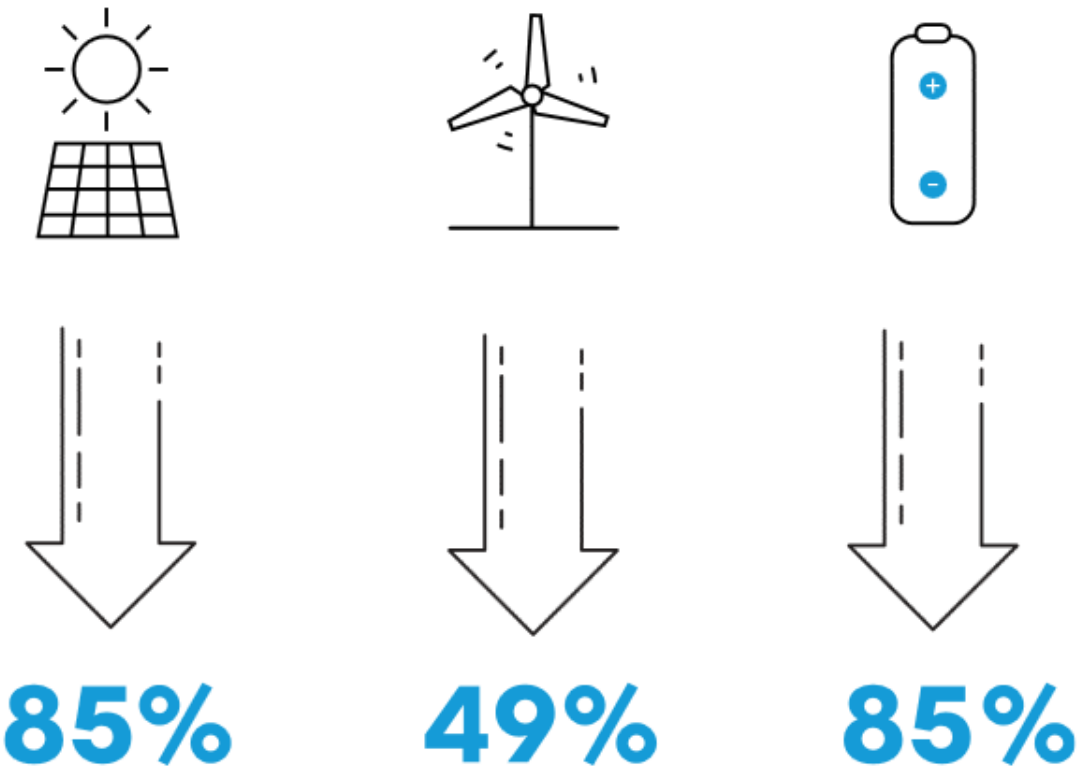
Our Vision for A Clean Planet for All: Industrial Transition

November 2018



Technology cost-declines since 2010

(Source: BloombergNEF)



