# Energy transition and Covid-19 crisis: the role of engineers

Session 4 – On the supply side: the demands of the citizens

WFEO - Committee on Energy
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## COVID-19 and Climate Goals:

## Is Green Hydrogen becoming a Demand of the Citizens?

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# INTRODUCTION

- Both, globalisation and cooperation remain major questions,
  not only with respect to the actual covid-19 crisis, but also to many other local and global crises.
- The global covid-19 crisis could expand so quickly
  because of the many international travelling and goods transportation ways.
- Staying at home and living under strict lock-down regulations would have stopped the pandemic, worldwide and in the single states.

- On the other hand e.g. distribution of masks were possible only by having **international transportation and trading systems**.
- But, the costs for and the shortage of masks reversed the interest of internationalisation and led back to install **local production possibilities and national value-chains.**
- Nevertheless the future will be **no "either or"**, but a mix of both possibilities.

# GENERAL DEMANDS OF THE CITIZENS



- Food and clean water
- Cars and fuels
- International travelling
- Peace and welfare
- Heating and cooling
- Buildings and (warm) accommodation
- Clothing
- Energy, especially electricity
- etc.

Any goods at any time - global supply chains
- national supply chains

# COVID-19 DEMANDS OF THE CITIZENS



- Masks
- Vaccines
- Disinfection liquids
- Ventilation systems
- Beds in hospitals
- Toilet paper - especially in Germany!
- Home office and quick internet connection
- Home-schooling, digitalization and tablets

And the general demands

  - Food and clean water
  - Cars and fuels
  - etc.

- Production of masks
- Production of vaccines
- Production of disinfection liquids
- Production of ventilation systems (hospitals, schools, work places, at home)
- Quick internet for home office and home schooling

And, of course,

- Supply of all kinds of normal demands
- Production of machines, cars, buildings
- Delivery of constantly available energy, especially electricity
- etc.

## Interruption of global supply chain

- Shortage of masks, vaccines, disinfection liquids
- Unfair distribution of all kinds of supply
- High risks of bribery

