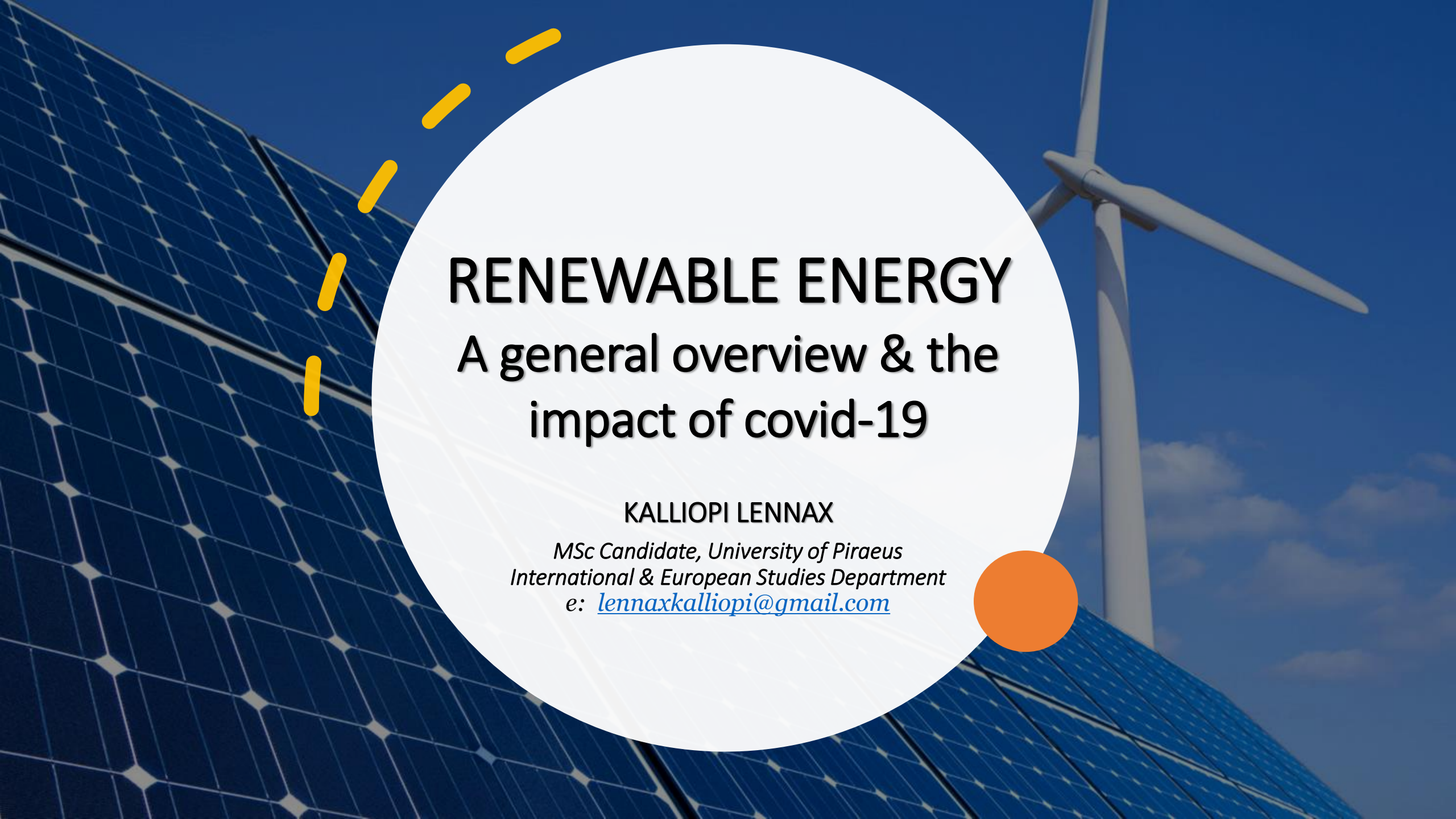

RENEWABLE ENERGY

A general overview & the impact of covid-19

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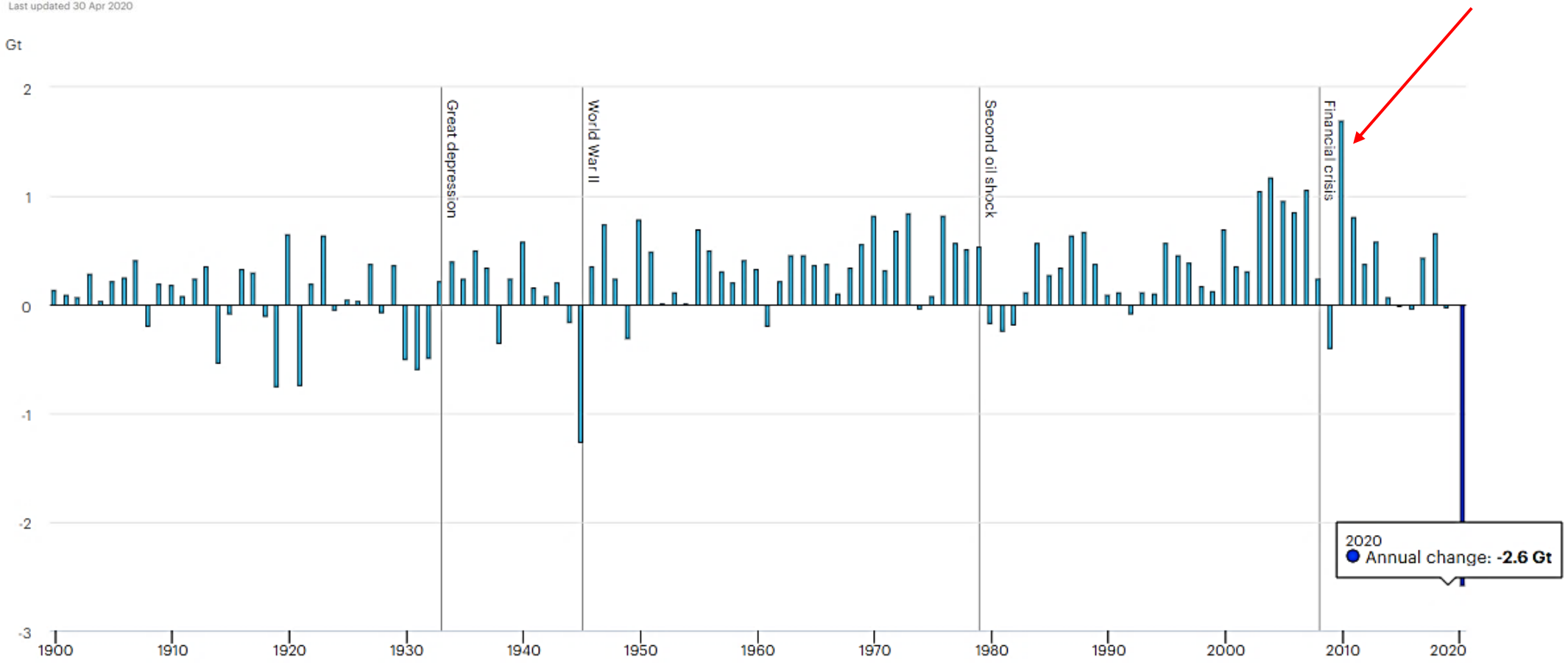
Annual change in global energy-related CO_2 emissions, 1900-2020

