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Renewable Communities:

*Empowering Local Communities through
Renewable Energy-**The State of the Art***



HISTORICAL PROCESS

FROM THE PANDEMIC UNTILL NOW

THE COVID-19 PANDEMIC, WHICH FORCED A GENERAL HALT IN THE EU, HAS HAD BOTH POSITIVE AND NEGATIVE CONSEQUENCES FOR THE ENVIRONMENT.

POSITIVE OUTCOMES

FROM AN ENVIRONMENTAL POINT OF VIEW, THE PANDEMIC REPRESENTED AN IMPORTANT STOP FOR EMISSIONS. THE STOP TO BOTH LAND AND AIR TRANSPORT, AMONG THE MOST IMPACTFUL, HAS SIGNIFICANTLY REDUCED EMISSIONS. SOCIAL ACTIVITIES HAVE ALSO BEEN DRASTICALLY DECREASED (ABUBAKAR *ET ALIA*, 2021).

NEGATIVE OUTCOMES

KEY COUNTRIES IN THE SUPPLY CHAIN OF RENEWABLE ENERGY PRODUCTS HAVE BEEN STOPPED (SAIS JOHN HOPKINS RESEARCH, 2022). MOREOVER, AS SOON AS ECONOMIES RESTARTED, CLEAN ENERGY PRODUCTS HAVE SUFFERED THE EFFECTS OF INFLATION.

FIT FOR 55 AND NEXTGENERATION EU

IN 2021, THE **EUROPEAN COMMISSION** ANNOUNCED THE '**FIT FOR 55**' PACKAGE, A COMPREHENSIVE SET OF LEGISLATIVE PROPOSALS AIMED AT REDUCING EMISSIONS BY AT LEAST 55% AND FOCUSING HEAVILY ON THE ROLE OF RENEWABLE ENERGY SOURCES. A KEY INITIAL STEP WAS TO REFORM THE RENEWABLE ENERGY DIRECTIVE, SPECIFICALLY CONCERNING THE TAXATION OF ENERGY.



WITH THIS IN MIND, AND HAVING TO DEAL WITH THE ECONOMIC REPRISAL OF EU COUNTRIES, THROUGH CREDIT SYSTEMS (I.E. E.F.M.) , *NEXTGENERATION EU* WAS LAUNCHED. IT IS A SYSTEM OF FUNDS TO HELP ECONOMIES, DURING THE AFTERMATHS OF COVID-19, THE NOVELTY IS THAT A HUGE PORTION OF THESE FUNDS MUST BE USED TO SUPPORT THE TWIN TRANSITION (GREEN AND DIGITAL TRANSITION IN TANDEM)

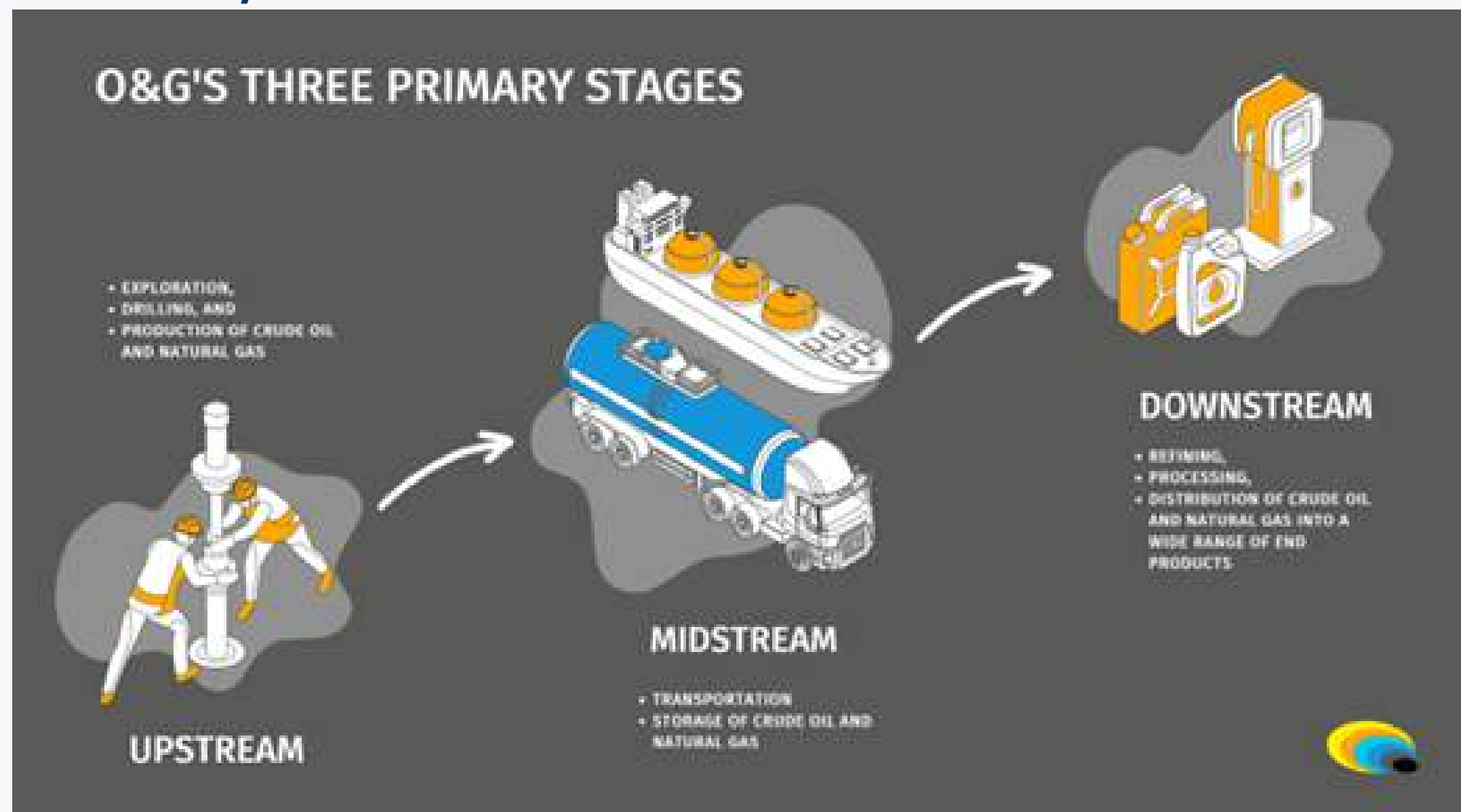
THE WAR IN UKRAINE AND REPowerEU

IN 2022, AFTER A LONG AND DIFFICULT PERIOD OF CRISIS DUE TO THE COVID-19 PANDEMIC, ANOTHER DISRUPTIVE EVENT HIT THE EU: THE OUTBREAK OF THE WAR IN UKRAINE.

FOLLOWING THE PUBLIC STATEMENTS BY EU LEADERS CONDEMNING THE WAR, THE RUSSIAN GOVERNMENT DECIDED TO CUT MORE THAN HALF OF ITS SUPPLY OF OIL AND NATURAL GAS THROUGH THE NORD STREAM 1 PIPELINE. SEVERAL COUNTRIES WERE AFFECTED MORE THAN OTHERS, ESPECIALLY GERMANY, BUT THE REPERCUSSIONS WERE FELT BY EVERYONE.

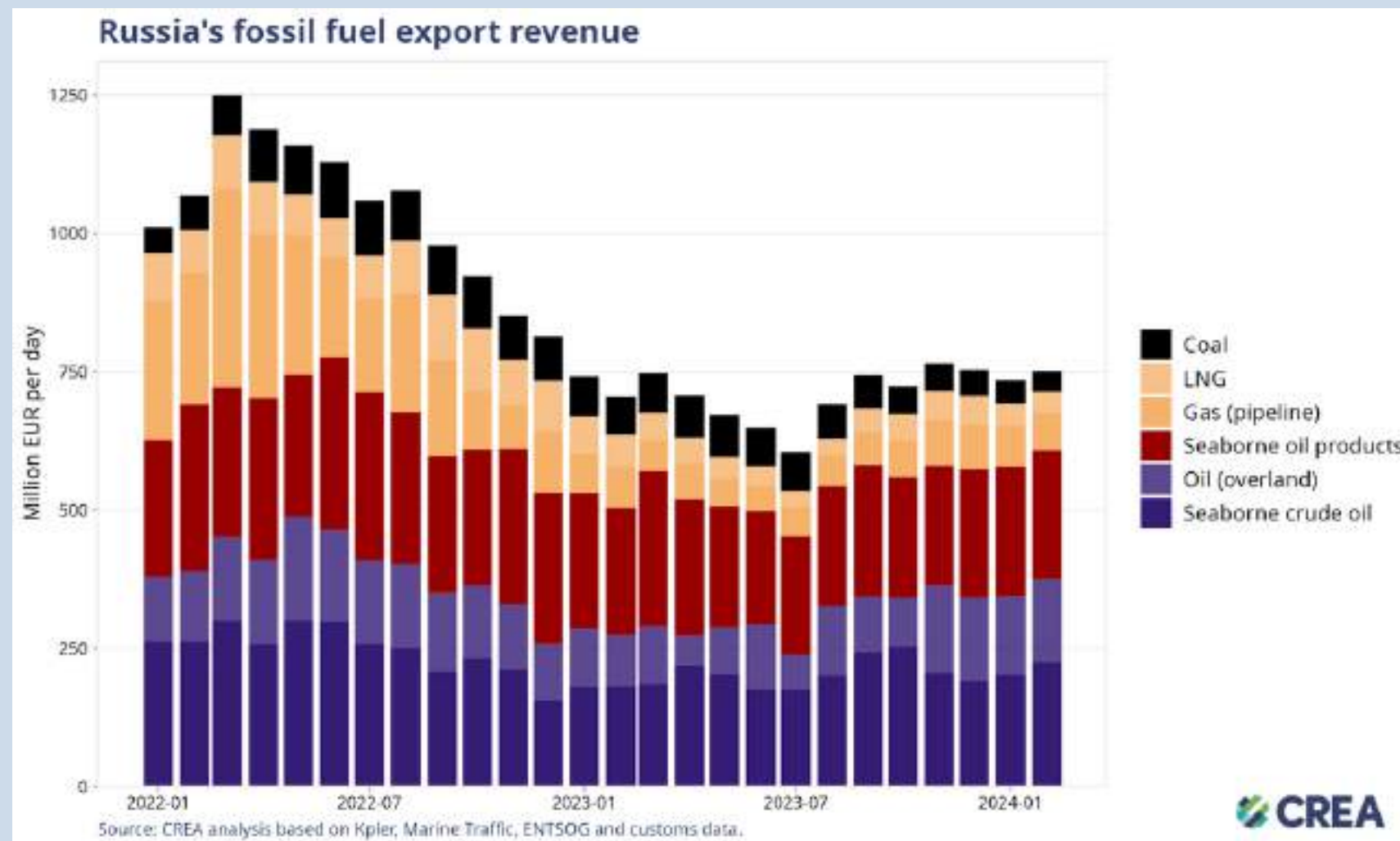


UP-, MID- AND DOWNSTREAM MODEL

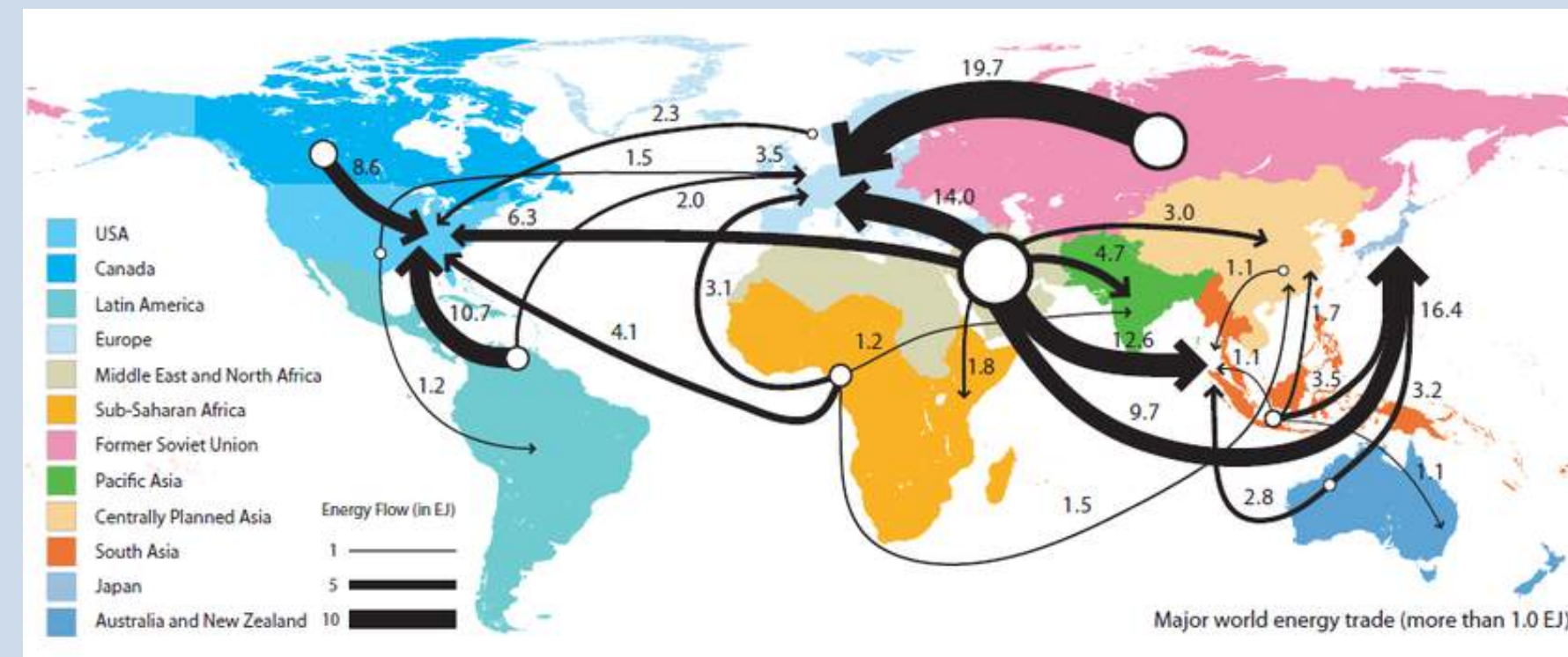


<https://www.wtsenergy.com/upstream-midstream-and-downstream/>

DEPENDENCE FROM RUSSIAN EXPORTS



<https://energyandcleanair.org/february-2024-monthly-analysis-of-russian-fossil-fuel-exports-and-sanctions/>