## Keeping-up supply chains

- High risks of infections
- High numbers of non-traceable contacts

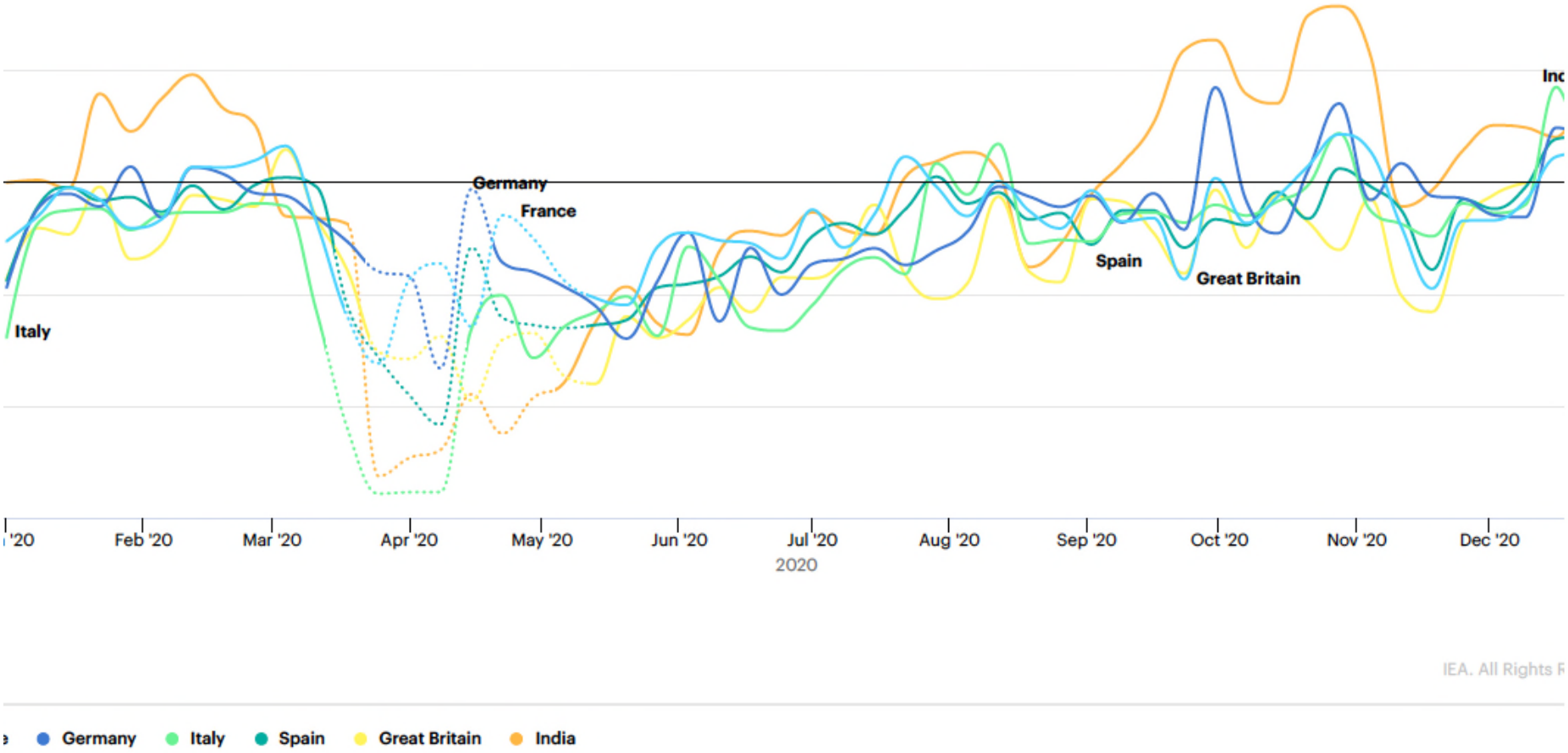
## Lock-down

- Disruption in production of goods
- Disruption/shortage of energy supply
- Bottlenecks in internet connection (economy, hospitals, home schooling, home office)

Above all political, ideological, religious, cultural, and certainly academic boundaries, the situation is described as follows from ASME:

- “The new coronavirus is sweeping through the world like a scythe, disrupting not only our lives but also our jobs, companies, and industries. Whether we suddenly find ourselves telecommuting, facing unanticipated supply chain difficulties, or unable to run our factories, we’re all affected. This update looks at some of the ways this virus-borne disease, Covid-19, is reshaping the engineering world.
- Covid-19 hit China first. To contain it, the government ordered a series of lockdowns that brought industry to a stall.
- Electricity demand in China dropped quickly with confinement measures.
- Electricity demand dropped quickly across Europe and India, too, with confinement measures of about 20%, but steadily recovered.

# ELECTRICITY DEMAND IN COVID-19 TIMES




Shortage of electricity in some countries (www.iea.org)

The crises will be kept in mind.

Cooperation and solidarity still remain values of living.

This will be the truth in all fields of living.

So, the questions of pre-pandemic world still have to be answered:

**What about climate change?**

**What about the goals to defend it and reach the 1.5 °C limit?**

This has to be answered by us, the engineers of WFEO!

In our case: The engineers of the SC Energy.

And as energy will be totally electrified in 2050 we have to look how energy transition can succeed with GREEN HYDROGEN.

