Enerdata

March
8

30 years ago | 30 years from now

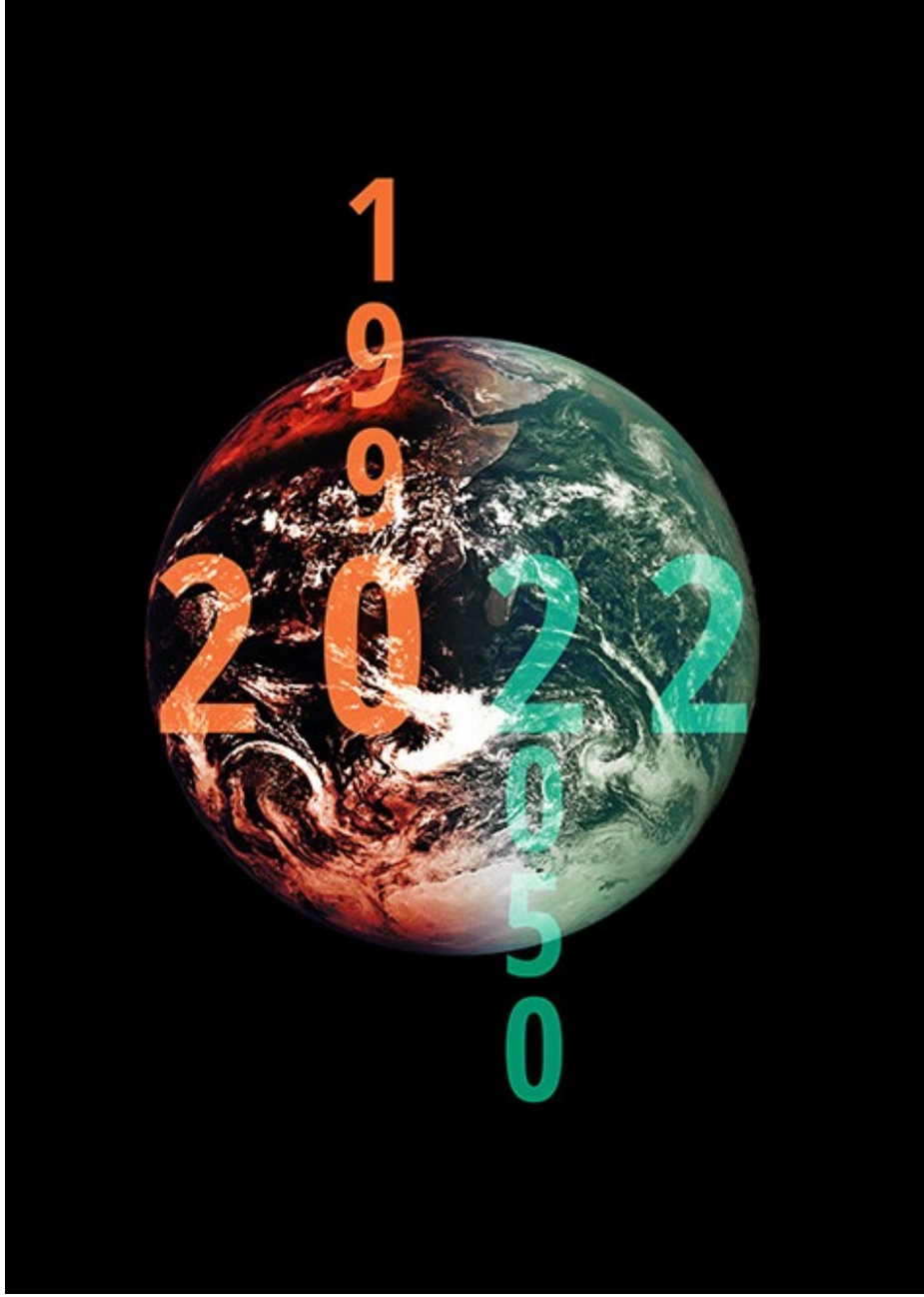
A WORLD OF ENERGY REVOLUTIONS

1990-2022-2050: Sixty years of global economy & energy transitions

AN EVENT
GRENOBLE
winner 2022
EUROPEAN
GREEN CAPITAL
An initiative of the European Commission

A WORLD OF ENERGY REVOLUTIONS

- 30 years of energy and climate expertise to support clients and partners
- 30 years of data science, modelling and forecasting, intelligence and research
- 30 years seems like a perfect timing for observing our moving world



CONFERENCES SCHEDULE

March 8th - Sixty years of global economy and energy transitions

March 15th - Energy systems in a deep decarbonisation future

March 22nd - New energy demand trends in the North and South

March 29th - The energy transition, a challenge for all of us!