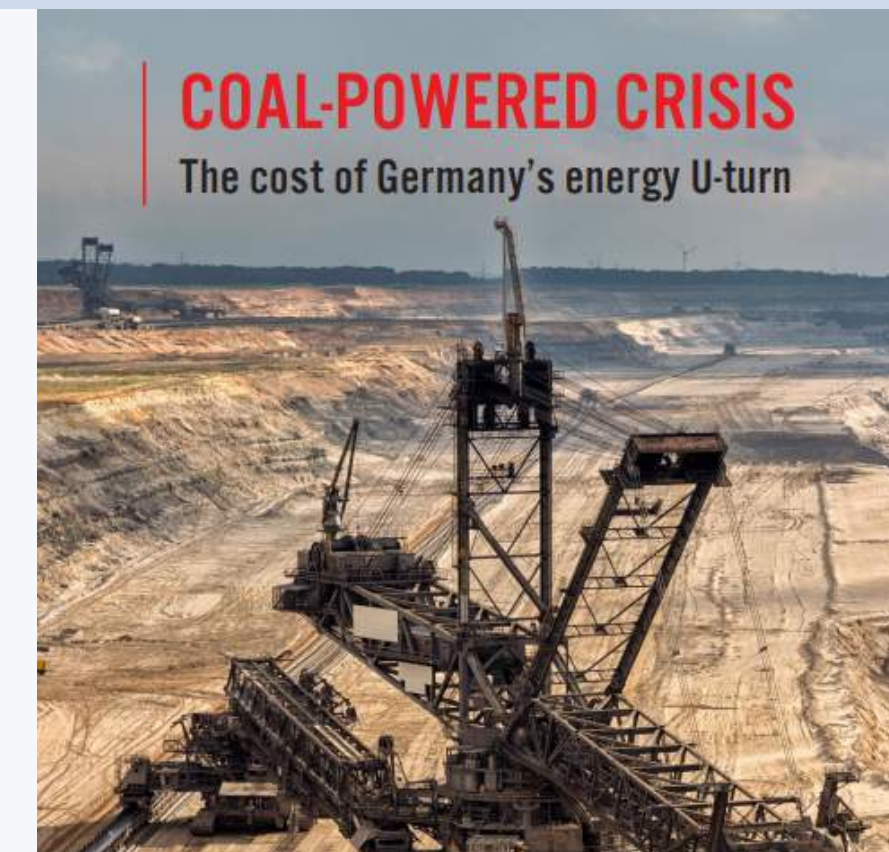


Evaluation of the main energy scenarios for the global energy transition - Scientific Figure on ResearchGate. Available from: https://www.researchgate.net/figure/Direct-energy-trade-22-p-129_fig2_303457109 [accessed 25 Sept 2025]

THE WAR IN UKRAINE AND REPowerEU (2)

THE OUTBREAK OF THE RUSSO-UKRAINIAN CONFLICT IN FEBRUARY SAW EUROPE'S ENERGY SUPPLY PUSHED INTO A PRECARIOUS STATE. FOR GERMANY, THIS TRIGGERED A U-TURN ON COMMITMENTS TO MOVE AWAY FROM COAL POWER: RETIRED COAL-FIRED POWER PLANTS WERE BROUGHT BACK ONTO THE GRID AND IMPORTS OF COAL INCREASED.

IN 2022, THE ITALIAN GOVERNMENT DEPLOYED SHORT-TERM ENERGY MEASURES FOLLOWING RUSSIA'S INVASION OF UKRAINE. FOR EXAMPLE, A REGULATION WAS ISSUED, WHICH AUTHORIZED THE SIX KEY OPERATING COAL PLANTS IN ITALY TO RUN AT HIGHER CAPACITY UNTIL MARCH 2023.



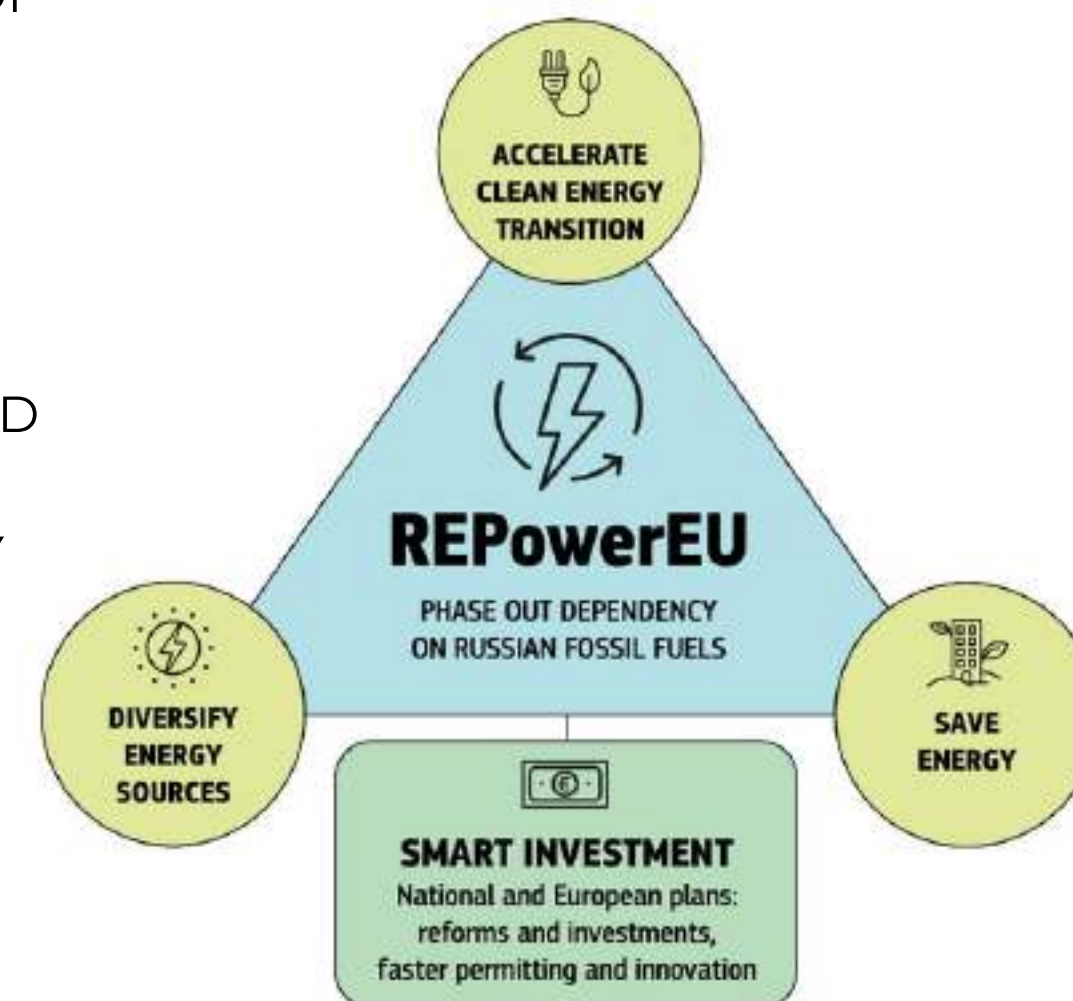
THE WAR IN UKRAINE AND REPowerEU (3)

REPOWER EU WAS ISSUED BY THE COMMISSION AFTER THE LEADERS OF THE EU DECIDED TO REDUCE THE DEPENDENCE FROM RUSSIA BY

- REDUCING OVERALL RELIANCE ON FOSSIL FUELS FASTER
- DIVERSIFYING SUPPLIES AND ROUTES
- FURTHER DEVELOPING AN EU HYDROGEN MARKET
- ACCELERATING THE DEVELOPMENT OF RENEWABLES
- IMPROVING THE INTERCONNECTION OF EUROPEAN ELECTRICITY AND GAS NETWORKS
- REINFORCING EU CONTINGENCY PLANNING FOR SECURITY OF SUPPLY
- IMPROVING ENERGY EFFICIENCY AND PROMOTING CIRCULARITY

REPOWEREU IS A PLAN FOR

- SAVING ENERGY
- PRODUCING CLEAN ENERGY
- DIVERSIFYING THE EU'S ENERGY SUPPLIES
- SMARTLY COMBINING INVESTMENTS AND REFORMS

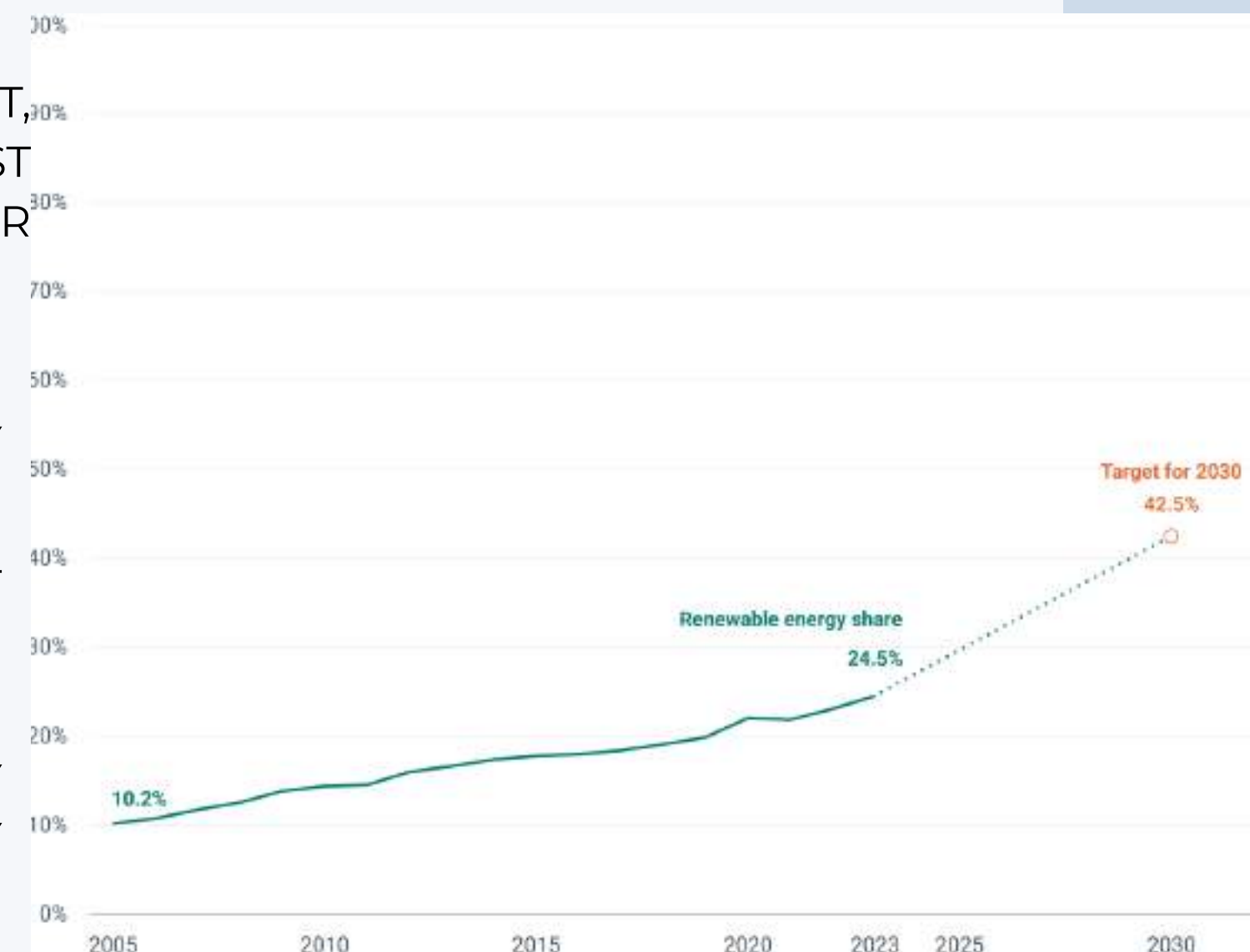


HAVE WE DELIVERED?

THE 2025 REPORT FROM THINK TANK EMBER HAS SAID THAT, GLOBALLY SPEAKING, SOLAR ENERGY HAS BEEN THE MOST EFFICIENT RENEWABLE ENERGY RESOURCE IN THE FISCAL YEAR 2024 (GRAHAM *ET ALIA*, 2025)

RENEWABLE ENERGY PRODUCTION AND CONSUMPTION IN THE EU HAVE BEEN GROWING AT A FAST PACE, SIGNIFICANTLY CONTRIBUTING TO THE MITIGATION OF EMISSIONS. BY 2023, RENEWABLES MADE UP ABOUT 24,5% OF THE BLOC'S GROSS FINAL ENERGY CONSUMPTION (EUROSTAT)