# MAIN FUELS IN TOTAL ENERGY DEMAND GLOBALLY – LUT AND ENERGY WATCH GROUP

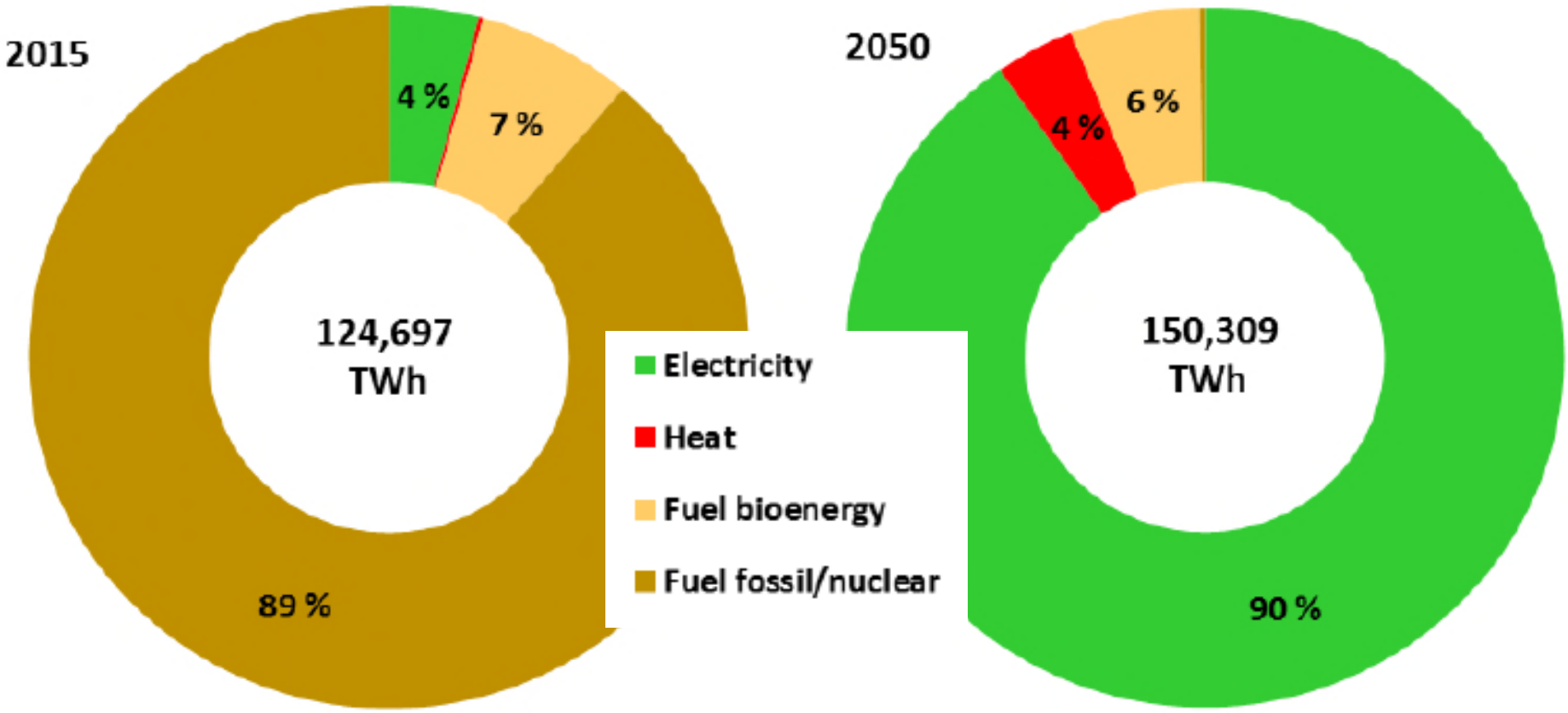



Figure ES-1: Shares of main fuels in the total primary energy demand globally, in 2015 and 2050.

4 March 2020 !!! In Covid-19 times !!!

Adoption by European Commission

of legislative proposal for a **European Climate Law**

with objective of the EU achieving

**net-zero greenhouse gas (GHG) emissions by 2050**.

This proposal is part of the **European Green Deal**, a programme first outlined in the political guidelines of the Commission President, Ursula von der Leyen. It aims to make

**Europe the first climate-neutral continent by 2050,**

while boosting the competitiveness of European industry and ensuring a just transition for the regions and workers affected.

Berlin, April 2021, !!! also in Covid-19 times !!!