Last updated 30 Apr 2020



The impact of the Covid-19 crisis on clean energy progress – Analysis - IEA

New Delhi, India

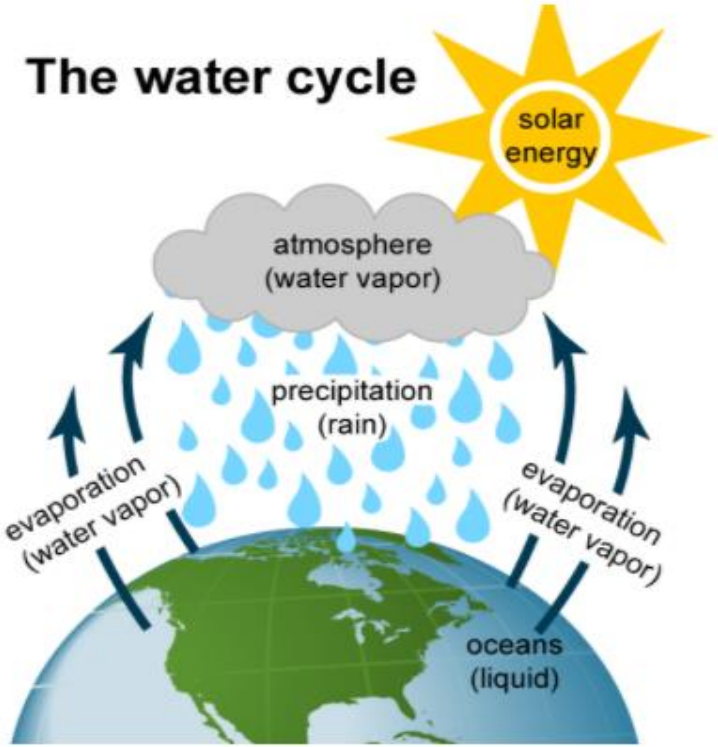
'It's positively alpine!': Disbelief in big cities as air pollution falls | Environment | The Guardian



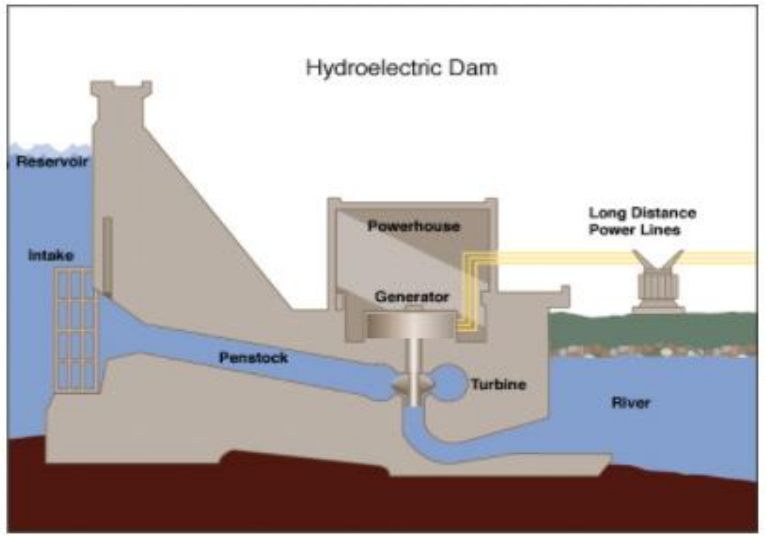



Types of renewables

Nuclear-generated electricity isn't renewable, but its generation emits (very) low levels of CO2, just like renewable energy sources.



Source: Adapted from National Energy Education Development Project (public domain)



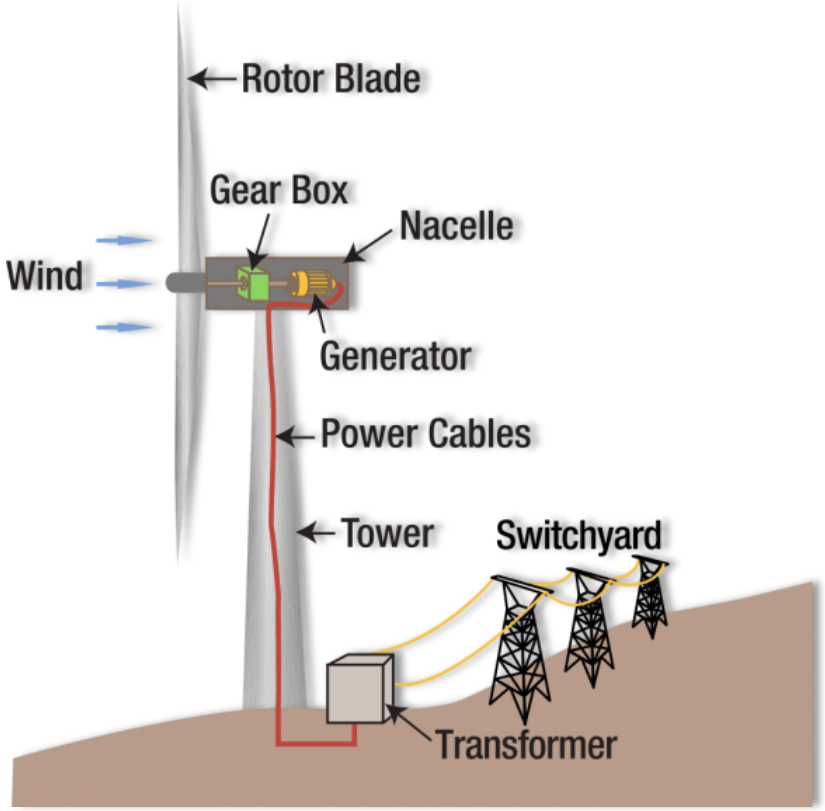
Source: Tennessee Valley Authority (public domain)

https://www.eia.gov/energyexplained/hydropower/

Hydropower relies on the water cycle

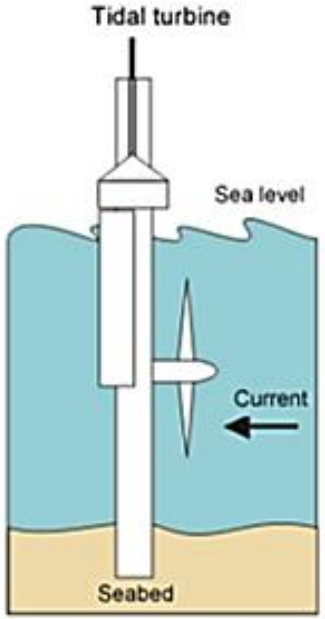
- The sun heats water on the earth's surface, which causes the water to evaporate.
- Water vapor condenses into clouds and falls as precipitation—rain and snow.
- Precipitation is collected in streams and rivers, which empty into oceans and lakes, where it evaporates and begins the cycle again.