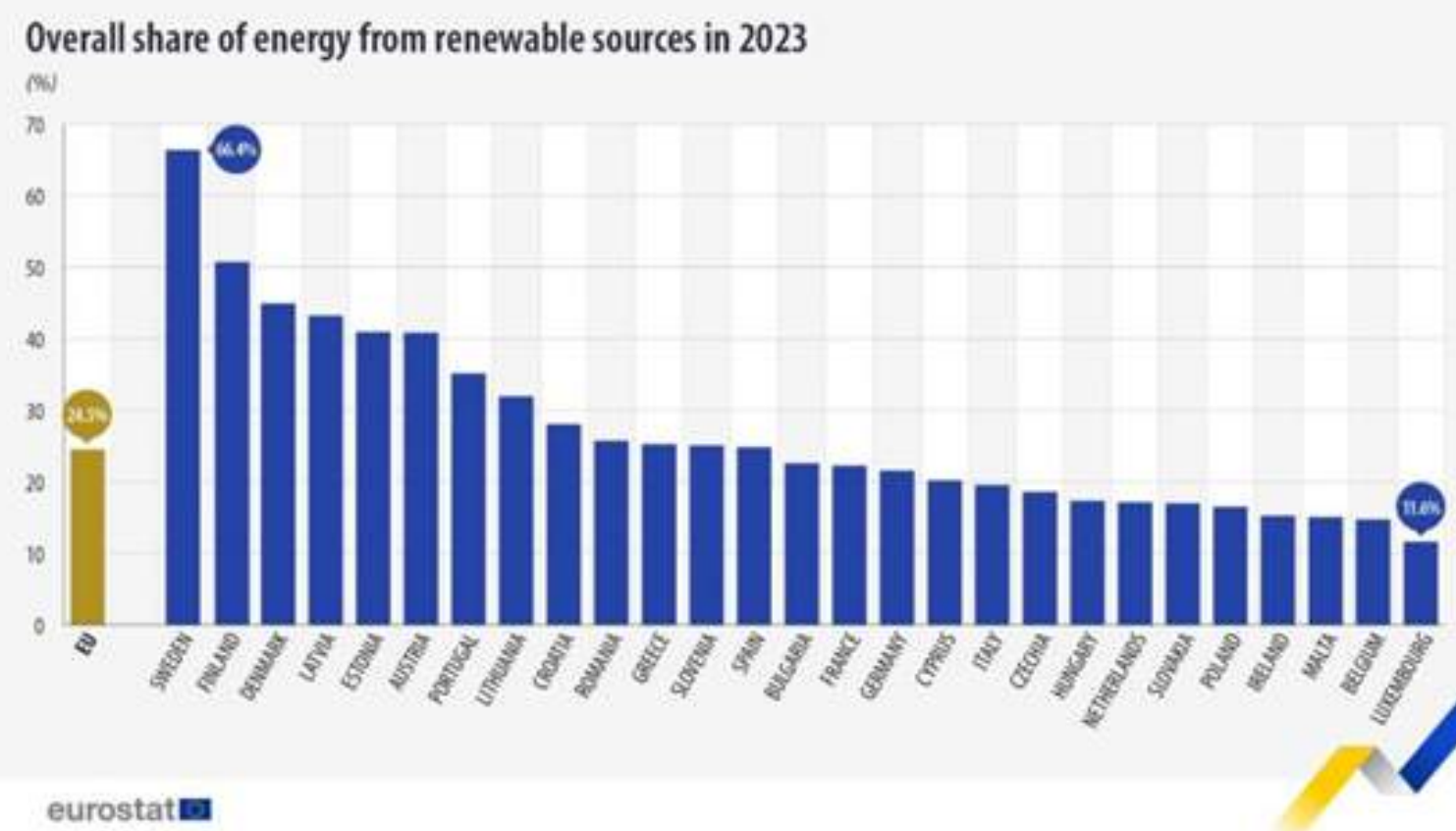
ACCORDING TO THE EUROPEAN ENVIRONMENTAL AGENCY, IN ABSOLUTE TERMS, GROSS CONSUMPTION OF RENEWABLE ENERGY INCREASED BY THE EQUIVALENT OF 7 MILLION TONS OF OIL, MAINLY DUE TO A SUBSTANTIAL INCREASE IN SOLAR ENERGY (19.7%) AND WIND ENERGY (9.3%) (EU. ENVIRONMENTAL AGENCY, 2025)



YES...

PRODUCTION AND CONSUMPTION OF RENEWABLES WITHIN THE UNION HAS INCREASED. FOR WHAT IT CONCERNS COUNTRIES WITH THE HIGHEST RATE IN TERMS OF PRODUCTION OF RENEWABLES, THE *TOP THREE* BELONGS TO SWEDEN, FINLAND AND DENMARK

AS REGARDS HOW MUCH ELECTRICITY IS GENERATED FROM THESE SOURCES, DENMARK RANKS FIRST (88.4%, MAINLY WIND), FOLLOWED CLOSELY BY PORTUGAL (87.5%) AND CROATIA (73.7%). GREAT NUMBERS, BUT VERY UNEQUAL. IN THE TERRITORY OF THE UNION, SOME COUNTRIES DO NOT EVEN EXCEED 20% OF ENERGY PRODUCED FROM RENEWABLES, SUCH AS LUXEMBOURG (5.1%), MALTA (15.1%) AND THE CZECH REPUBLIC (15.9%)



EUROPEAN CASE STUDIES

SWEDEN

SWEDEN CERTAINLY HAS THE MOST PROMISING ENERGY MIX - HAVING ALREADY REDUCED EMISSIONS BY A LOT AND TARGETING A 70% CUT UNTIL 2030. AMONG OTHER THINGS, IT ALSO DECIDED IN 2024 TO INCREASE WIND PRODUCTION WITH OFFSHORE WIND TURBINES



AUSTRIA

AUSTRIA, ALREADY COMMITTED TO MAKING ITSELF CLIMATE NEUTRAL IN 2040, GENERATED OVER 85% OF ITS ELECTRICITY FROM RES IN 2023 AND IMPORTANT PARTNERSHIPS ARE STARTING. IN PARTICULAR, THERE ARE CONSIDERABLE INCENTIVES ON GEOTHERMAL ;



EUROPEAN CASE STUDIES

DENMARK

IT REPRESENTS THE MOST SUCCESSFUL CASE STUDY ON EUROPEAN SOIL. IN FACT, THE IEA CITES IT AS AN EXAMPLE OF LEADERSHIP ON EUROPEAN SOIL. IN THE ENERGY MIX, MOST ELECTRICITY COMES FROM WIND AND PHOTOVOLTAICS, BUT THE MOST INTERESTING FACT IS IN THE HEATING SECTOR. THE TARGET IS TO REACH 100% BIOMETHANE IN 2030



Sønderborg

THE IEA-DHC REPORT CITES THE MUNICIPALITY AMONG ITS SUCCESSFUL CASE STUDIES. ACCORDING TO THE 2025 REPORT, THE CITY, UNDER THE PUBLIC-PRIVATE INITIATIVE **PROJECTZERO**, HAS DECIDED TO BECOME NEUTRAL BY 2029, AND OBVIOUSLY THIS ALSO CONCERNS THE DECARBONISATION OF ITS ENERGY AND HEATING SECTORS.

EUROPEAN CASE STUDIES

Sønderborg

HOW?

- 1) NATIONAL POLICIES (**HEAT SUPPLY ACT**) AND **LOCAL PLANS**, WHICH FOCUS ON ENERGY EFFICIENCY, ELECTRIFICATION AND THE REDUCTION OF FOSSIL FUELS.
 - CONVERTING OIL AND GAS BOILERS TO DISTRICT HEATING OR INDIVIDUAL HEAT PUMPS,
- 2) DETAILED SCENARIO ANALYZES TO FIND THE MOST COST-EFFECTIVE SOLUTIONS
- 3) EXCESS HEAT FROM LOCAL INDUSTRIES
- 4) STAKEHOLDER INVOLVEMENT AND ACTIVE WARMING PLANNING THROUGH ANNUAL DIALOGUES
- 5) INTEGRATED ENERGY SYSTEM THAT, AMONG OTHER THINGS, **RECYCLES** THE ENERGY ALREADY PRODUCED.
- 5) SECTOR COUPLING FOCUSES ON IMPROVING EFFICIENCY BY MAKING THE MOST OF ENERGY FLOWS BETWEEN DIFFERENT SECTORS. FOR EXAMPLE, CAPTURING CO₂ FROM BURNING STRAW AND WOOD CHIPS AND COMBINING IT WITH HYDROGEN TO PRODUCE GREEN FUELS

EUROPEAN CASE STUDIES

ITALY

ITALY HAS SHOWN COMMITMENT TO RENEWABLES, BUT STRUCTURAL PROBLEMS REMAIN. THE MAJOR SOURCE REMAINS HYDROELECTRIC, SOLAR AND WIND PRODUCTION, WITH IMPORTANT GEOTHERMAL CENTERS IN TUSCANY.

A not-well distributed phenomenon

THE NORTH THAT HAS THE MOST PHOTOVOLTAIC SYSTEMS (LOMBARDY WITH 120,699 SYSTEMS AND VENETO WITH 110,059). BUT IF WE TALK ABOUT OVERALL INSTALLED POWER, THE SOUTH PAVES THE WAY, IN PARTICULAR PUGLIA (3438 GW), DUE TO THE WIDER RADIATION IT RECEIVES



Consumi di energia elettrica in Italia

Maggio 2025



24,3 mld kWh

Maggio 2025

-2,7%

SU MAGGIO 2024

-1,1%

SU GENNAIO-
MAGGIO 2024

126,4 mld kWh

Gennaio-
Maggio 2025

Consumi
industriali*

+1%

SU MAGGIO 2024

*Indice IMCEI

86,5%

Produzione
nazionale

13,5%

Energia
scambiata
con l'estero

55,9%

Copertura
rinnovabili della
domanda

37,3%
Idroelettrico

3,4%
Geotermico

37,2%
Fotovoltaico

13,8%
Eolico

8,3%
Biomasse

EUROPEAN CASE STUDIES

ITALY

Political stance

IN MAY 2024, THE GOVERNMENT HAD DECIDED TO SLOW DOWN THE ADVANCE OF PHOTOVOLTAICS IN ITALY, ESPECIALLY TO FAVOR FARMERS' LOBBIES AND THE FISH MARKET.



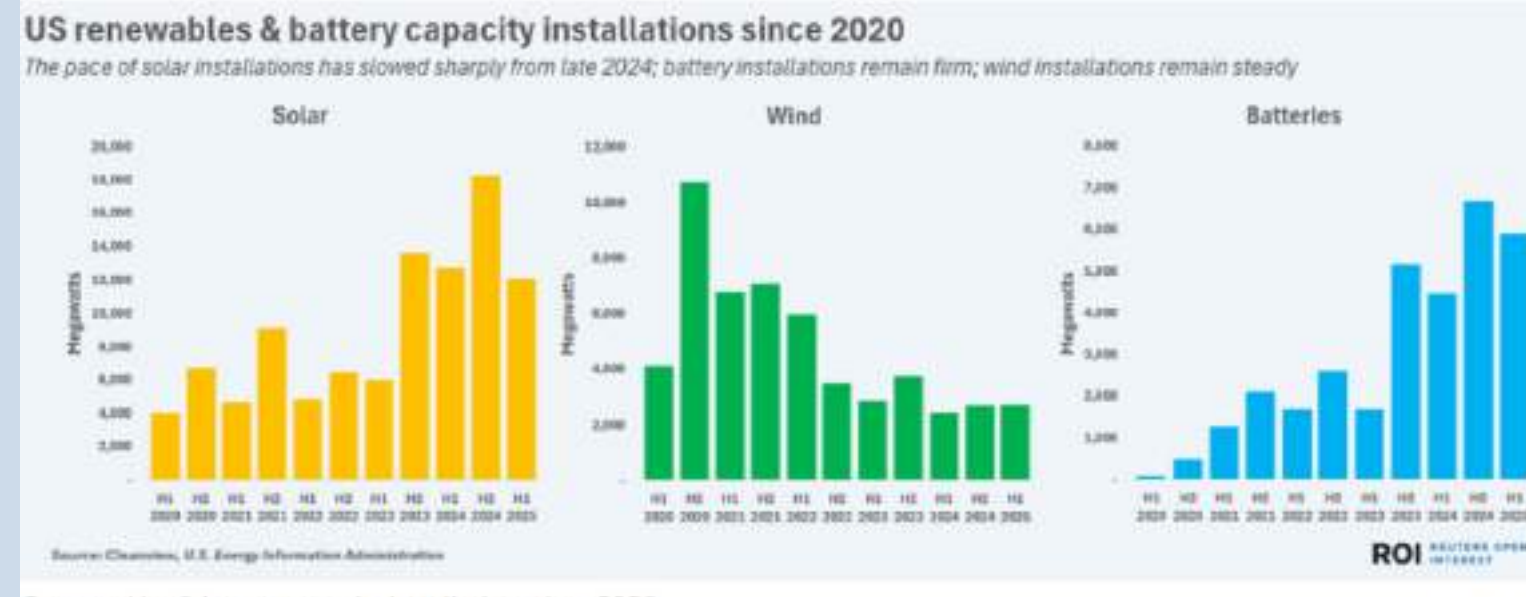
The great absentee

DEMAND MANAGEMENT, AND, THEREFORE, THE WHOLE MATTER OF REMUNERATION THAT CONCERNS IT, IS TRULY LEFT TO ITSELF BECAUSE THERE IS AN ABSENCE OF A FIXED CONSIDERATION, BUREAUCRATICALLY THE APPROACH IS VERY RIGID AND PUBLIC ATTENTION IS VERY LOW (FABRIZIO BONEMAZZI, 2025)



OUTSIDE OF THE EU USA

2025 WAS THE YEAR FOR THE UNITED STATES WITH THE SMALLEST PERCENTAGE INCREASE OF THE DECADE. IF SOLAR HAD MANAGED TO HAVE A GROWTH OF 25% ANNUALLY IN THE LAST 5 YEARS, IN 2025, IN RELATION TO THE PREVIOUS YEAR, IT INCREASED BY A MERE 10%. WIND TURBINES, ON THE OTHER HAND, WERE EVEN LESS SO (1.5%). BATTERIES, IMPORTANT FOR STORING ENERGY IN DEAD MOMENTS, HAVE INSTEAD INCREASED.



THE FAMOUS TRUMPIST DRILL BABY DRILL DIDN'T WORK, BECAUSE THE ECONOMIC SITUATION REPRESENTS A STRONG OBSTACLE (ANTONINO NERI, 2025). OIL PRICES HAVE FALLEN TO \$62 A BARREL SINCE TAKING OFFICE AND ARE EXPECTED TO REACH EVEN LESS (\$51 A BARREL) (THE GRIST, 2025)

OUTSIDE OF THE EU CHINA

CHINA, DESPITE ITS VAST MANUFACTURING INDUSTRY CAPABLE OF HAVING THE HIGHEST EMISSIONS IN THE WORLD, IS ACTUALLY A LEADER IN THE RENEWABLES SECTOR. THIS YEAR, THE RENEWABLEMATTER.EU SAYS, THE NEW WIND, SOLAR AND NUCLEAR CAPACITY HAS BEEN ENOUGH TO REDUCE COAL ENERGY PRODUCTION, DESPITE ENERGY DEMAND RISING. IN 2024, BEIJING DECIDED TO INVEST 400 BILLION IN RENEWABLES. CHINA USES HYDROELECTRICITY A LOT (13.8% OF THE ENERGY MIX), BUT WHAT IS DRIVING IS CERTAINLY SOLAR IN THIS CASE TOO. DESPITE THESE ADVANCES, IT REMAINS VERY ANCHORED IN FOSSIL FUELS.



OUTSIDE OF THE EU

INDIA

INDIA IS MAKING HUGE STRIDES. IN JULY 2025 IT ANNOUNCED THAT IT HAD MANAGED TO REACH THE TARGET OF 50% ELECTRICAL CAPACITY FROM NON-FOSSIL RESOURCES. THIS IS PART OF A MUCH BROADER POLICY STARTED BY THE GOVERNMENT WITH BUDGET 2025, WHERE MANY FUNDS ARE REDIRECTED IN THE SECTOR: SOLAR AND WIND HAVE BEEN SIGNIFICANTLY STRENGTHENED. BUT NOT ONLY THAT: THE RESOURCE THAT INDIA TRIES TO BET ON COMPETITIVELY IS GREEN HYDROGEN. HOWEVER, THIS MUST LEAD TO A SUBSTANTIAL REVIEW OF THE ENERGY SECTOR.