By incidence with the German-Chinese experts meeting,

the German Federal Institutional Court declared in a historic decision, that the country's current climate law is insufficient to effectively protect future generations from climate change.

The consequence: The German Government must adapt its current targets, providing for clear measures from 2030 on.

One thing is clear: This ruling provides enormous momentum for the national climate movement, and its

**IMPACT WILL SPREAD FAR BEYOND GERMANY'S BORDERS.**

IPCC estimates the remaining

**carbon emission budget** from 2018 to be

**420 Gt $CO_2$,**

which gives a 66 % chance of staying below 1.5 $^{o}$C.

Counting from 2020 this budget is **used up in 8 years**,

if emissions are not reduced.

So, what to do?

Politically - Technically - …- Hopefully

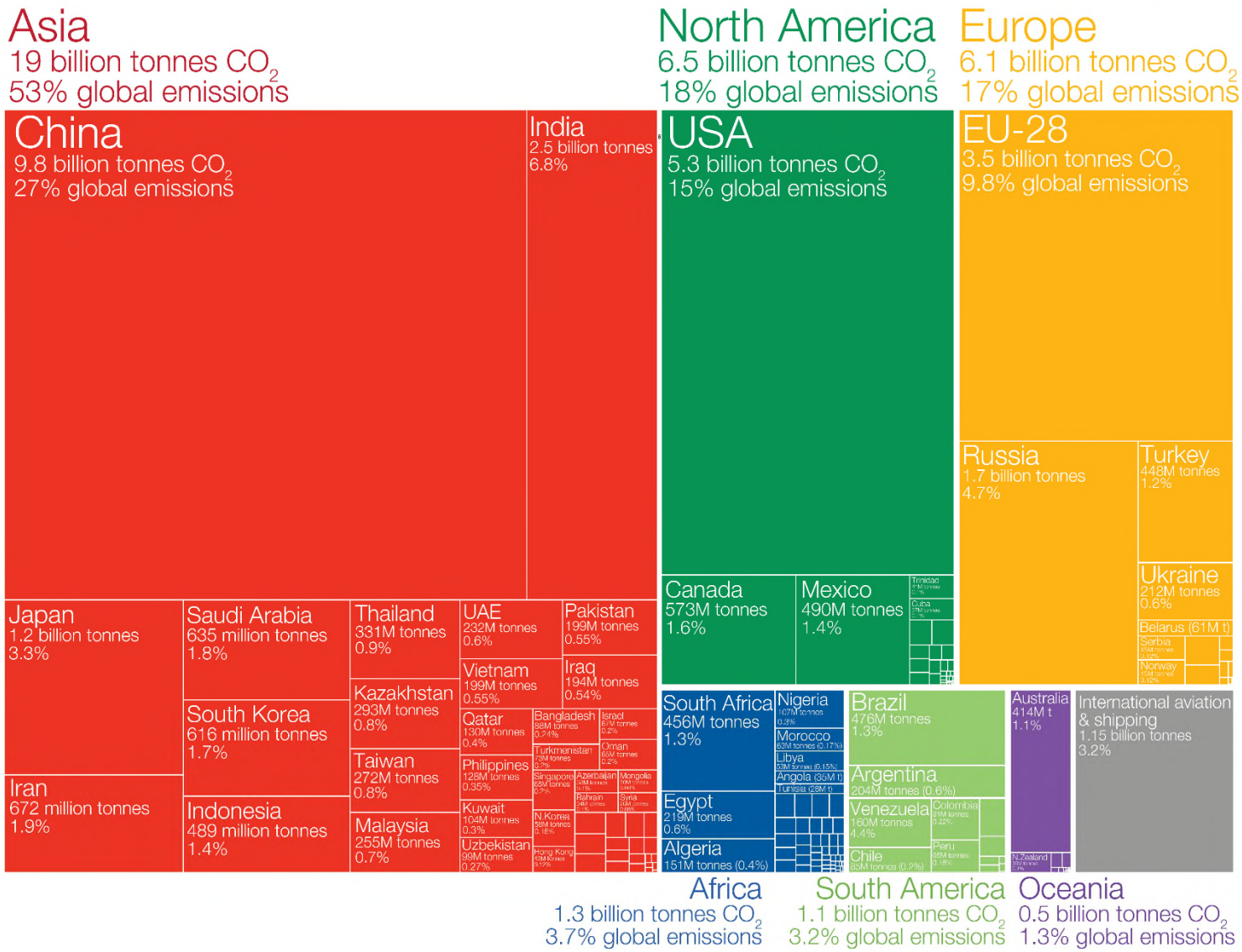
in the after COVID-19 times?