The greater the water flow, the more electricity produced!



Barrage of the tidal power plant on the estuary of the Rance River in Bretagne, France

Source: Stock photography (copyrighted)

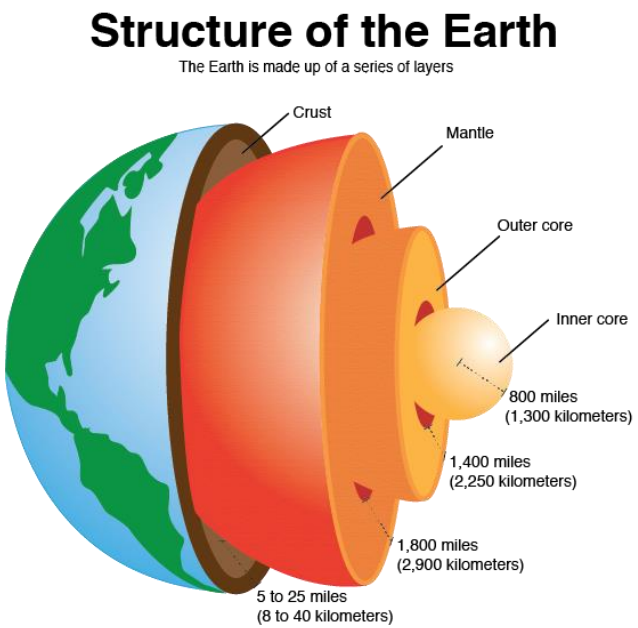


Source: Adapted from National Energy Educatic Development Project (public domain)

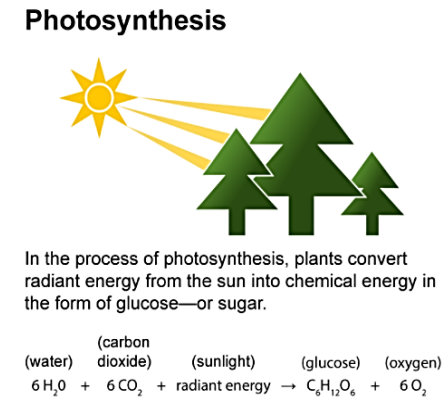
Tidal power - U.S. Energy Information Administration (EIA)

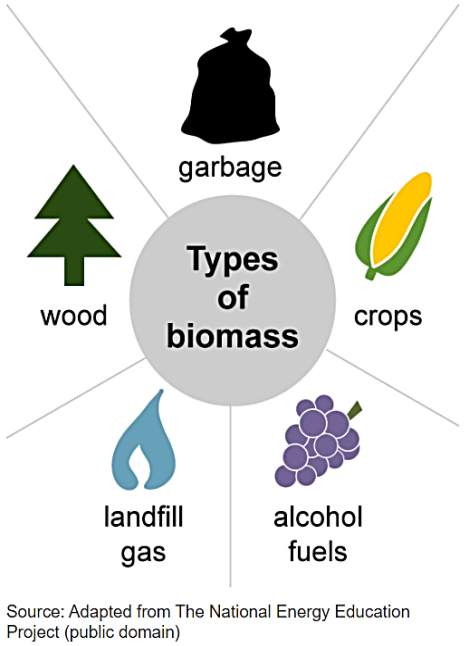
The main components of…

… a wind turbine and a tidal power plant.



Earth's inner core is solid, softer than thought: Study – Civilsdaily





Biomass explained - U.S. Energy Information Administration (EIA)

Geothermal…

and biomass energy!

What are top 10 advantages?

- Renewables are better for the environment
- We can rely on RES
- Renewable energy conserves natural resources
- There are lots of options to choose from
- Can reduce our energy bills
- Can increase energy security
- Renewable technology is usually low maintenance
- Can be used for both domestic and industrial use
- RE creates jobs
- Can provide power to remote locations

But also…

Potential to produce enormous amounts of energy

Rapid growth and decreasing cost

Considerably low amounts of waste

Low level greenhouse emissions

No long transportation distances of fossil fuels necessary

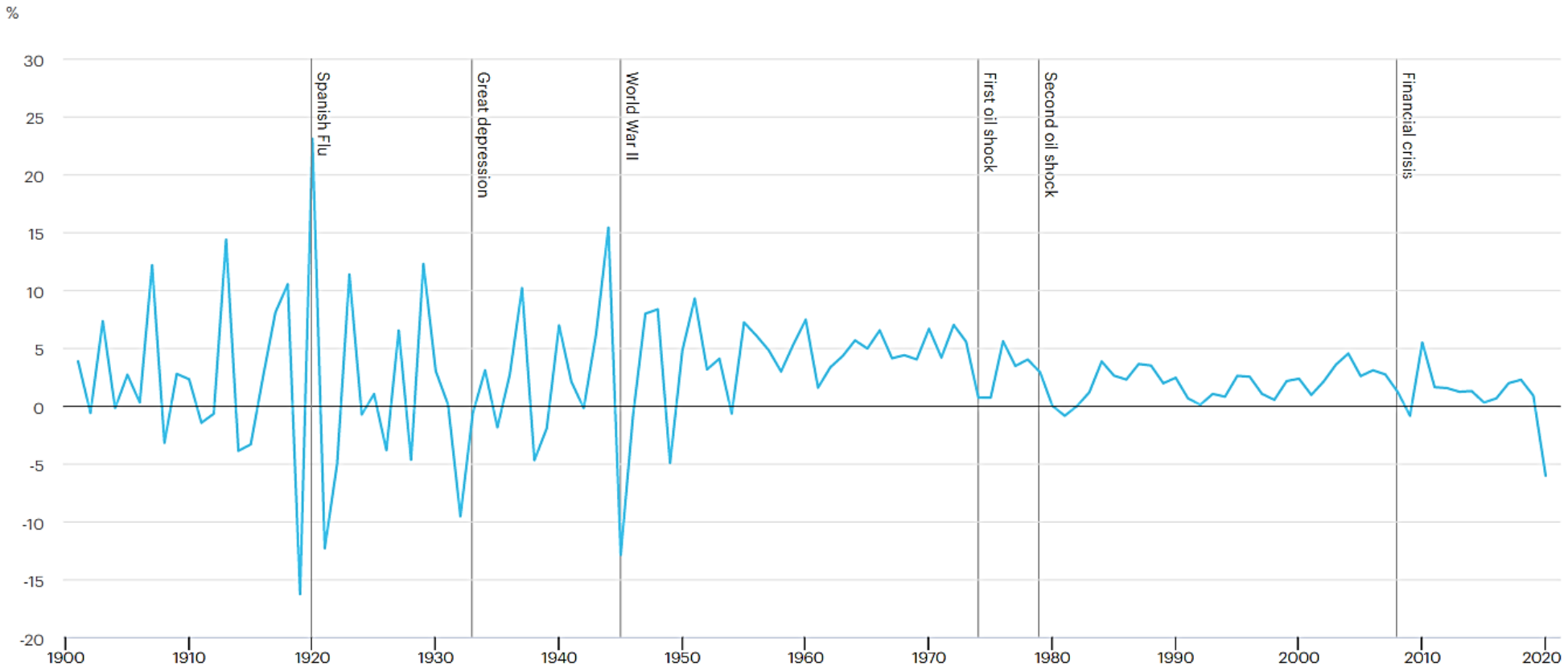
What are top 10 disadvantages?