OUTSIDE OF THE EU

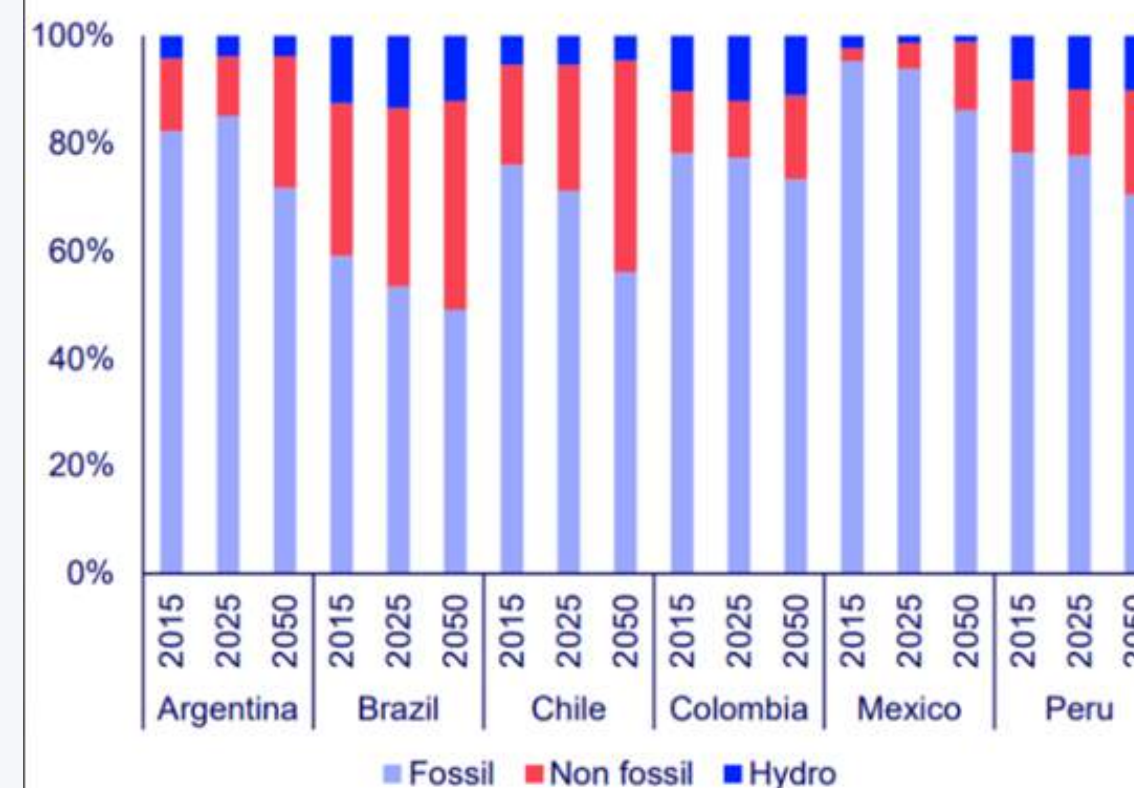
LATIN AMERICA

ACCORDING TO THE 2025 WOOD MACKENZIE REPORT, WHILE IN THE GIANTS OF THE CONTINENT (ARGENTINA, BRAZIL, COLOMBIA, MEXICO, CHILE AND PERU) THERE IS A PROGRESS IN THE USE OF RENEWABLES (OR AT LEAST NON-FOSSIL FUELS), PROCESSES SUCH AS MASSIVE URBANIZATION, AND THE STRONG DEPENDENCE ON EXPORTS OF MINERALS AND FOSSIL FUELS MAKES THE OBJECTIVES STILL DIFFICULT TO ACHIEVE

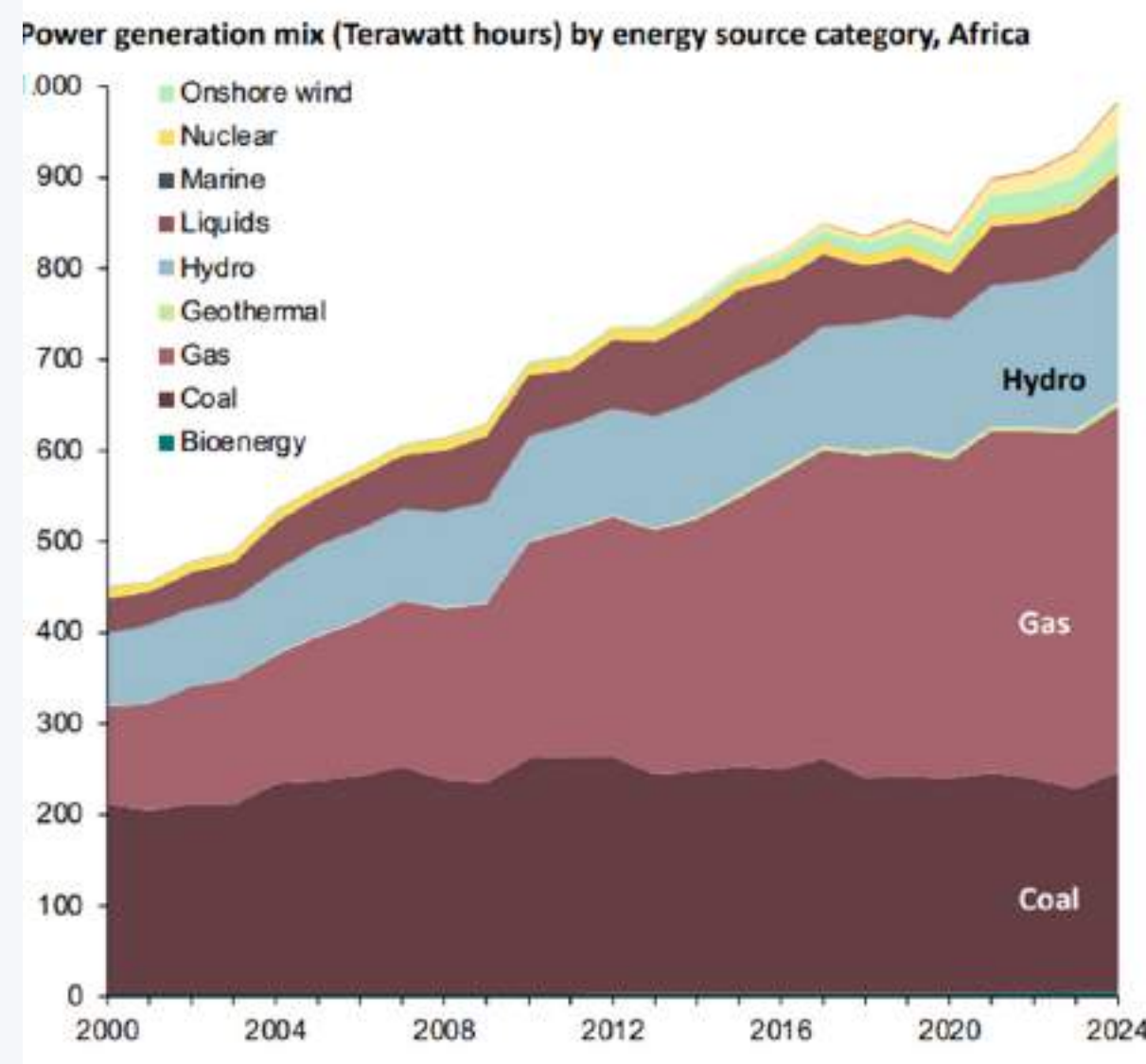
Latin America's top economies raise the game in renewable power

Nearly 70% of electricity comes from renewables, which is about 60% more than the global average

Share of total primary energy demand by fuel type



OUTSIDE OF THE EU



AFRICA

WHY IS THE CONTINENT WHICH, OVERALL, HOLDS A VERY HIGH PERCENTAGE OF RENEWABLE ENERGY RESOURCES ALSO THE PART OF THE WORLD THAT OBJECTIVELY PRODUCES THE LEAST?

ACCORDING TO THE ENERGY CHAMBER'S 2025 REPORT, ELECTRICITY DEMAND IS THE LOWEST, AND THIS DOES NOT LEAD TO STRUCTURAL REFORM. ACCESS TO ELECTRICITY IS AMONG THE LOWEST IN THE WORLD. AS MUCH AS THERE IS ENORMOUS POTENTIAL (JUST THINK OF THE RARE EARTH DEPOSITS AND THAT KENYA IS THE LEADING PRODUCER OF GEOTHERMAL ENERGY), THE MAIN PRODUCTION REMAINS COAL, GAS, AND, FORTUNATELY IN THIRD PLACE, HYDROELECTRICITY.



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Renewable Communities:

*Empowering Local Communities through
Renewable Energy-**Fossil Fuels***

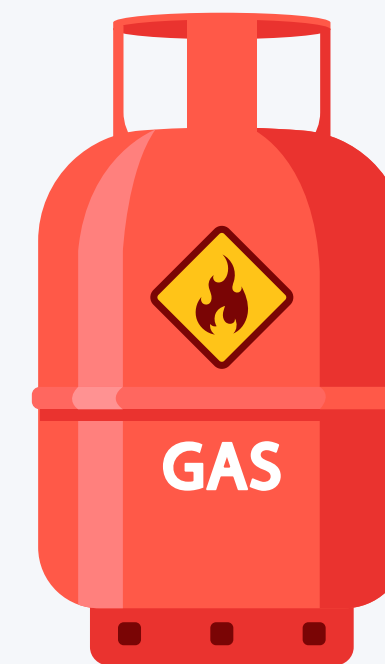
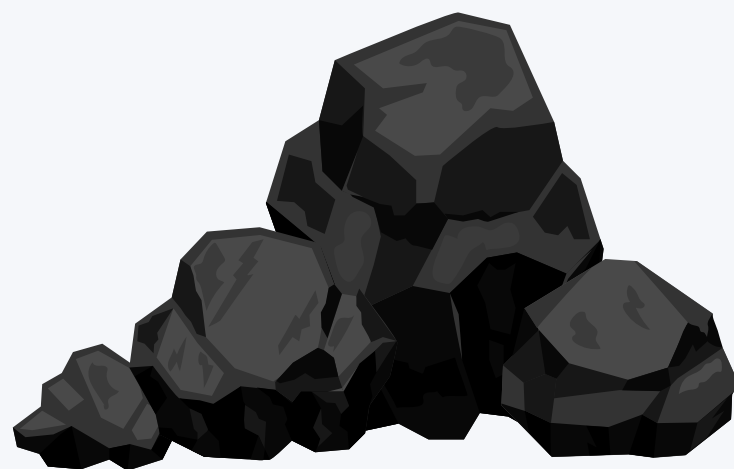


FOSSIL FUELS

DEFINITION

DEFINITION OF THE ENVIRONMENT INFORMATION ADMINISTRATION (EIA) OF THE US GOVERNMENT

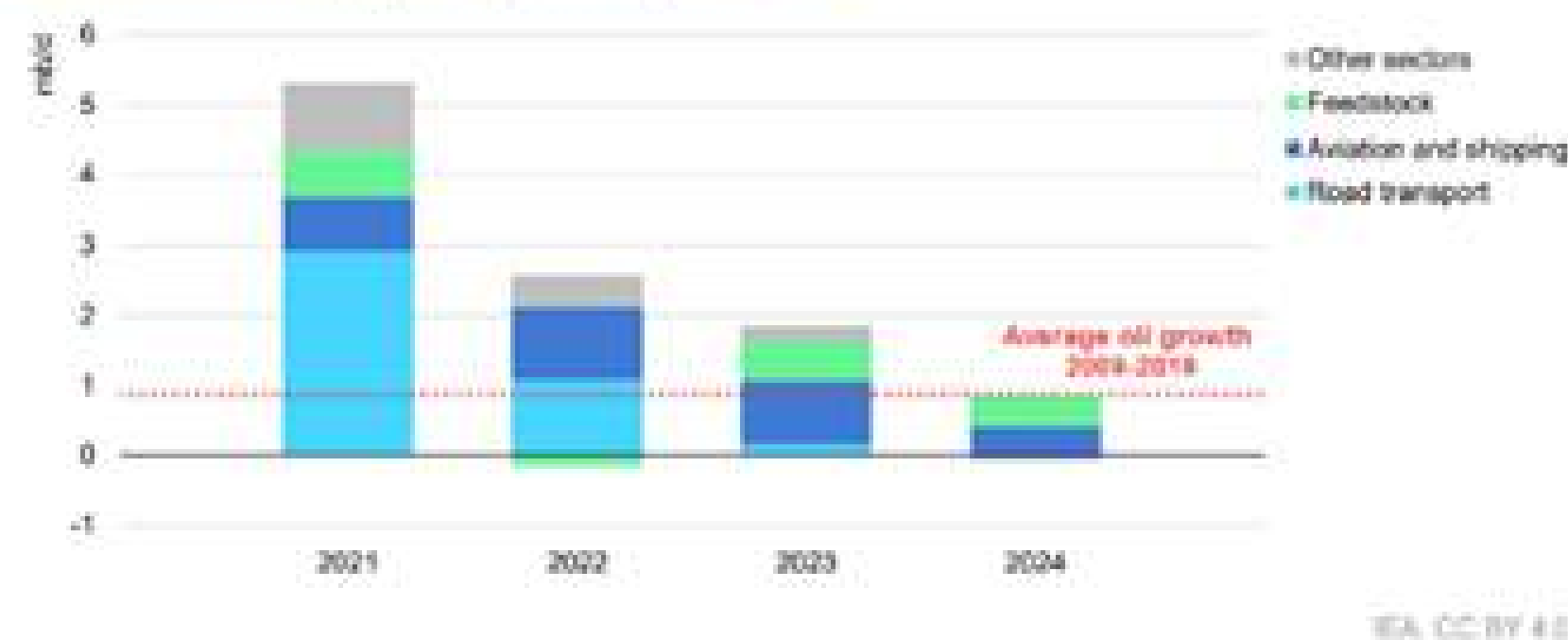
AN ENERGY SOURCE FORMED IN THE EARTH'S CRUST FROM DECAYED ORGANIC MATERIAL. THE COMMON FOSSIL FUELS ARE PETROLEUM, COAL, AND NATURAL GAS.