GLOBAL CARBON EMISSION

# Who emits the most $CO_2$?

Global carbon dioxide ($CO_2$) emissions were 36.2 billion tonnes in 2017.

Our World in Data




Shown are national production-based emissions in 2017. Production-based emissions measure $CO_2$ produced domestically from fossil fuel combustion and cement, and do not adjust for emissions embedded in trade (i.e. consumption-based).

Figures for the 28 countries in the European Union have been grouped as the 'EU-28' since international targets and negotiations are typically set as a collaborative target between EU countries. Values may not sum to 100% due to rounding.

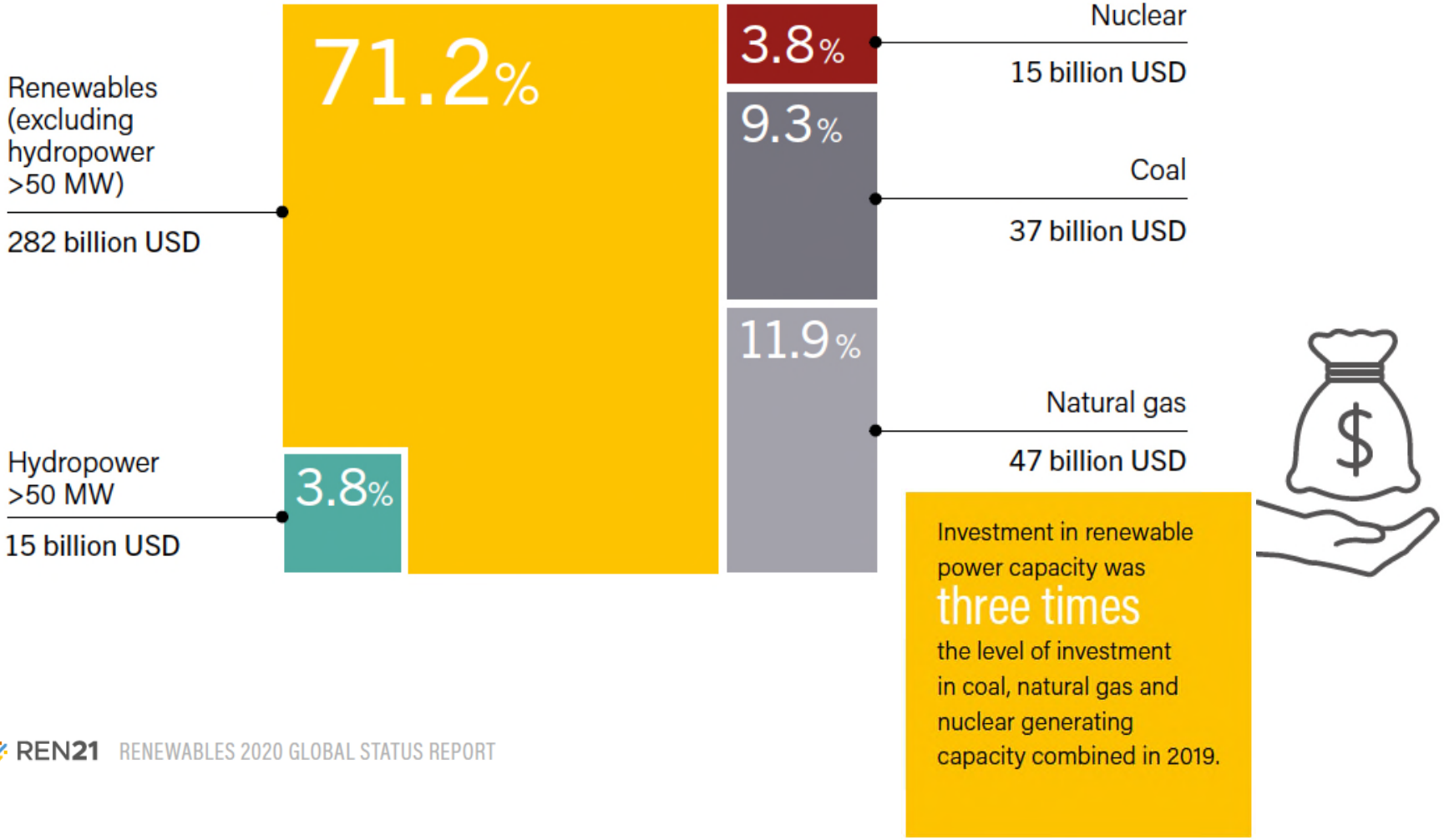
20.10.2021

Data source: Global Carbon Project (GCP).

This is a visualization from OurWorldinData.org, where you find data and research on how the world is changing.

# GLOBAL INVESTMENT IN NEW POWER

FIGURE 52. Global Investment in New Power Capacity, by Type (Renewables, Coal, Gas and Nuclear Power) 2019



Actually the most likely and hopeful way for energy transition seems to impose a

very deep electrification

to all sectors by

green electricity in combination with green hydrogen

To meet this commitment (see below), the world must bring CO2 emissions to net-zero by mid-century (ETC)

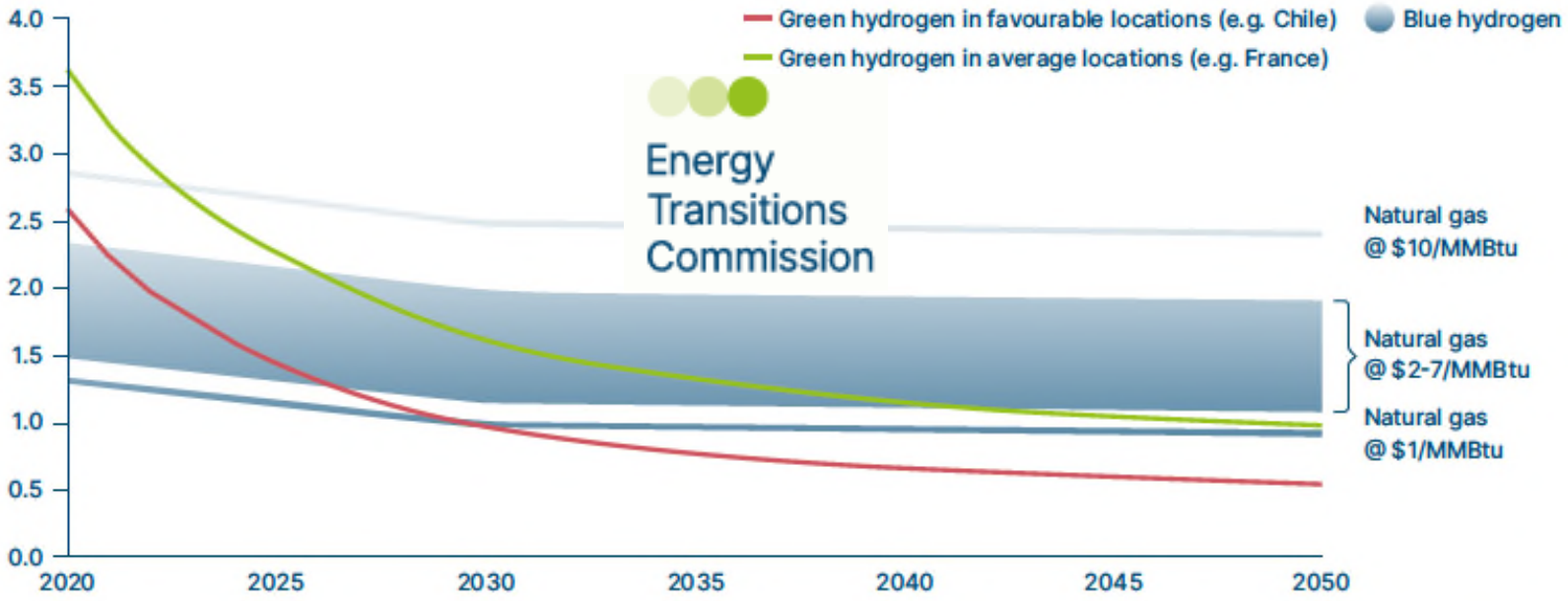
## Making the Hydrogen Economy Possible

**Accelerating Clean Hydrogen in an Electrified Economy**

**The Energy Transitions Commission (ETC) is a global coalition of leaders from across the energy landscape committed to achieving net-zero emissions by mid-century, in line with the Paris climate objective of limiting global warming to well below 2°C and ideally to 1.5°C.**