Chair

Marie ROUSSELOT

Energy Efficiency & Demand Department Manager

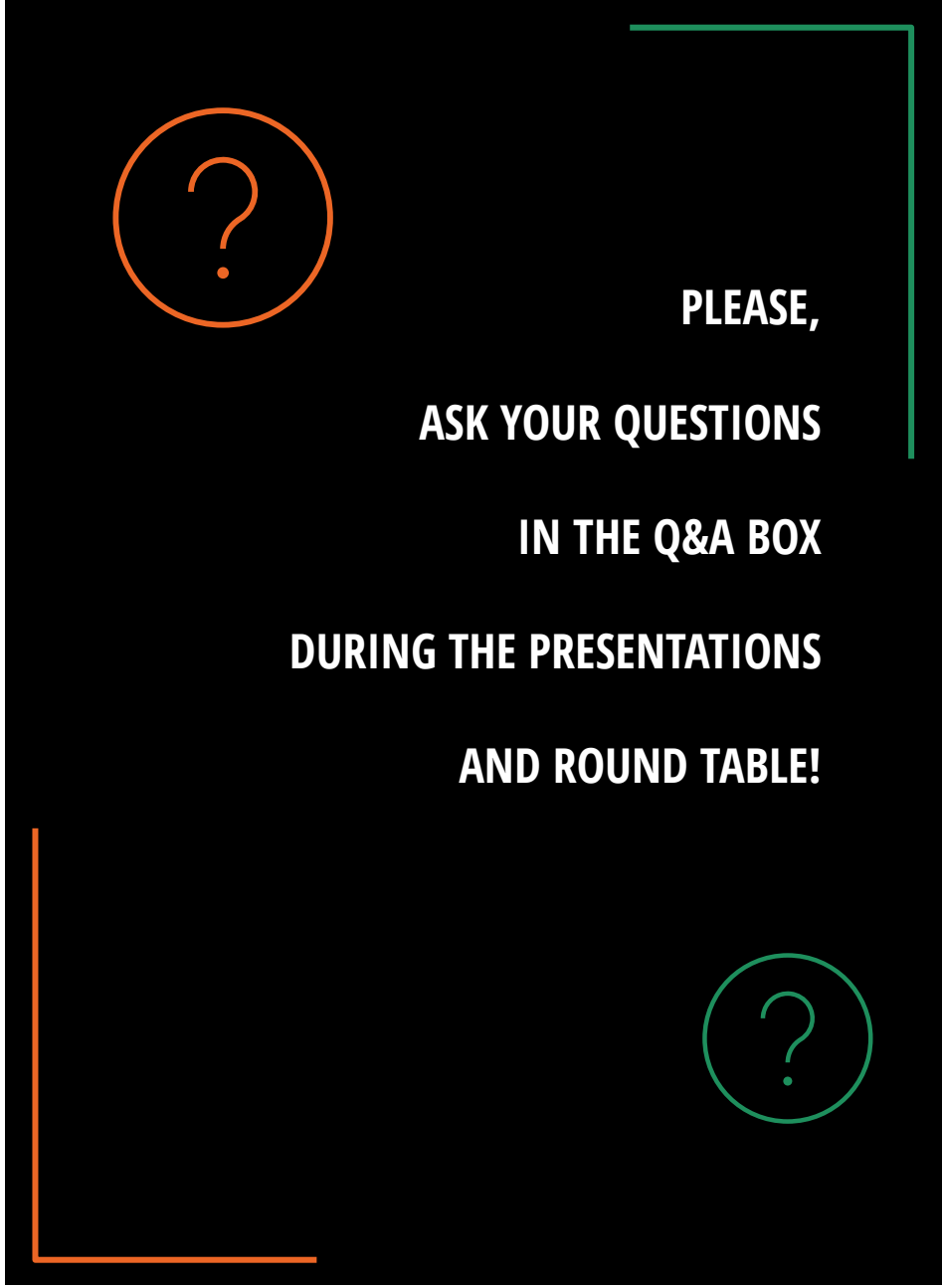
Enerdata

Sixty years of global economy and energy transitions

SPEAKERS TOPICS

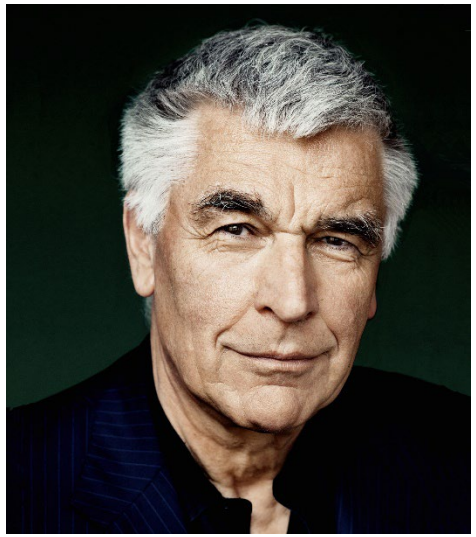
- major changes of the energy system and the energy world projections in 2050
- past trends and expected changes in the dynamics of the world economy
- climate policies currently undertaken in the G20 countries and diagnostic on the needs for reinforcing policy initiatives ends and expected changes in the dynamics of the world economy

ROUND TABLE



SPEAKERS

Quentin BCHINI
Project Manager
Global Energy Forecasting Department
Enerdata



Gerd LEIPOLD
Director
Climate Transparency

Patrick CRIQUI
Research Director
CNRS & University Grenoble Alpes

Major changes of the energy system and the energy world projections in 2050

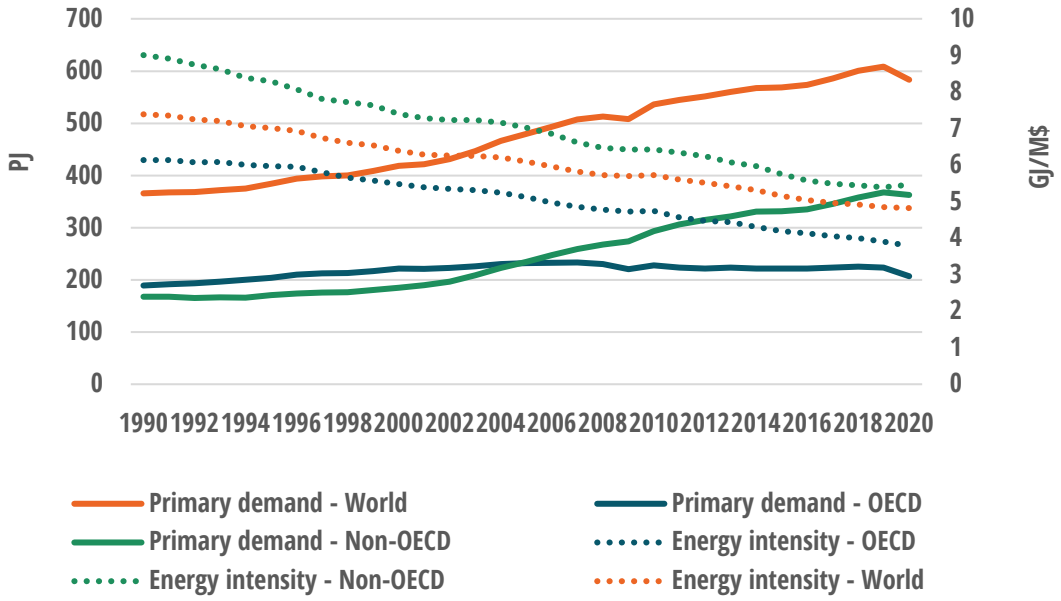
Quentin BCHINI
Enerdata

Primary energy demand since 1990

- Global primary energy demand has increased by 60% since 1990
- In the same time, GDP* and population increased by 145% and 50% respectively ⇨ moderate trend of improvement regarding energy intensity of the global economy
- Demand in emerging economies has more than doubled since 1990, while OECD countries have seen a relative stabilization during that period

