WEC Netherlands 2020

PHASING OUT CARBON

How to decarbonise north-western Europe's energy mix in the run-up to 2050

Welcome and official opening

Jeroen van Hoof, Chair WEC Netherlands

The WEC project partners

DNV·GL

pwc

ebn

Rabobank

New Energy Coalition

Port of Rotterdam

VATTENFALL

Nouryon

TNO

Vopak

Welcome

Host:

Marcel Hoenderdos

Programme

14.00	Welcome coffee and registration
14.30	Report findings by Jan Willem Velthuijsen (Chief Economist, PwC)
15:00	Handover report with Bert Roukens (Energy Envoy, Ministry of Economic Affairs) and Jeroen van Hoof (Chair WEC, The Netherlands)
15.10	Keynote speech by Hans Coenen (Vice President Corporate Strategy, NV Nederlandse Gasunie)
15.30	Keynote speech by Prajeev Rasiah (Executive Vice President, Energy Northern Europe, Middle East & Africa, DNV GL – Energy)
15.50	Break
16.15	Breakout sessions
17.20	Interview on stage by Marcel Hoenderdos
17.40	Closing remarks
17.50	Networking drinks

We are proud to introduce three prominent keynote speakers

Jan Willem Velthuijsen

Chief Economist,
PwC Netherlands

Hans Coenen

VP Corp, Strategy,
NV Gasunie

Prajeev Rasiah

Executive VP,
DNV GL

Presentation Jan Willem Velthuijsen

Chief Economist, PwC Netherlands

PHASING OUT CARBON

WORLD ENERGY COUNCIL

HOW TO DECARBONISE NORTH-WESTERN EUROPE'S ENERGY MIX IN THE RUN-UP TO 2050

The challenge is clear:

Taking out the last carbon atom from the energy mix

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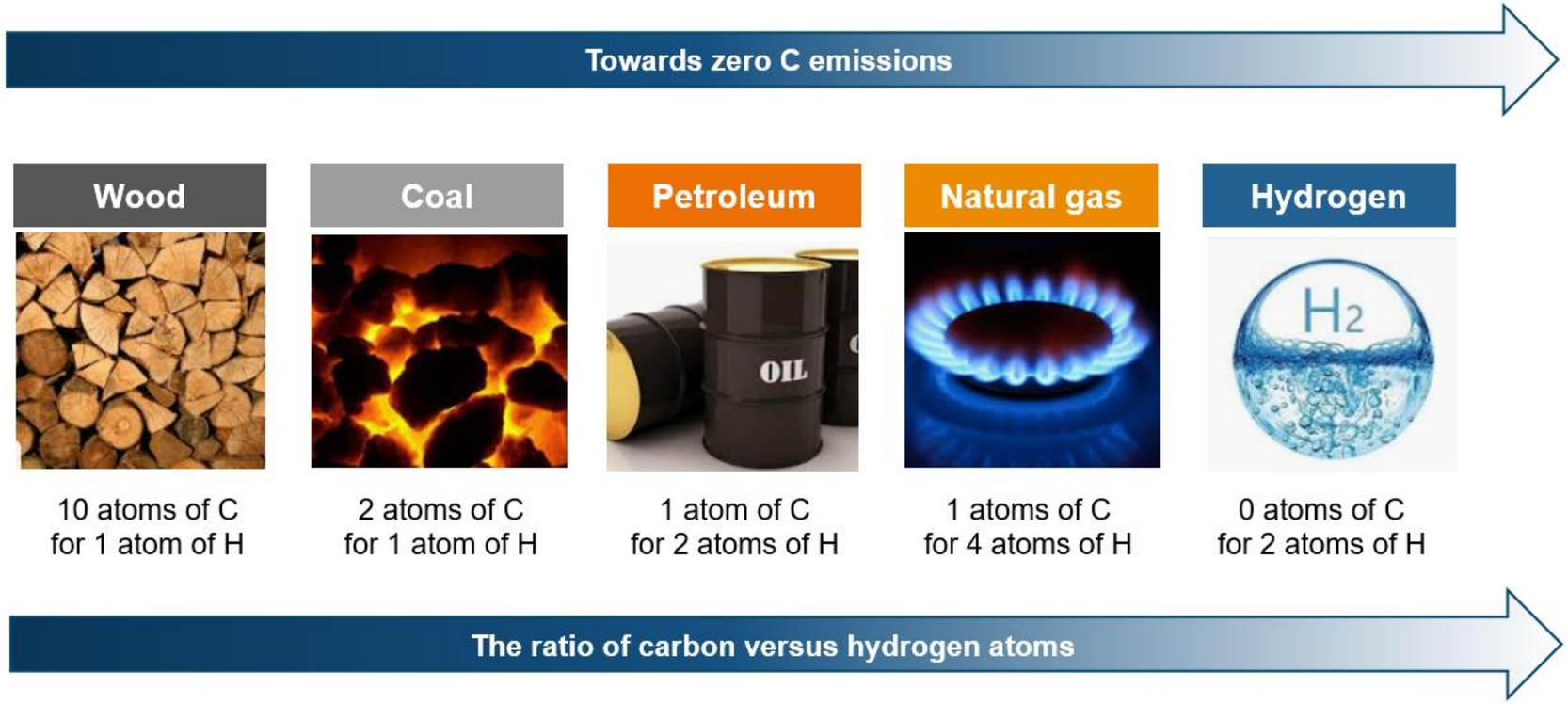


Some other things are clear as well:

Inevitable trend:

Prosperous but ageing population

COP21 · CMP11
PARIS 2015
UN CLIMATE CHANGE CONFERENCE

Goal:

Meet the Paris Agreement objectives by 2050

Goal:

Maintain a substantial competitive industrial sector

Achieving these objectives requires three giant ifs

1

Energy efficiency improvements – all across the board

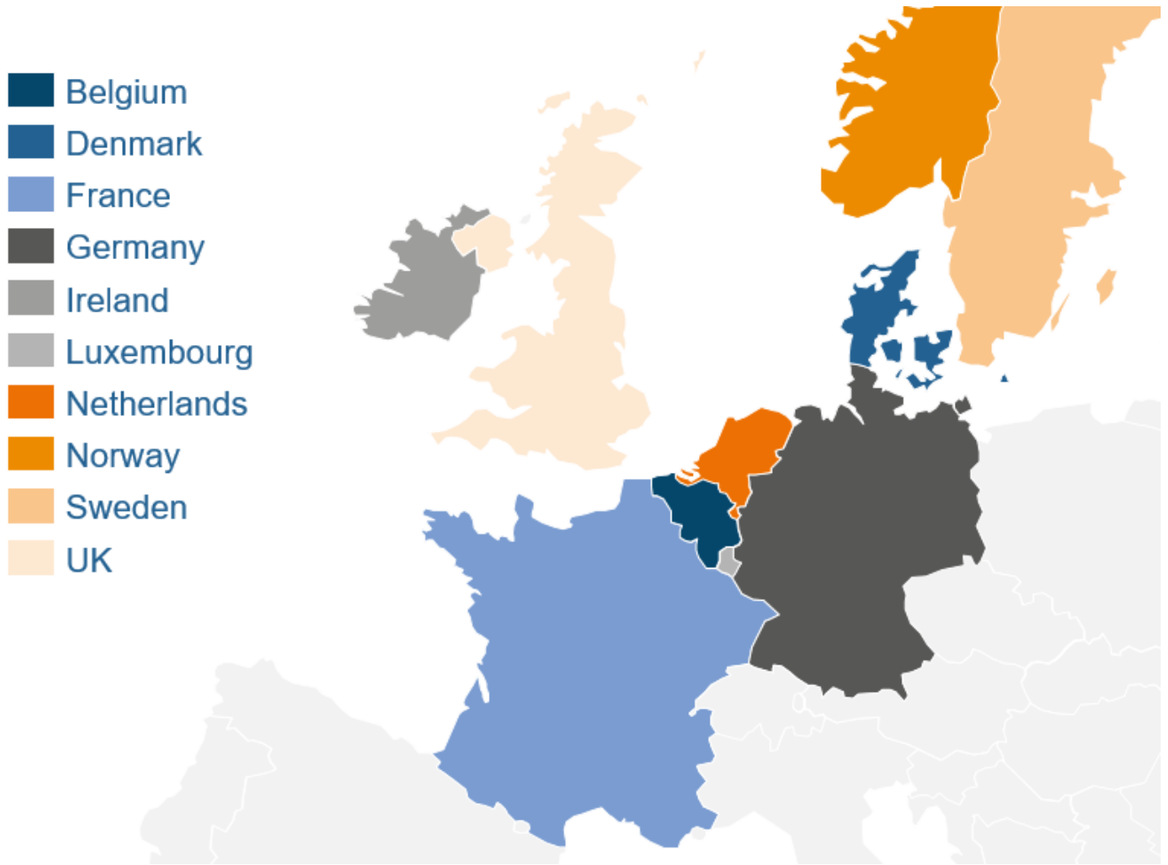
2

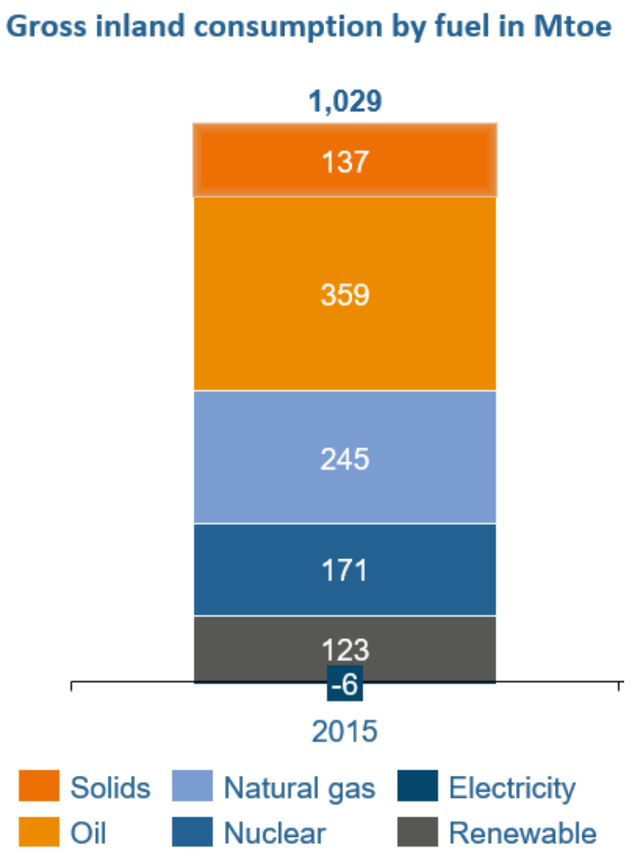
Electrification - where we can

3

Decarbonisation - fuels and gases

The achievability of the objectives is tested in a model





To begin with, we need all the efficiency improvements we can find

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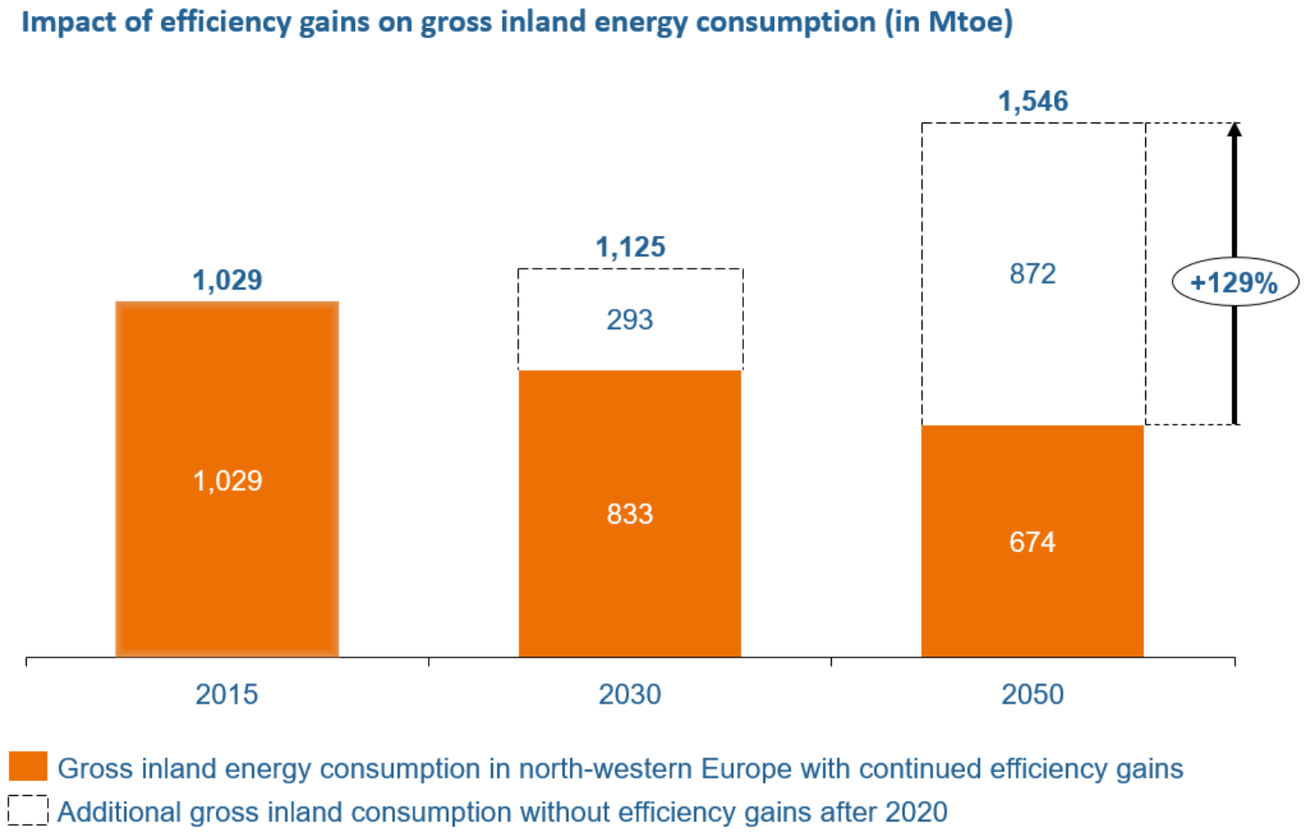
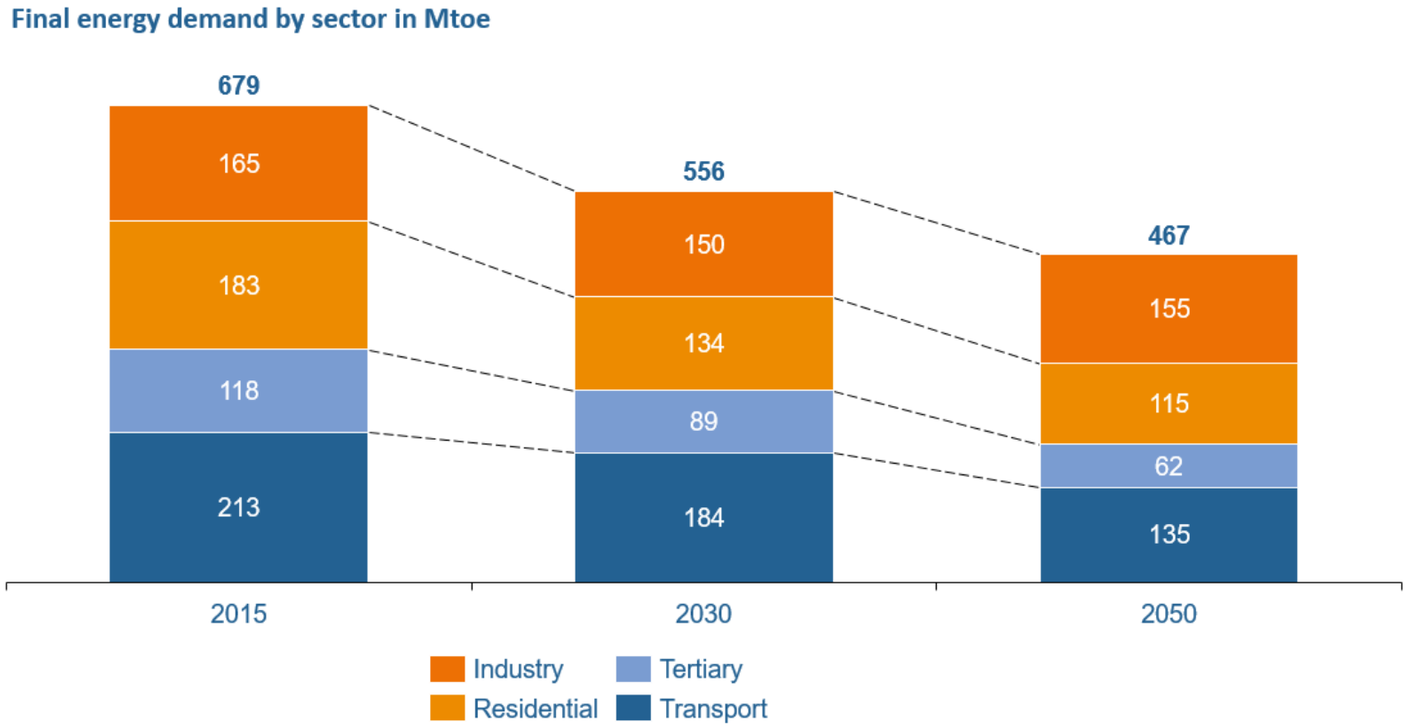


- Implementing all available **efficiency improvement options** is the first big step – at 1.3% per year

High-hanging fruit is exactly what it is
Hence, any **additional energy** supply will likely be **carbon-intensive** and have a disproportional **impact** on **emission levels**

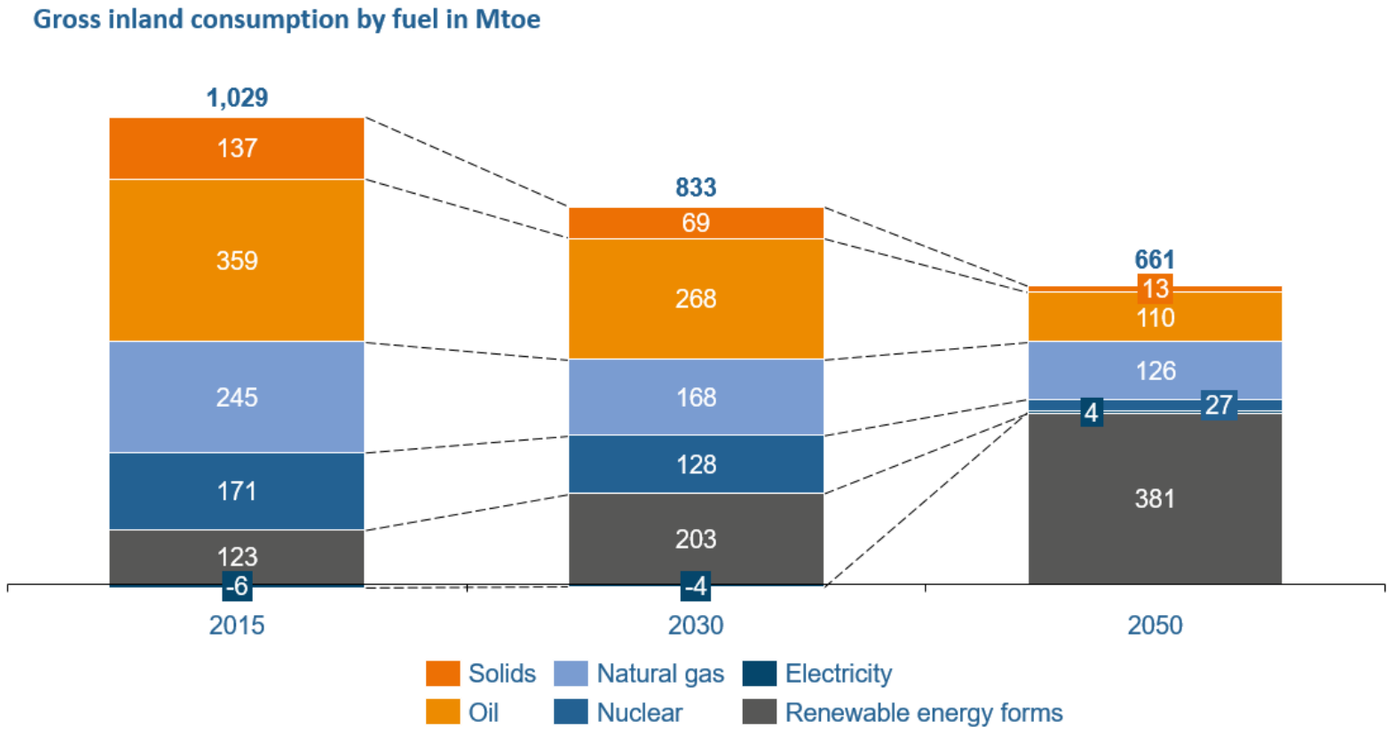
Electrification and efficiency gains can generate big results for all sectors – except for manufacturing