1. Technology is expensive
2. RE is often weather dependent and unpredictable
3. Geographic limitations exist
4. RE is difficult to store
5. Renewable power plants require lots of space
6. It may cause destruction of habitats
7. Landscape destruction
8. Noise pollution
9. Construction of windmills may require time
10. Birds can be killed by wind turbines

How is covid-19 **negatively** affecting renewable energy?

Rate of change of global primary energy demand, 1900-2020

Open



Global energy and CO2 emissions in 2020 – Global Energy Review 2020 – Analysis - IEA

Projected change in primary energy demand by fuel in 2020 relative to 2019

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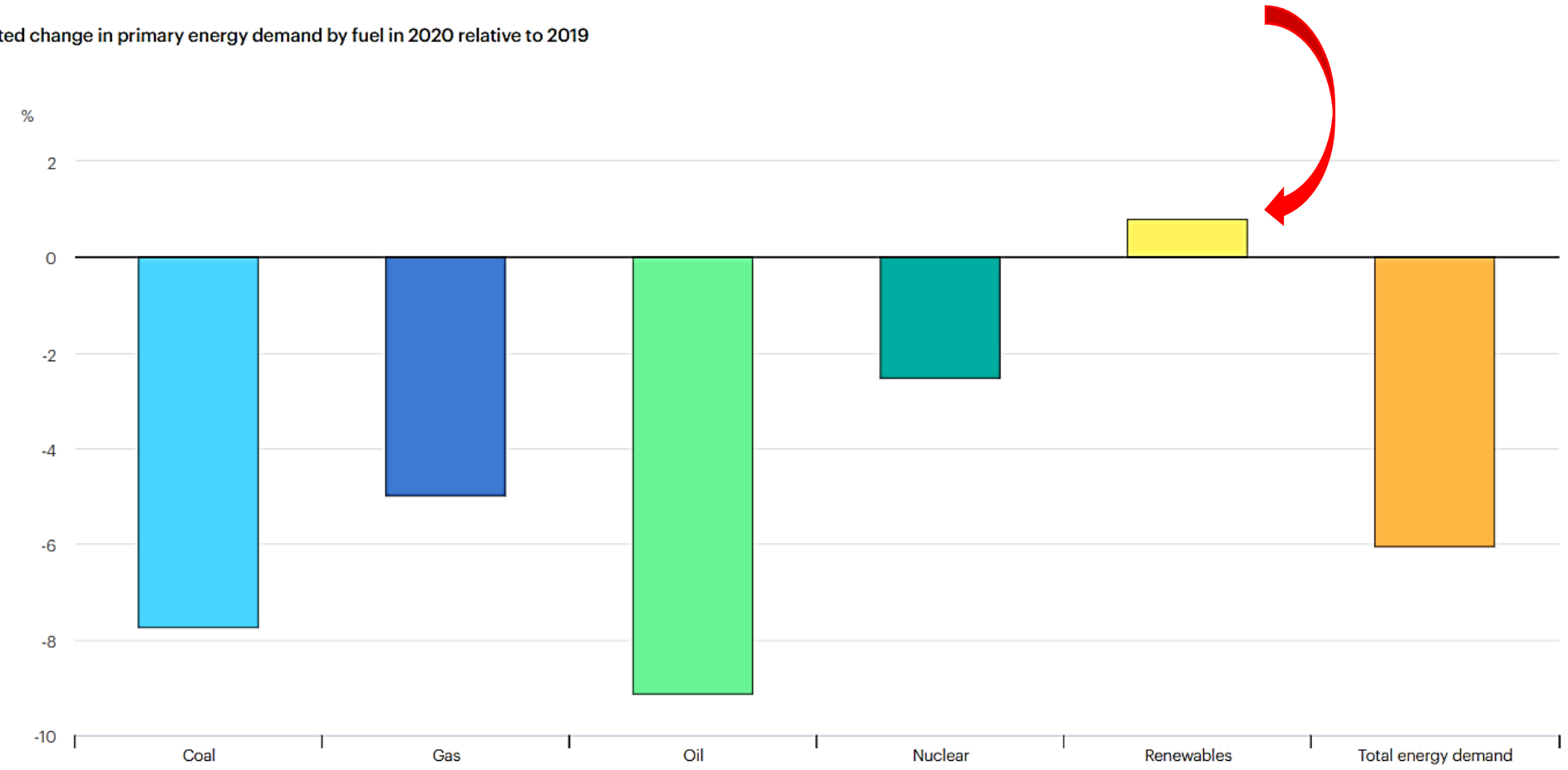

[Projected change in primary energy demand by fuel in 2020 relative to 2019 – Charts – Data & Statistics - IEA]