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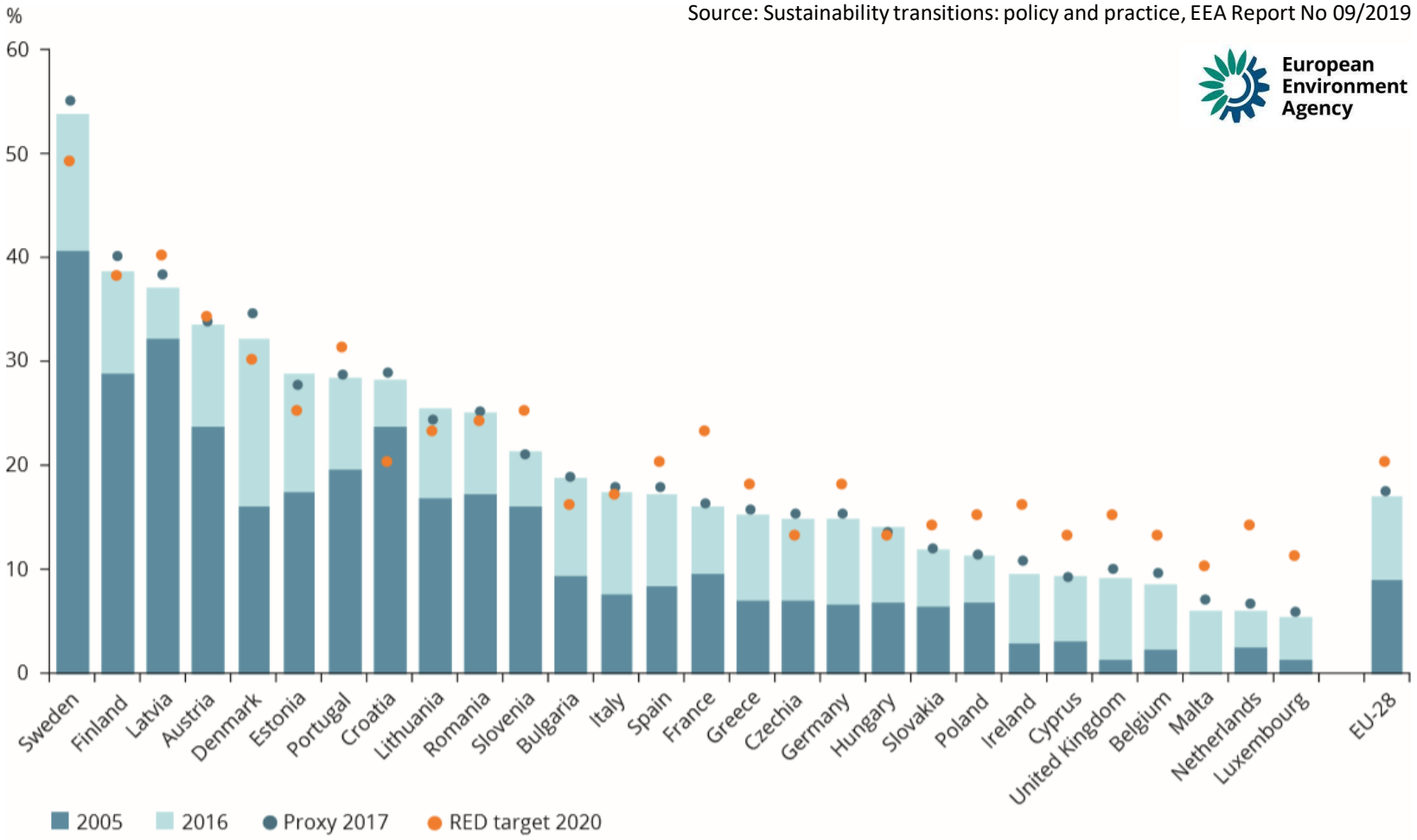
Proportions of energy from renewable sources in the EU Member States