FOSSIL FUELS

SOURCE: GLOBAL ENERGY OUTLOOK 2025-INTERNATIONAL ENERGY AGENCY

Global oil demand growth by sector, 2021-2024

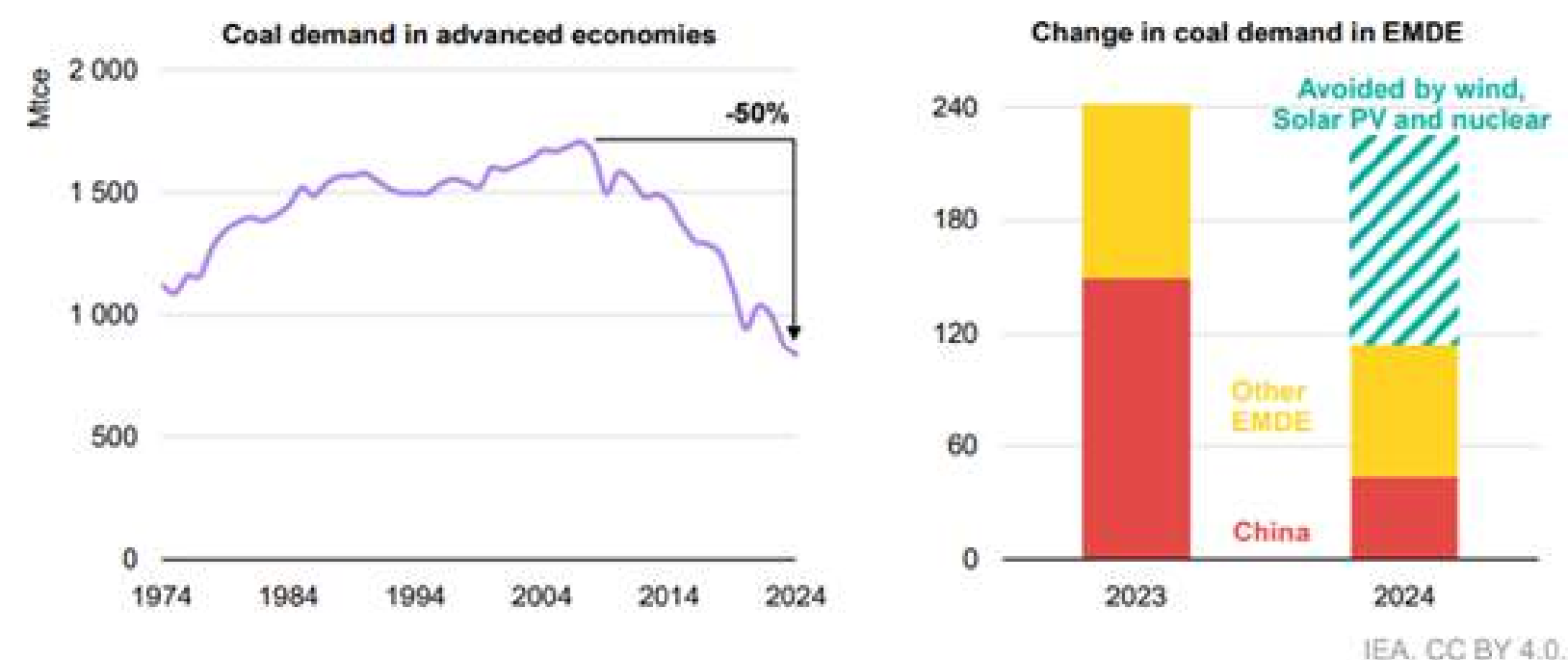


OIL IS STILL USED FOR A SERIES OF REASONS, IN PARTICULAR, IN 2024, FOR THE SO-CALLED CHEMICAL FEEDSTOCKS (RAW MATERIALS FROM WHICH INDUSTRIES PRODUCE ALMOST EVERYTHING AROUND US: SYNTHETIC FABRICS, PACKAGING...), THE AVIATION. ON THE OTHER HAND, IT DECLINES THE IMPACT OF THE TRANSPORT SECTOR, CERTAINLY ALSO DUE TO THE OPENING UP TO MORE SUSTAINABLE MODELS.

FOSSIL FUELS

SOURCE: GLOBAL ENERGY OUTLOOK 2025-INTERNATIONAL ENERGY AGENCY

Coal demand in advanced economies, 1974-2024, and change in coal demand in emerging market and developing economies in 2023 and 2024



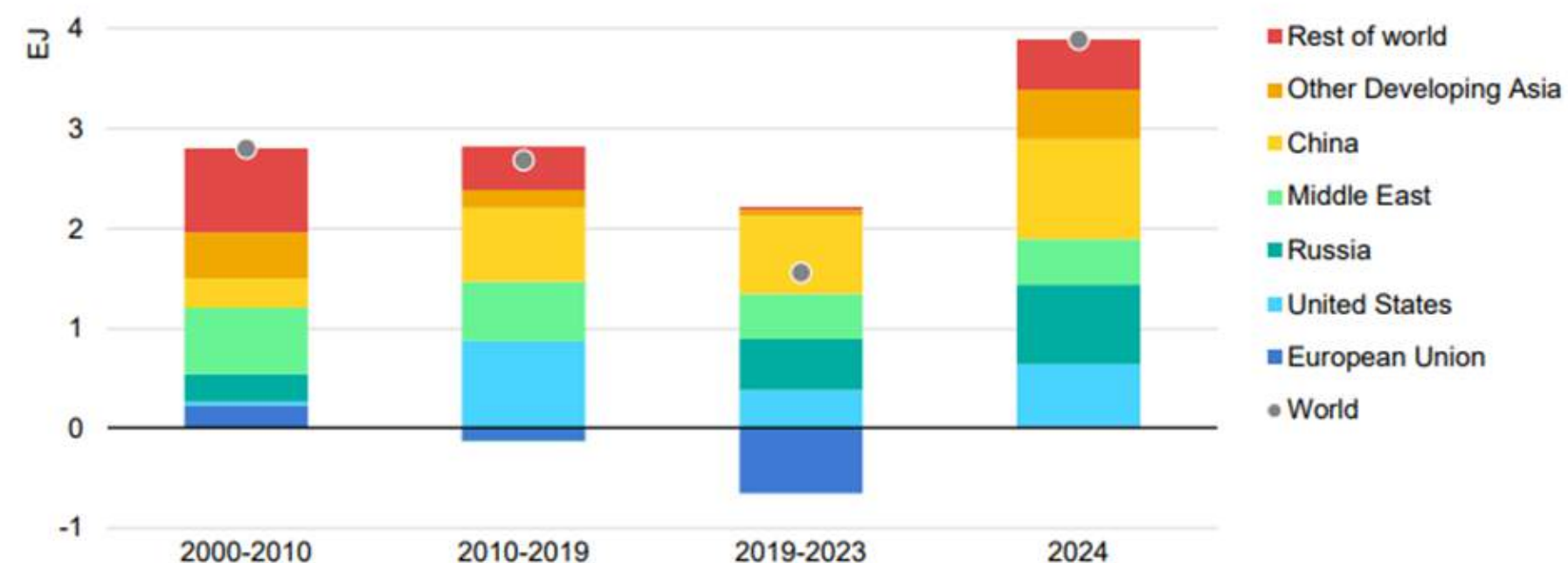
COAL, ON THE OTHER HAND, INCREASED BY 1.2%, WITH DEMAND TRANSPORTED MAINLY FROM ASIA, ESPECIALLY CHINA. CHINA REPRESENTS ONE OF THE ECONOMIES WHERE ELECTRICITY IS MOST REQUESTED FOR VARIOUS USES.

WHY? COAL STILL REPRESENTS, IN MOST CASES, THE ENERGY SOURCE DEPLOYED TO FILL THE GAP BETWEEN ENERGY PRODUCTION AND ENERGY CONSUMPTION.

FOSSIL FUELS

SOURCE: GLOBAL ENERGY OUTLOOK 2025-INTERNATIONAL ENERGY AGENCY

Change in natural gas demand by region, 2000-2024



IEA. CC BY 4.0.

NATURAL GAS: AFTER AN INITIAL MARKET SHOCK IN 2022 AND 2023 FOLLOWING THE WAR, DEMAND STABILIZED FURTHER IN 2024 AND RETURNED TO STRUCTURAL GROWTH. DEMAND IS ESSENTIALLY DRIVEN BY INDUSTRIES BUT ALSO DICTATED BY EXTREME CHANGES. UNPRECEDENTED HEAT WAVES IN CHINA, INDIA AND THE UNITED STATES HAVE CONTRIBUTED TO HIGHER CONSUMPTION IN THE ENERGY PRODUCTION SECTOR.



FOSSIL FUELS

For a more detailed approach

SOLID FOSSIL FUELS (AKA COAL)

HARD COAL
ANTHRACITE
COKING COAL
OTHER BITUMINOUS COAL
BROWN COAL
SUB-BITUMINOUS COAL
LIGNITE

COAL PRODUCTS

PATENT FUEL
COKE OVEN COKE
GAS COKE
COAL TAR
BROWN COAL BRIQUETTES

MANUFACTURED GASES

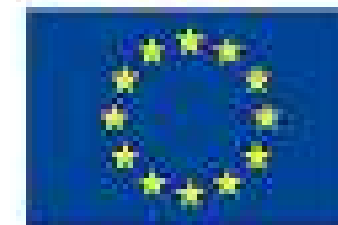
COKE OVEN GAS
BLAST FURNACE GAS
GAS WORKS GAS
OTHER RECOVERED GASES

PEAT AND PEAT PRODUCTS

PEAT
PEAT PRODUCTS
OIL SHALE AND OIL SANDS

OIL AND PETROLEUM PRODUCTS

REFINERY GAS
ETHANE
LIQUEFIED PETROLEUM GASES
MOTOR GASOLINE



eurostat

MOTOR GASOLINE
AVIATION GASOLINE
GASOLINE-TYPE JET FUEL
KEROSENE-TYPE JET FUEL
(EXCLUDING BIOFUEL PORTION)
OTHER KEROSENE

and the list goes on...



ENERGY-CONSUMPTIVE ACTIVITIES

THE INDUSTRIAL SECTOR

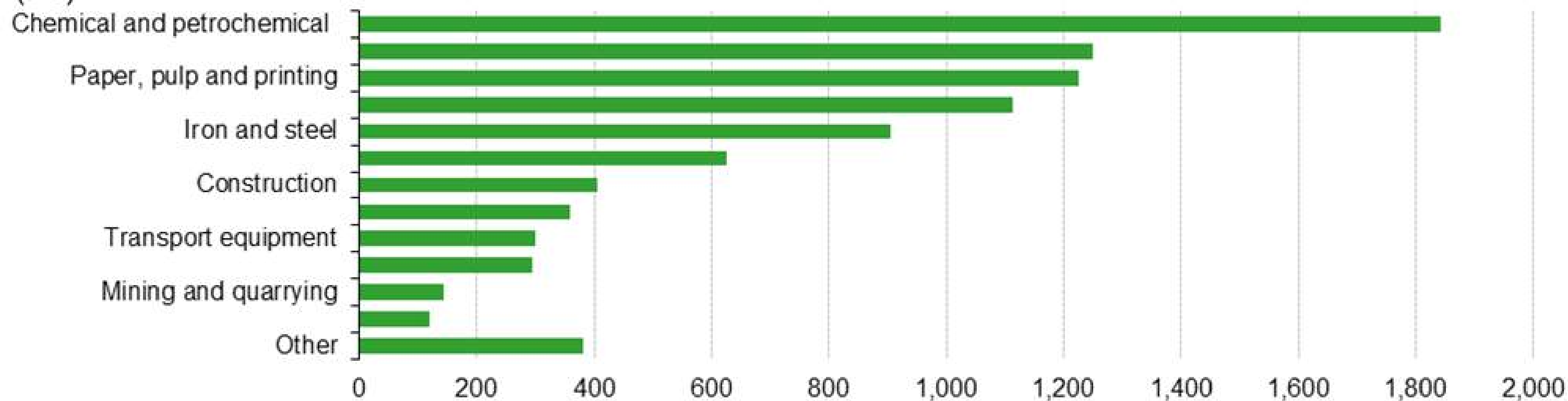
THE INDUSTRIAL SECTOR REMAINS THE SECTOR WHERE THE MOST IS CONSUMED IN ABSOLUTE TERMS. ALWAYS ACCORDING TO THE GLOBAL ENERGY OUTLOOK 2025, DEMAND HAS GROWN IN CHINA AND INDIA FROM METALLURGICAL INDUSTRIES (IRON, STEEL,). AS MENTIONED BEFORE, INDUSTRIES THAT PRODUCE SYNTHETIC FABRICS AND ALL PACKAGING ALSO PUSH FOR INCREASED OIL CONSUMPTION. IN THE EU, EUROSTAT REPORTS THE MOST ENERGY CONSUMPTIVE INDUSTRIES IN THE SECONDARY SECTOR.

MIND YOU: THE DATA EUROSTAT PROVIDES ARE BASED ON 2023 DATA (THE NEWEST WE COULD FIND)

ENERGY-CONSUMPTIVE ACTIVITIES

Total final energy consumption by industrial sector, EU, 2023

(PJ)



Source: Eurostat (nrg_bal_s)

eurostat

ENERGY-CONSUMPTIVE ACTIVITIES

THE FOOD INDUSTRY

THE FOOD SECTOR REPRESENTS ONE OF THE LARGEST ENERGY CONSUMERS WORLDWIDE, ACCOUNTING FOR APPROXIMATELY 30% OF THE TOTAL ENERGY CONSUMPTION. FOOD PROCESSING EQUIPMENT AND MACHINERY REQUIRE ELECTRICITY TO RUN, AS WELL AS INTENSIVE PROCEDURES SUCH AS BAKING, FRYING, CANNING, BOTTLING, REFRIGERATING, STERILIZATION AND ALIKE. (CORIGLIANO AND ALGIERI, 2024). HUGE IMPACTS COME FROM CATTLE FARMS AS WELL..