- **Manufacturing has less options** for electrification and efficiency improvements for high-grade heat, heavy-duty mechanics and feedstock

Pushing the manufacturers
As a result, energy demand will decline the least for this sector, thus **focus on industrial emission reduction is key**

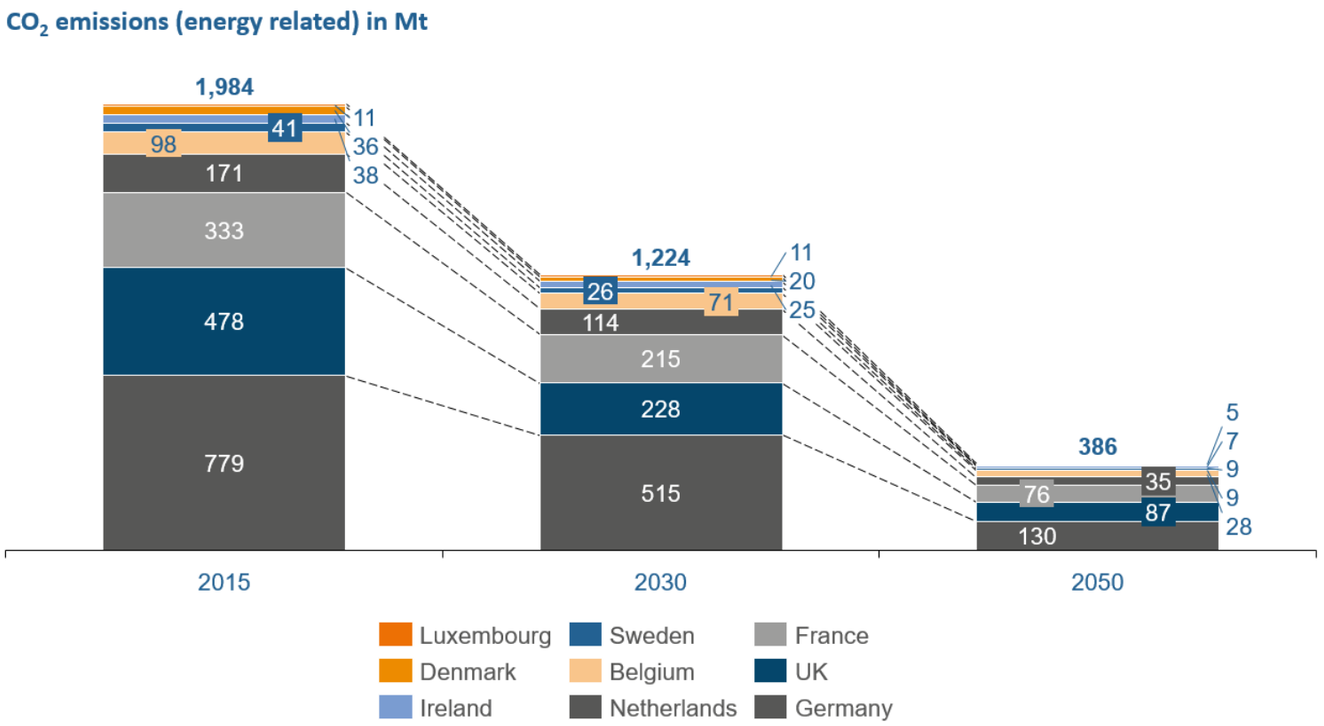
An additional push needs to come from decarbonisation of fuels



- **Fuels** currently make up **70%** of final energy demand, versus **30%** for **electricity**
- The **share of fuels** is expected to decline, but will still **remain around 50%** or more in 2050

Who thinks power was easy? Whereas green electricity generation is planned for and scaling up, **decarbonisation of fuels** is still **very limited** and **no clear pathway** exists

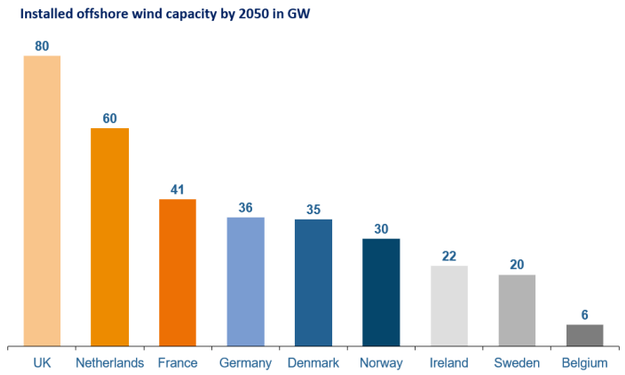
Even with all these efforts, investment in CCUS and carbon sinks is needed

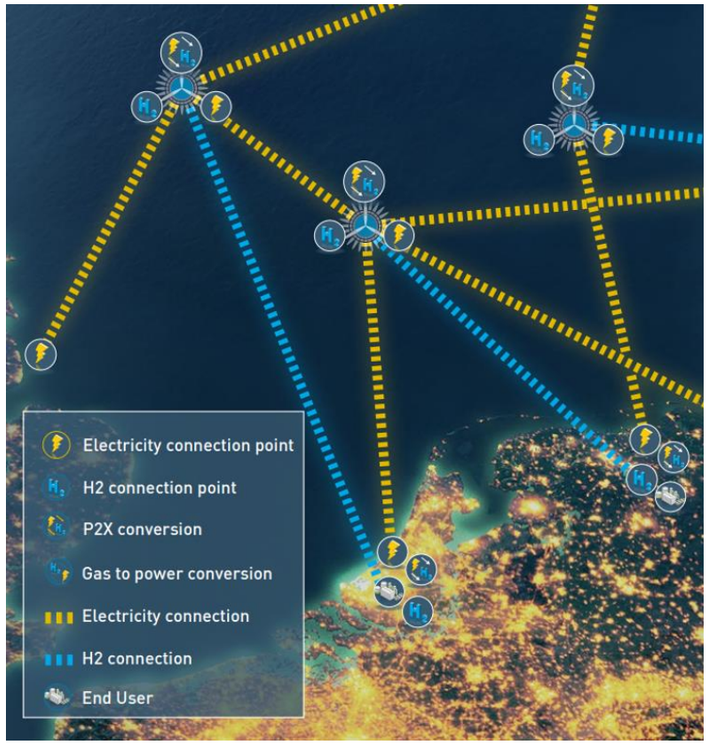


- Efficiency improvements, electrification, growth in renewable power, and decarbonisation of fuels should **reduce CO_2 emissions by at least 80%** compared to 2015

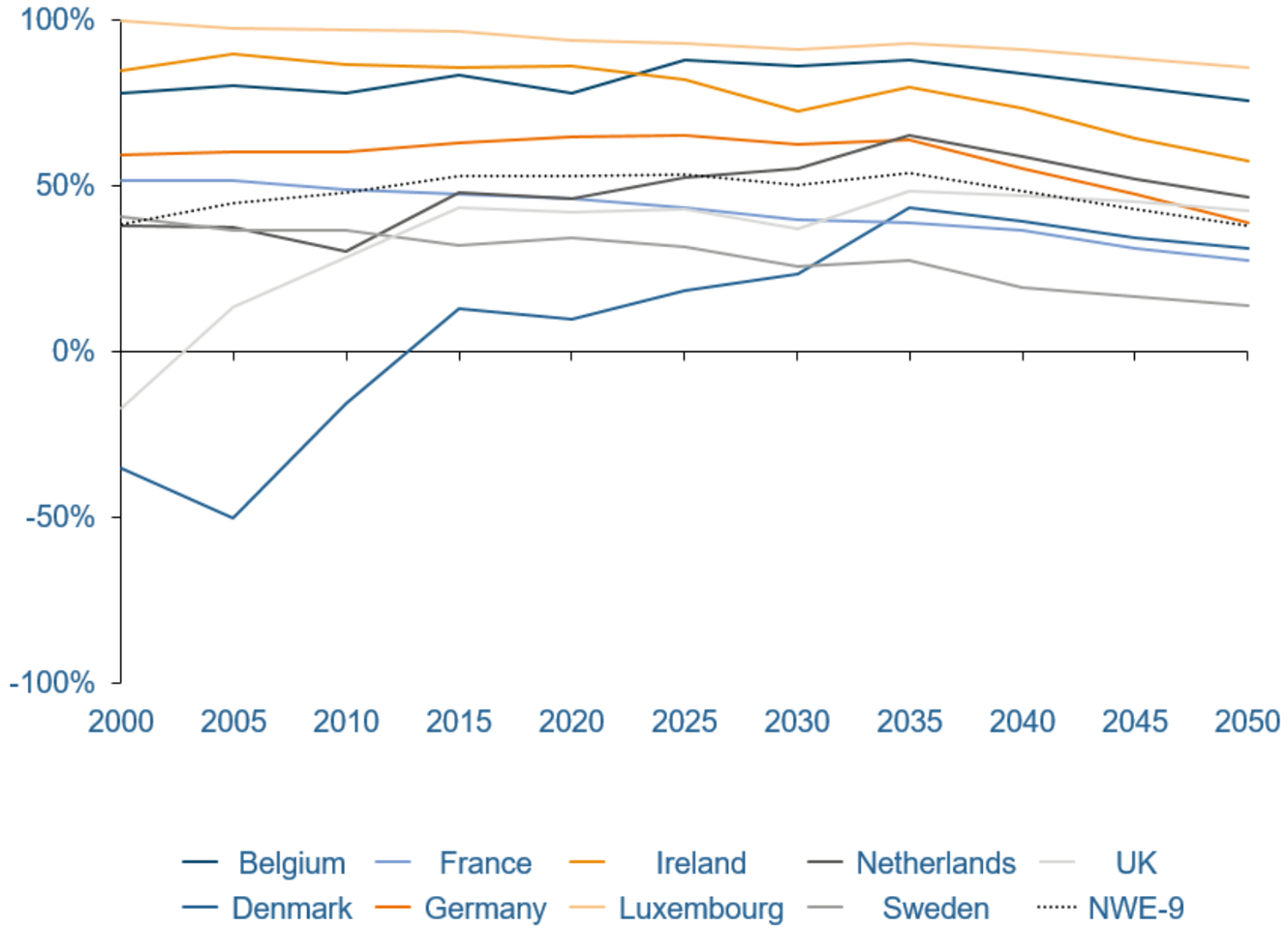
Where do we leave the residu?
To realise **net zero emissions**, either the energy mix will have to be fully decarbonised or the remaining CO_2 and other greenhouse gas emissions will have to be eliminated via CCUS and/or carbon sinks (forestation).

North Sea power and technologies like P2G will carry us a long way – but our import dependency will remain substantial





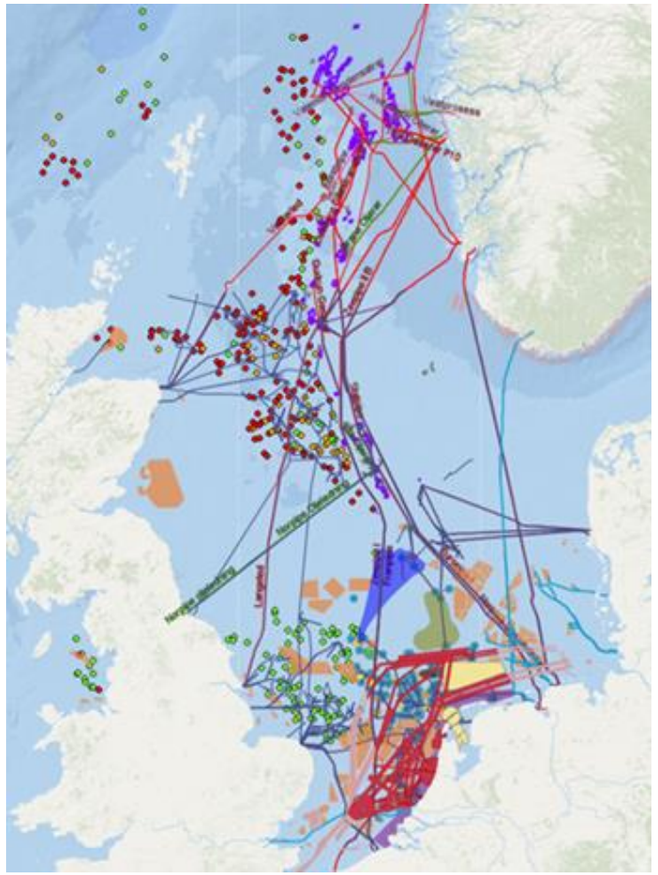
If we use less, we can afford to produce less – still energy import dependency remains around 50%



- Strategically managing our relationships with energy supplying countries is needed for **security of supply**

What if they believe us?
Being bravely vocal about our **green ambtions** should not lead to **underinvestment** in **energy supply capacity** by foreign countries

The vast infrastructure and the proximity to the rich markets make the North Sea a perfect spot



- The **offshore and onshore gas grids** provide north-western Europe with **great opportunities** to implement **hydrogen** and **power-to-gas** technologies to produce low-carbon fuels

- Furthermore, hydrogen and power-to-gas can provide **storage** and **back-up capacity**

It's all there
Using part of the **offshore wind power capacity** for these purposes **strongly limits** the required **investments in electricity grids**

Optimism around renewable electricity generation seems spreading – but how do we scale up?

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Factors holding back investments:

- Uncertainty around support mechanisms
- Profitability paradox – more renewables lower returns
- Public resistance
- Grid connection costs

Actions to be taken:

- Capacity remuneration mechanisms
- EU wide long-term support mechanisms
- Regulation to support upfront grid investments
- Renewables locations aligned with network

Consumption and production of decarbonised fuels needs to be stimulated - in sync

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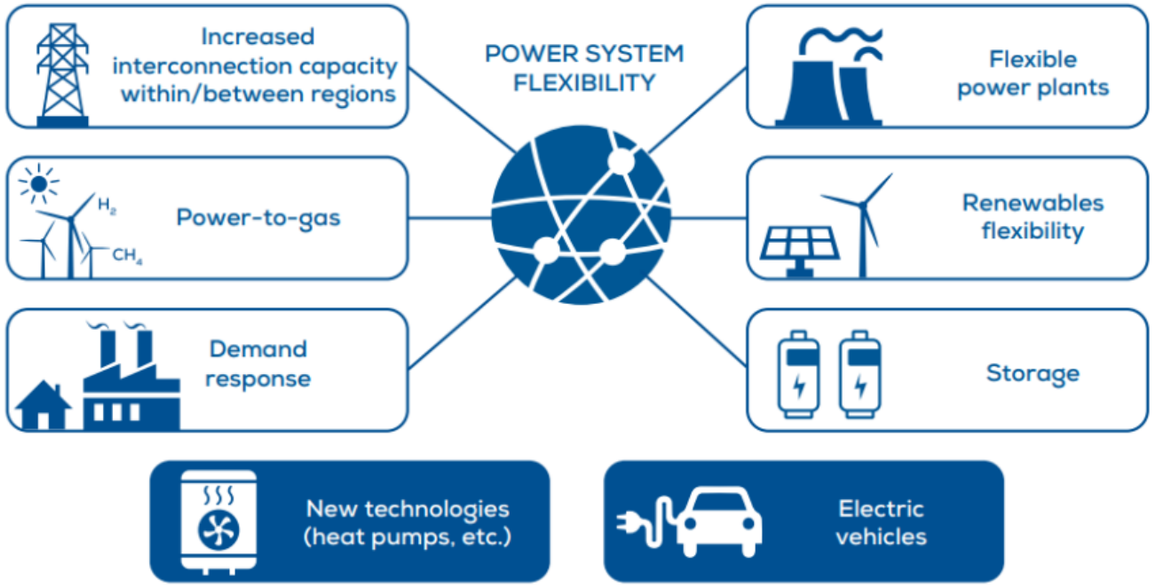
Factors holding back investments:

- Biomass required for green fuels affects agriculture
- Public opposition to CCS
- Hydrogen and power-to-gas still in pilot stage
- So far little political focus on fuel decarbonisation

Actions to be taken:

- Demonstration projects for hydrogen and power-to-gas
- Regulation for low-carbon fuels
- Harmonisation and standardisation
- Boost demand of carbon-neutral gas
- Prescribing admixing - guarantees of origin

Don’t forget flexibility, back-up capacity and security of supply



Flexibility:

- Price formation needs to reflect system requirements
- Make households and businesses more responsible for flexibility via regulation or economic incentives

Back-up capacity:

- Clarity in the Member States on the role and mandate of TSOs and DSOs
- Capacity mechanisms

Security of supply:

- Topic higher on political agenda
- Maintain long-term strategic energy supplies

Summing up

Seven key policy measures EU should consider …

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1. Set **milestones** and ultimate targets
2. Manage **simultaneous emergence** of demand and supply
3. Uphold **technology neutrality**
4. Ensure **markets** function well and playing fields are leveled
5. **Admix** carbon-neutral gases to stimulate use
6. Design support scheme to scale-up **hydrogen and PtG** production
7. Facilitate the **uptake demand for hydrogen** by:
    - Gradually discourage the industrial use of grey hydrogen or comparable feedstock
    - Incentivise a fuelling infrastructure for hydrogen and other green fuels
    - Tackle the greening of aviation and shipping

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… to realise a decarbonised energy mix for north-western Europe in 2050

Presentation Hans Coenen

VP Corp, Strategy, NV Gasunie

gasunie
crossing borders in energy

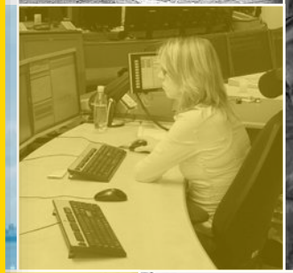
Den Haag, 5 March 2020

An alliance of molecules and electrons in an integrated energy system

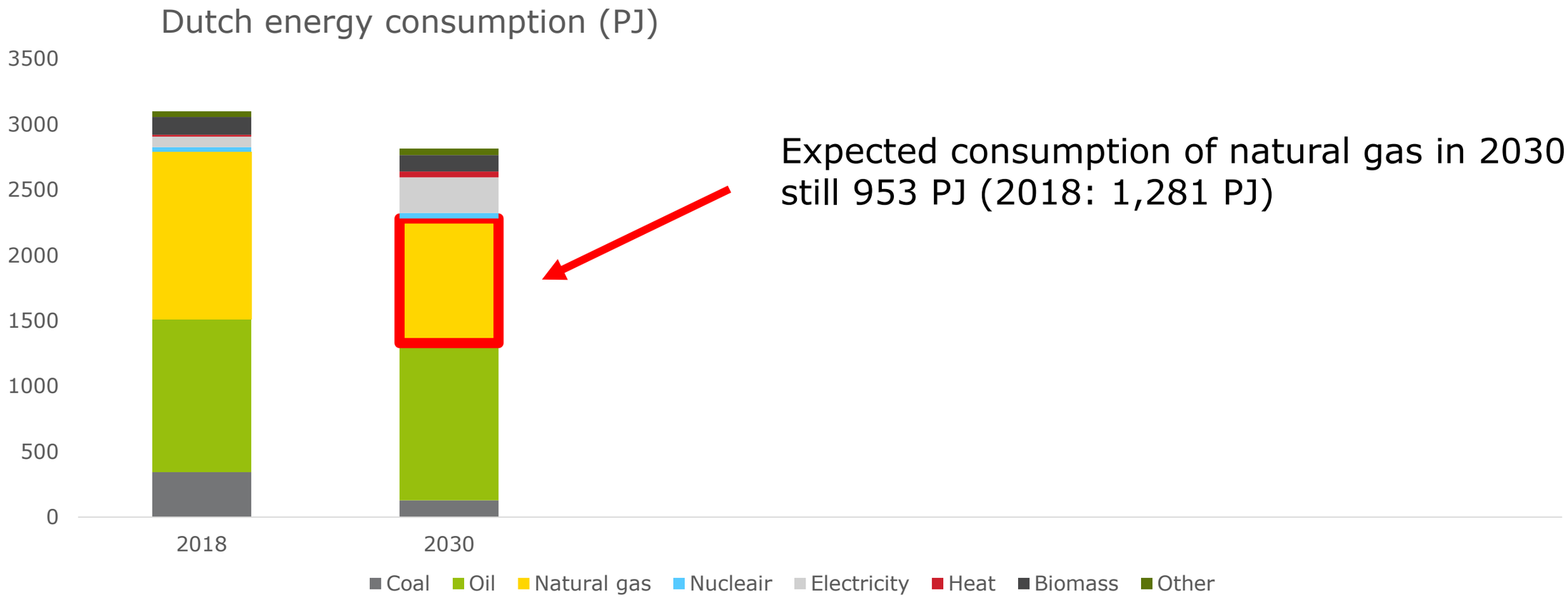
Hans Coenen, Vice President Corporate Strategy & Business Development Gasunie