Source: Sustainability transitions: policy and practice, EEA Report No 09/2019

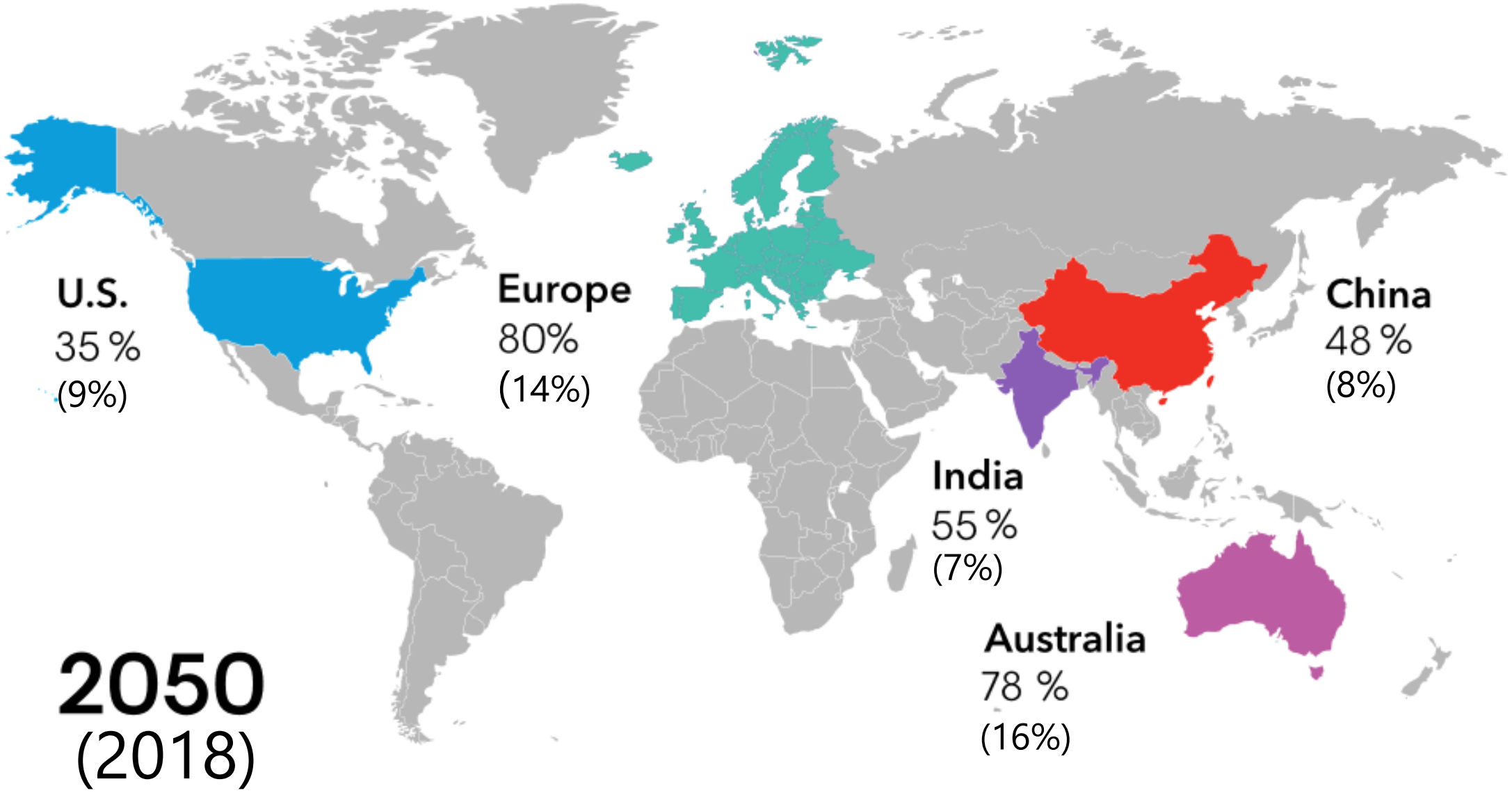


Note: The dark blue bars show the percentages of energy derived from renewable energy sources in 2005. The tops of the light blue bars show the levels that they reached in 2016.

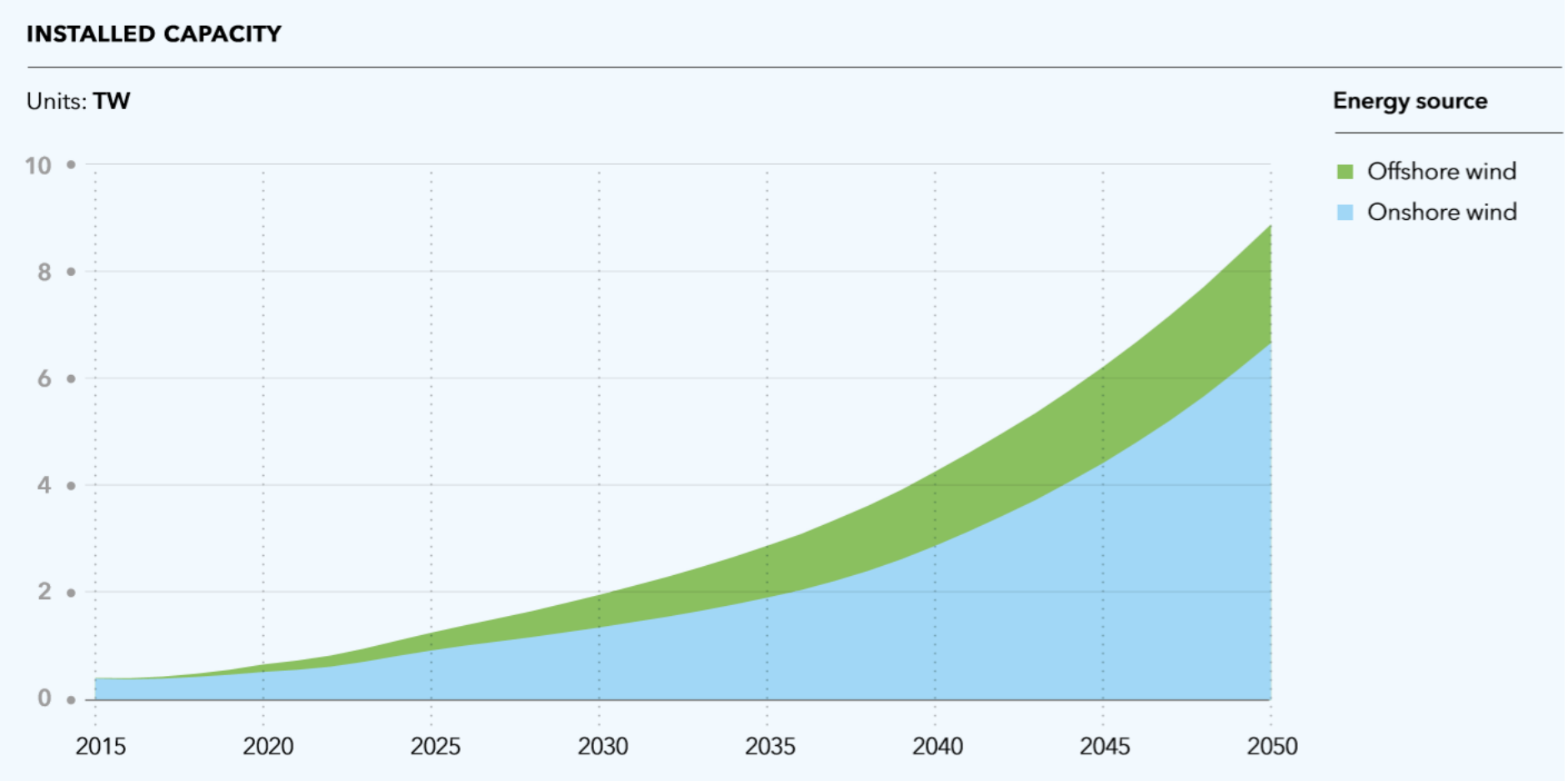
For the whole energy system, renewable energy in Europe increased from 8.5 % in 2004 to 17.0 % in 2016 (Eurostat, 2018), implying that the aggregate 20 % target for 2020 is within reach. Some countries have already reached their 2020 targets, while others are some way off.