# Green hydrogen from electrolysis likely to become cheapest clean production route in the long term, in favourable locations it could be competitive with blue in the 2020s

Cost of hydrogen production from different production routes (excluding transport & storage costs)
$/kg $H_2$




**NOTES:** Blue hydrogen production: i) forecast based on SMR+CCS costs (90% capture rate) in 2020 transitioning to cheaper ATR+CCS technology in the 2020s; Green hydrogen production: i) favorable scenario assumes average LCOE of PV and onshore wind of lowest 33% locations (falling from $22/MWh in 2020 to $10/MWh in 2050) and average scenarios assumes median LCOE from lowest 75% locations (falling from $39/MWh in 2020 to $17/MWh in 2050) from BloombergNEF forecasts, ii) additional 20% (favorable) and 10% (average) LCOE savings included due to directly connecting dedicated renewables to electrolyser, iii) 18 % learning rate for favorable & 13 % for average scenario. Electrolyser capacity utilization factor: 45%. Comparison to BloombergNEF most favorable ($0.55/kg) and average ($0.86/kg) and Hydrogen Council favorable (ca. $0.85/kg) and average (ca. $1.45/kg) in 2050.

**SOURCE:** BloombergNEF (2021), *Natural gas price database* (online, retrieved 01/2021), BloombergNEF (2020), *2H 2020 LCOE Data Viewer*; BloombergNEF (2021), *1H2021 Hydrogen Levelised Cost Update*; Hydrogen Council (2021), *Hydrogen Insights*

Penetration of electric energy into other energy sectors can best be achieved by

# Green Hydrogen

About 56 countries started national hydrogen activities since 2017.

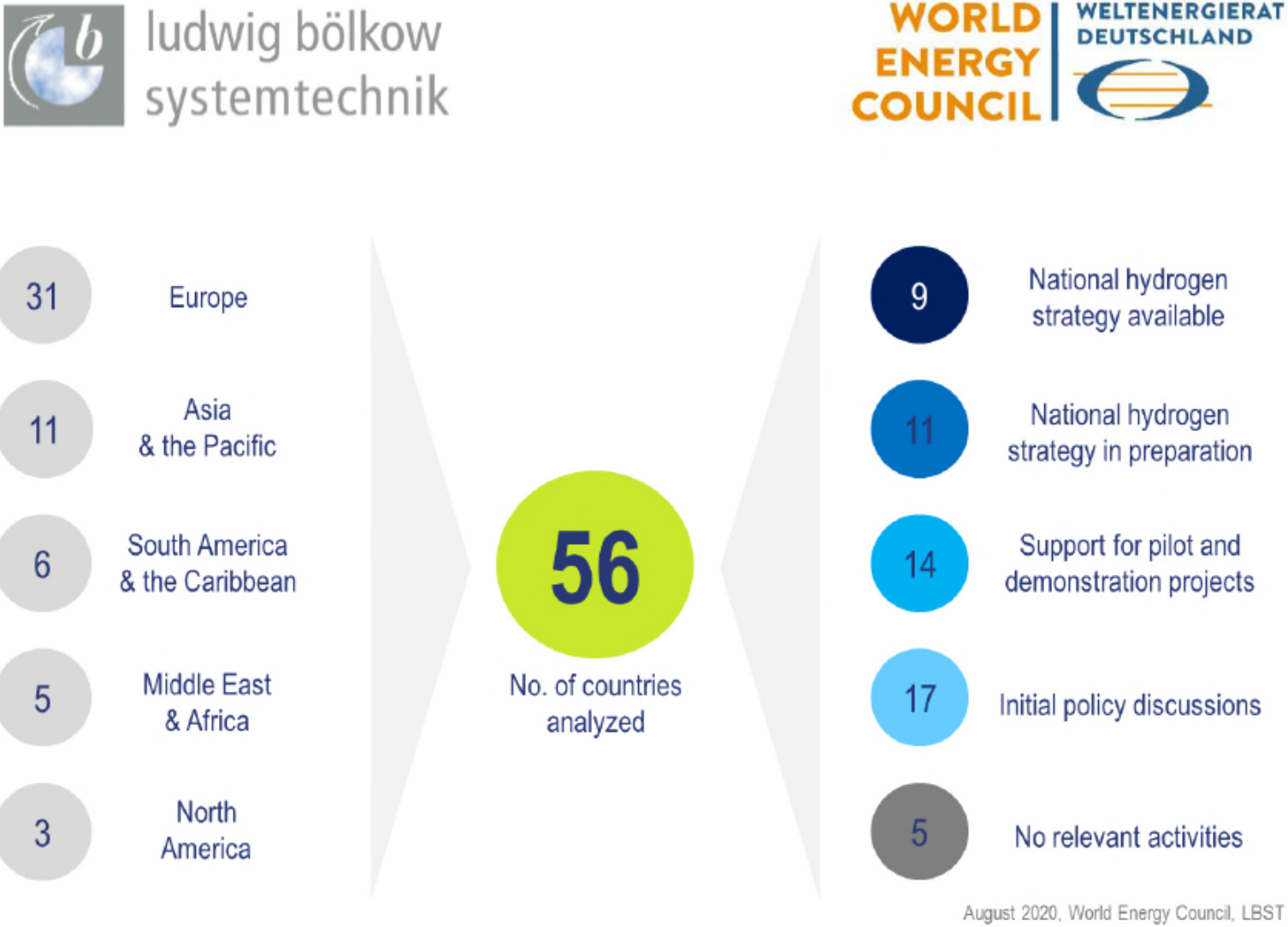
The EU will invest not less than 470 billion € in the hydrogen-economy till 2050.