Renewable electricity capacity additions, 2007-2021, updated IEA forecast

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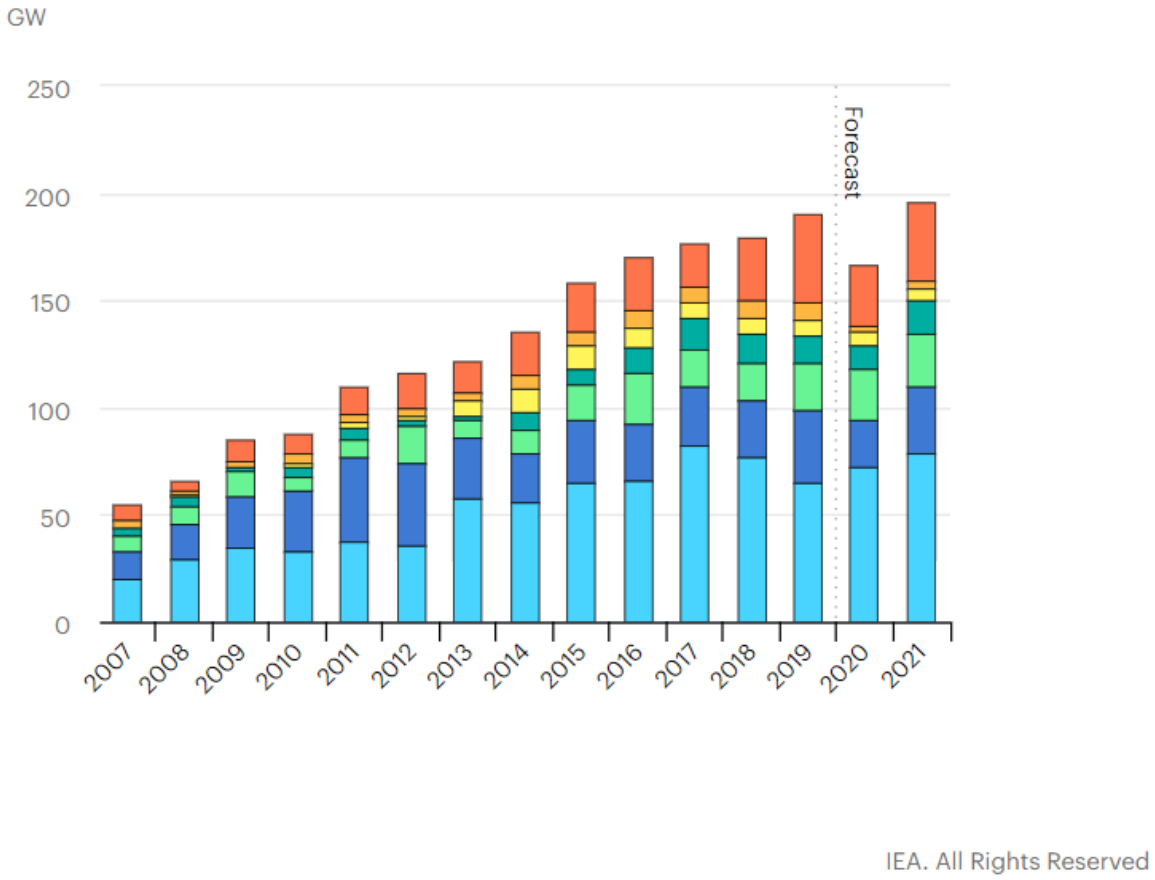
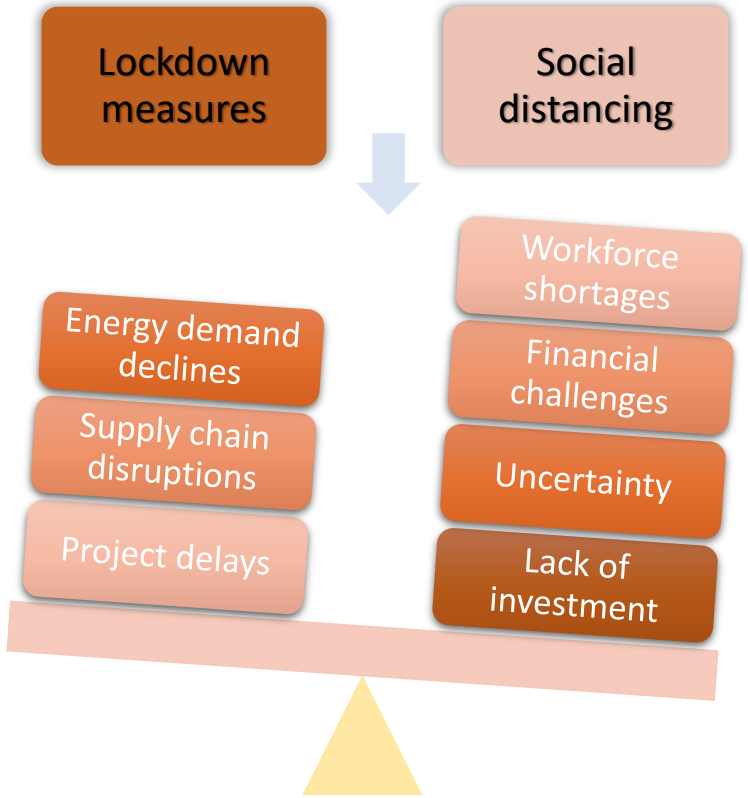
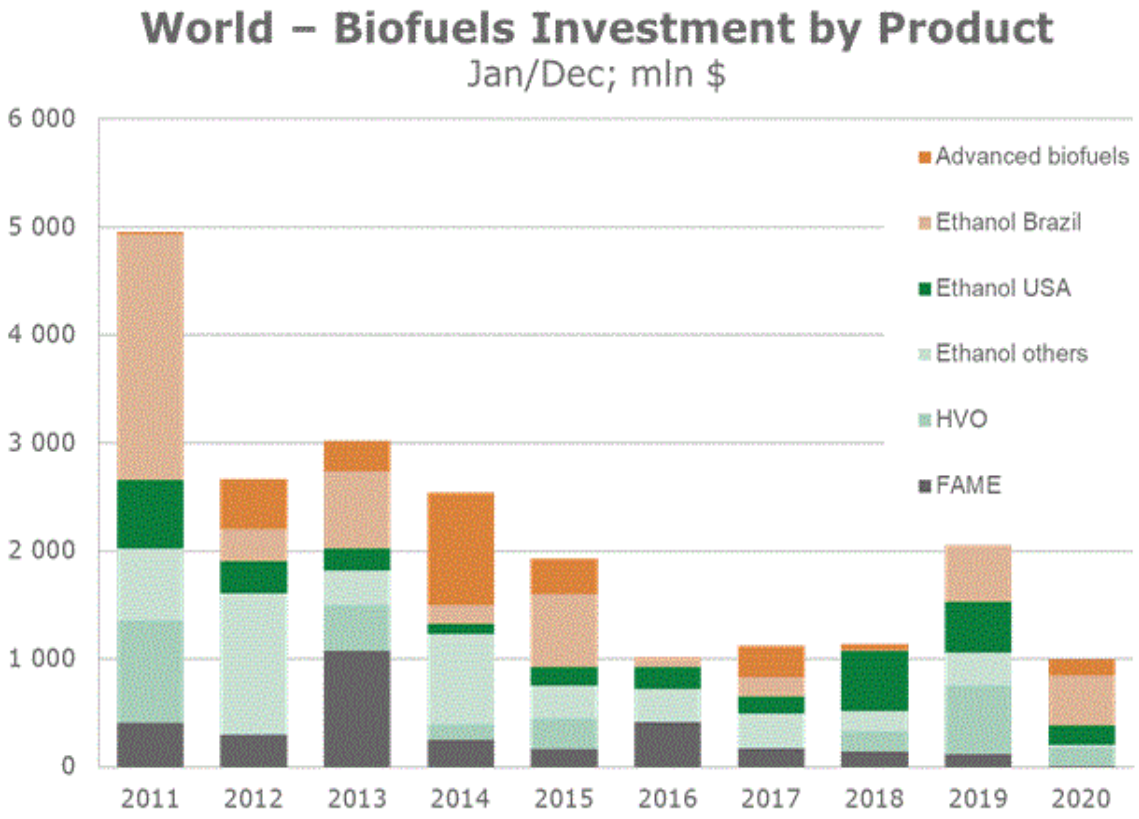


China Europe United States India Japan Brazil Rest of the world

[The impact of the Covid-19 crisis on clean energy progress – Analysis - IEA]



Transport biofuel production is expected to contract by 13% - its first drop in two decades.