Solar and wind penetration in the energy mix

(Source: BloombergNEF)

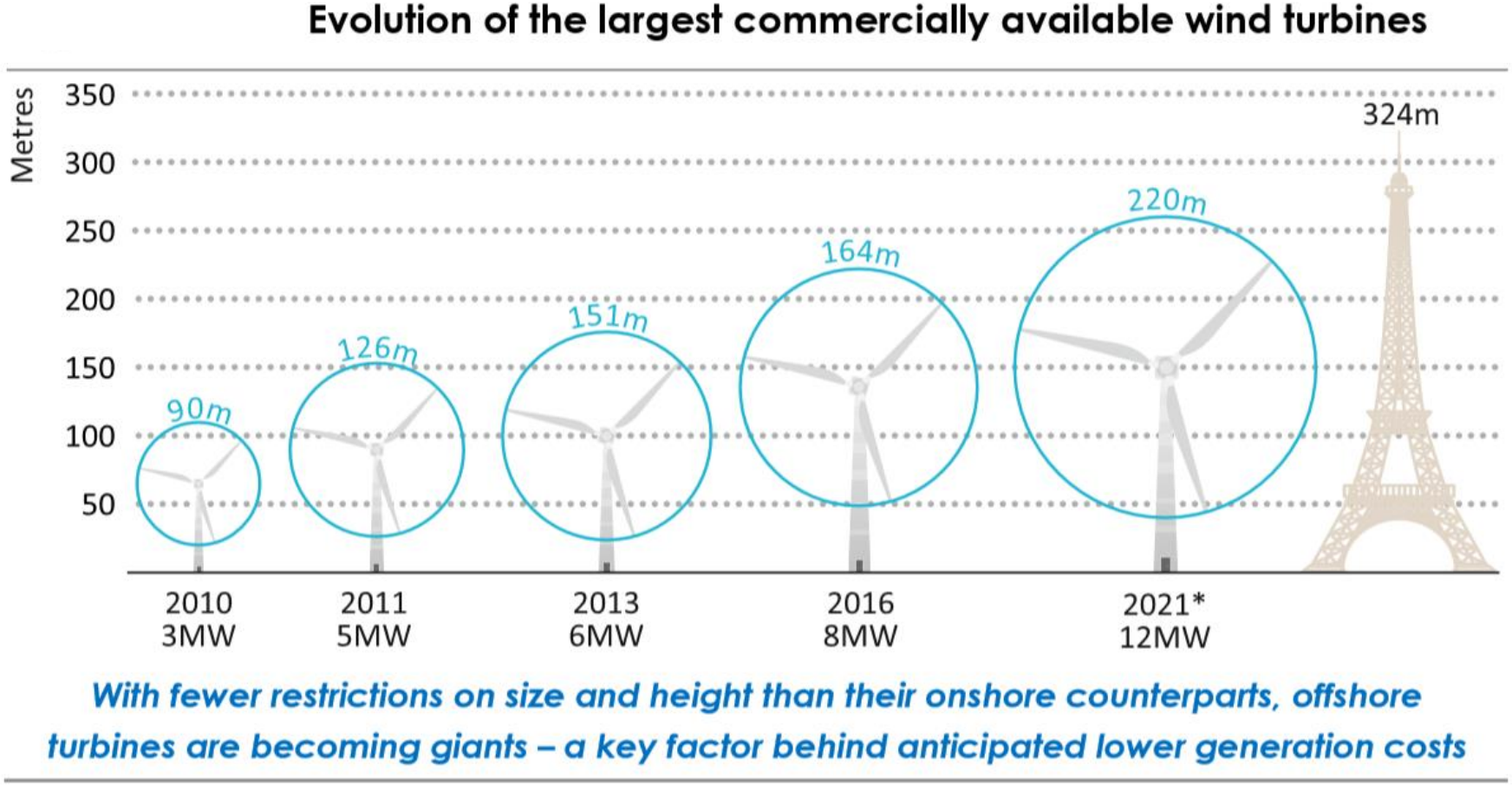


ONSHORE AND OFFSHORE WIND



„Our model forecasts a very bright future for the wind industry with sustained and accelerating growth in installed capacity reaching around 670GW in 2020, 2000GW in 2030, and 9000GW in 2050".

Source: Renewables, Power and Energy Use Forecast to 2050 (DNV GL)



The key trend in offshore wind is the increasing physical size of turbines, in terms of height and swept area, which raises their maximum output. The height of commercially available