* GDP (Gross Domestic Product) at constant power purchasing parity

Global and regional primary demand and energy intensity (1990-2020)



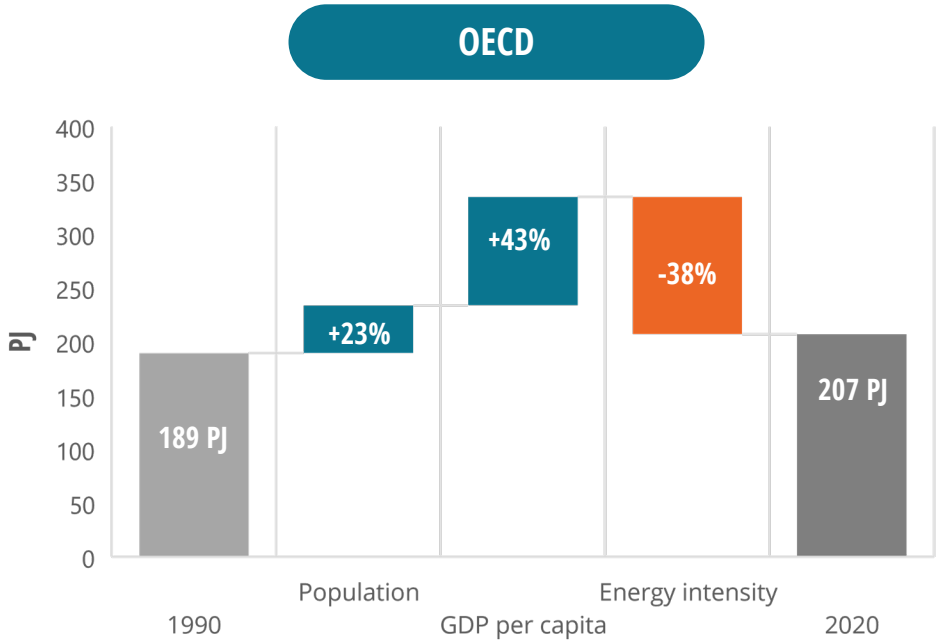
Source: Enerfuture, Global Energy Forecasting

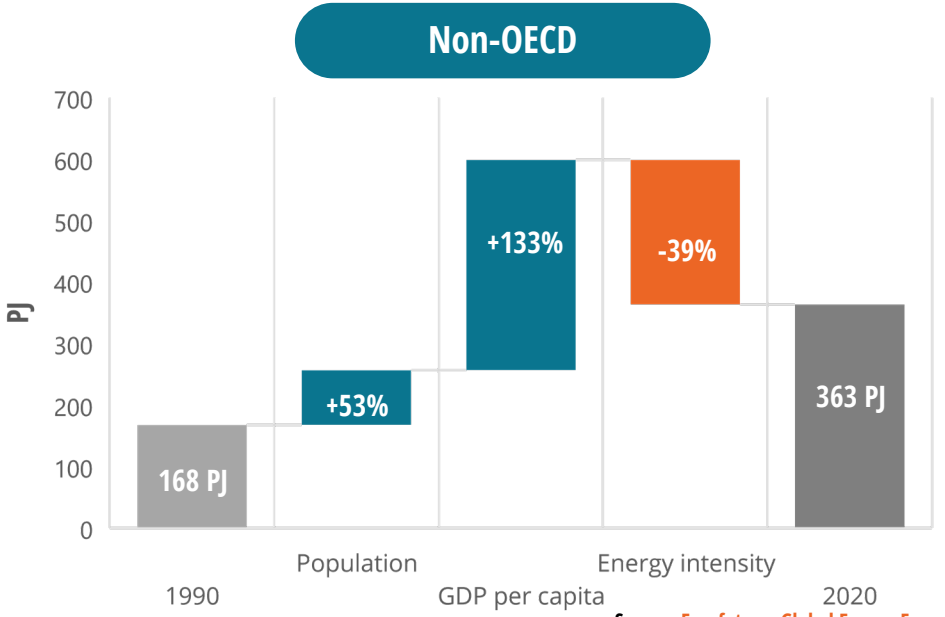
Main drivers to energy demand

- $Energy\ consumption = Population * \underbrace{\frac{GDP}{Population}}_{\textbf{GDP per capita}} * \underbrace{\frac{Energy\ consumption}{GDP}}_{\textbf{Energy intensity}}$

- The main driver behind the increase in energy demand since 1990 has been the economic growth, particularly in emerging economies

- Significant reductions in energy intensity are typically observed, but are not necessarily reflective of explicit measures to decrease energy efficiency





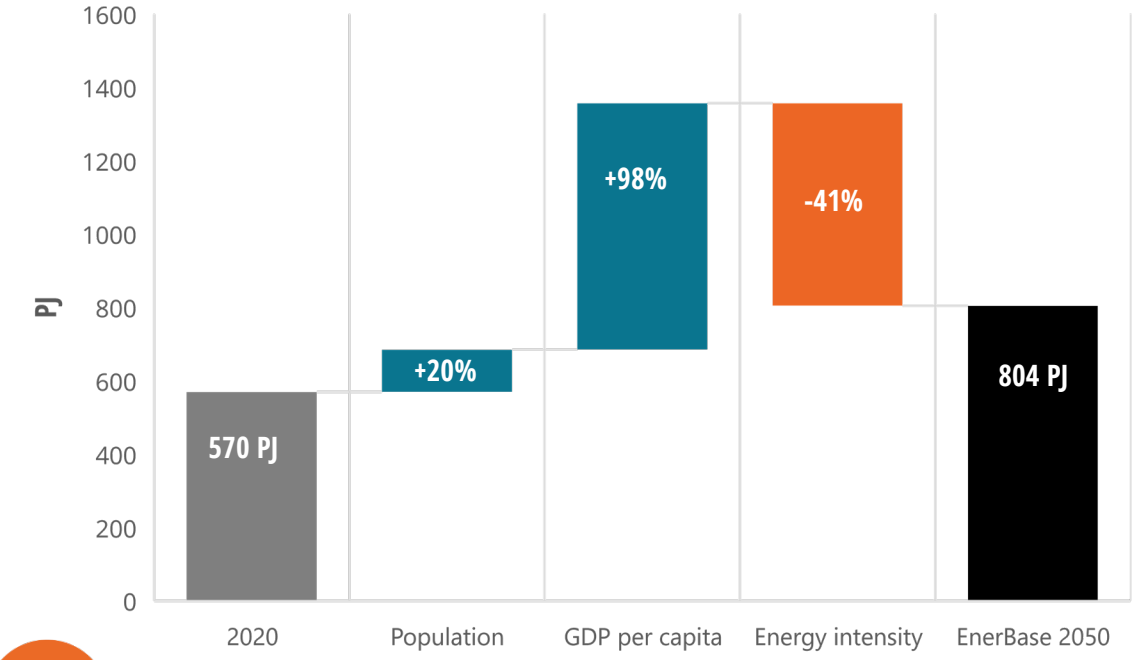
Source: Enerfuture, Global Energy Forecasting