Japan was first in 2017.

France started 2018.

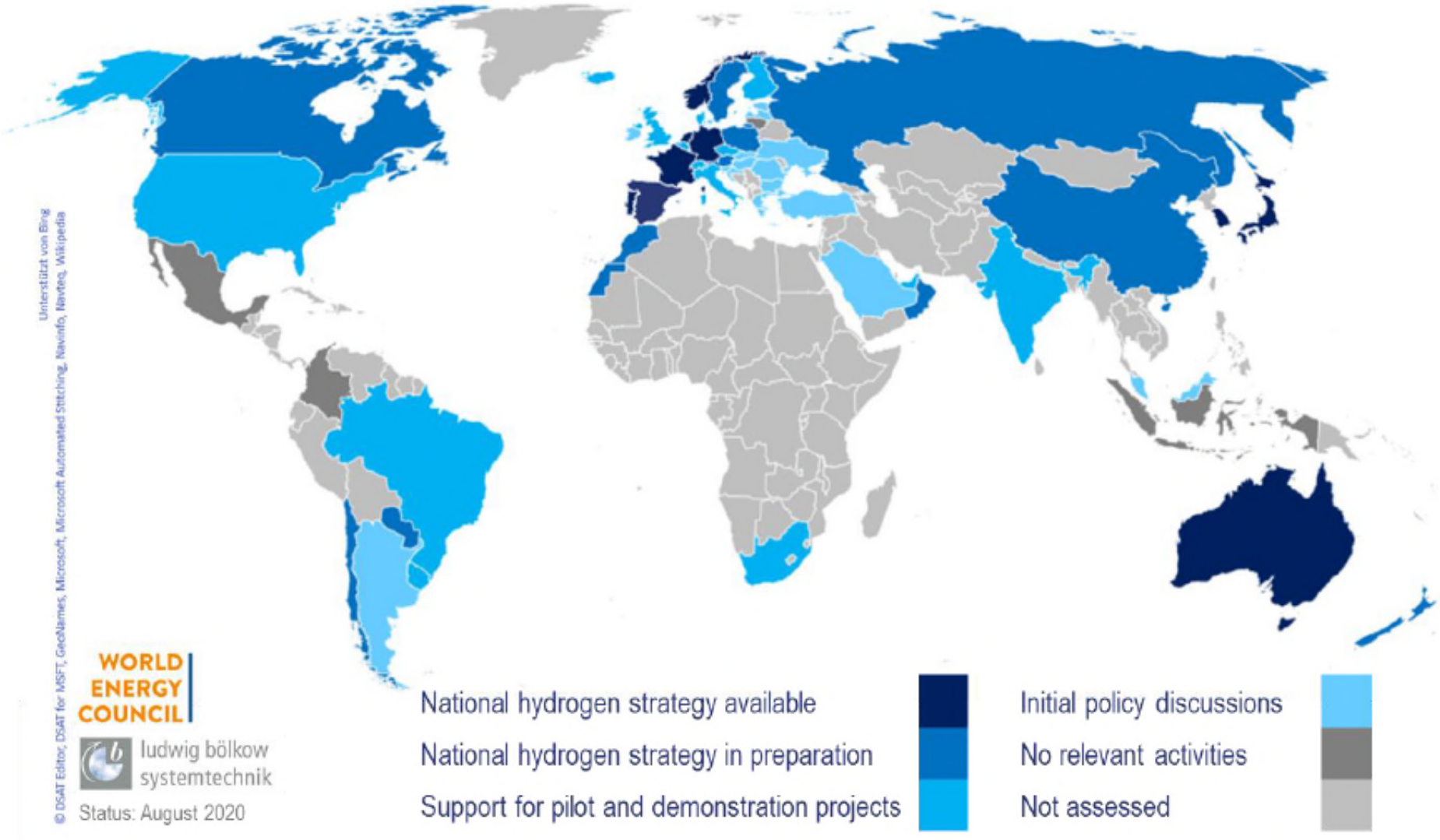
Germany started its hydrogen strategy with a lot of money 2020.