turbines has increased from just over 100 m in 2010 (3 MW turbine) to more than 200 m in 2016 (8 MW turbine), which increased the swept area by 230%. A 12 MW turbine now under development is expected to reach 220 m. An even-larger 15 MW turbine is targeted by the industry by 2030.

RES DIVERSITY CONTRIBUTES TO CONSISTENT SUPPLY

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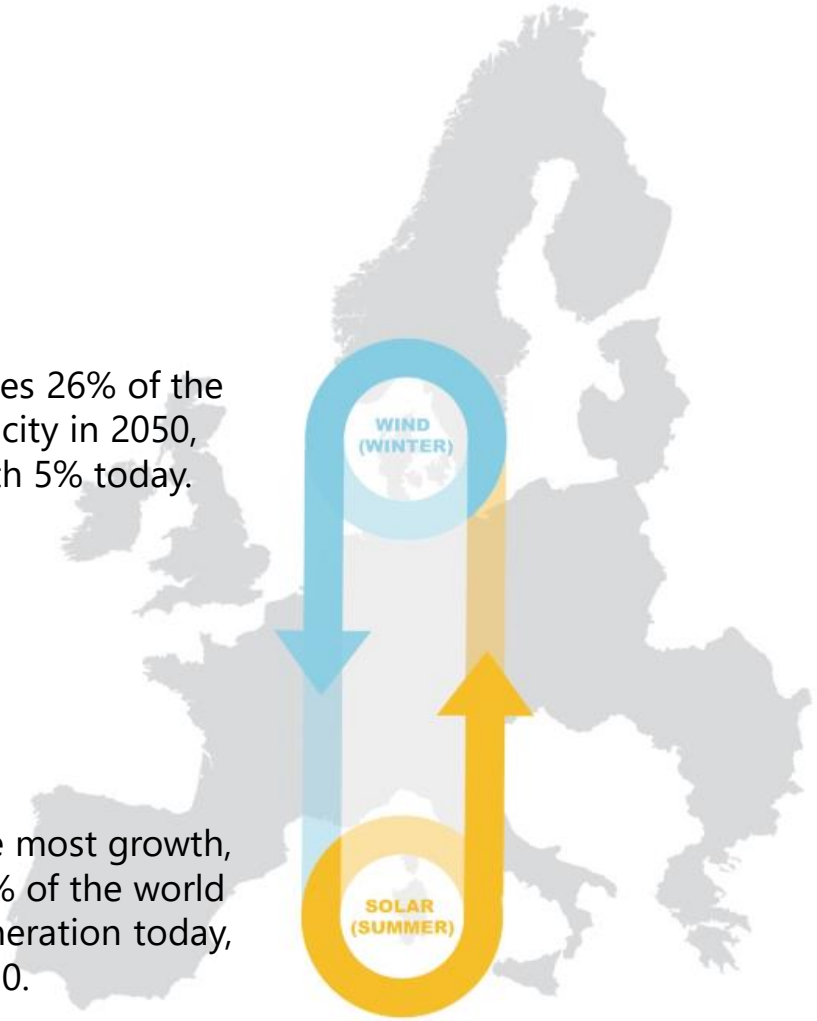
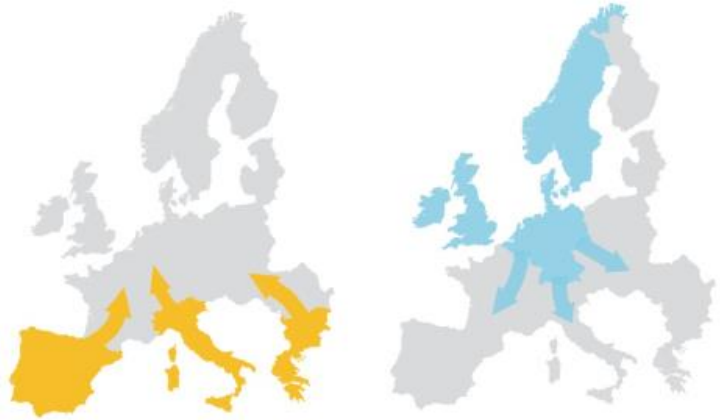
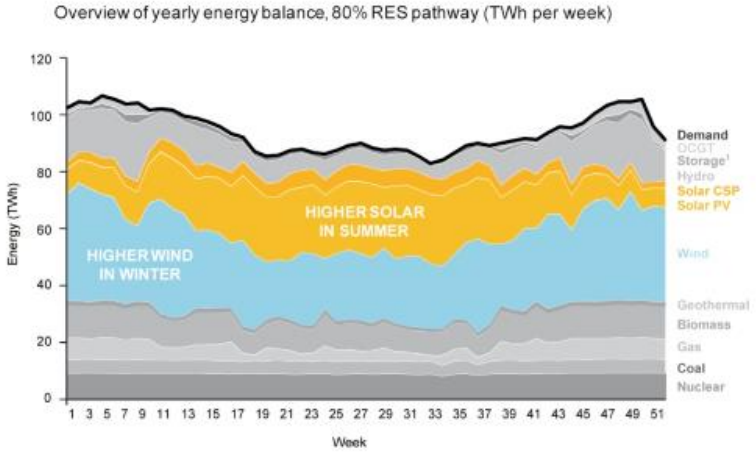
Wind generates 26% of the world's electricity in 2050, compared with 5% today.