Energy demand and emissions driven by economic and population growth

- Global energy demand in a base case scenario (EnerBase) is expected to rise by at least 40% between 2020 and 2050

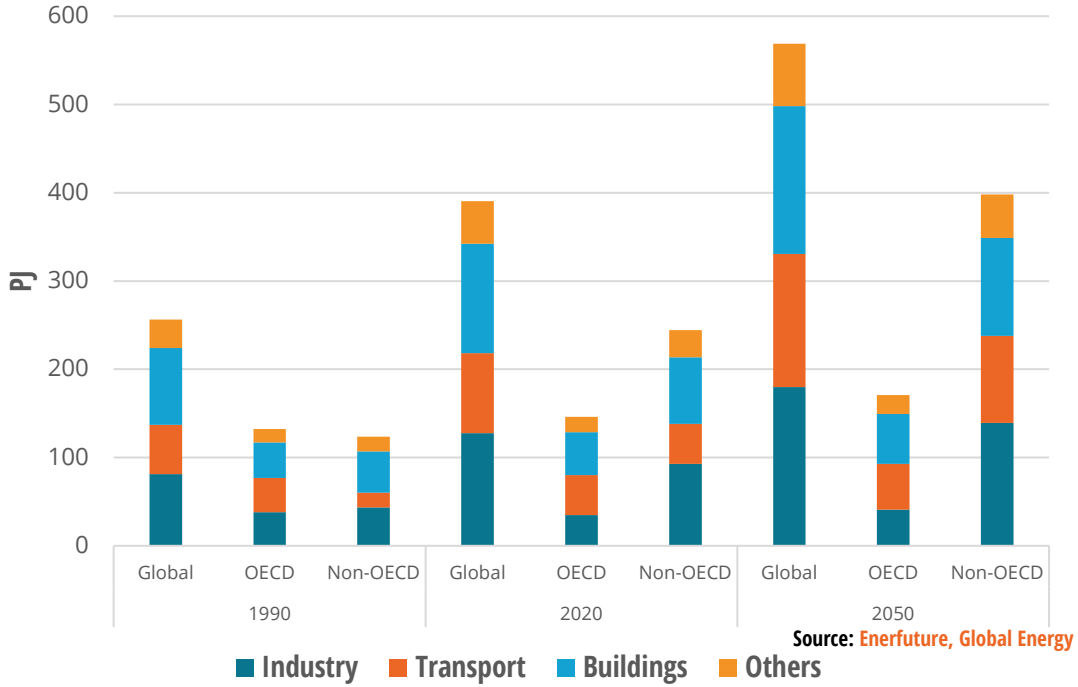
- Final energy demand increases by almost 50%, with emerging economies accounting for 70% of global consumption (vs. 50% in 1990 and 63% in 2020)

Global primary energy demand (2020-2050, EnerBase scenario)



Source: Enerfuture, Global Energy Forecasting

Global and regional final consumption by sector



Source: Enerfuture, Global Energy Forecasting

EnerFuture scenarios: key indicators

EnerBase: existing measures, extrapolation of historic trends

EnerBlue: additional realistic measures, aligning with NDC (Nationally Determined Contributions) emission targets

EnerGreen: scenario compatible with a temperature increase below 2°C

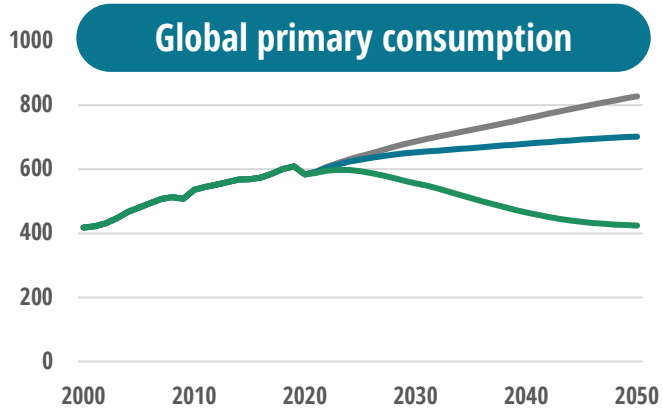
Average evolution (%/a)	1990 - 2020	*2010 - 2020*	2020-2050		
			+5-6°C	+3-4°C	+2°C
Carbon intensity	-1.5%	*-2.1%*	-1.9%	-3.0%	-7.3%
Energy intensity of GDP (final)	-1.4%	*-1.7%*	-1.6%	-2.1%	-3.7%
Carbon factor	-0.1%	*-0.4%*	-0.3%	-0.9%	-3.7%