Biofuels Dashboard 2020 | IFPEN (ifpenergiesnouvelles.com)

Global heating energy consumption

Y-o-y change in global and renewable heat consumption in industry and buildings, 2014-2020

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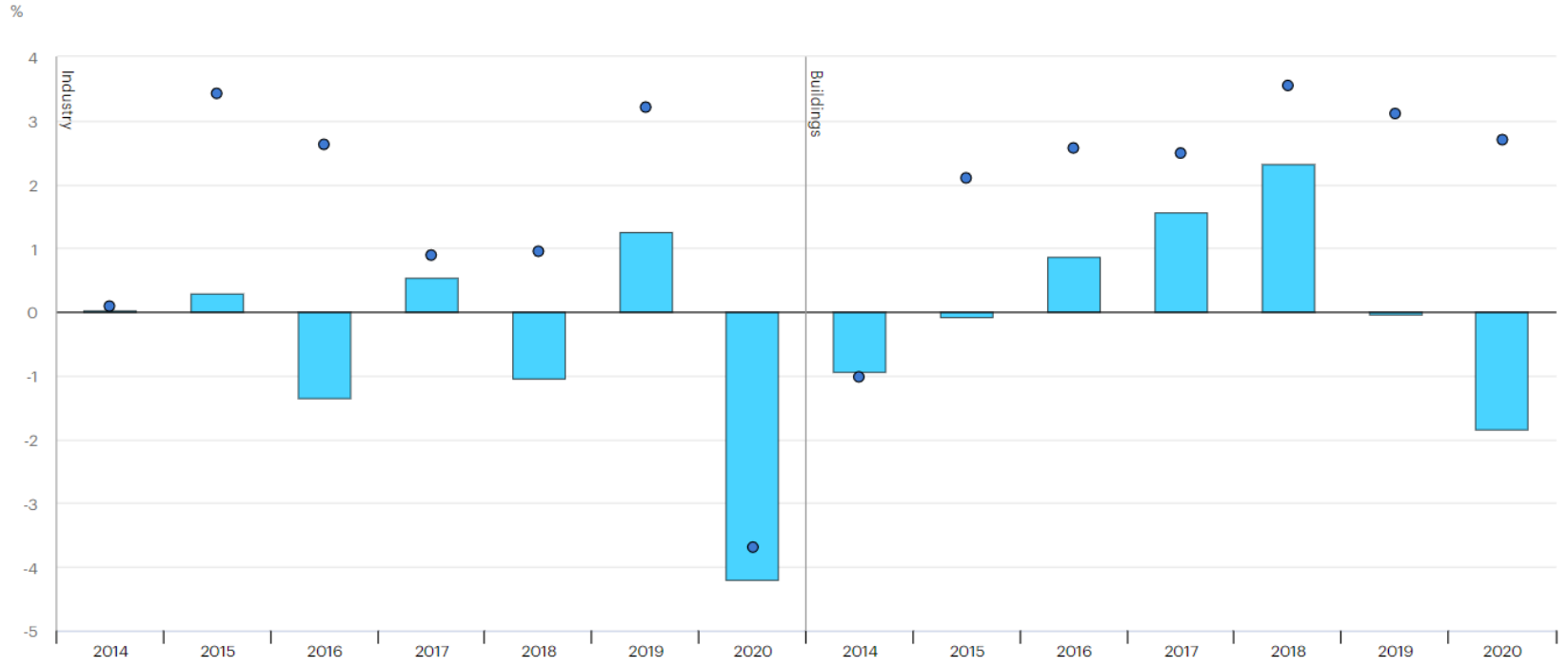

Change in total heat consumption Change in renewable heat consumption

Renewable heat – Renewables 2020 – Analysis - IEA

How is covid-19 **positively** affecting renewable energy?

Change in energy demand and renewables output in electricity, heat and transport, 2019 to 2020