Solar sees the most growth, rising from 2% of the world electricity generation today, to 22% in 2050.







Source: ROADMAP 2050 A practical guide to a prosperous, low-carbon Europe

EU ENERGY NETWORK

Diagrammatic representation of integrated European power grid.

Source: ROADMAP 2050 A practical guide to a prosperous, low-carbon Europe

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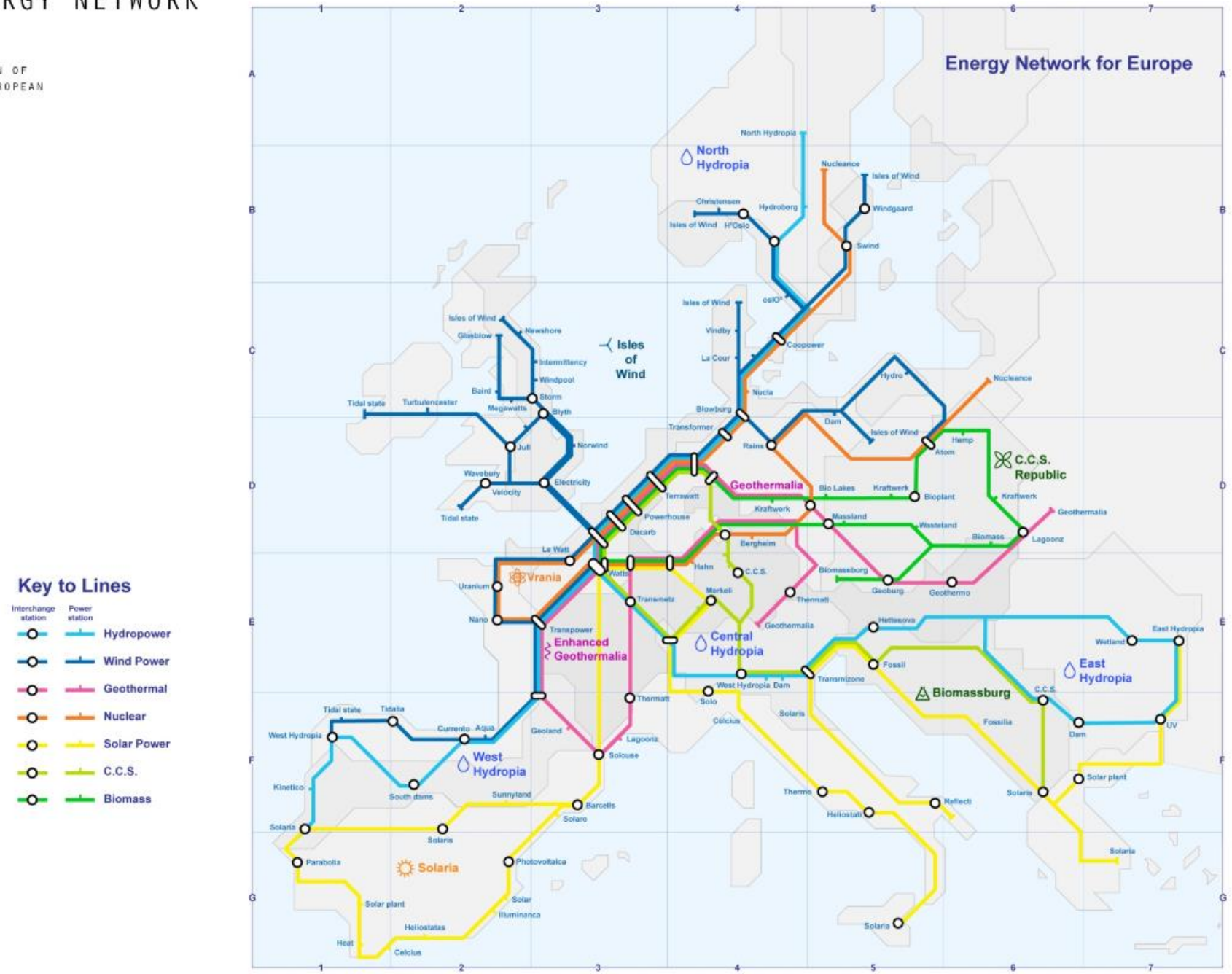