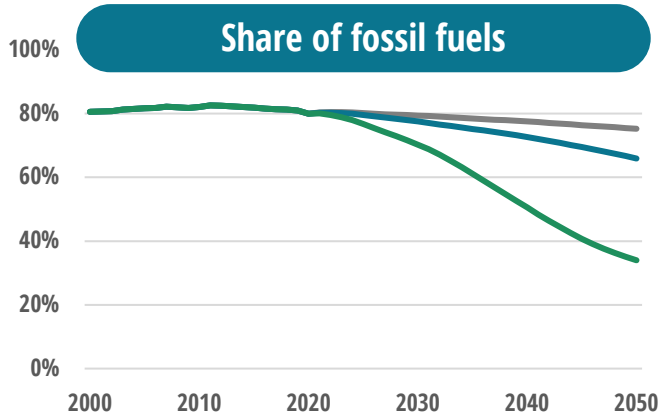
CO_2 emissions released to produce one unit GDP

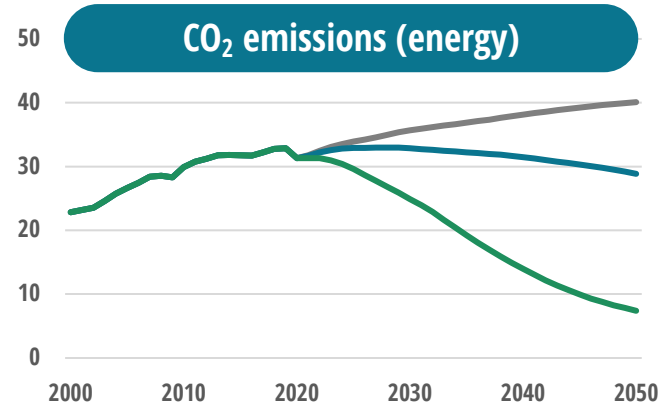
Energy consumption necessary to produce one unit of GDP

CO_2 emissions released for an average unit of energy consumption

Source: Enerfuture, Global Energy Forecasting







Source: Enerfuture, Global Energy Forecasting

A need to act on decoupling growth and energy consumption

- Energy consumption :
  - **1990-2020**: driven by economic and demographic growth
  - **2020-2050**: same trends in the absence of meaningful measures to further decouple GDP and energy consumption

- Credible deep-decarbonisation pathways: major behavioural and technical transformations on the energy demand

- To maintain an increase < 2°C by 2100: accelerate the decrease of energy intensity compared to the last 30 years

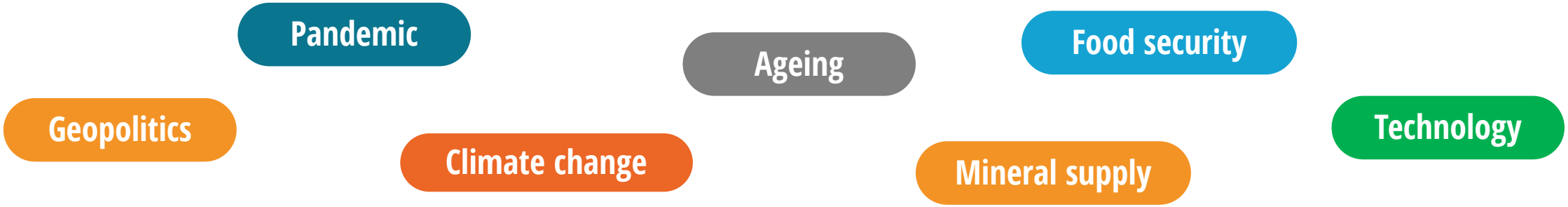
The world economic and energy system in perspective: momentum and ruptures

Patrick CRIQUI
CNRS-UGA, Enerdata

Enerdata

A long term view on the world economy (from CEPII « Horizon 2050 »)

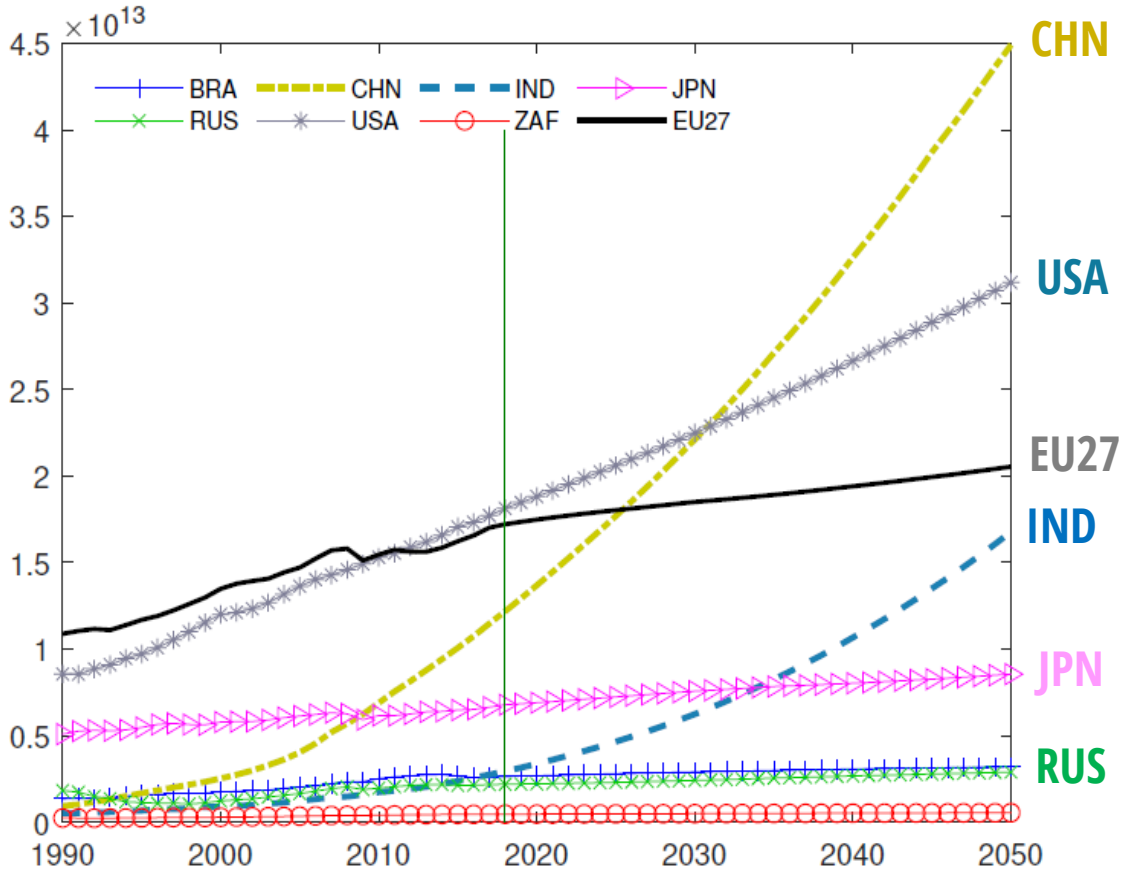
- Global crises impact the dynamics of the world economy with uncertainties