Gasunie is a European energy infrastructure company

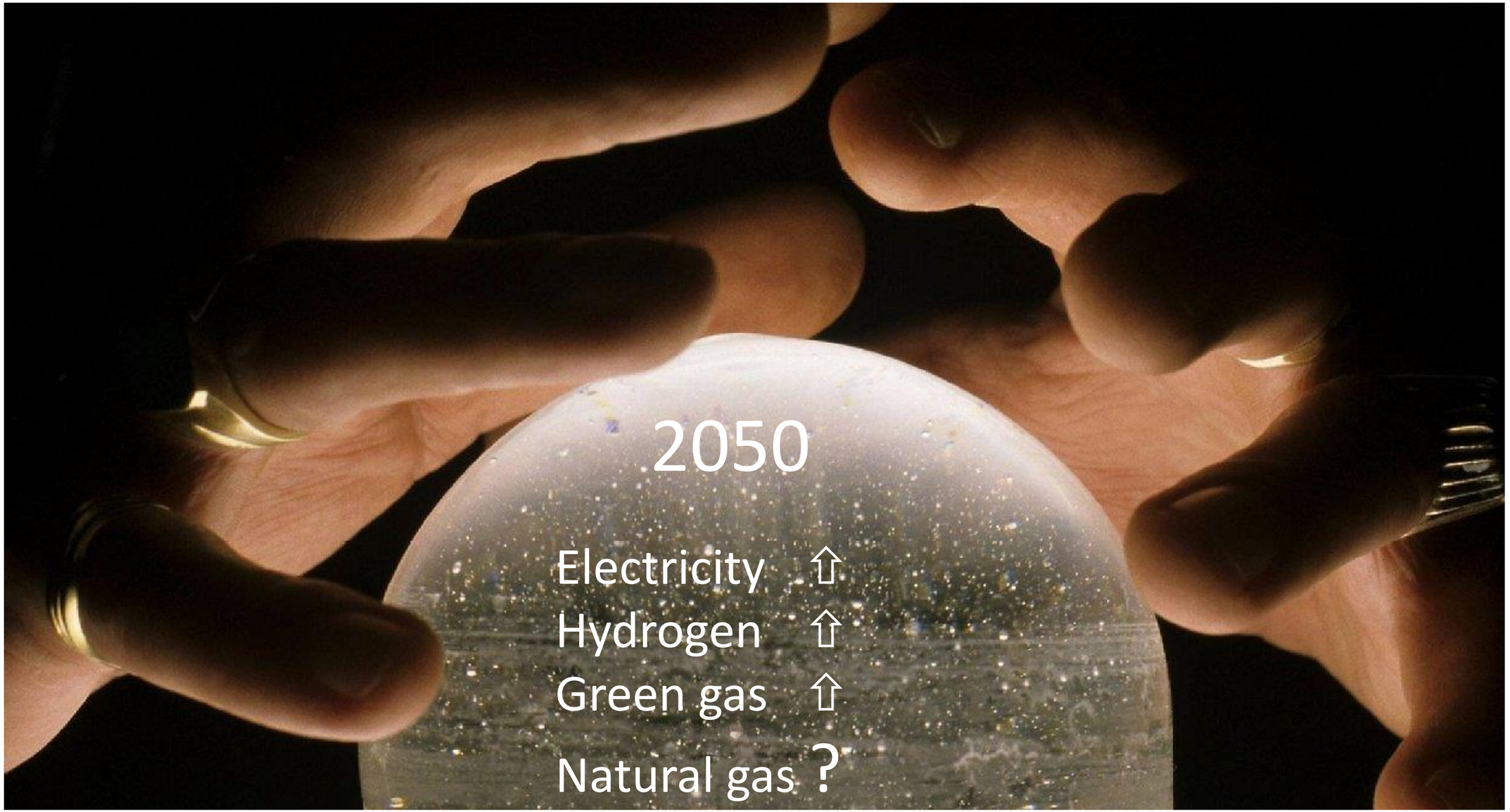
Our core activities are transport and storage of natural gas, green gas and hydrogen in the Netherlands and North Germany.

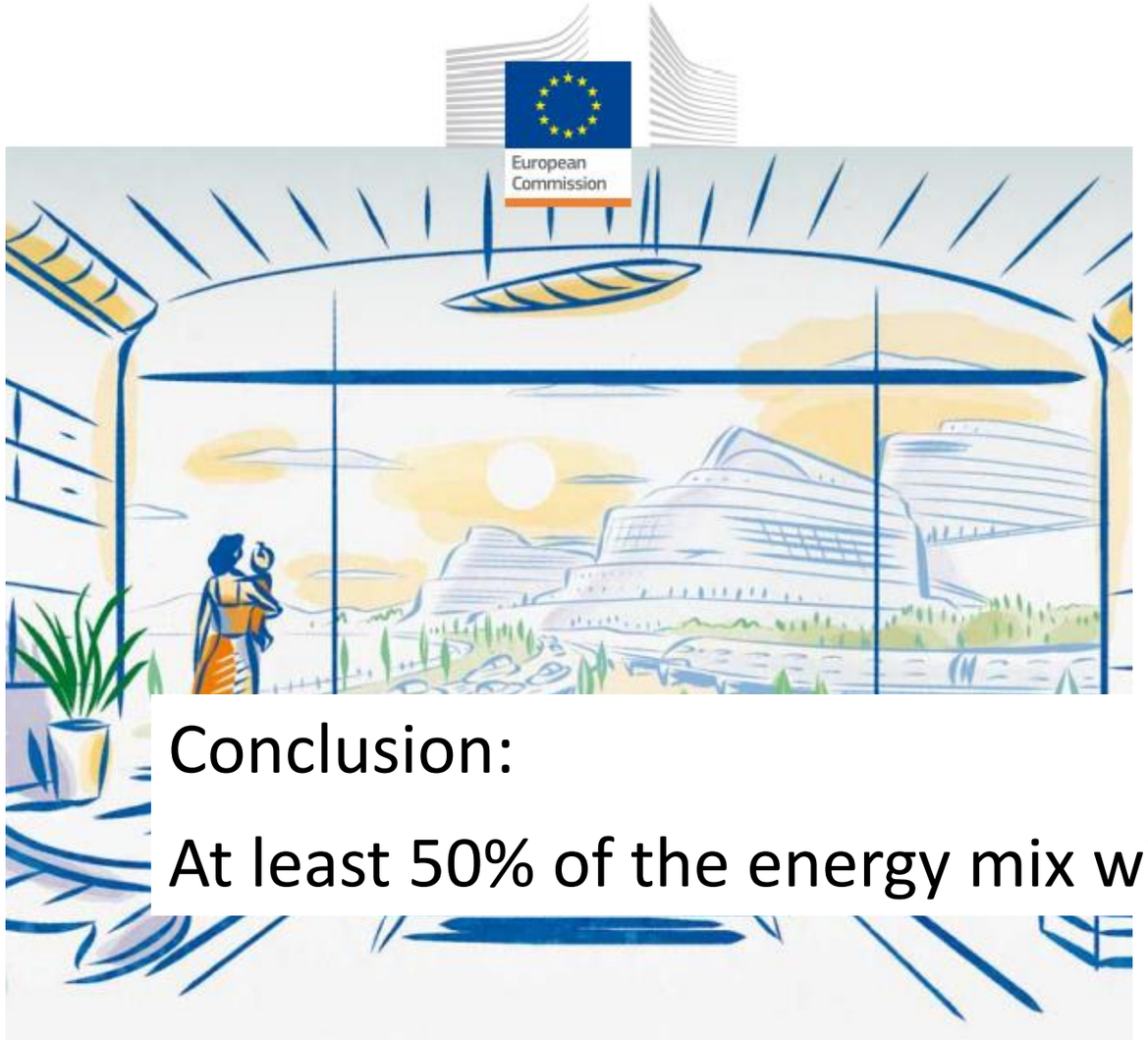


Renewable energy increases, still a lot of fossil fuels in the near future



Expected consumption of natural gas in 2030 still 953 PJ (2018: 1,281 PJ)


2050
Electricity ⇧
Hydrogen ⇧
Green gas ⇧
Natural gas ?



(3) Electricity plays an increasing role

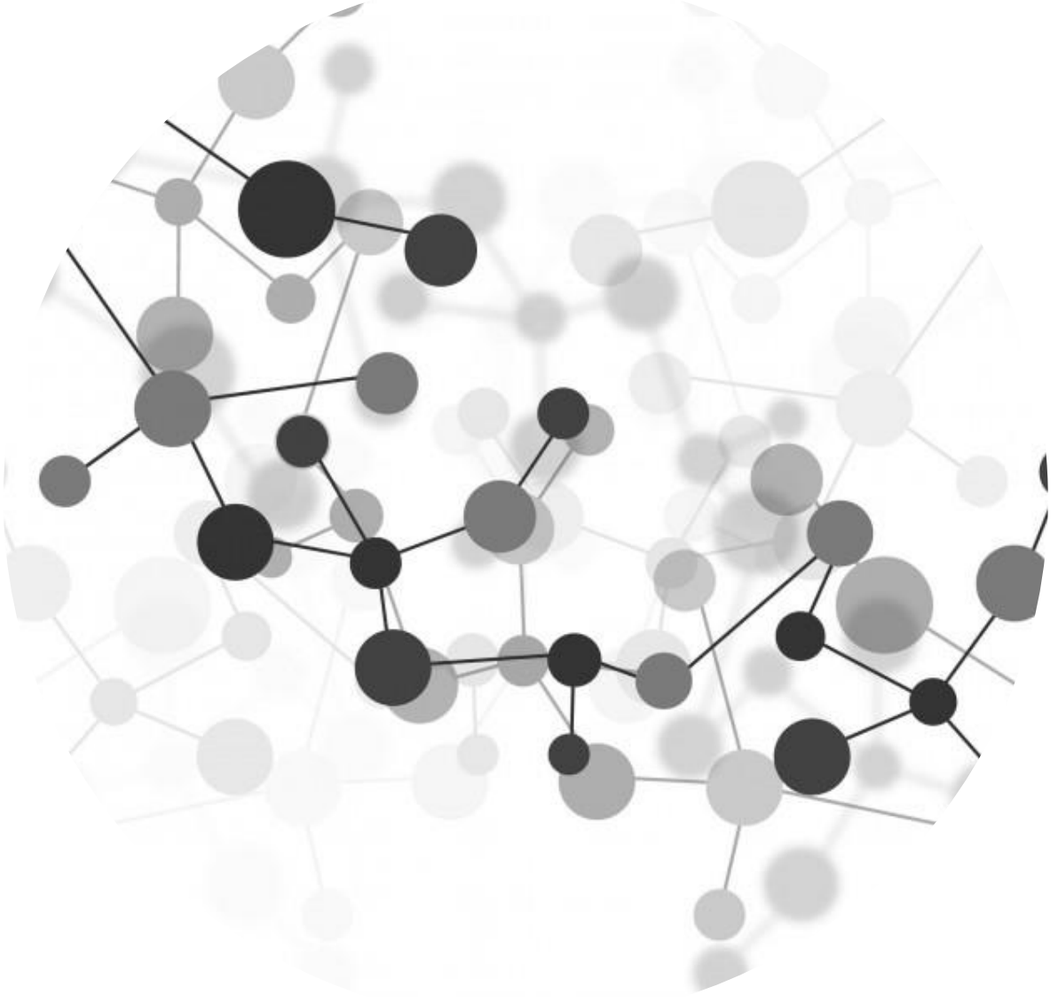
All scenarios show electricity will have to play a much greater role than now (almost doubling its share in final energy demand to 36–39% in 2050) and will have to contribute to the decarbonisation of transport

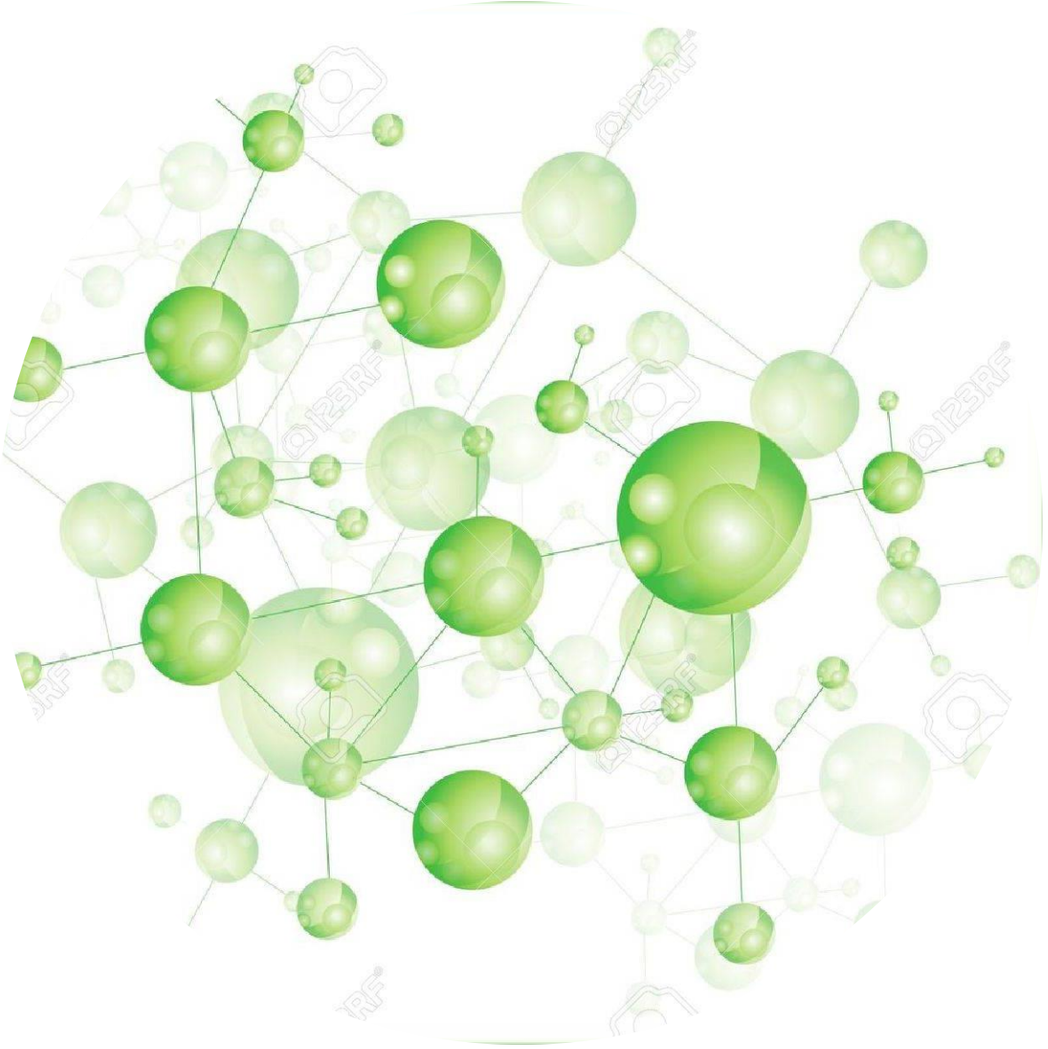
Conclusion:

At least 50% of the energy mix will consist of molecules

Energy

roadmap 2050





Den Haag, 5 March 2020

Infrastructure Outlook 2050

A joint study by Gasunie and TenneT on integrated energy infrastructure in the Netherlands and Germany

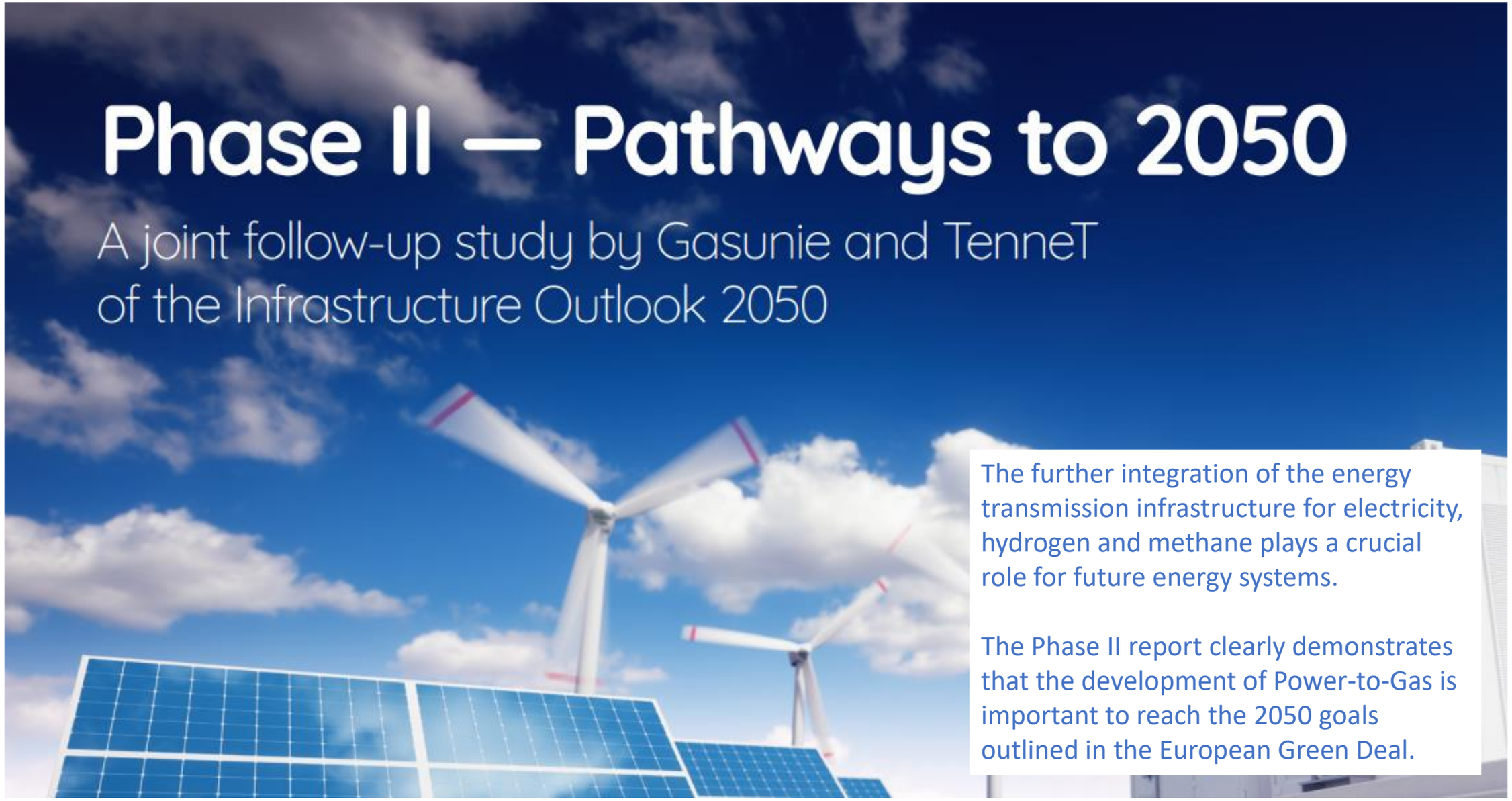
An energy system based on domestic renewables will require a firm integration of electricity and gas networks.

Growing demand for electricity will require expansion of the electricity grids after 2030. Smart sector coupling will enable us to keep this expansion limited.