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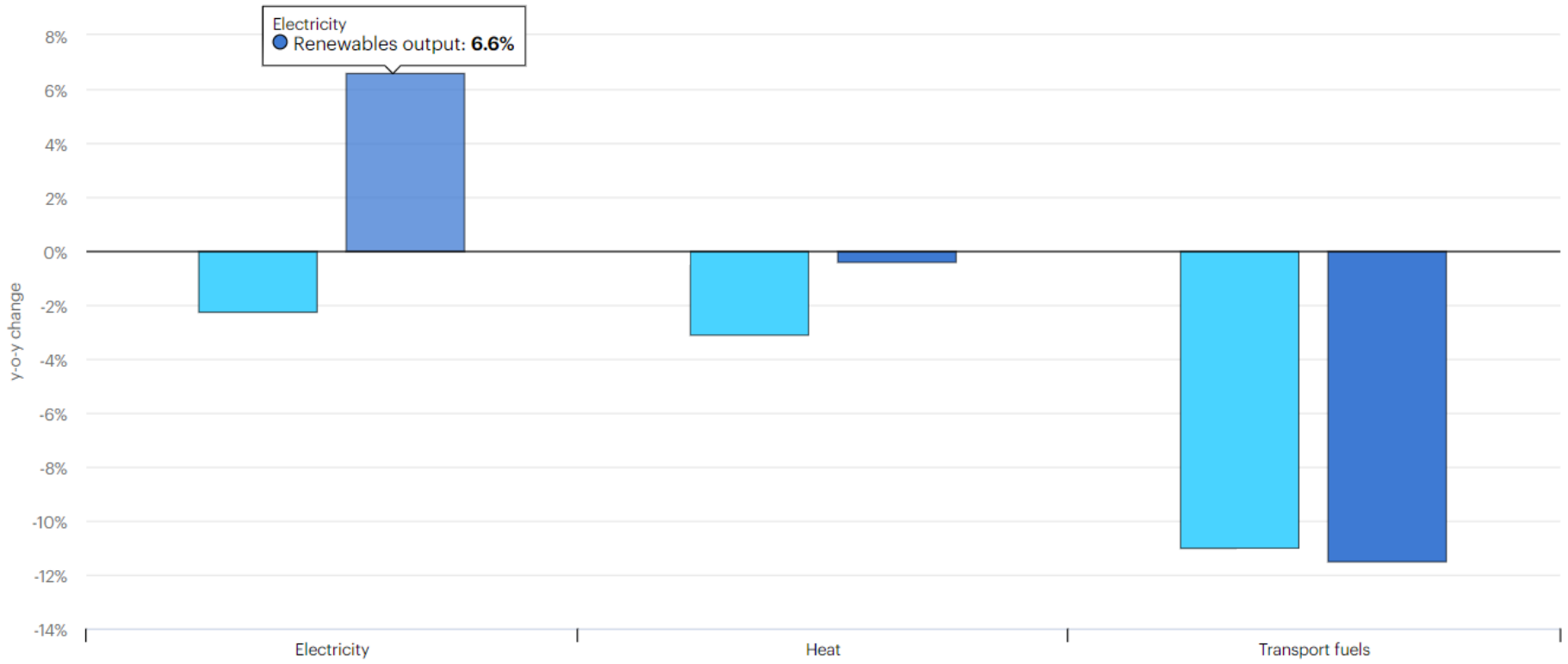
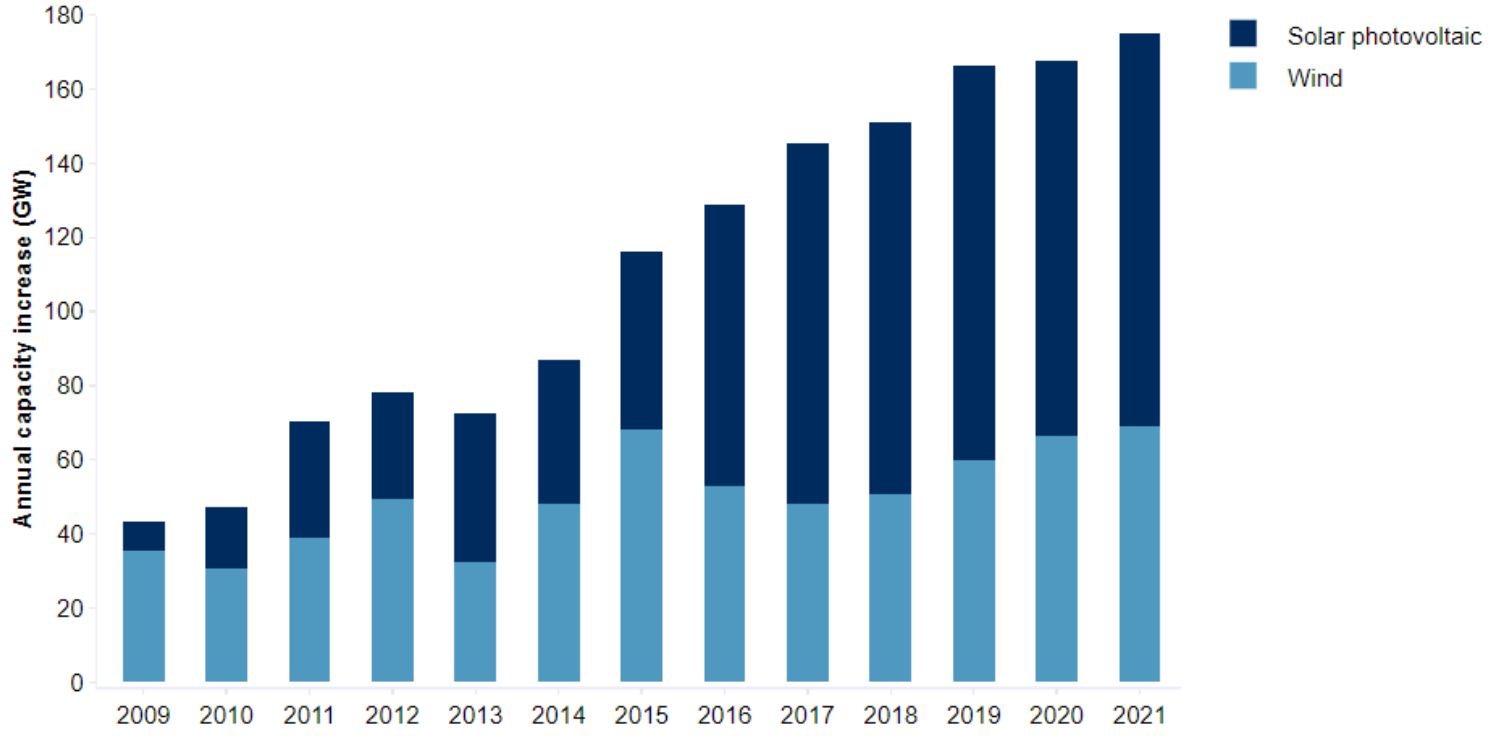


Total energy demand Renewables output

Renewables 2020 – Analysis - IEA

Renewables Resilient Amid COVID-19: More Constructive Policies And Robust Market Players Commitments To Spur Growth



GW--Gigawatt. Source: S&P Global Platts Analytics.

COVID-19 Could Make 2020 Crucial for Renewables | S&P Global

Both the IEA and IRENA forecast a reduction in overall renewable capacity additions in 2020 while reporting a 30 GW rebound in 2021.

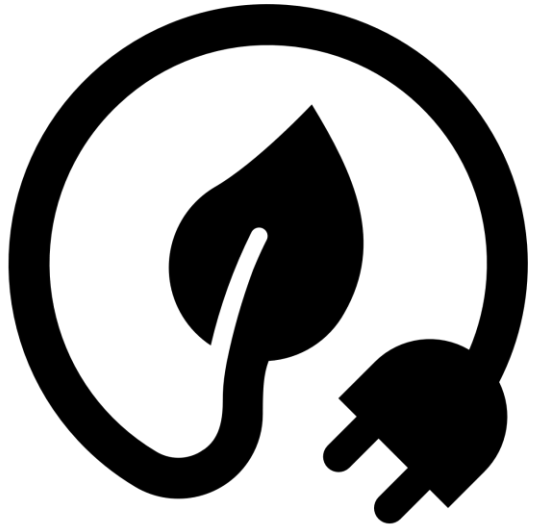
IEA's executive director, Fatih Birol, says…

- "Renewable power is defying the difficulties caused by the pandemic, showing robust growth while others fuels struggle."
- "In 2025, renewables are set to become the largest source of electricity generation worldwide, ending coal's five decades as the top power provider (…) By that time, renewables are expected to supply one-third of the world's electricity."
- "Renewables are resilient to the Covid crisis but not to policy uncertainties. Governments can (…) help bring about a sustainable recovery and accelerate clean energy transitions."