- Fundamental drivers to be considered and modelled to understand the long term dynamics

A long term view on the world economy (from CEPII « Horizon 2050 »)

Figure 2: GDP evolution (at constant 2011 USD)



Source CEPII: dec 2021, MaGE model (Macroeconomics of the Global Economy)

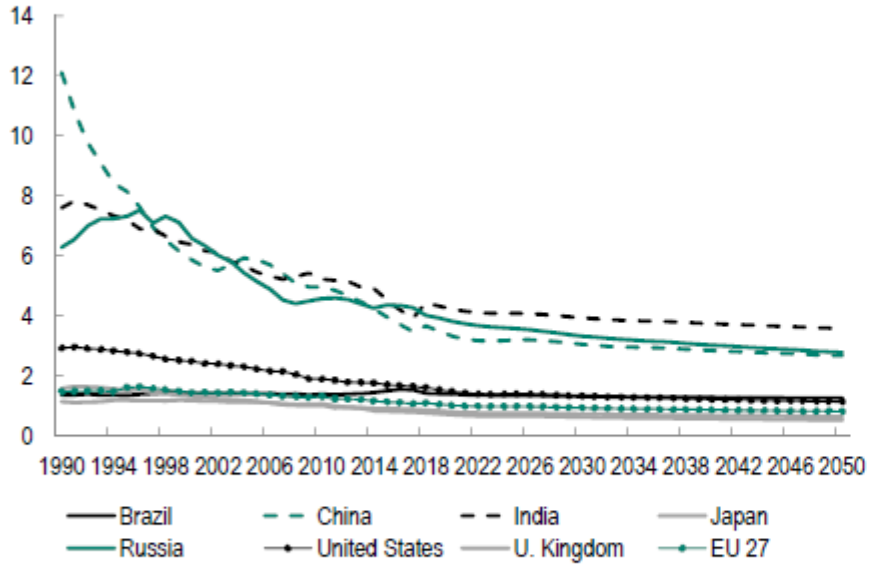
Table 9: Long-run projections' ranking of GDP (constant 2011 USD) for the 40 largest economies

	1990		2020			2050		
	Country	10^{12}	Country	10^{12}	Rank	Country	10^{12}	Rank
1.	United States	8.55	United States	18.8	=	China	44.8	+1
2.	Japan	5.08	China	13.6	+8	United States	31.1	−1
3.	Germany	2.73	Japan	6.90	−1	India	16.8	+2
4.	France	2.00	Germany	4.31	−1	Japan	8.55	−1
5.	Italy	1.86	India	3.37	+10	Germany	5.35	−1
6.	Russian Feder.	1.82	U. Kingdom	3.17	+1	U. Kingdom	5.04	=
7.	U. Kingdom	1.71	France	3.12	−3	Nigeria	4.66	+17
8.	Brazil	1.38	Brazil	2.67	=	Indonesia	4.06	+8
9.	Canada	1.00	Russian Feder.	2.21	−3	France	3.97	−2
10.	China	0.93	Italy	2.19	−5	Turkey	3.26	+7

A long term view on the world economy (from CEPII « Horizon 2050 »)

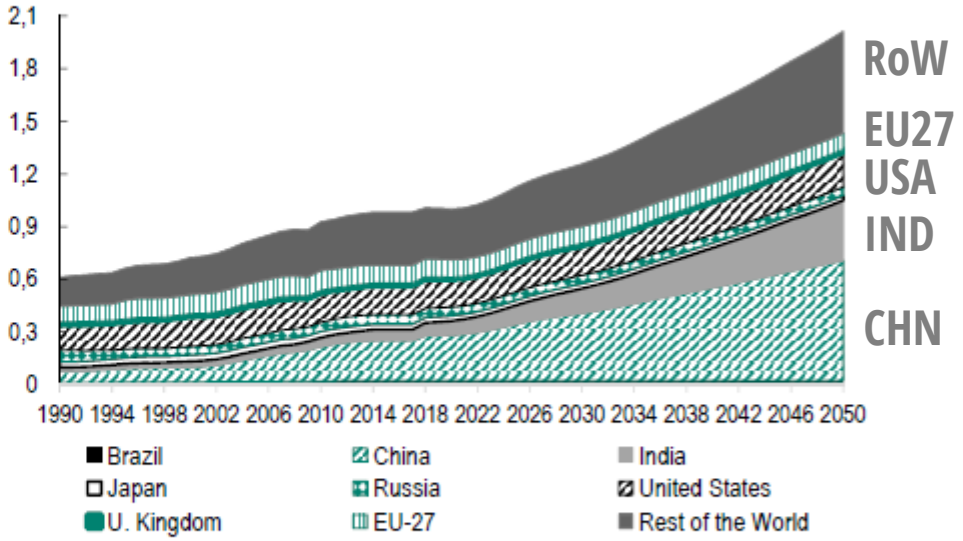
- Without additional policies and in spite of continuous energy intensity gains, world energy consumption will double between today and 2050
- Keeping up with the Paris agreement target will imply reinforced action for more sufficiency, energy efficiency and deep decarbonisation of supply

Figure 2 – The decrease in energy intensity is far from negligible…
Energy consumption to GDP in relation to that of the EU-27 in 2020



Interpretation: In 2020, energy consumption per unit of GDP was 3.3 times higher in China than in the EU-27. In 2050, producing one dollar of Chinese GDP is still expected to require 2.7 times more energy than producing one dollar of EU-27 GDP in 2020. It required 12 times more in 1991.