Adequate allocation of power-to-gas locations is necessary in order to stay within the financial and spatial planning limits for investments in the electricity grids.

gasunie crossing borders in energy

TenneT Taking power further



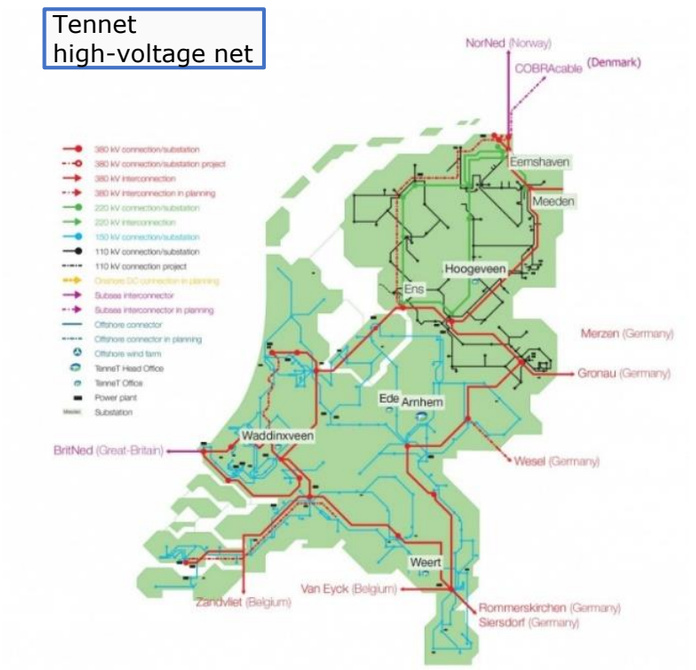
The further integration of the energy transmission infrastructure for electricity, hydrogen and methane plays a crucial role for future energy systems.

The Phase II report clearly demonstrates that the development of Power-to-Gas is important to reach the 2050 goals outlined in the European Green Deal.

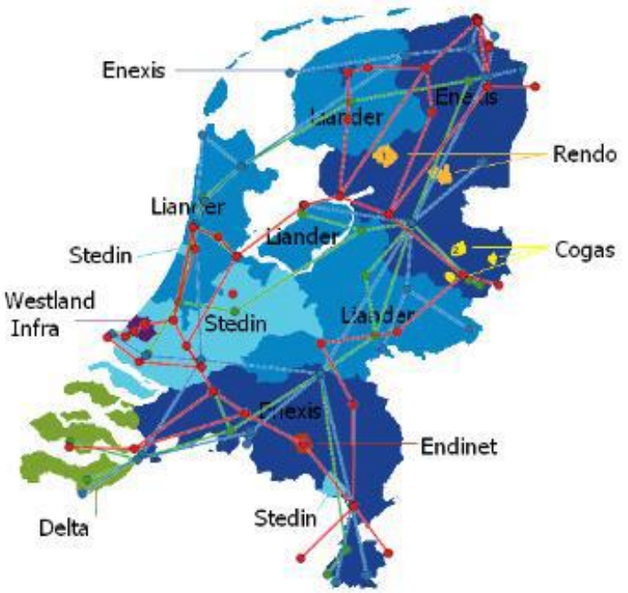
Den Haag, 5 March 2020

Integrated Infrastructure Outlook 2030-2050

Tennet
high-voltage net



Gasunie
high-pressure net



2020

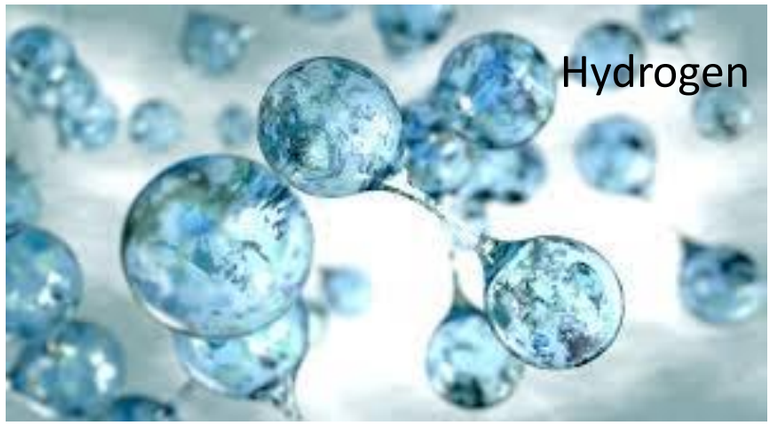
Capacity: 20 GW ⟷ Capacity: 350 GW

Climate agreement

Gasunie and TenneT took the initiative, together with the regional network operators, to develop an Integrated Infrastructure Outlook 2030-2050, including insights from the industry, energy sector and other parties (April 2021)

This Integrated Infrastructure Outlook gives guidance to investment plans of the network operators and market parties and forms a building block for new policies and regulations of the government.

The greening of molecules



CC(U)S

Super Critical Water Gasification

Gasification plant with wide range wet feedstock ability

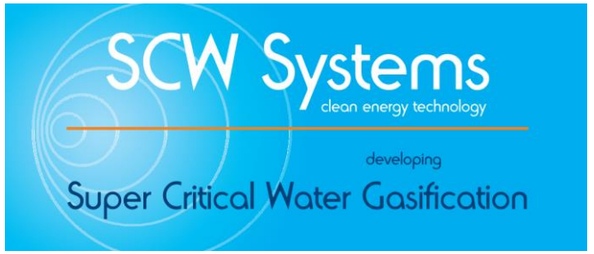
Current status: Plant of 18 MW sng under construction, first test, successful, in Q4 2019

Partners: SCW Systems

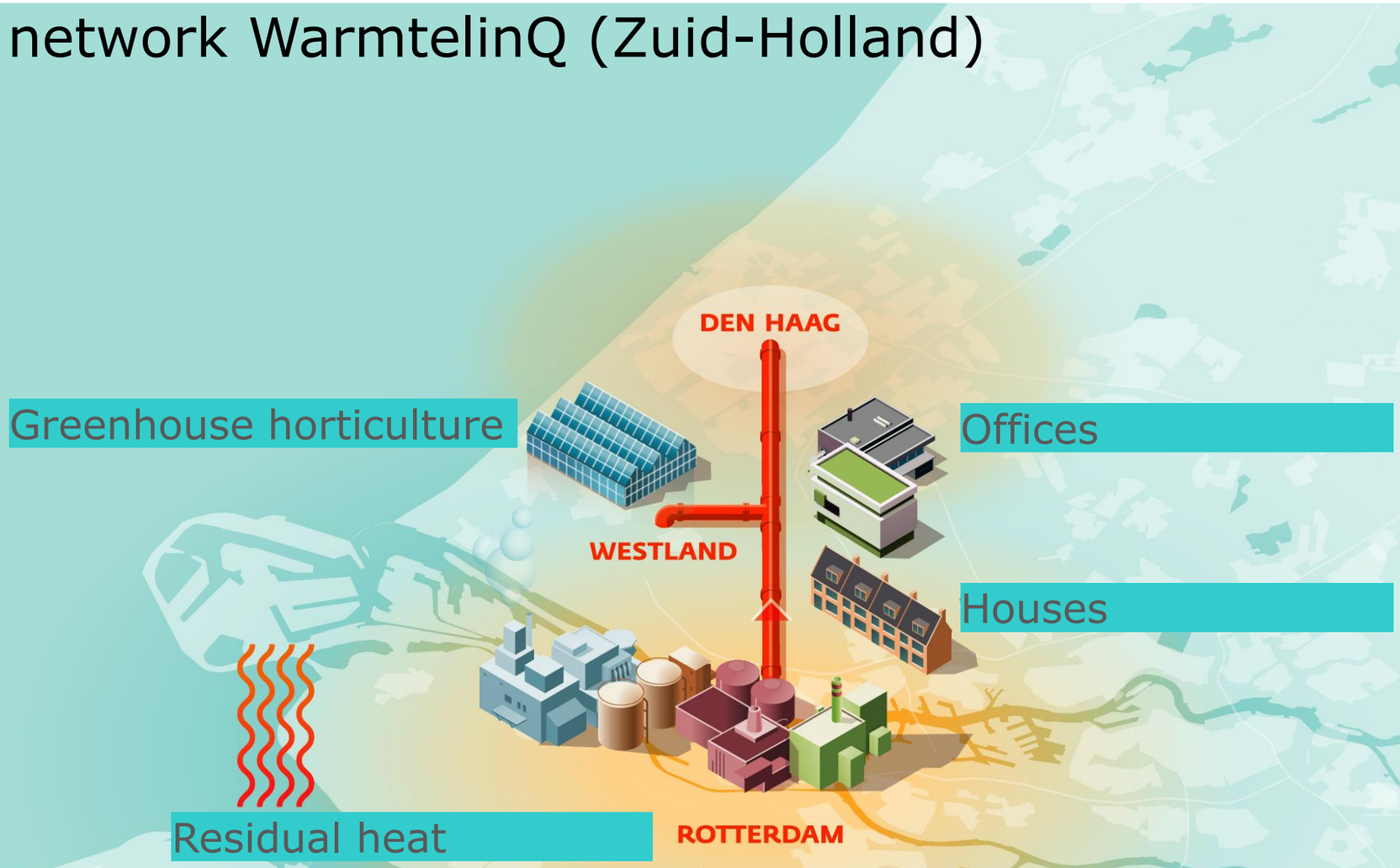
Technology status: Demonstration

Role of Gasunie: Participant in demo plant

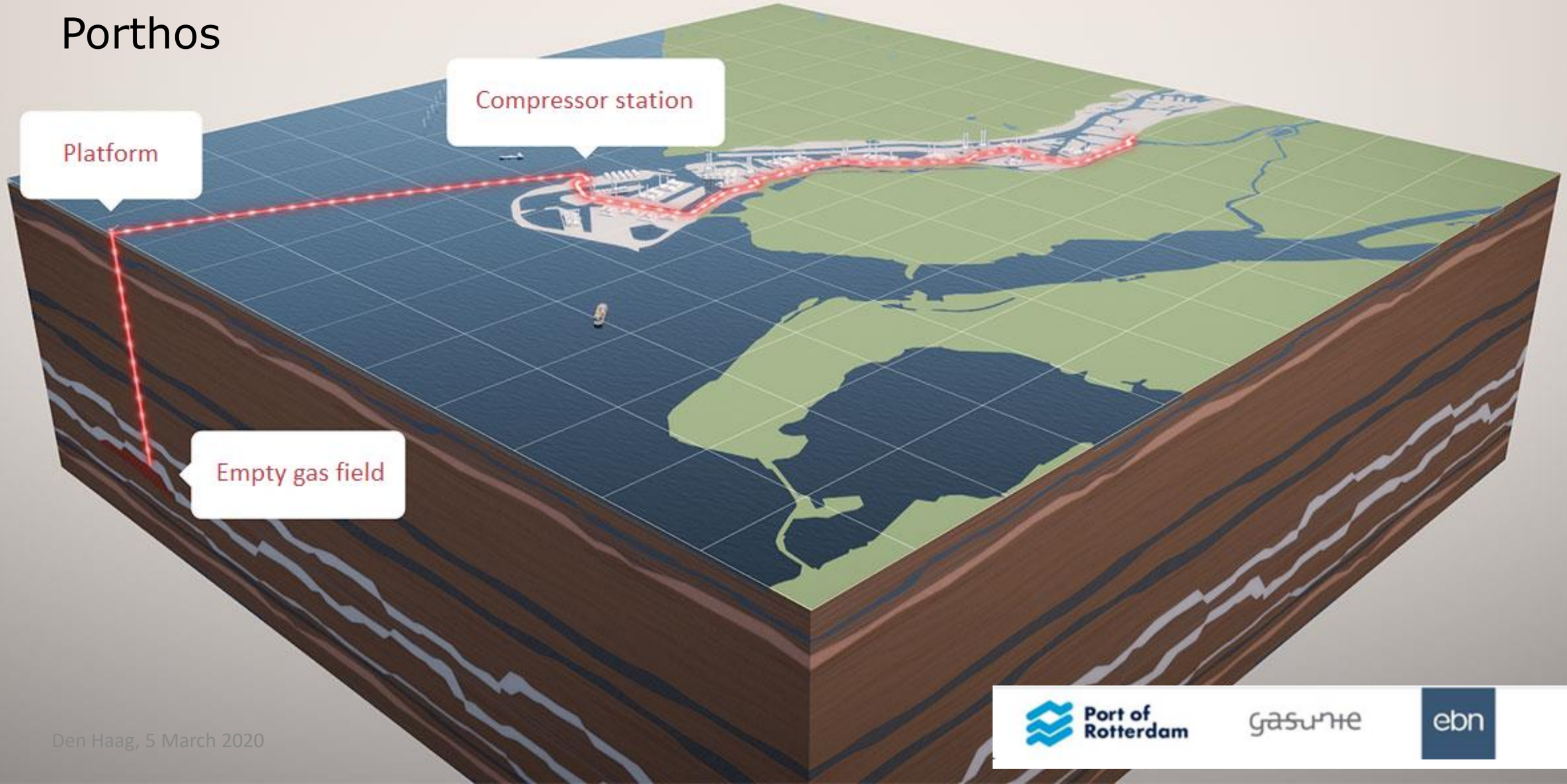
Potential: wide range of feedstock (manure, sewage sludge) for production of green gas or syngas in NL, EU and global



Heat network WarmtelinQ (Zuid-Holland)



Porthos



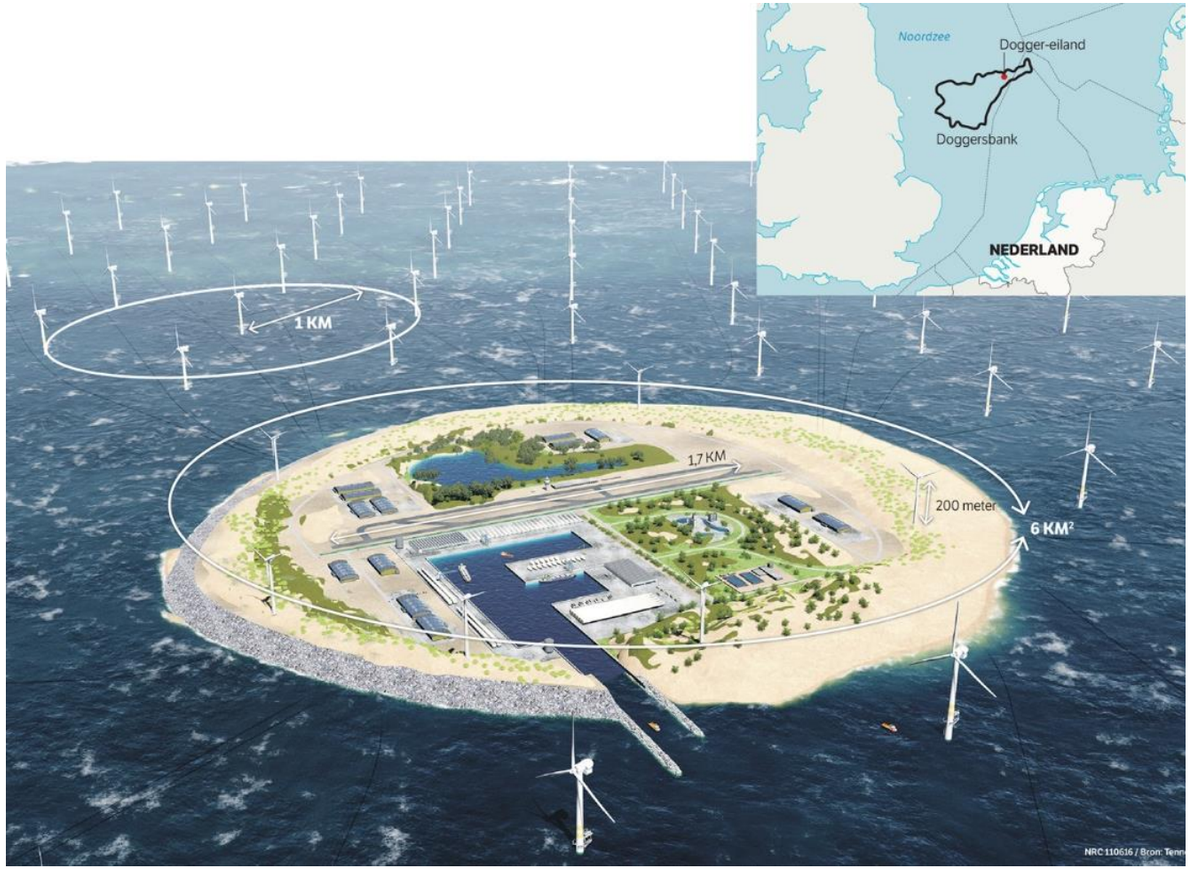
Proposed dedicated Hydrogen Network in the Netherlands

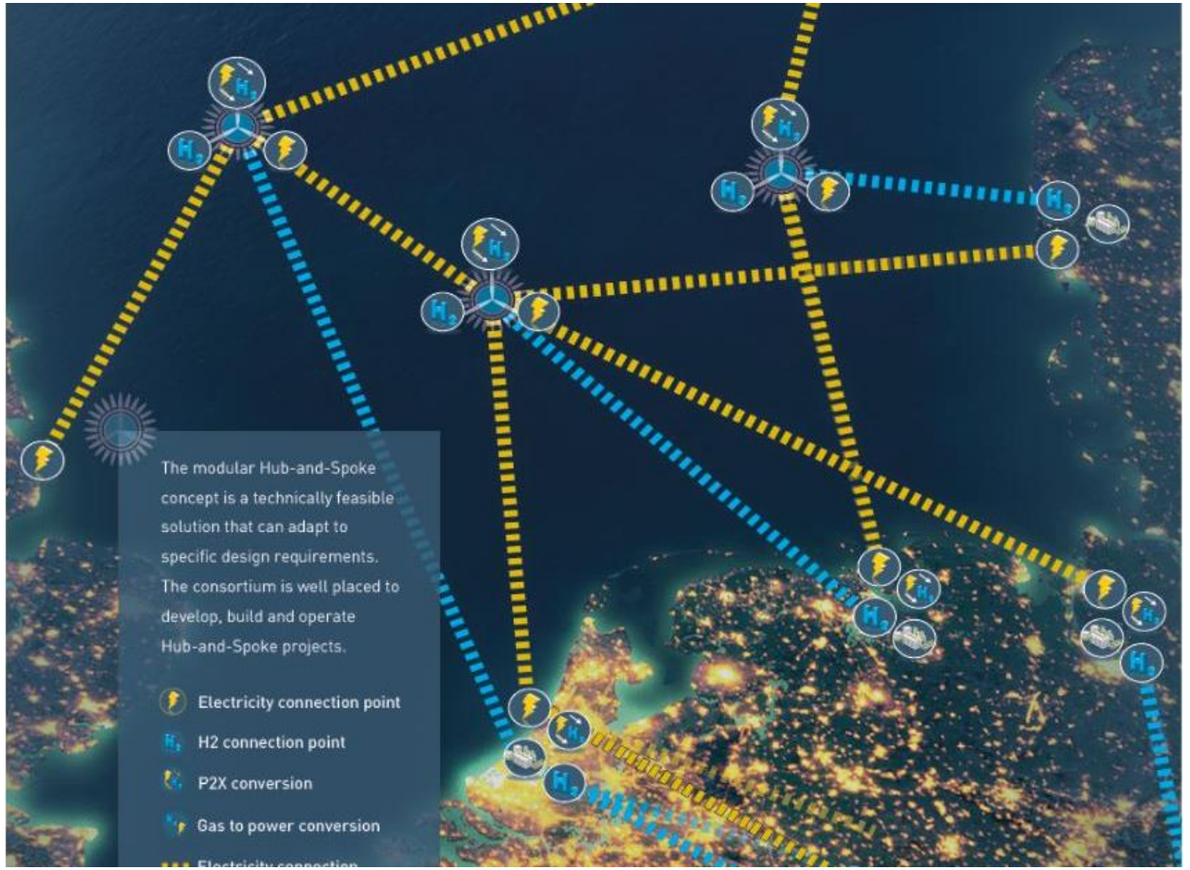
Backbone: H_2 transport and storage

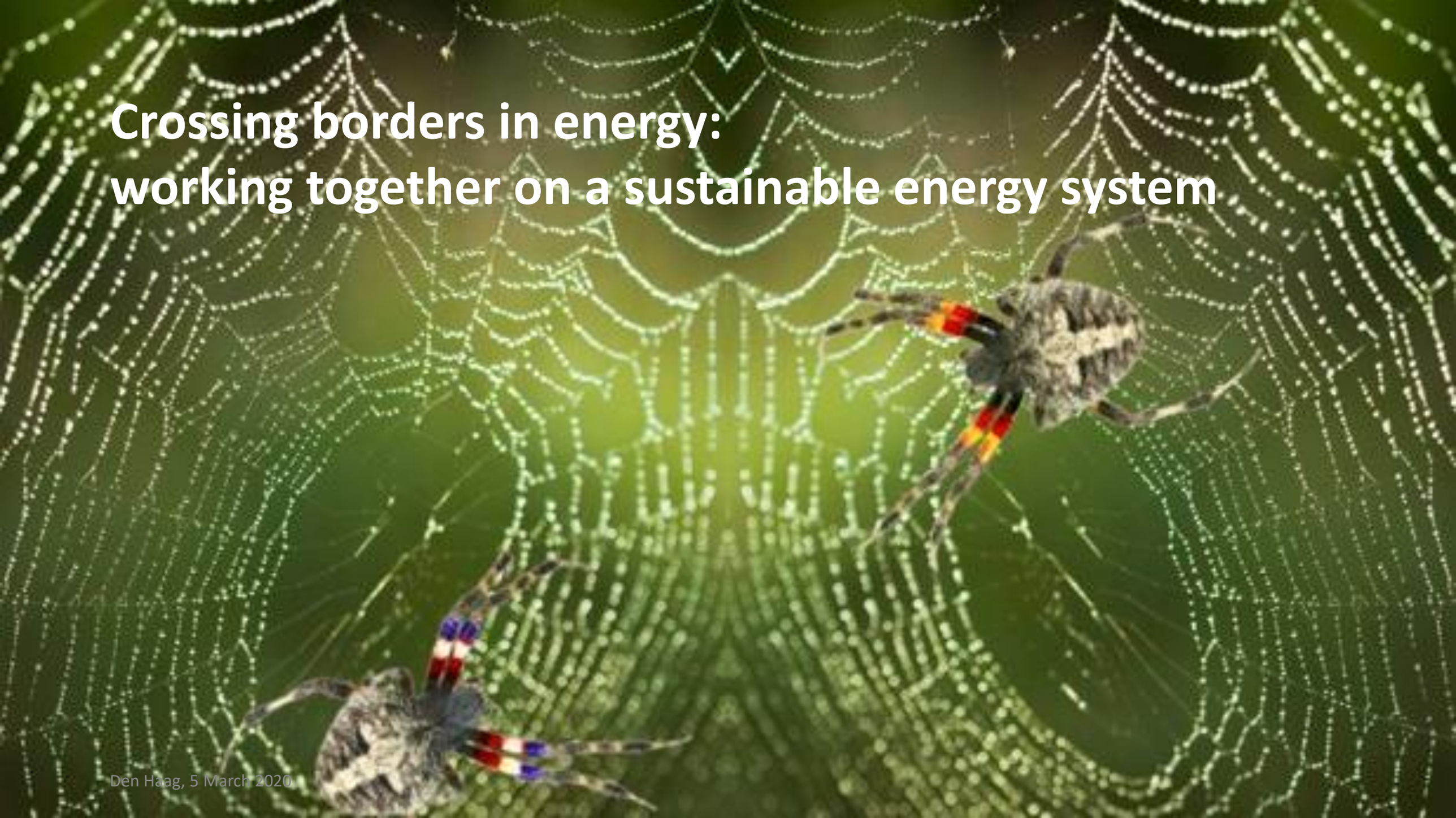
Phase I: 2025 - 2030

- Capacity 5 -10 GW
- Make use of existing infra
- Demand side mainly industry
- Supply side industry & wind at sea (electrolysis)
- H_2 Storage development Hystock caverns to match supply & demand