NATIONAL ENERGY INDEPENDENCE STRATEGY

ENERGY FOR LITHUANIA'S FUTURE, 2018

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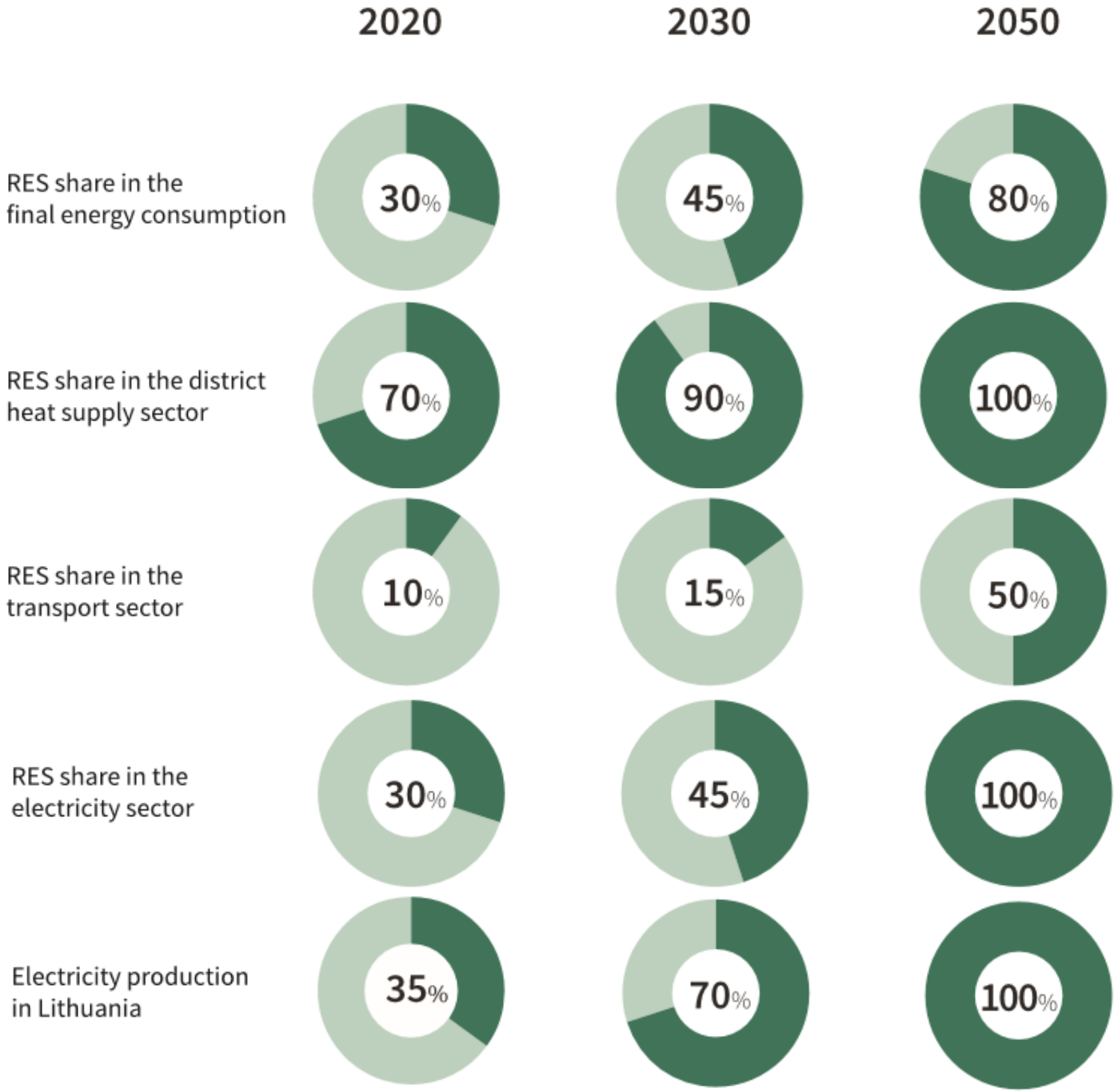