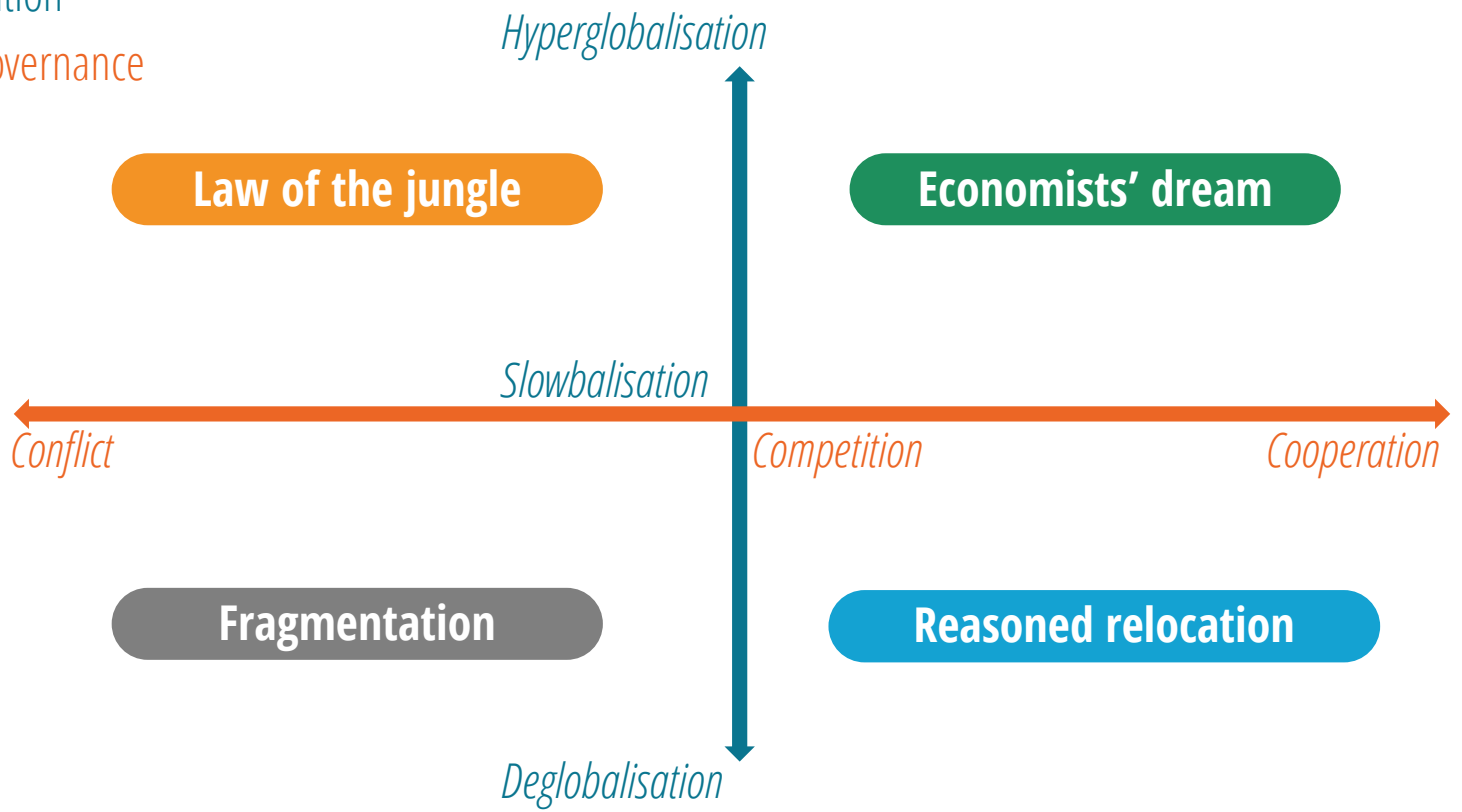
Figure 3 – … but energy efficiency gains cannot prevent a doubling of global energy consumption
Energy consumption with respect to the world 2020 value



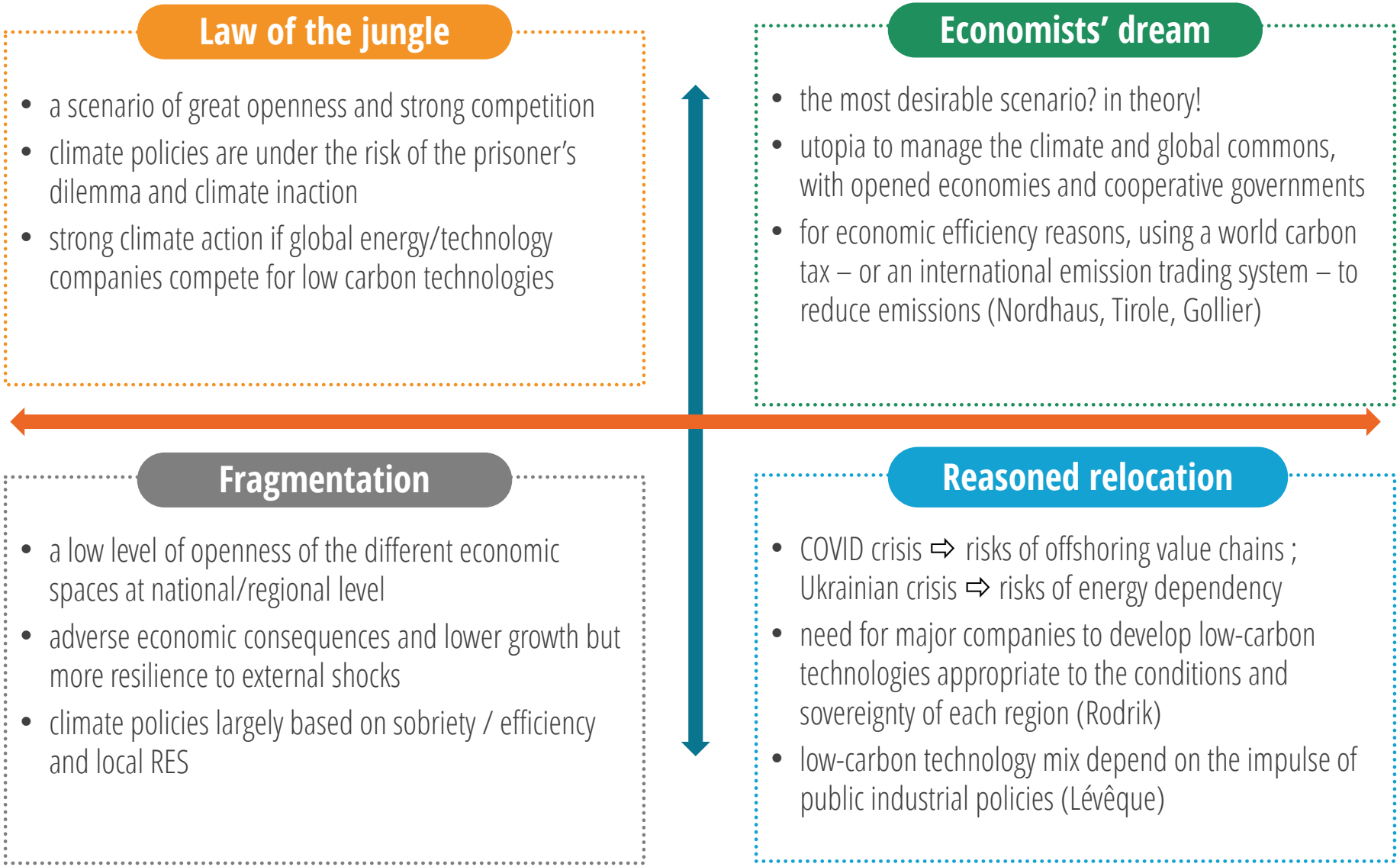
Source: Authors' calculations based on the EconMap 3.1 database.