North Sea Wind Power Hub:
Germany, Denmark, the Netherlands







Crossing borders in energy: working together on a sustainable energy system

Den Haag, 5 March 2020

Presentation Prajeev Rasiah
Executive VP, DNV GL

DNV·GL

Accelerating the energy transition

Renewable energy supply and use

Prajeev Rasiah

05 March 2020

Safeguarding life, property and the environment

150+ years

100+
countries

100,000
customers

12,500
employees

5%
of revenue spent on R&D

MARITIME

OIL & GAS

ENERGY

BUSINESS ASSURANCE

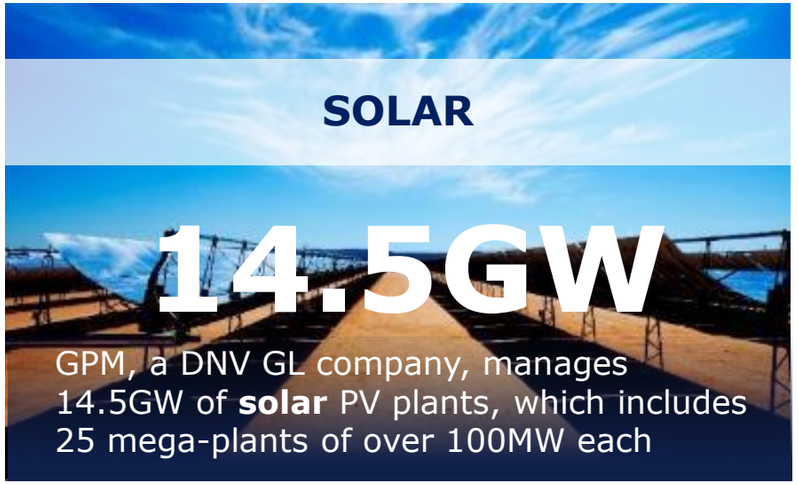
DIGITAL SOLUTIONS

Creating confidence across the energy value chain

WIND

90%

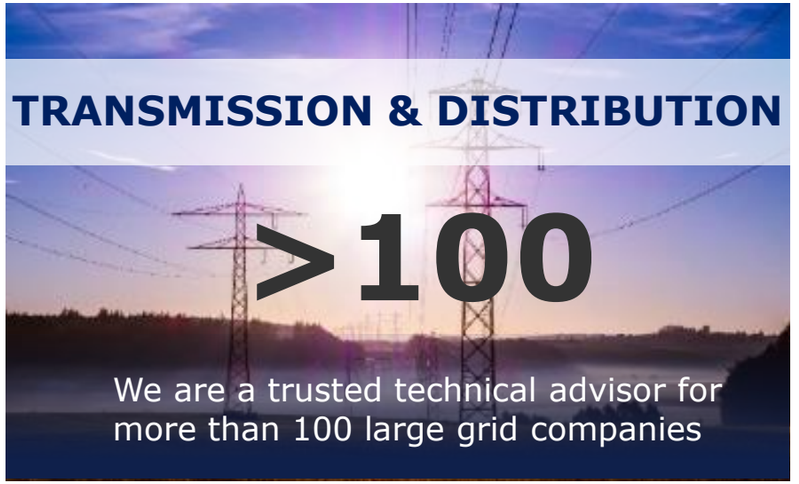
90% of certified **offshore wind** farm projects utilized our project certification



SOLAR

14.5GW

GPM, a DNV GL company, manages 14.5GW of **solar** PV plants, which includes 25 mega-plants of over 100MW each



TRANSMISSION & DISTRIBUTION

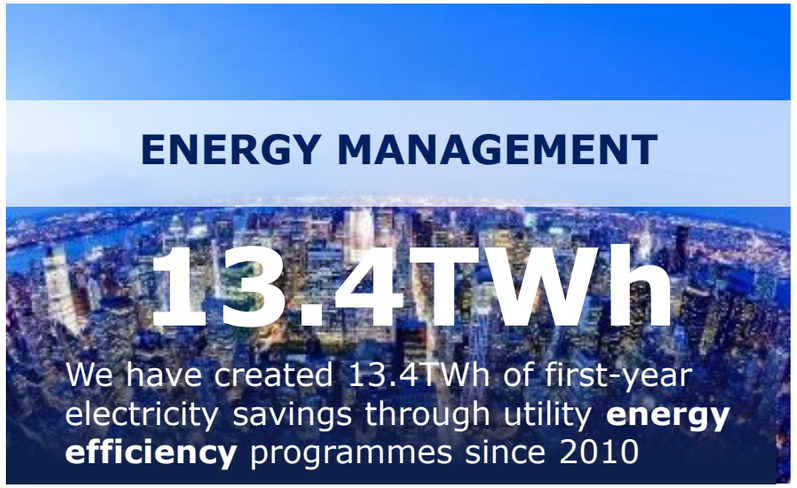
>100

We are a trusted technical advisor for more than 100 large grid companies

STORAGE

5m

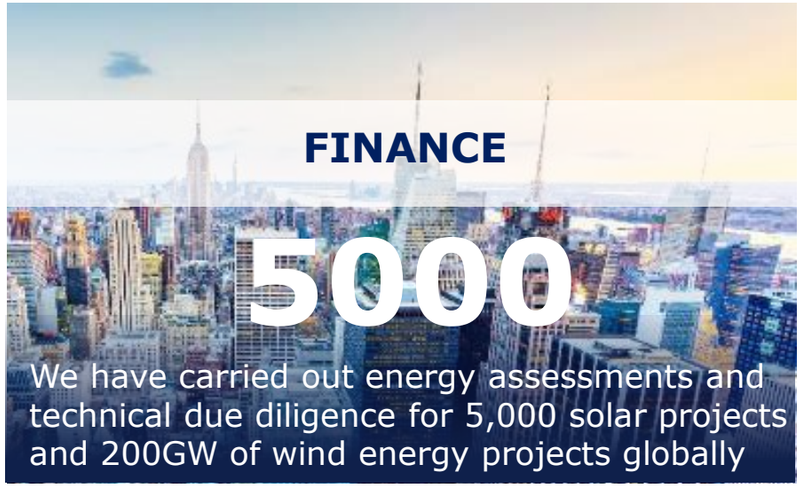
More than 5 million hours of energy storage battery testing



ENERGY MANAGEMENT

13.4TWh

We have created 13.4TWh of first-year electricity savings through utility **energy efficiency** programmes since 2010

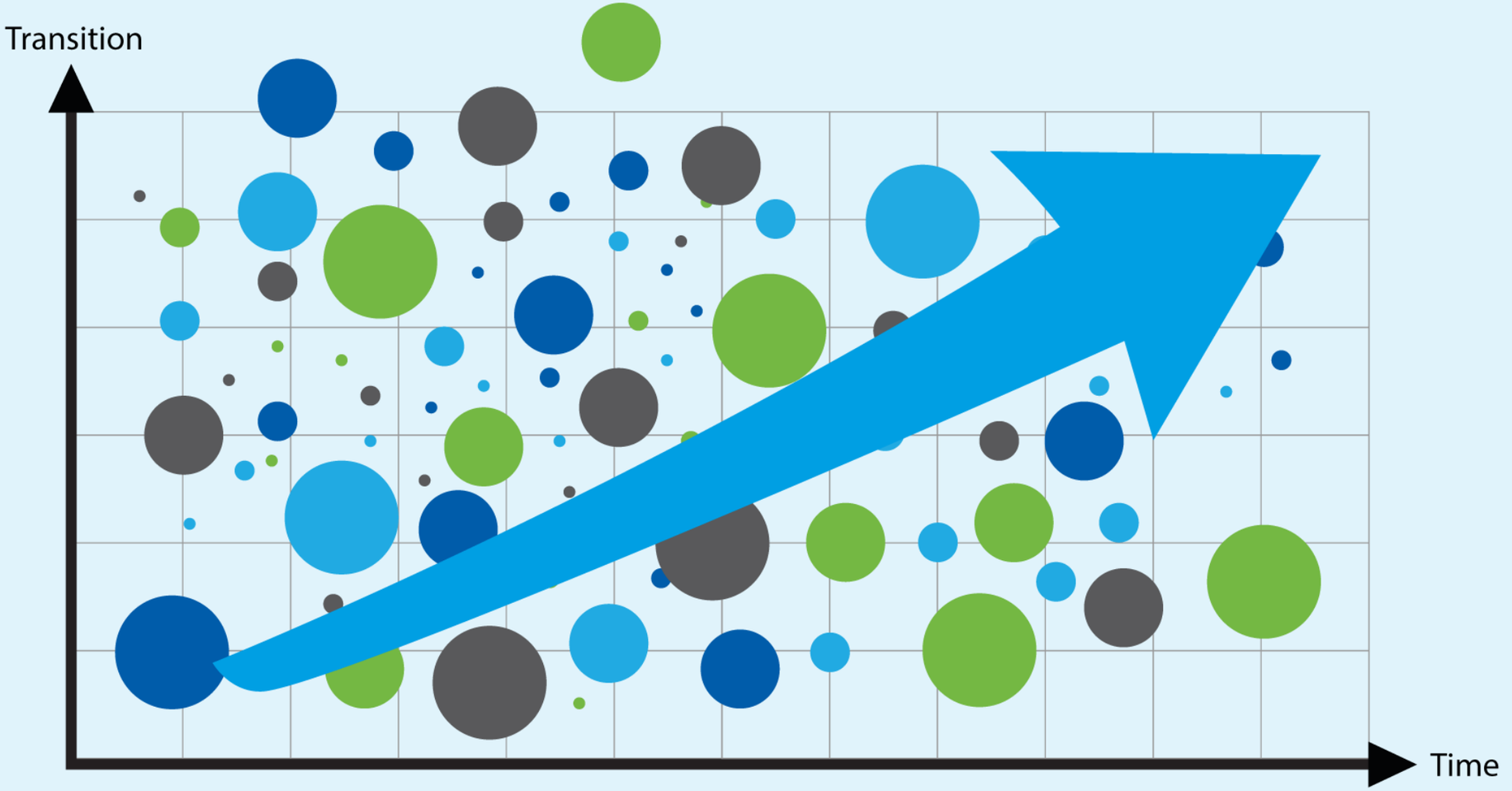


FINANCE

5000

We have carried out energy assessments and technical due diligence for 5,000 solar projects and 200GW of wind energy projects globally

Forecast – not a new scenario



OUR FINDINGS

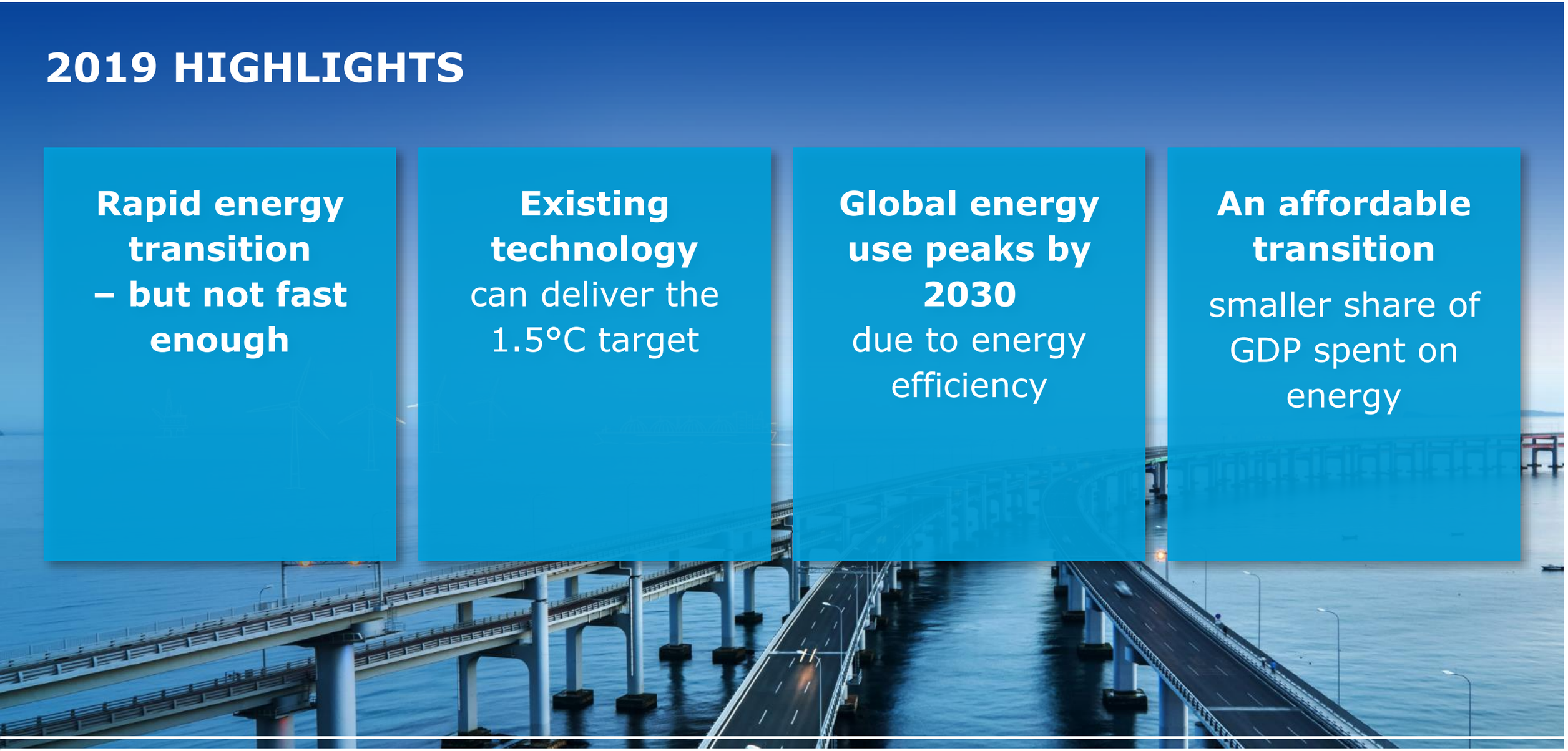
2019 HIGHLIGHTS

Rapid energy transition – but not fast enough

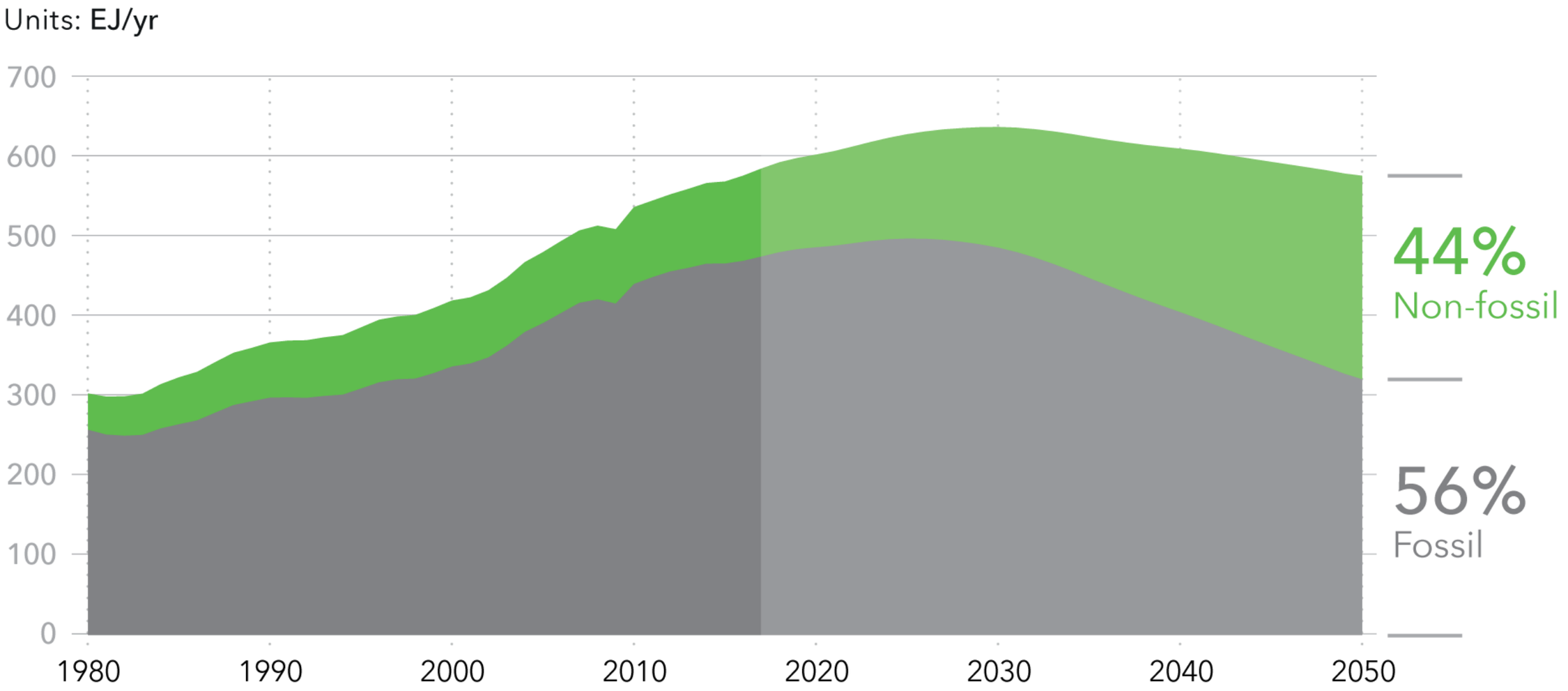
Existing technology can deliver the 1.5°C target