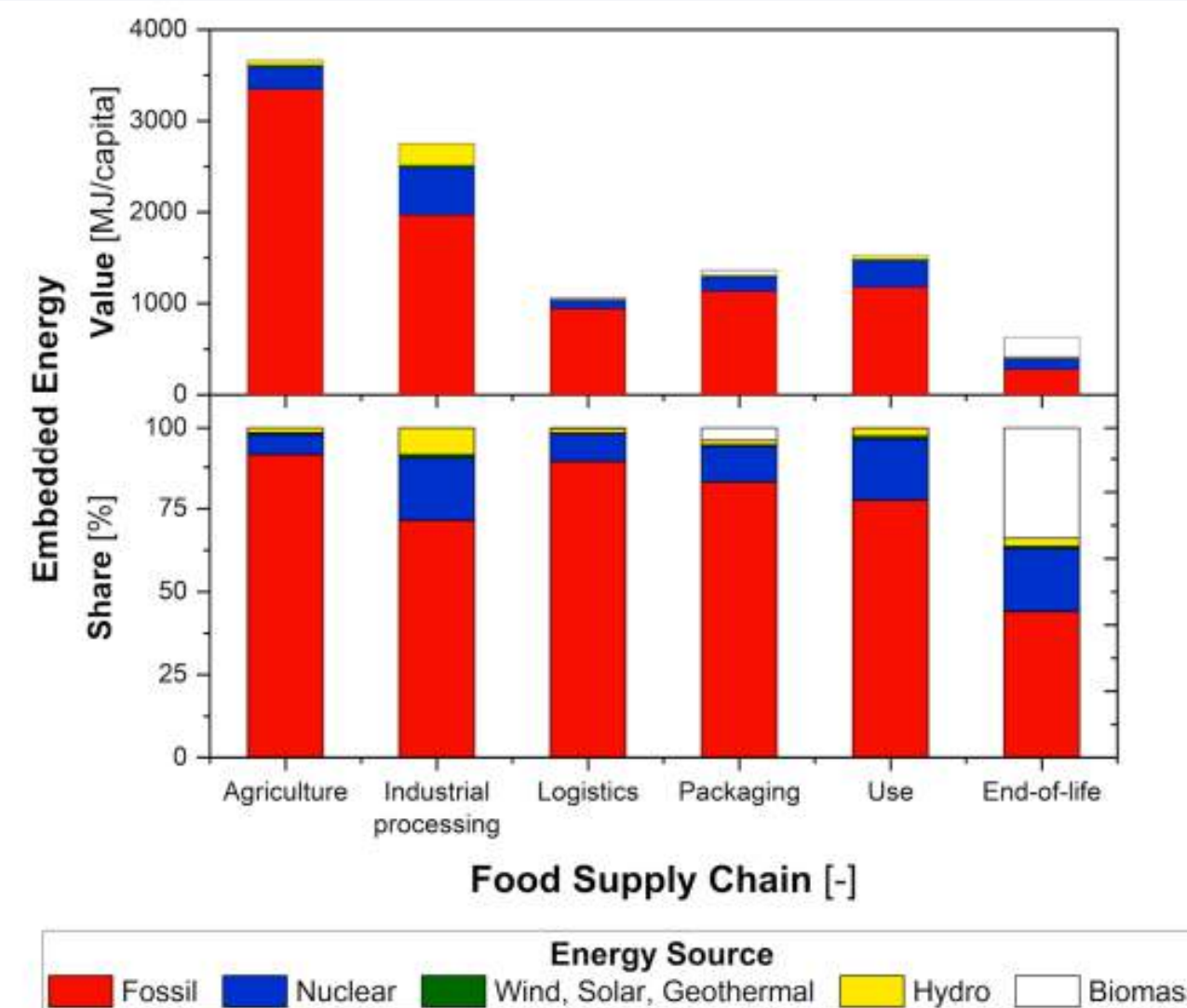
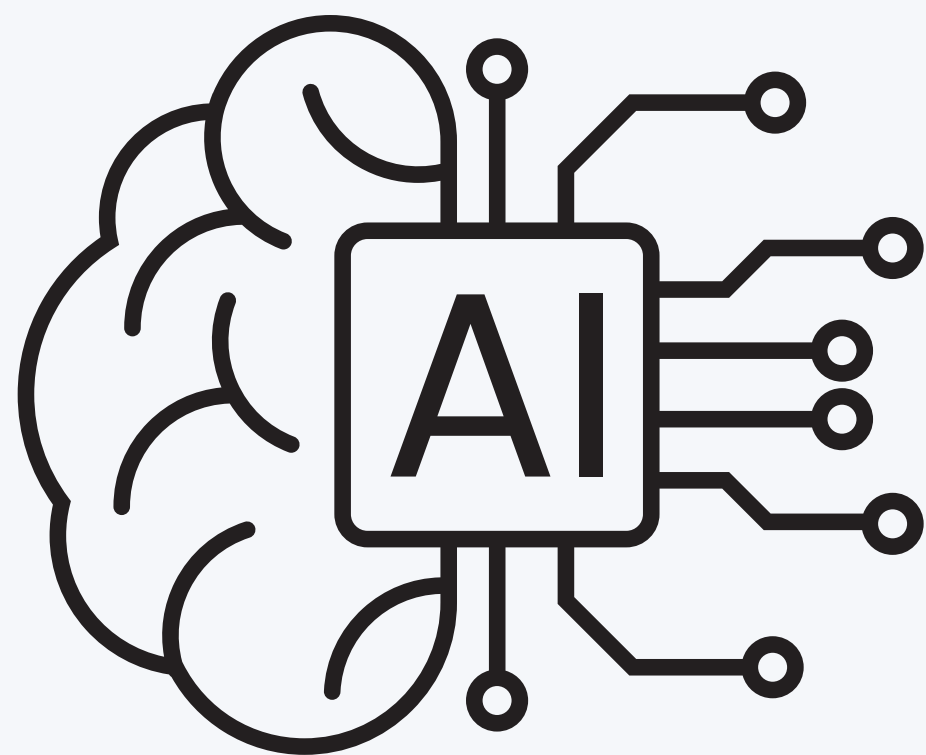


Fig. 7. Energy employment in various food sectors categorized per source. European Union.

ENERGY-CONSUMPTIVE ACTIVITIES

AI AND DATA CENTERS



IN ADDITION TO REQUIRING A LARGE AMOUNT OF INVESTMENTS (AT LEAST 736 BILLION PROJECTED ACCORDING TO GOLDMAN SACHS), THE DEMAND FOR ENERGY FROM THIS SECTOR IS ENORMOUS.

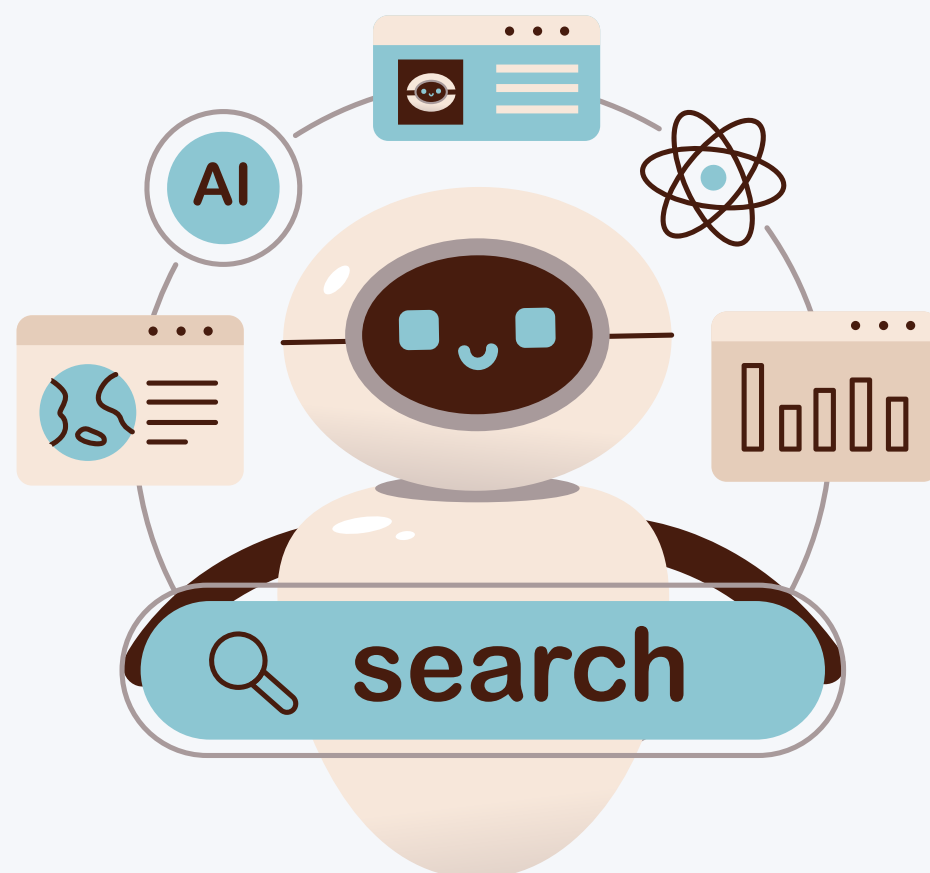
“AT PRESENT, GOLDMAN SACHS RESEARCH ESTIMATES THE POWER USAGE BY THE GLOBAL DATA CENTER MARKET TO BE AROUND 55 GIGAWATTS (GW). THIS IS COMPRISED OF CLOUD COMPUTING WORKLOADS (54%), TRADITIONAL WORKLOADS FOR TYPICAL BUSINESS FUNCTIONS SUCH AS EMAIL OR STORAGE (32%), AND AI (14%).

(...) OUR ANALYSTS PROJECT POWER DEMAND WILL REACH 84 GW BY 2027, WITH AI GROWING TO 27% OF THE OVERALL MARKET, CLOUD DROPPING TO 50%, AND TRADITIONAL WORKLOADS FALLING TO 23%.

THIS BASELINE SCENARIO COULD, HOWEVER, BE AFFECTED BY A DECELERATION IN USAGE BY AI — FOR EXAMPLE, IF THE TRANSITION TO AI-DRIVEN WORK AND AI MONETIZATION DOESN'T DEVELOP AS QUICKLY AS ANTICIPATED. IN SUCH MUTED SCENARIOS, DEMAND COULD DIVERGE FROM THE BASELINE ESTIMATE BY 9-13 GW.”

ENERGY-CONSUMPTIVE ACTIVITIES

AI AND DATA CENTERS



GENERATIVE AI ON THE OTHER HAND, ACCORDING TO MIT - PROJECTS GROWTH OF 1050 TERA WATTS PER HOUR. TO EXEMPLIFY, MIT CITES THE PARAMETERS USED TO BUILD OPENAI'S GPT-3, WHICH ARE NOT VERY SAFE BY DISCRETION, FROM THE UNIVERSITY OF BERKLEY, THEY WOULD COUNT AT 1287 MEGAWATTS PER HOUR OF ELECTRICITY .

TO BE CLEAR: A **LIGHT BULB** CONSUMES A 50 WATT PER HOUR. ONE MEGAWATT CORRESPONDS TO ONE MILLION WATTS. ONE TERA WATT CORRESPONDS TO ONE TRILLION. A LOT OF ENERGY

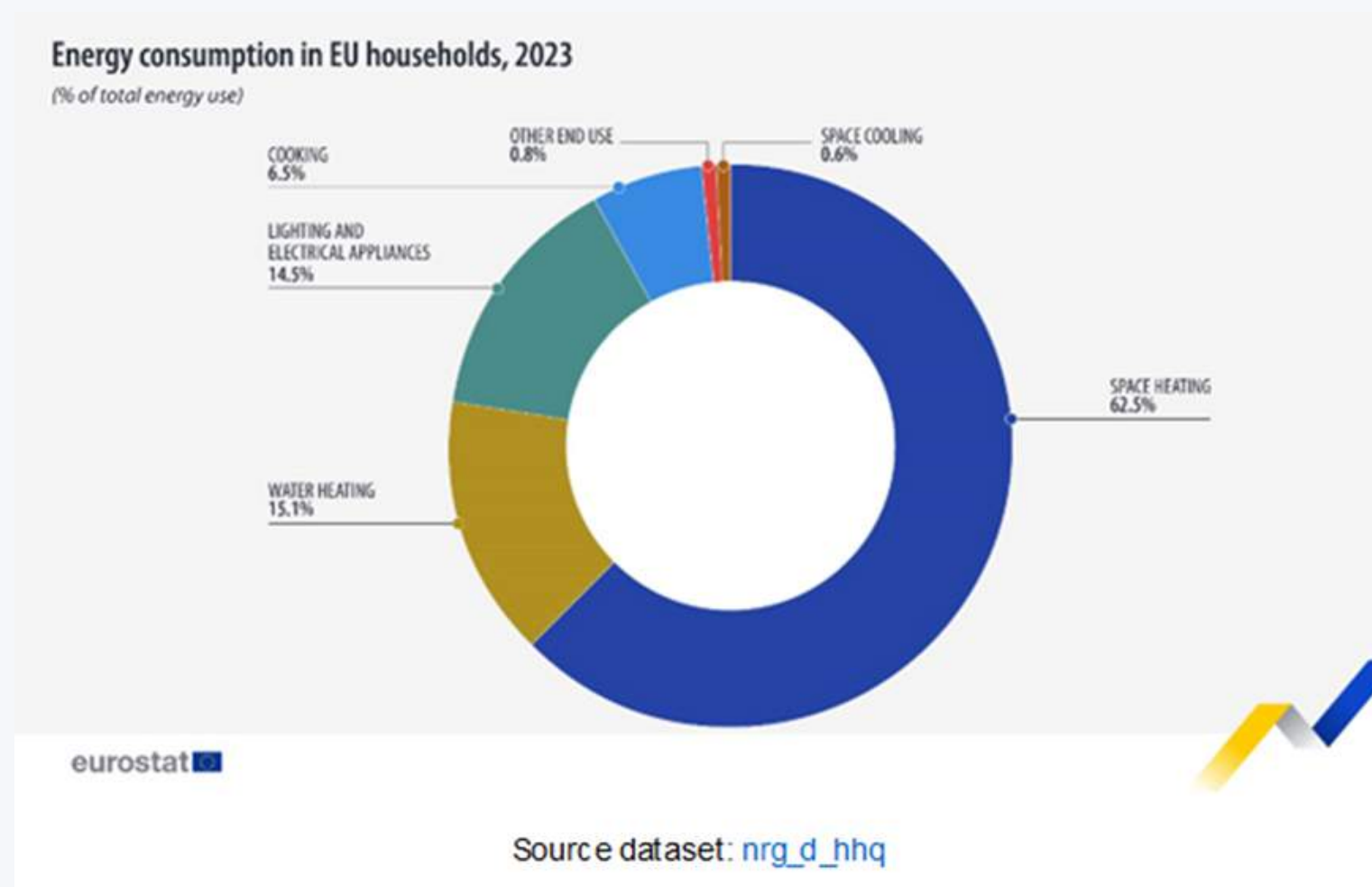
ENERGY-CONSUMPTIVE ACTIVITIES

HOUSEHOLDS' CONSUMPTION

EUROSTAT DATA

DATA SHOWS THAT THE DOMESTIC SECTOR(HOUSEHOLDS) CONSUME ENERGY IN RELATION TO THE FOLLWOING ACTIVITIES:

- HEATING OF INTERIOR SPACES
- WATER HEATING
- HOUSEHOLD APPLIANCES AND LIGHTING
- COOKING
- COOLING OF INTERIOR SPACES
- OTHER USES



ENERGY-CONSUMPTIVE ACTIVITIES

HOUSEHOLDS' CONSUMPTION

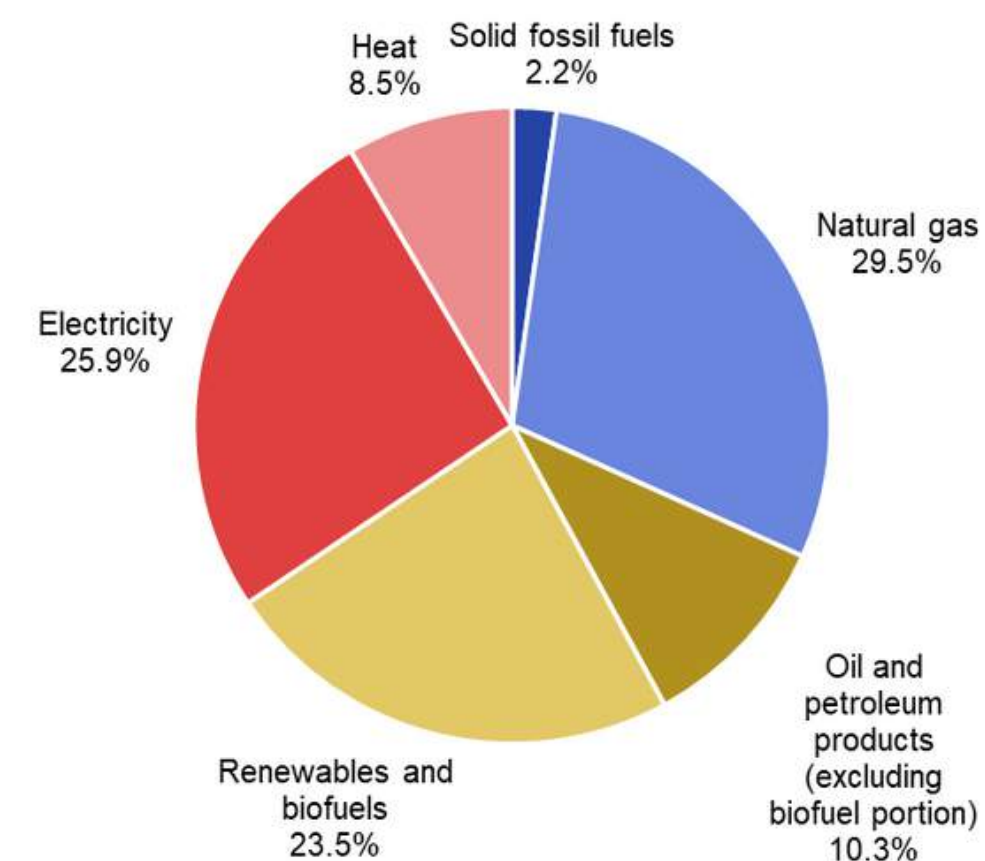
EUROSTAT DATA

WHICH SOURCES WERE USED THE MOST ACCORDING TO EUROSTAT?

- NATURAL GAS (29.5%)
- ELECTRICITY (25.9%)
- **RENEWABLES (23.5%)**
- PETROLEUM AND PETROLEUM-BASED PRODUCTS (10.3%)

Final energy consumption in the residential sector by fuel, 2023

(%)



Source: Eurostat (online data code: nrg_bal_c)

eurostat



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Renewable Communities:

*Empowering Local Communities through
Renewable Energy-**Renewable Sources***



RENEWABLE ENERGY

DEFINITION(S)

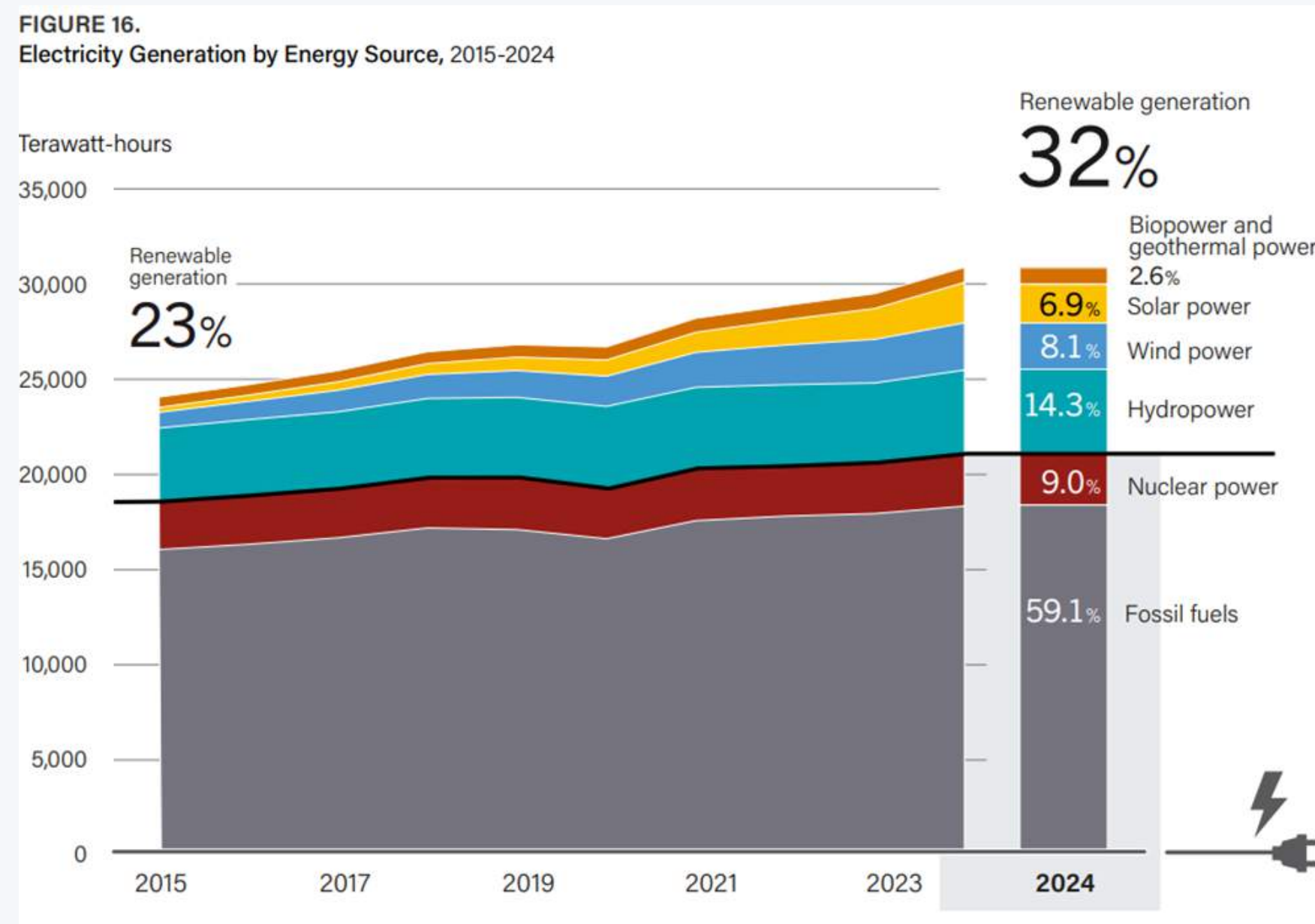
UNITED NATION WEBSITE: RENEWABLE ENERGY IS ENERGY DERIVED FROM NATURAL SOURCES THAT ARE REPLENISHED AT A HIGHER RATE THAN THEY ARE CONSUMED. SUNLIGHT AND WIND, FOR EXAMPLE, ARE SUCH SOURCES THAT ARE CONSTANTLY BEING REPLENISHED.

EUROSTAT: RENEWABLE ENERGY SOURCES, ALSO CALLED RENEWABLES, ARE ENERGY SOURCES THAT REPLENISH (OR RENEW) THEMSELVES NATURALLY.

US ENERGY INFORMATION ADMINISTRATION: RENEWABLE ENERGY IS ENERGY FROM SOURCES THAT ARE NATURALLY REPLENISHING BUT FLOW-LIMITED; RENEWABLE RESOURCES ARE VIRTUALLY INEXHAUSTIBLE, BUT THEY ARE LIMITED BY THE AVAILABILITY OF THE RESOURCES.

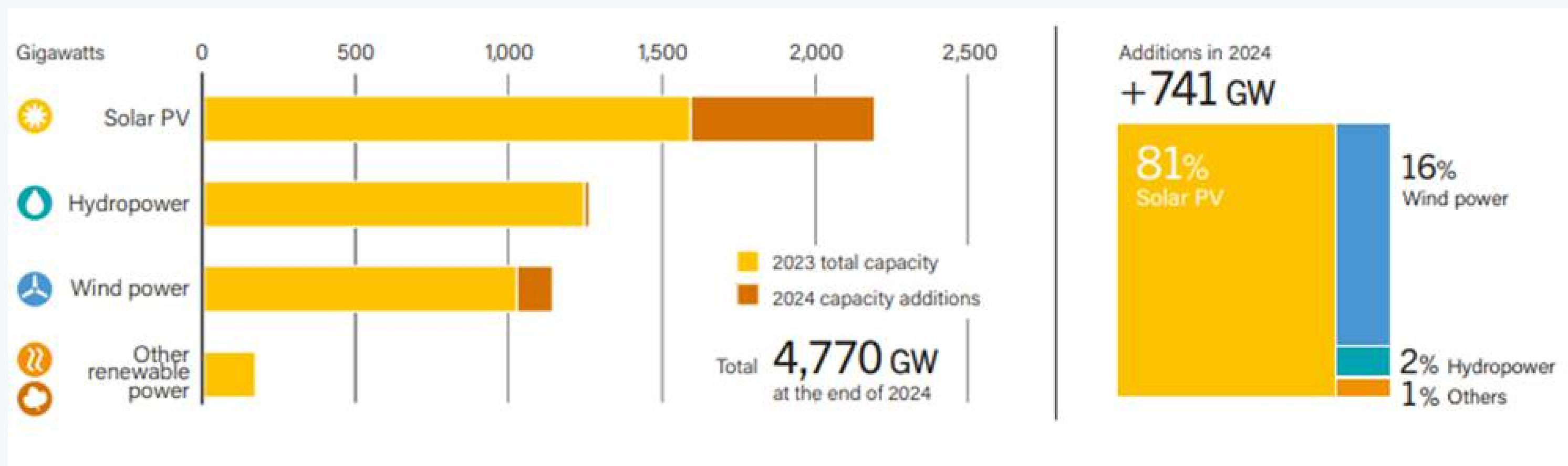
RENEWABLE ENERGY

SOURCE: RENEWABLES 2025 GLOBAL STATUS REPORT: GLOBAL OVERVIEW, FROM MULTISTAKEHOLDER GLOBAL NETWORK RENEWABLE 21.

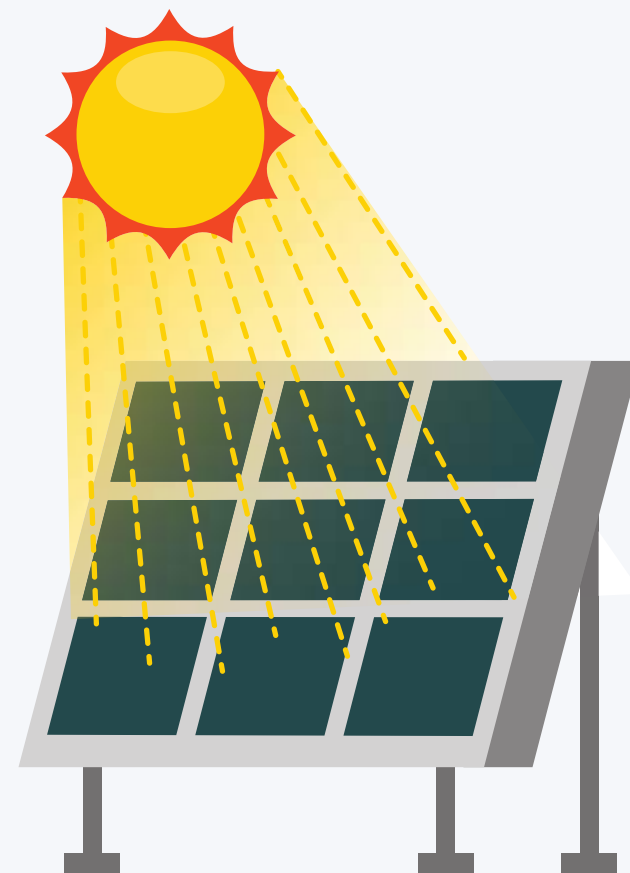


RENEWABLE ENERGY

SOURCE: RENEWABLES 2025 GLOBAL STATUS REPORT: GLOBAL OVERVIEW, FROM MULTISTAKEHOLDER GLOBAL NETWORK RENEWABLE 21.



RENEWABLE ENERGY



SOLAR POWER AND ENERGY

Solar power works by converting energy from the sun into power. There are two forms of energy generated from the sun for our use – electricity and heat (*National grid, 2023*).

As shown by the graph, solar power and electricity is the one that has been on the rise in recent years. With 609,921 MW, China is the leading country in solar power production, followed by the USA, Japan, Germany, and India.

RENEWABLE ENERGY

WIND POWER AND ENERGY



The wind blows through the blades of a wind turbine, generating kinetic power. The rotation of the blades activates the box behind them (nacelle and shaft), which converts the kinetic energy into electrical one.

Wind energy and power rose of 16% as of 2024 analysis. Almost half of the worldwide production from wind power comes from China, followed again by the US, and Germany (WWEA, 2025).