# “HYDROGEN COUNTRIES”



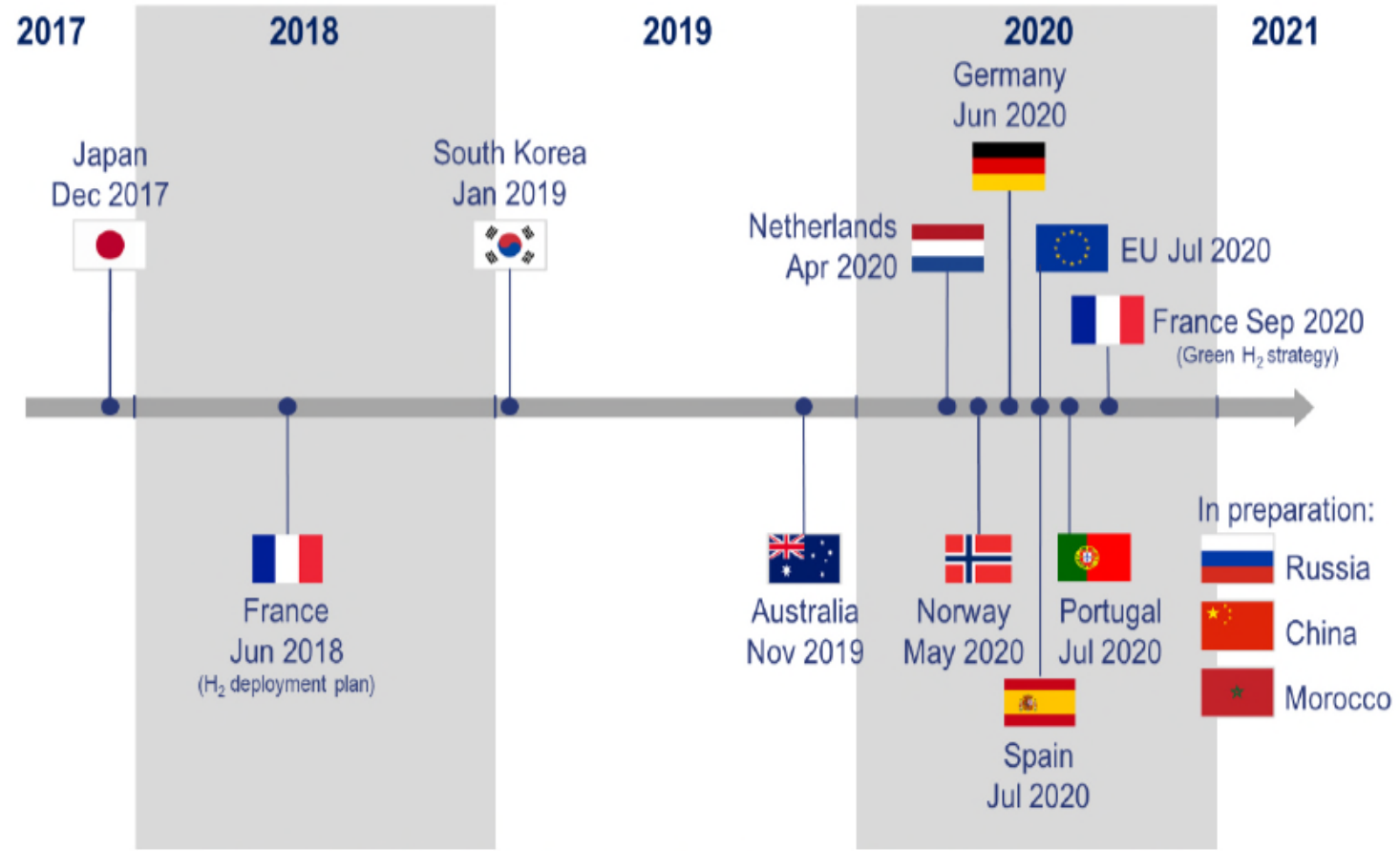

**Analysis of 56 countries for their hydrogen activities (August 2020)**

# HYDROGEN ACTIVITIES WORLDWIDE




**Status of international hydrogen activities of national governments (August 2020)**

# NATIONAL HYDROGEN STRATEGIES




**Timeline of analysed national hydrogen strategies publication**

The North-West region of Germany in co-operation with others will become a platform and an example for a big scale

**Hydrogen Economy**

with strong sector coupling (electricity, street traffic and logistics, trains, steel mills, cement factories, buildings, heating systems etc.).

.....

Another one, the **newest** German project is "Aquaventus" and placed on and around the island of Helgoland in the German Bight of the North Sea.

Till 2035 Offshore Windparks shall be installed around it having a capacity of 10 GW (more than all old ones together)

and producing **1 Mio tons of Hydrogen per year**

transported onshore through a pipeline for use and/or storage in one of the existing huge caverns in salt stocks in Germany with volumes > 100.000 $m^3$ .

# GREEN HYDROGEN is the key for

fulfilling the demands of the citizens
in the long after pandemic term till 2050
to reach the limit of

1.5 °C

in heating up the atmosphere.

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