Global energy use peaks by 2030 due to energy efficiency

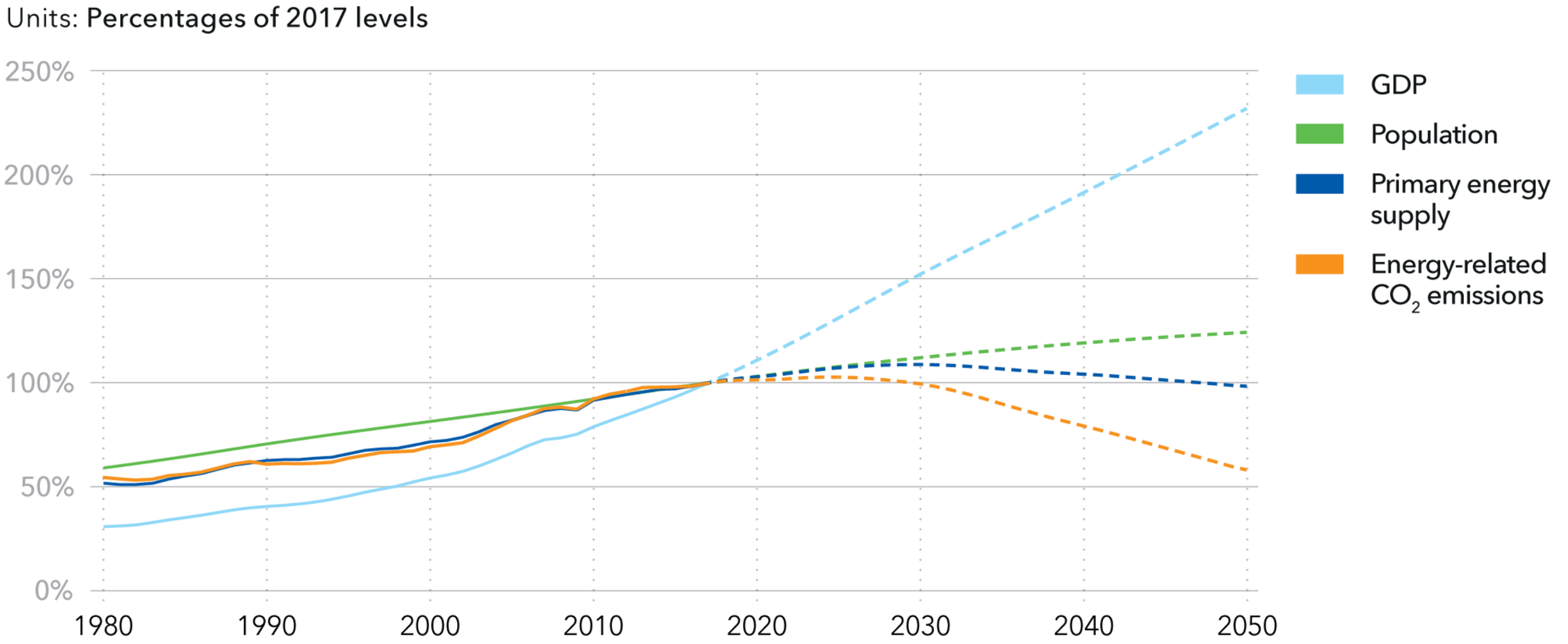
An affordable transition smaller share of GDP spent on energy