RENEWABLE ENERGY



HYDROELECTRIC POWER

By altering the flow of a body of water, a dam or diversion structure exploits the kinetic power of the water's flow (through the turbines) and turns it into electricity (*U.S. Department of Energy*)

Hydroelectric power advanced by a mere 2%, and top producers globally remain (again) China, Brazil, the US, and in Europe Norway and Sweden. (*GeeksforGeeks, 2025*)

RENEWABLE ENERGY

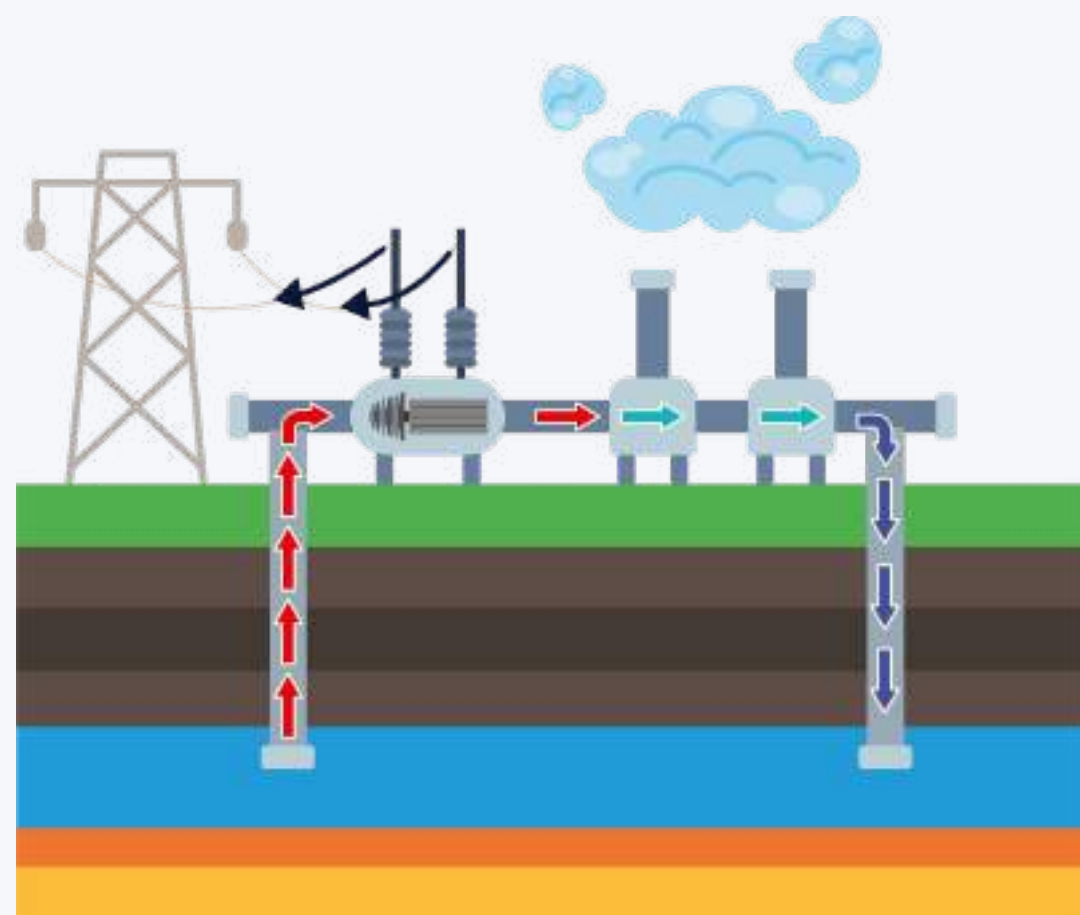


BIOENERGY

Pile of leaves, organic matter... bioenergy consists into converting this biomass into usable energy forms, through direct combustion, anaerobic digestion, or thermochemical conversion. (*International Organization for Standardization*)

According to the IEA, led by bioenergy, renewable fuels could approach 6% of energy demand from industry, buildings and transport in 2030.

RENEWABLE ENERGY

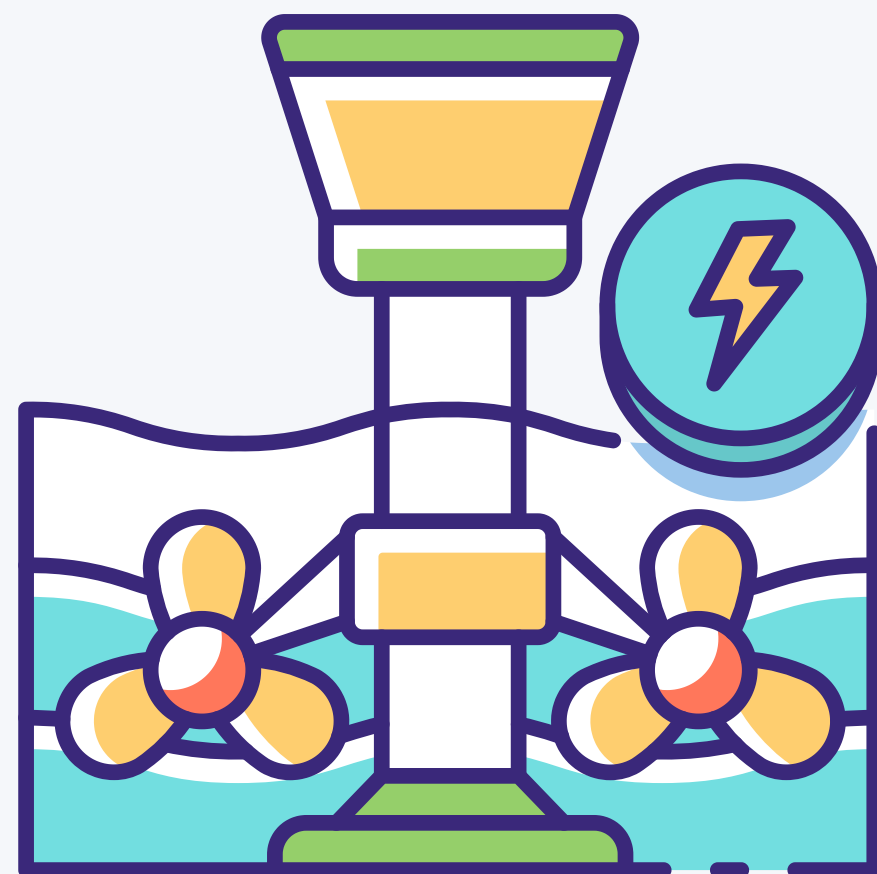


GEOTHERMAL ENERGY

Geothermal energy is a renewable energy source harnessed from the thermal energy stored in rocks and fluids deep within the Earth's crust. It is gathered through drilled wells, which connect the fluid to the surface. (*European Commission website*).

According to the EU Commission, in 2024, geothermal energy accounted for 0.5% of the electricity generated from renewables

RENEWABLE ENERGY



WAVE AND TIDAL ENERGY

Ocean energy, which many consider the least developed, essentially harnesses both waves and tides. The force of the waves, which remains stronger at the surface, is captured by WECs (Wave Energy Converters) through various methods (e.g., mechanical energy to electrical energy, kinetic to electrical, turbogeneration). Tides, on the other hand, become energy sources in the same manner as wind power: through horizontal axis, three-bladed turbines. (*Enel Green Power*)



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Renewable Communities:

*Empowering Local Communities through
Renewable Energy-**The EU legal framework***



THE GREEN DEAL

COMMUNICATION (2019) 630 FINAL ALSO KNOWN AS **GREEN DEAL**, IS THE STRATEGY THE EU COMMISSION HAS ISSUED IN 2019 TO ADDRESS MAJOR PROBLEMS, WHOSE MAJOR GOAL IS TO REACH THE **CLIMATE NEUTRALITY** IN **2050**. THE OVERALL STRATEGY IS BASED ON **3 MAJOR POINTS** :

- 1) ECONOMIC GROWTH DECOUPLED FROM RESOURCE EXPLOITATION**
- 2) ACHIEVING ZERO-NET EMISSIONS BY 2050;**
- 3) LEAVE NO ONE BEHIND IN THE PROCESS**



THE GREEN DEAL

WHAT DOES IT MEAN IN PRACTICAL TERMS?

IT MEANS TO:

- **DESIGNING A SET OF DEEPLY TRANSFORMATIVE POLICIES**

...AND, THUS, SUSTAIN, PROMOTE, AND FINANCE THEM

- **MAINSTREAMING SUSTAINABILITY IN ALL EU POLICIES**

...AND REALLY IMPLEMENT A JUST AND FAIR TRANSITION



EUROPEAN COMMISSION

Brussels, 11.12.2019

COM(2019) 640 final

COMMUNICATION FROM THE COMMISSION

The European Green Deal

1. INTRODUCTION - TURNING AN URGENT CHALLENGE INTO A UNIQUE OPPORTUNITY

This Communication sets out a European Green Deal for the European Union (EU) and its citizens. It resets the Commission's commitment to tackling climate and environmental-related challenges that is this generation's defining task. The atmosphere is warming and the climate is changing with each passing year. One million of the eight million species on the planet are at risk of being lost. Forests and oceans are being polluted and destroyed¹.

The European Green Deal is a response to these challenges. It is a new growth strategy that aims to transform the EU into a fair and prosperous society, with a modern, resource-efficient and competitive economy where there are no net emissions of greenhouse gases in 2050 and where economic growth is decoupled from resource use.

THE GREEN DEAL-ENERGY SECTOR

SOURCE: MARELLI *ET ALIA*, DELIVERING THE EU GREEN DEAL - PROGRESS TOWARDS TARGETS, PUBLICATIONS OFFICE OF THE EUROPEAN UNION, LUXEMBOURG, 2025, [HTTPS://DATA.EUROPA.EU/DOI/10.2760/3105205](https://data.europa.eu/doi/10.2760/3105205), JRC140372.

AMONG THE MOST IMPORTANT FOUNDATIONAL GOALS IS THE OBJECTIVE OF OFFERING CLEANER, MORE AFFORDABLE, AND SECURE ENERGY. ONE OF THE KEY AIMS THE GREEN DEAL SET OUT TO ACHIEVE WAS A FULLY INTEGRATED ENERGY MARKET, ALWAYS RESPECTING A TECHNOLOGY-NEUTRAL PROCESS. MANY CRUCIAL ACTIONS HAVE ALREADY BEEN CARRIED OUT UNDER THE GREEN DEAL:

- EU STRATEGY FOR ENERGY SYSTEM INTEGRATION
- FIT FOR 55
- REPOWER EU
- RENEWABLE ENERGY DIRECTIVE
- THE INDUSTRIAL GREEN DEAL ACT
- THE NET ZERO INDUSTRY ACT
- CRITICAL RAW MATERIALS ACT.



THE GREEN DEAL-ENERGY SECTOR

SOURCE: MARELLI *ET ALIA*, DELIVERING THE EU GREEN DEAL - PROGRESS TOWARDS TARGETS, PUBLICATIONS OFFICE OF THE EUROPEAN UNION, LUXEMBOURG, 2025, [HTTPS://DATA.EUROPA.EU/DOI/10.2760/3105205](https://data.europa.eu/doi/10.2760/3105205), JRC140372.

THE MAIN CHALLENGES IN IMPLEMENTING THE PLAN CENTER ON LAGGING PROGRESS AND INCOMPLETE DATA REPORTING. THE SINGLE LEGISLATIVE PACKAGES HAVE OUTSTANDING DATA, BUT WE CAN SUMMARIZE IT IN 4 POINTS:

1. RENEWABLE ENERGY LAG
2. INCOMPLETE DATA
3. CONSUMPTION TARGET CLOSER,
4. STEEPER SAVINGS REQUIRED



THE GREEN DEAL-ENERGY SECTOR

SOURCE: Mario Draghi, THE FUTURE OF EUROPEAN COMPETITIVENESS, 2025

MOREOVER, THE GREEN DEAL, AT THE TIME OF ITS DRAFTING, COULD NOT FORESEE MAJOR DISRUPTIVE EVENTS, WHICH LED TO A LOSS IN COMPETITIVENESS. THE COMMISSION ASKED MARIO DRAGHI TO MAKE A REPORT ON THE STATE OF THE UNION. TO THE ENDS OF THE DISSERTATION, A CLEAR POINT WAS OUTLINED (AGAIN):

- SINCE IN THE EU THERE HAS NEVER BEEN A CLEAR DECOUPLING (TO MAKE THE INDUSTRIAL SECTOR, INDEPENDENT FROM FOSSIL FUELS) , THE COMMISSION MUST NOW SEEK TO MAKE THE INDUSTRIES **GREENER**



THE CLEAN INDUSTRIAL DEAL

BEARING ALL THIS IN MIND, THE COMMISSION HAS SET A NEW STRATEGY. INDUSTRIES, AS HIGHLIGHTED IN THE REPORT ON THE PROGRESS OF THE GREEN DEAL MUST BE INTEGRATED INTO THE DIALOGUE TO BEST IMPLEMENT THE LEGISLATION AND RESOLVE INVESTMENT BARRIERS AND SKILL SHORTAGES.

THE CLEAN INDUSTRIAL DEAL PRESENTS MEASURES TO IMPROVE EVERY SINGLE STEP OF PRODUCTION, WITH A STRONGER FOCUS ON **ENERGY-INTENSIVE INDUSTRIES** (STEEL, METALS, CHEMICALS, WHICH URGENTLY NEED TO BE DECARBONIZED) **AND THE CLEAN-TECH SECTOR**, DEFINED AS THE FUTURE OF COMPETITION.



THE AFFORDABLE ENERGY ACTION PLAN

WITHIN THE GENERAL FRAMEWORK OF THE CLEAN INDUSTRIAL DEAL, A NEW COMMUNICATION ON FEBRUARY 26, 2025, WAS THE AFFORDABLE ENERGY ACTION PLAN (COM/2025/79), WHICH IS BASED ON 4 MAIN PILLARS:

1. LOWERING ENERGY COSTS FOR EVERYONE
2. COMPLETING THE MUCH-ANTICIPATED ENERGY UNION
3. ATTRACTING INVESTMENTS AND ENSURING THEIR DELIVERY
4. INCREASING PREPAREDNESS FOR POTENTIAL ENERGY CRISES



**MAKING COSTS MORE
AFFORDABLE**

**LOWERING ENERGY
SUPPLY COSTS**

**ENSURING WELL-
FUNCTIONING GAS
MARKETS**

ENERGY EFFICIENCY

**8 MEASURES FOR
IMPLEMENTATION**

**COMPLETING THE
ENERGY UNION**

**TRIPARTITE
CONTRACTS**

**ENSURING PRICE
STABILITY**

**CRISIS
PREPAREDNESS**





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