Coronavirus Pandemic Speeds Shift to Cleaner Energy
– The Wall Street Journal

Indicators:

- The share of **renewables** in global **electricity** supply reached nearly **28%** in the first quarter of 2020, up from 26% during the same period in 2019.
- Total RES share in **electricity generation** will **grow by almost 7%** by the end of 2020 (IEA).
- Despite economic uncertainties, investor appetite for renewables remains strong.
- **Delayed project** activity ramped up quickly.
- **Logistical challenges** have been mostly resolved after reopening the borders.
- Even though solar PV capacity additions might decline in 2020, **wind capacity additions** could be up **over 10%**.
- Emerging market and **policy developments** are indicating upsides to renewables investments in the years to come.



Apart from COVID-19, RES acceleration happens thanks to…

- **Falling costs** for solar PV and wind in the electricity sector,
- Long-term **zero CO_2 emissions** goals to face climate change - **Paris Agreement, Green Deal**,
- **Sustainability** goals,
- **Energy security**,
- **Geopolitical** situation in the Middle East,
- Protection of human **health**,
- Favorable **monetary policies** with low interest rates.
- **China's** announcements for new solar PV and wind grid projects in recent months.
- More **billions** are invested annually in RES than in fossil fuels and nuclear energy altogether.

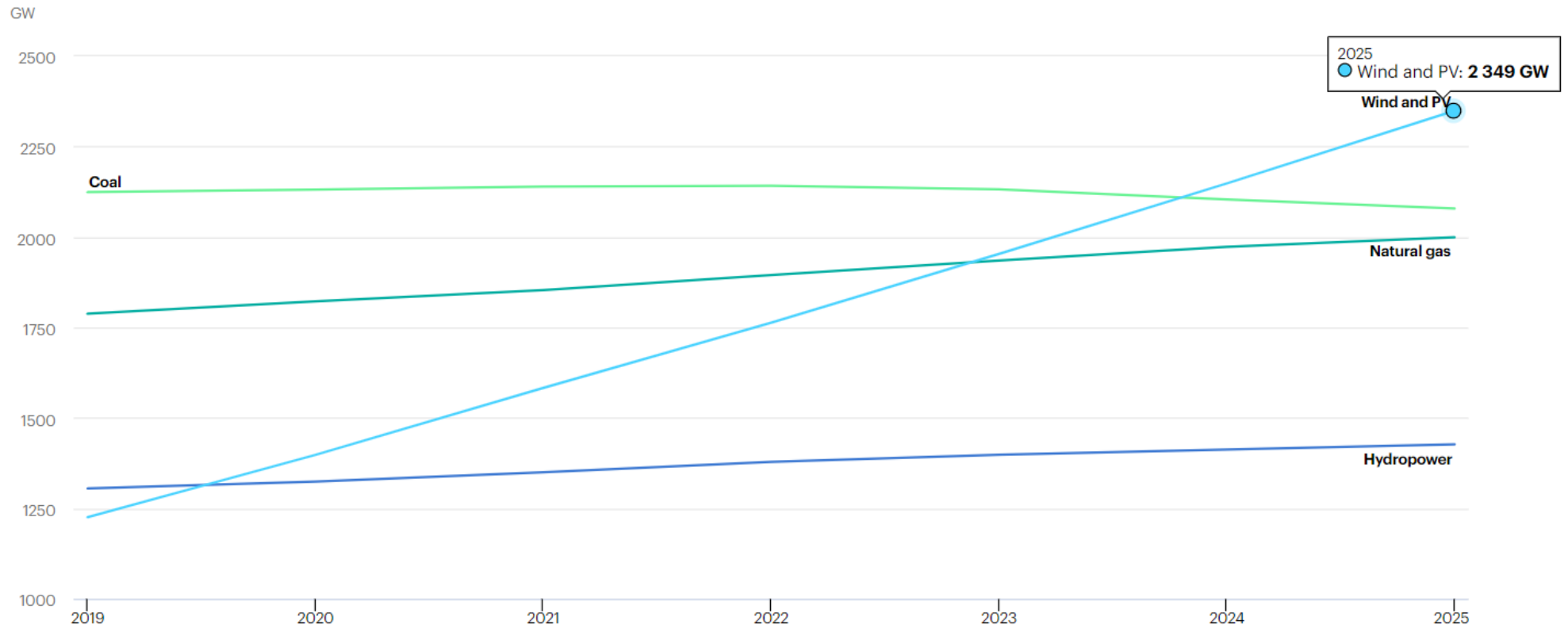
Table 1. Renewable Energy Indicators 2019

		2018	2019
INVESTMENT			
New investment (annual) in renewable power and fuels[1]	billion USD	296.0	**301.7**
POWER			
Renewable power capacity (including hydropower)	GW	2,387	**2,588**
Renewable power capacity (not including hydropower)	GW	1,252	**1,437**
Hydropower capacity[2]	GW	1,135	**1,150**
Wind power capacity	GW	591	**651**
Solar PV capacity[3]	GW	512	**627**
Bio-power capacity	GW	131	**139**
Geothermal power capacity	GW	13.2	**13.9**
Concentrating solar thermal power (CSP) capacity	GW	5.6	**6.2**
Ocean power capacity	GW	0.5	**0.5**
HEAT			
Modern bio-heat demand (estimated)[4]	EJ	13.9	**14.1**
Solar hot water demand (estimated)[5]	EJ	1.4	**1.4**
Geothermal direct-use heat demand (estimated)[6]	PJ	384	**421**

Global Overview (ren21.net)

Total installed power capacity by fuel and technology 2019-2025, main case

Open



Wind and PV · Hydropower · Coal · Natural gas

[Renewables 2020 – Analysis - IEA]

Key facts

1. The lockdown periods reduced global carbon emissions.
2. There are 6 types of RES with both advantages and disadvantages.
3. Renewables, especially in electricity, have been resilient so far, but governmental support remains key.
4. In 2025, RES will surpass coal.
5. Renewables are set to lead the global electricity sector.
6. Wind and solar PV technologies will continue to grow during 2021–2030 with reduced costs encouraging more projects to be set up in the coming years.

USEFUL LINKS

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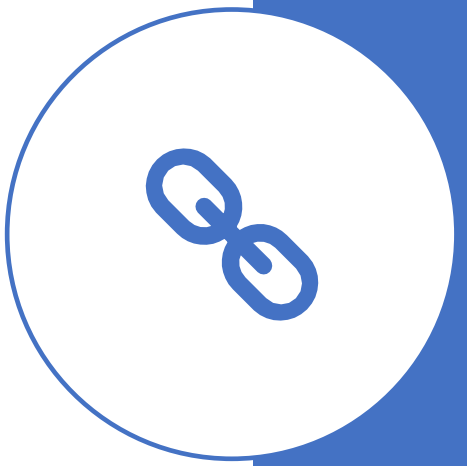

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Thank you for your attention!