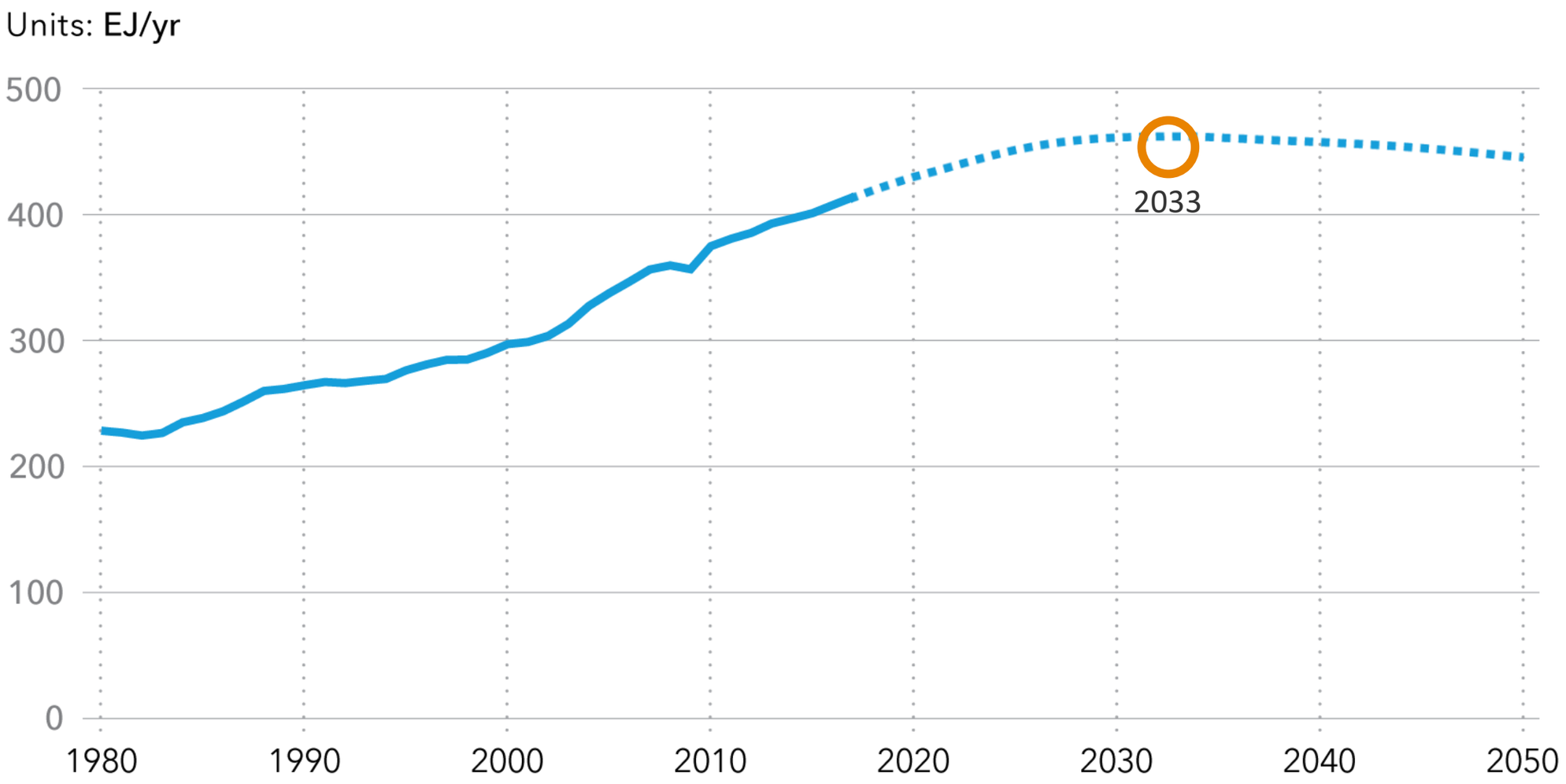
Close to equal split



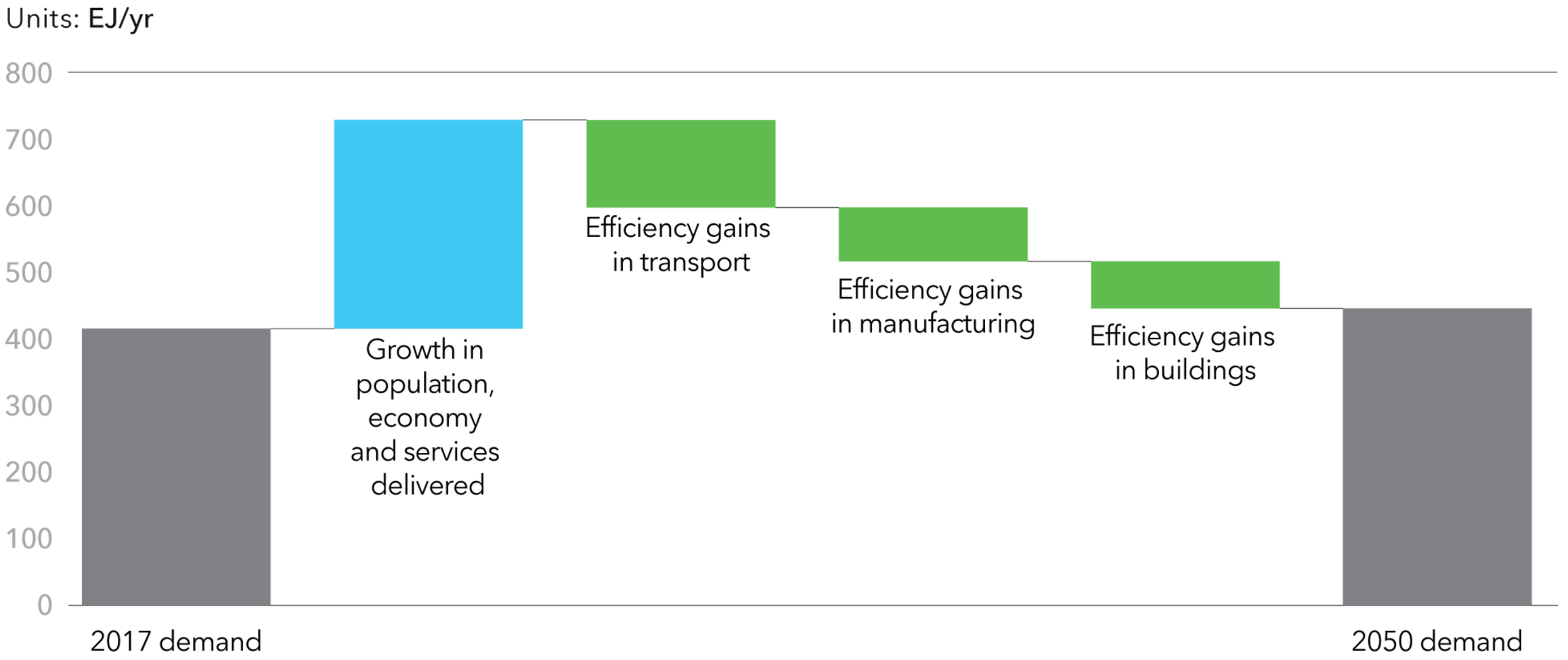
Decoupling of GDP



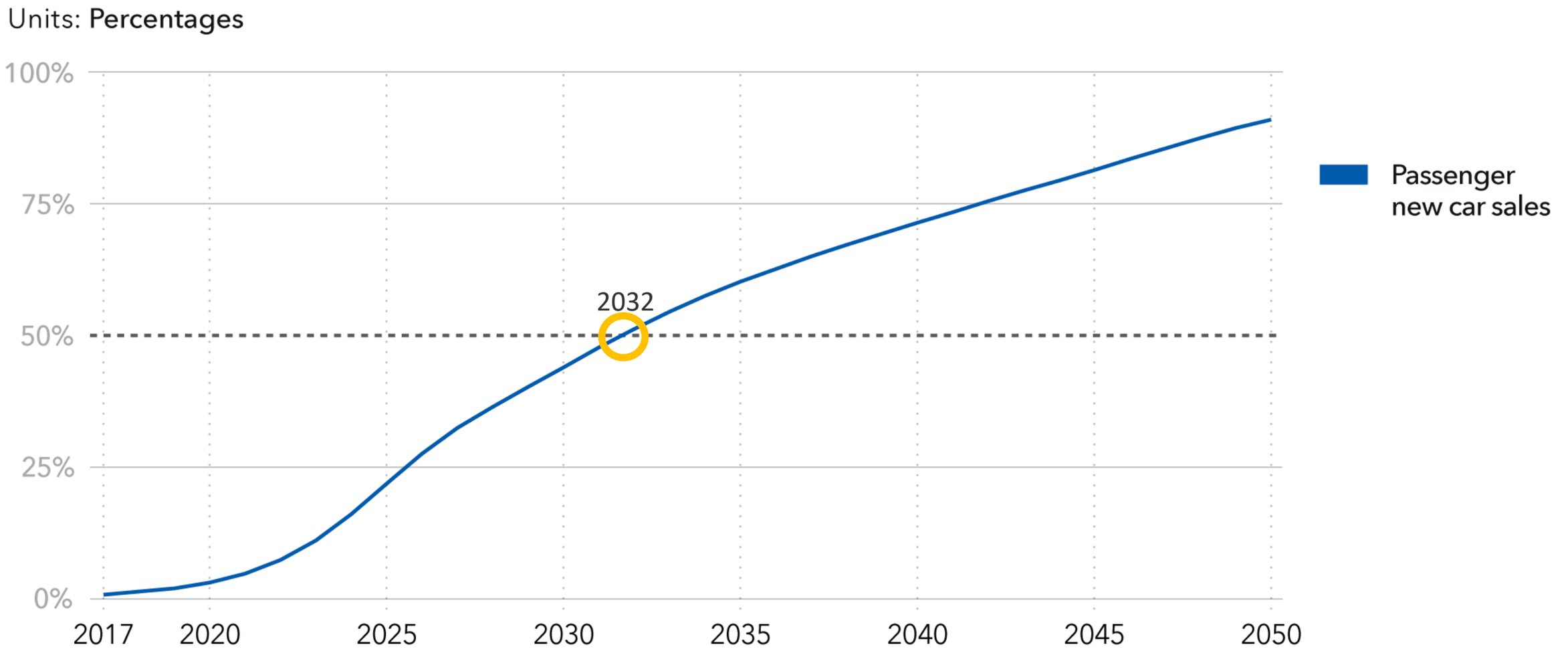
Energy demand will peak



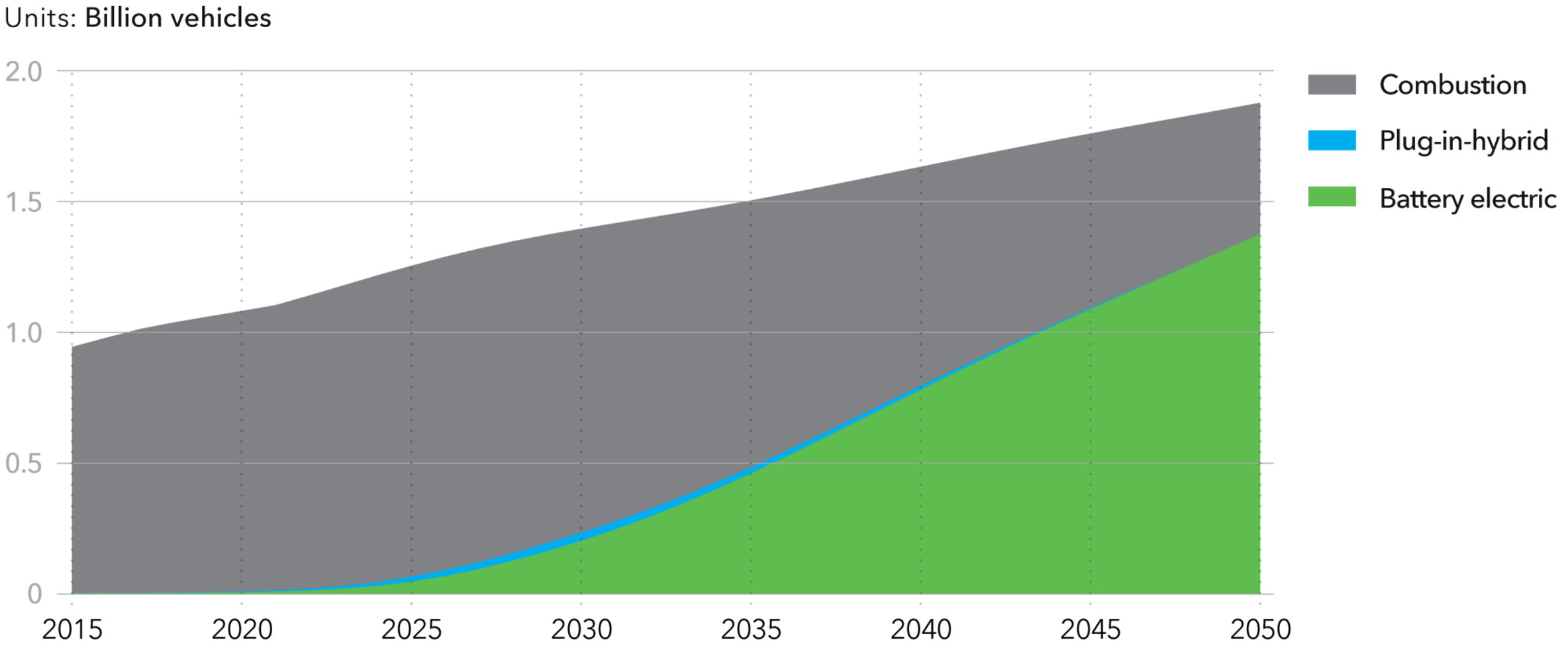
Efficiency gains 2050



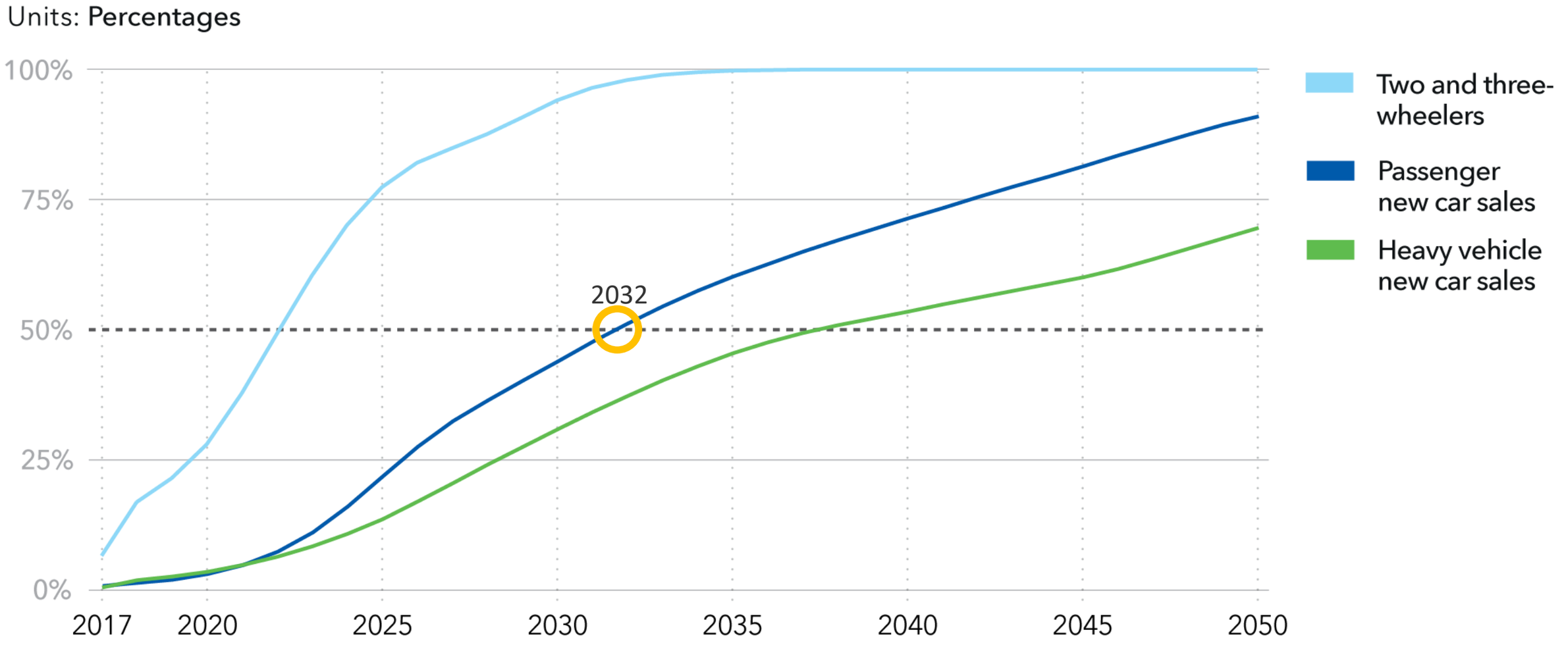
Global electric vehicle sales



Global passenger vehicles



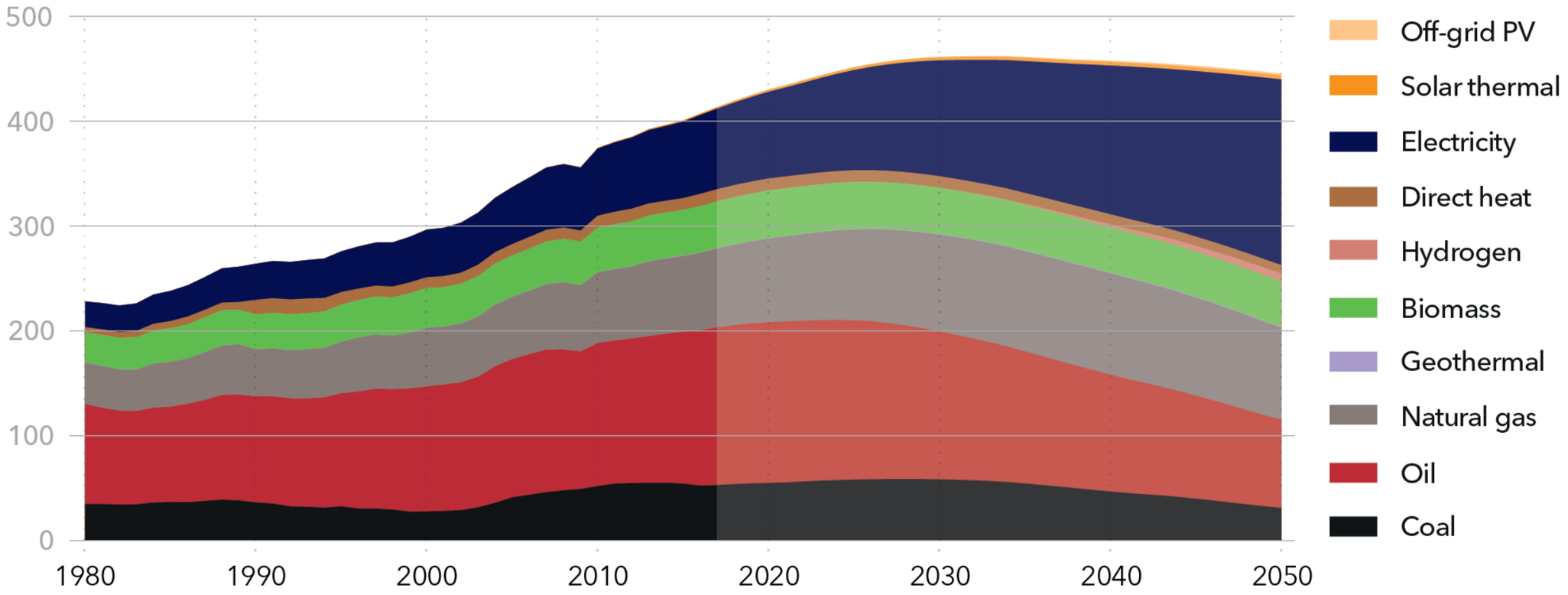
Global electric vehicle sales



The share of electricity in the final energy demand mix will more than double

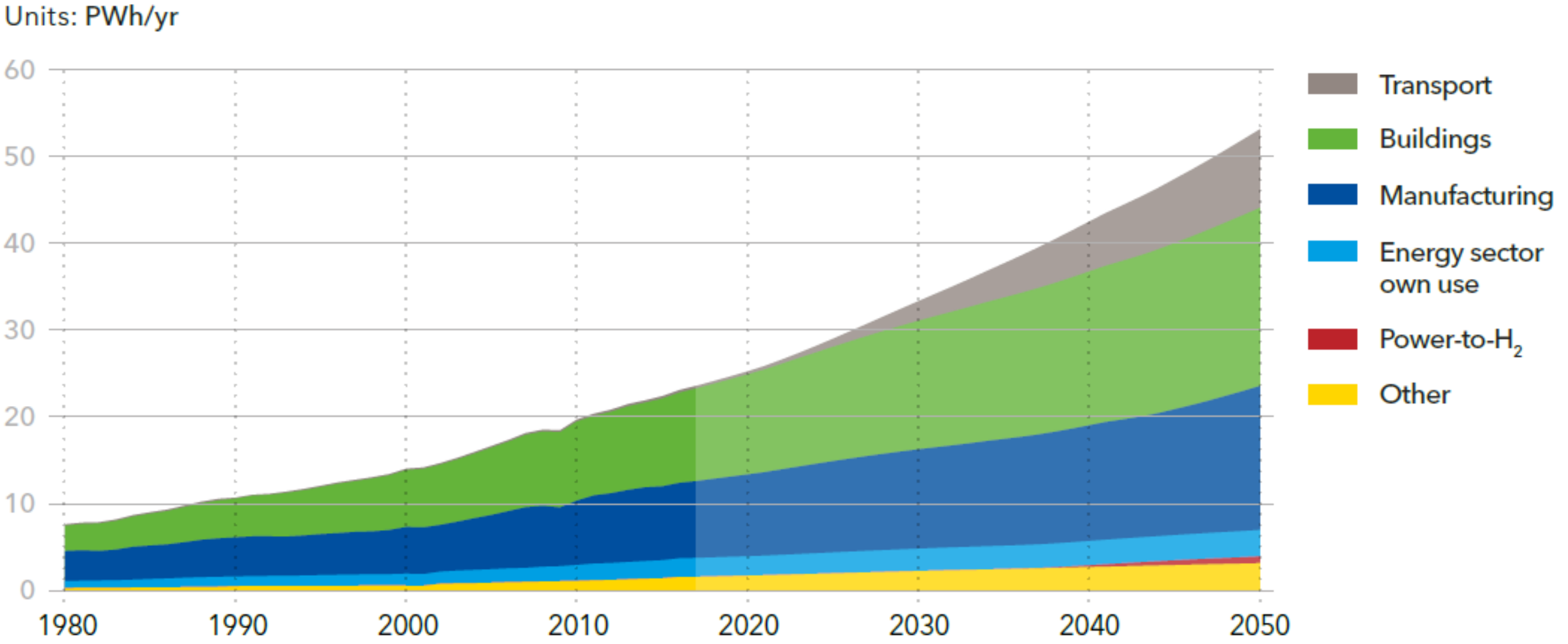
World final energy demand by carrier

Units: EJ/yr

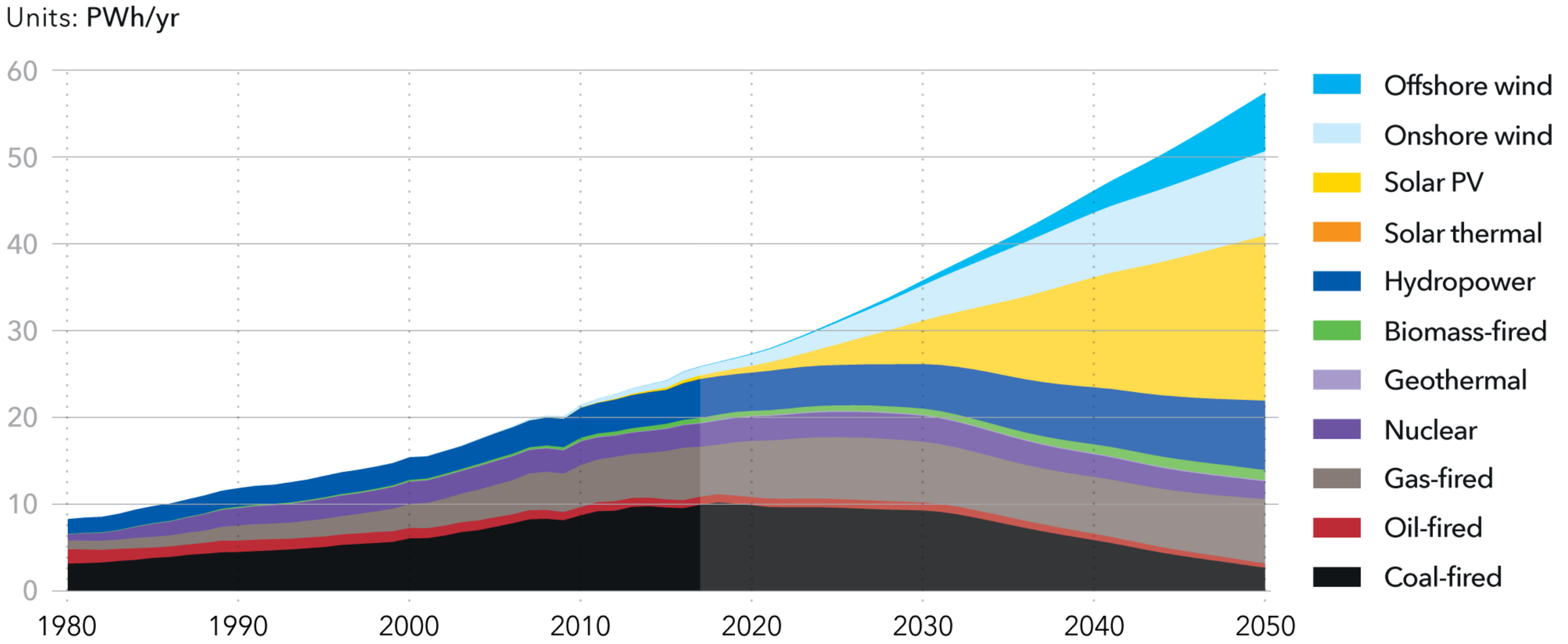


Historical data source: IEA WEB (2018)

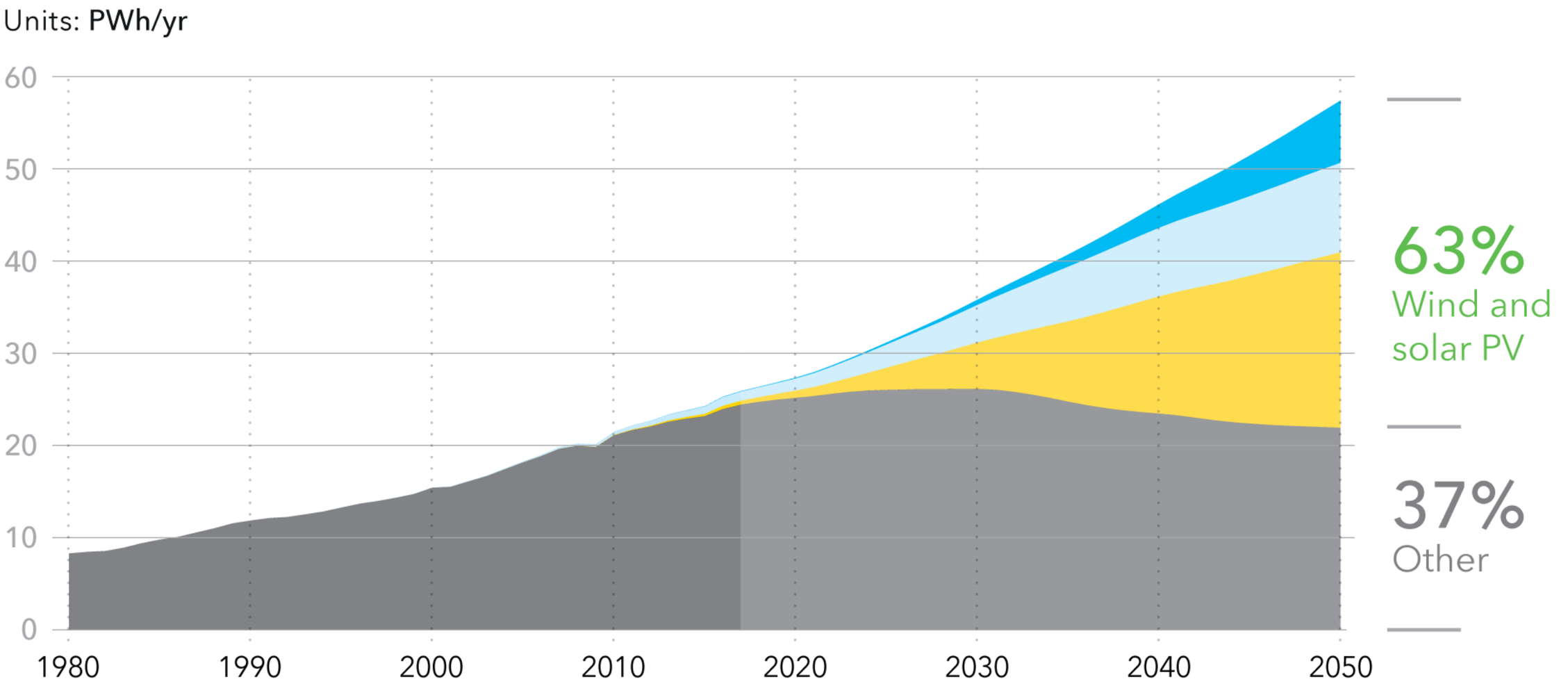
World electricity demand by sector



World electricity generation



World electricity generation



Tremendous growth due to high cost learning curve rates

19%

18%

16%

Installed wind capacity will reach 4 TW by 2050

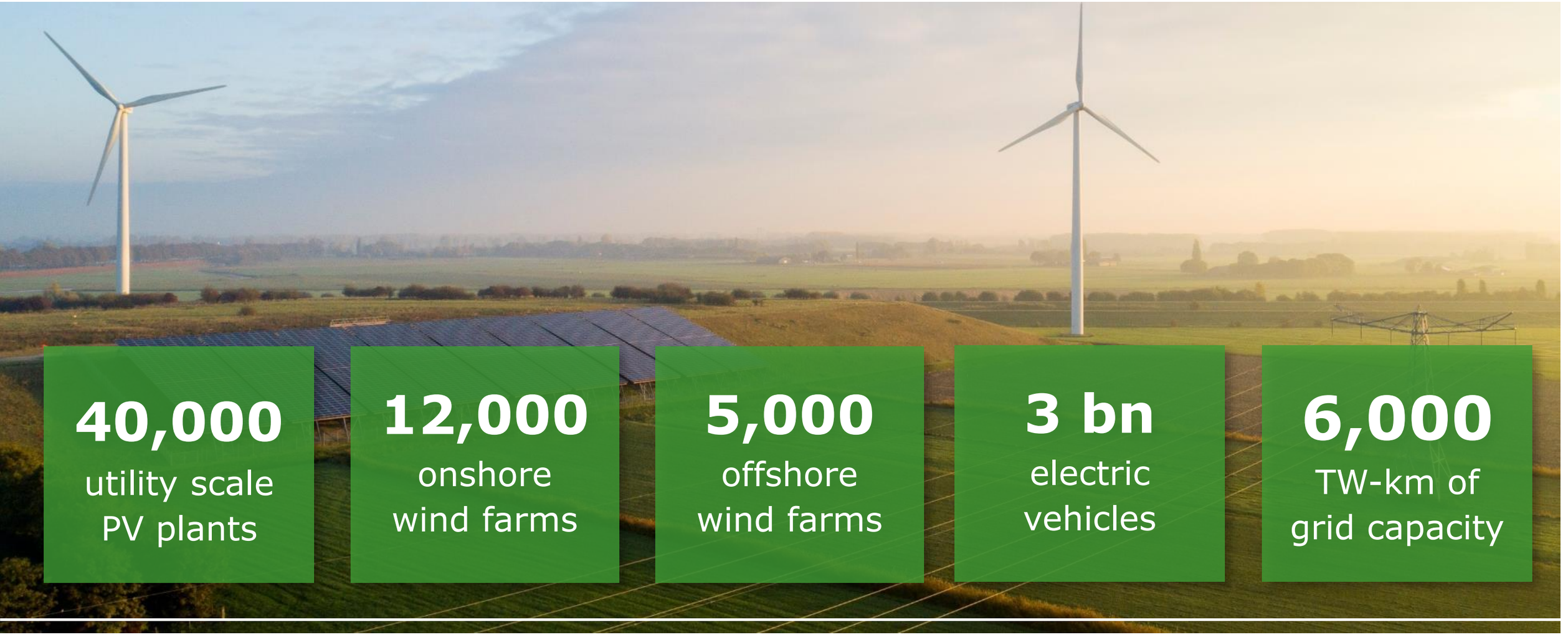
Installed onshore and offshore wind capacity by region

		2017		2030		2050	
		Onshore	Offshore	Onshore	Offshore	Onshore	Offshore
NAM	North America	100	0	318	69	476	355
LAM	Latin America	22	0	66	1	169	100
EUR	Europe	155	16	287	56	330	168
SSA	Sub-Saharan Africa	3	0	8	1	100	27
MEA	Middle East and North Africa	9	0	39	1	207	94
NEE	North East Eurasia	1	0	9	0	75	0
CHN	Greater China	162	3	641	8	1 543	175
IND	Indian Subcontinent	34	0	34	4	122	360
SEA	South East Asia	1	0	8	7	104	159
OPA	OECD Pacific	10	0	162	2	296	116
World		**496**	**19**	**1 571**	**148**	**3 421**	**1 554**

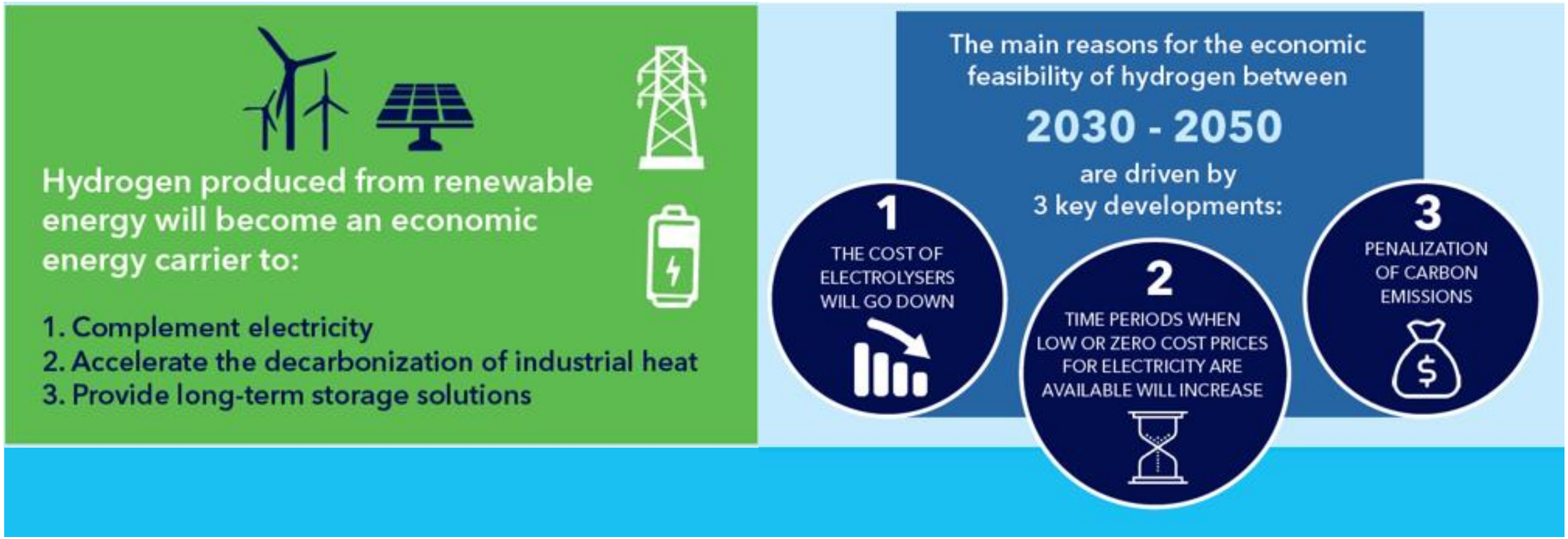
Average capacity factor of installed **onshore wind** will increase from 21% to 34% worldwide

Average capacity factor of installed **offshore wind** will increase from 29% to 51% worldwide