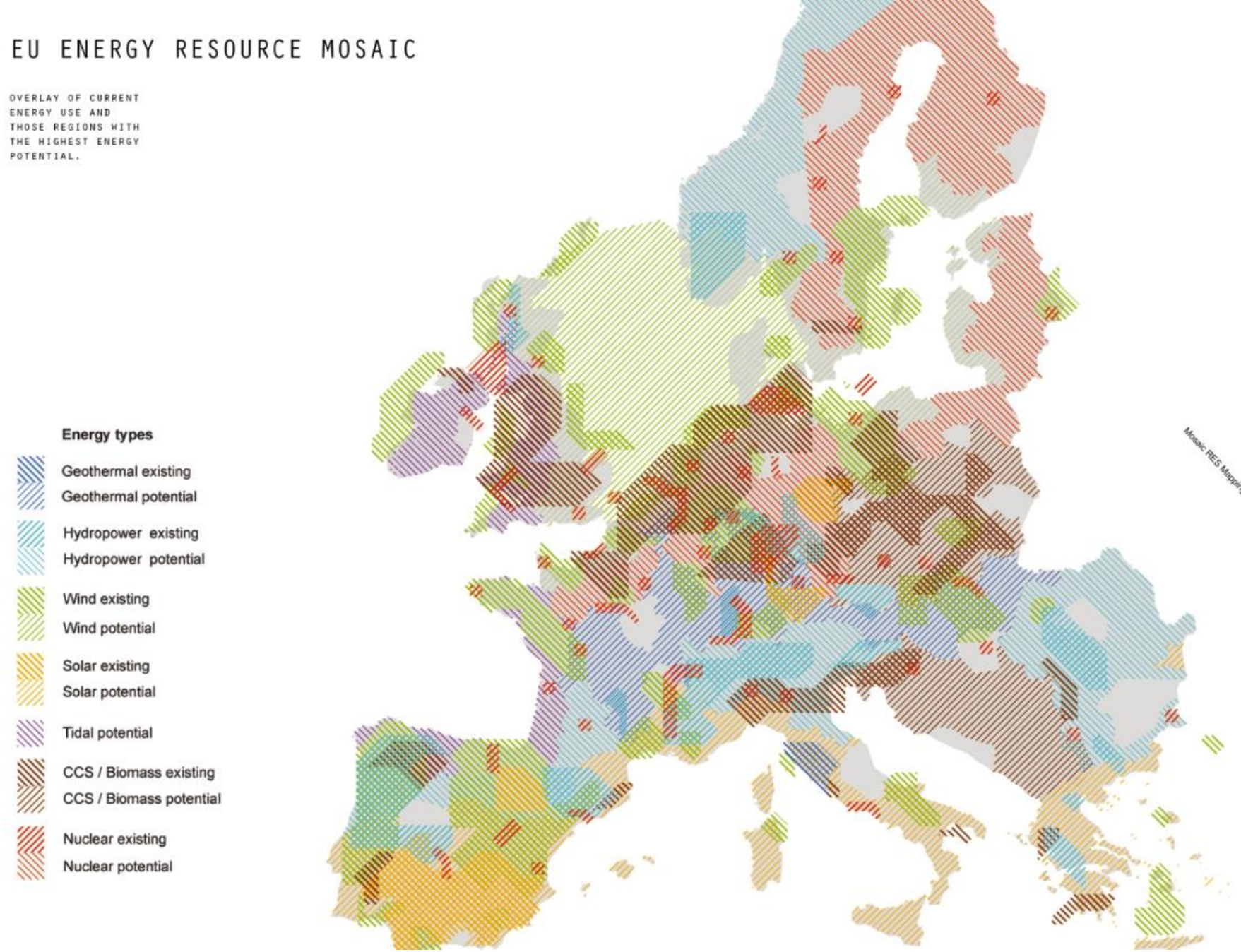

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THANK YOU FOR YOUR KIND ATTENTION!

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