Momentum and ruptures: what perspectives for the world economy?

- Ruptures are needed in the economy and energy-climate policies
- Future trends will depend on:
  - The pursuit or slowdown of economic integration
  - The degree of cooperation in international governance



Which climate policies for which state of the world?



Please look up!

- Since the end of WWII, the world has probably never been more uncertain than today
- The COVID and Ukraine crises are outbursts that implied drastic changes, respectively for health (and fiscal) policies and for energy independence policies
- Climate change is a slower burning problem, but its consequences might be still more devastating… and we are aware in advance!
- There is thus an emergency to find the right combination of economically efficient and socially acceptable solutions for each political space

Climate policy? Quo Vadis?

4 DRIVERS – 4 CHALLENGES

Gerd LEIPOLD
Climate Transparency

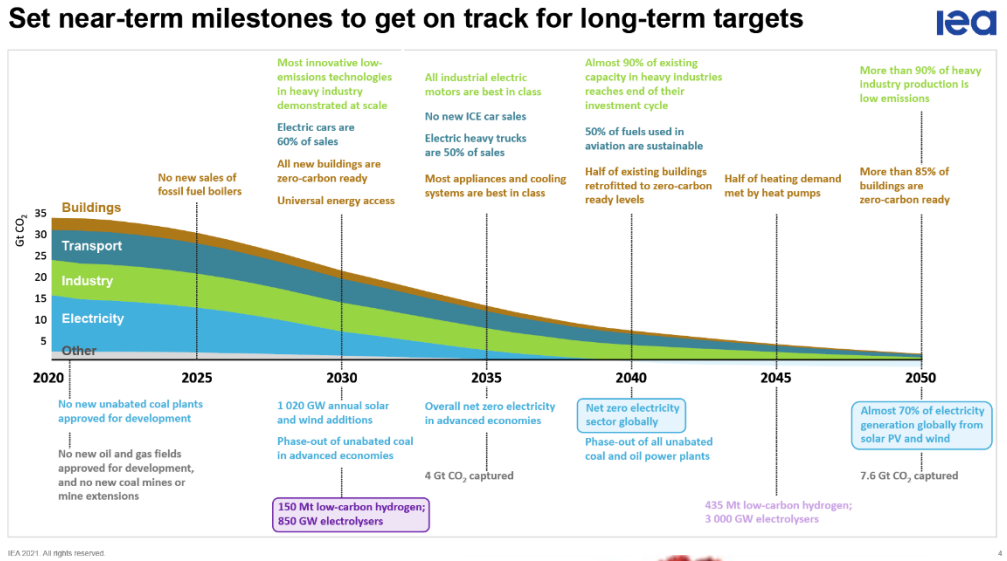
Enerdata

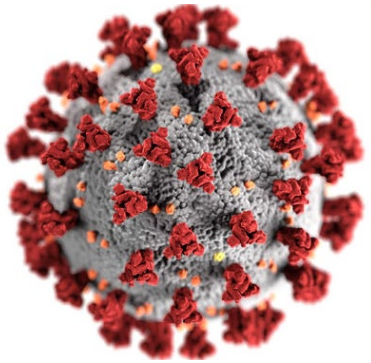
Four Drivers

- **The Paris Agreement 2015**
  - Smart architecture: top-down goal and bottom-up action
  - Enormous increase in climate policy since 2015
  - Net-zero announcements
- **The Youth Movement**
  - Created public movement and support
  - Established the 1.5 degree goal as the target
- **Science, technology and industry**
  - IPCC
  - Renewables are cost competitive
  - Sizable industry investments
- **Extreme weather events**

Four Challenges

- **Implementing and improving NDCs**
  - Increasing the ambition
  - Implementing and achieving goals
- **Realising the transition**
  - Credible pathway to mid-century net-zero emissions
  - 2030 targets compatible with mid-century target
- **Keeping continuity and momentum**
  - Public support is not guaranteed
  - Short-term crises will interfere
- **Achieving sustainability with present economic model**
  - Present economic model is not sustainable
  - ???





CONTACT: research[@]enerdata.net

HELPING YOU SHAPE THE ENERGY TRANSITION

About Enerdata:

Enerdata is an independent research company established in 1991, specializing in the analysis and forecasting of energy and climate issues, at world and country level.

Leveraging our globally recognised databases, intelligence systems and models, we assist our clients in designing their policies, strategies and business plans.

Thank you for your attention!

https://www.enerdata.net/