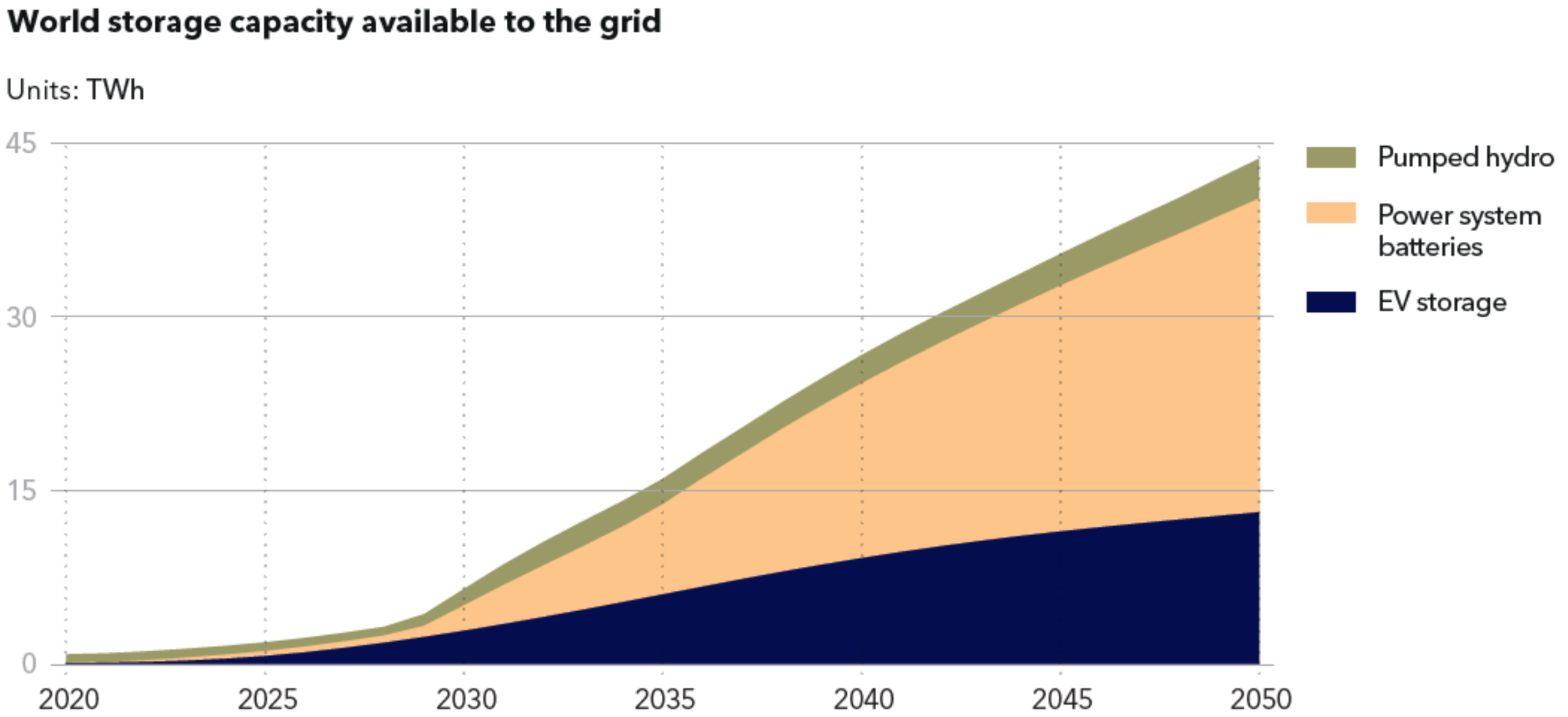
The power grid will almost triple in size by 2050



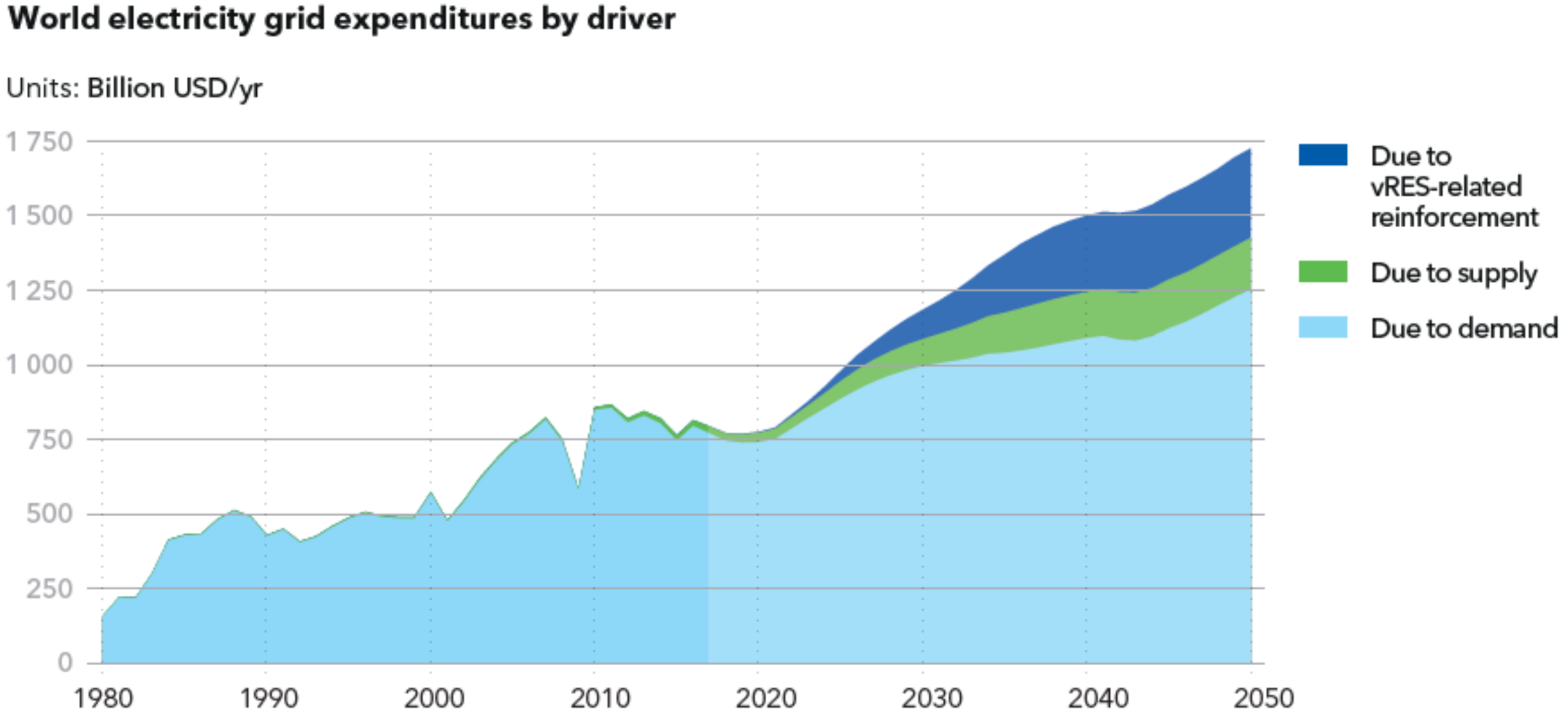
Hydrogen in the electricity value chain powered by low price from renewables



Price differentials and reduced costs will make storage profitable

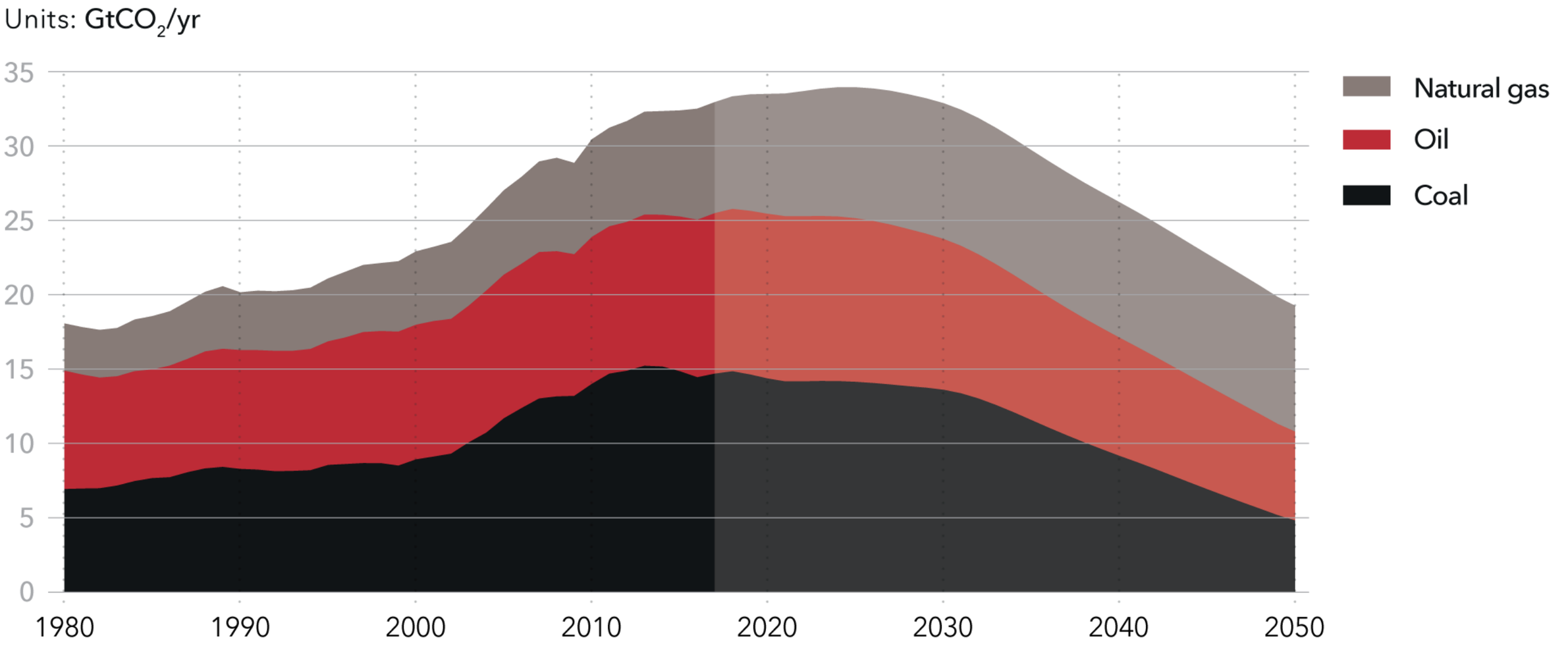


Grid investments will outgrow demand growth

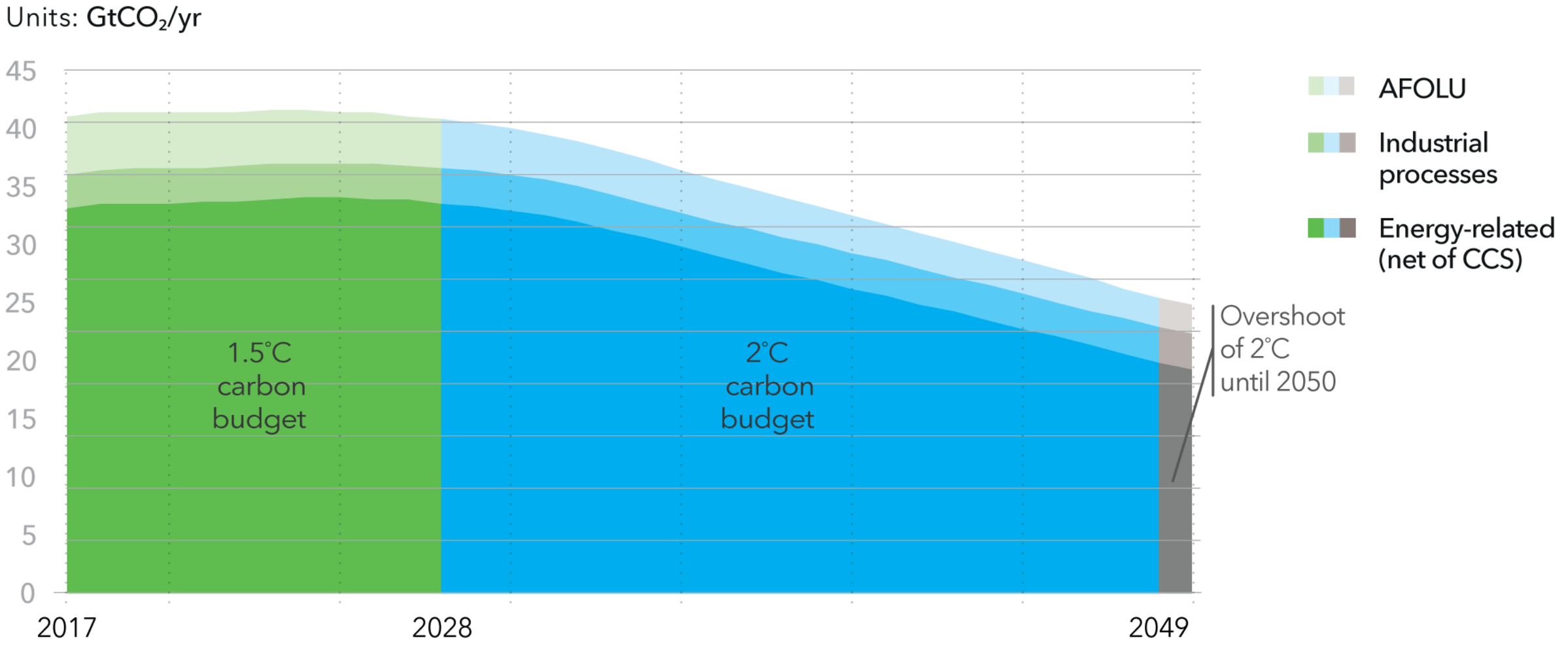


FAST, BUT NOT FAST ENOUGH

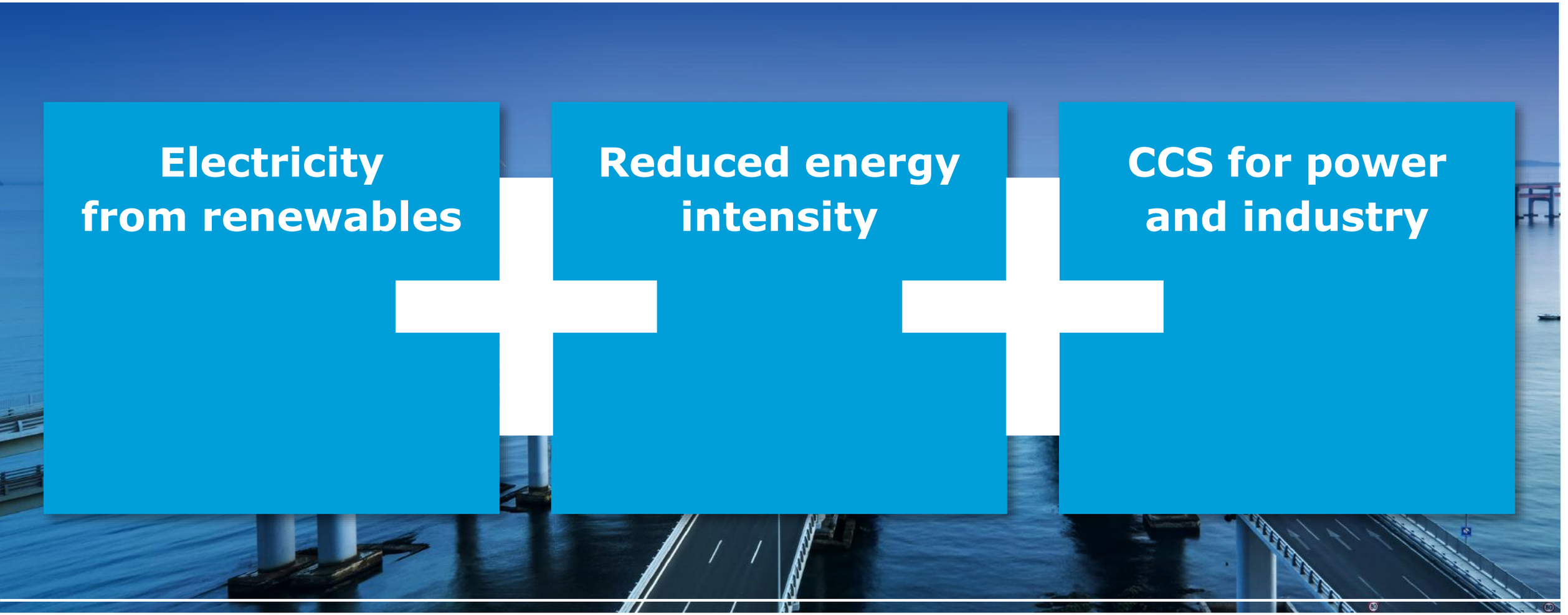
Emissions by fossil fuel



Carbon emissions and carbon budget

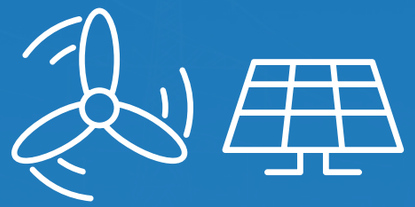


What can be done to close the gap?



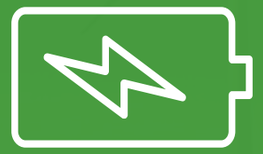
Measures to help close the gap and accelerate the transition

1



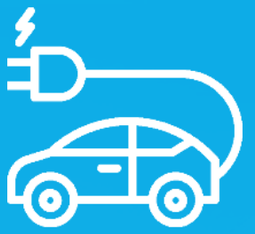
Grow solar power by >10 times to 5 TW and wind by 5 times to 3 TW by 2030

2



50-fold increase in production of batteries for the 50 million electric vehicles needed per year by 2030

3

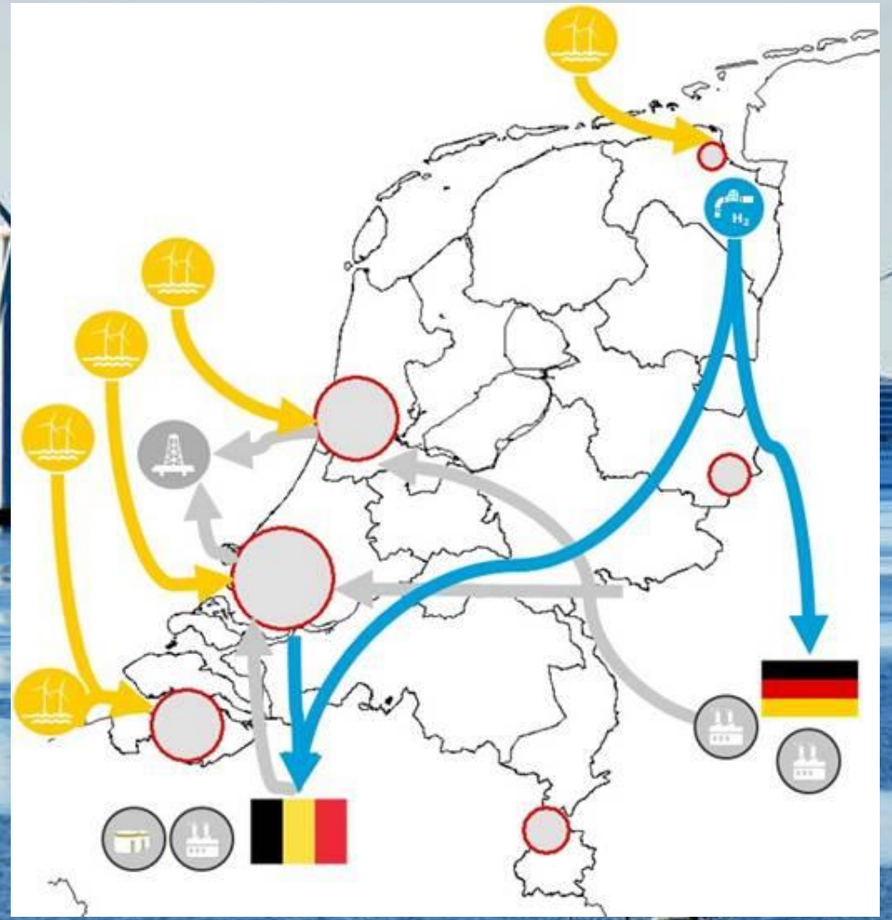


Create new infrastructure for charging electric vehicles on a large scale

New opportunity for a megatrend

COMPETITIVE ADVANTAGE

- NL has all the ingredients
- Learnings from Denmark
- Electrification of processes



BUSINESS AS *UNUSAL*

- Engage
- Think big(ger)

Thank you!

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Prajeev Rasiah

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SAFER, SMARTER, GREENER

Breakout sessions

1. Infrastructure
Hosted by René Peters (TNO), Ruud Melieste (Havenbedrijf Rotterdam) and Hans Coenen (NV Nederlandse Gasunie)
-> Location: **Create**

2. Regulation/Regislation
Hosted by Karolina Ryszka (Rabobank) and Jillis Raadschelders (DNV GL)
-> Location: **Meet**

3. Strategy
Hosted by Catrinus Jepma (New Energy Coalition), Ewald Breunesse (Shell) and Marcel vd Kar (Vopak)
-> Location: **Event**


Interview on stage


Thank you!