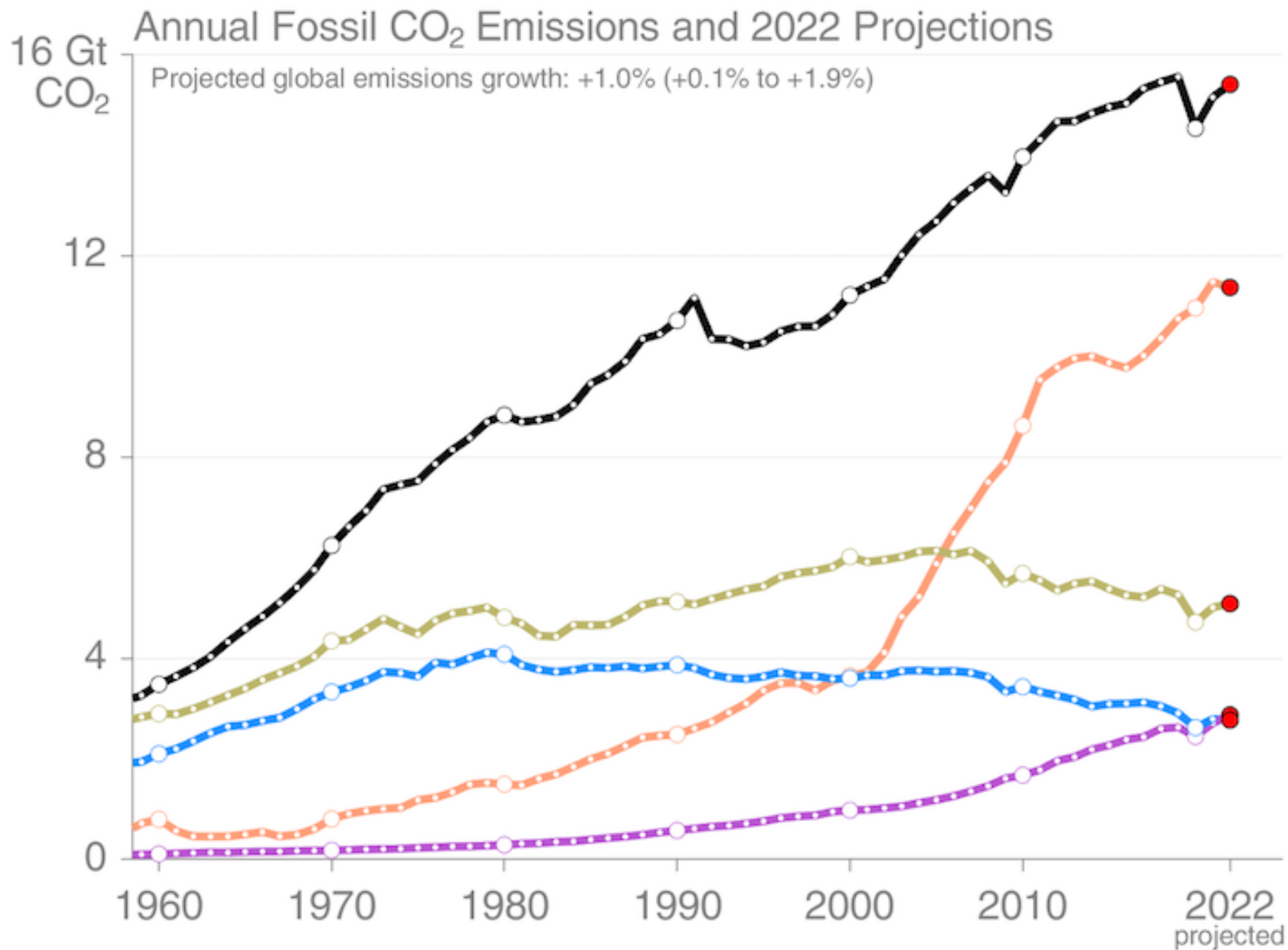


Convegno per i 25 anni del Kyoto Club Roma 26 giugno 2024 - Spazio Europa



Gianni Silvestrini
Direttore scientifico Kyoto Club e QualEnergia





Projected Gt CO₂ in 2022

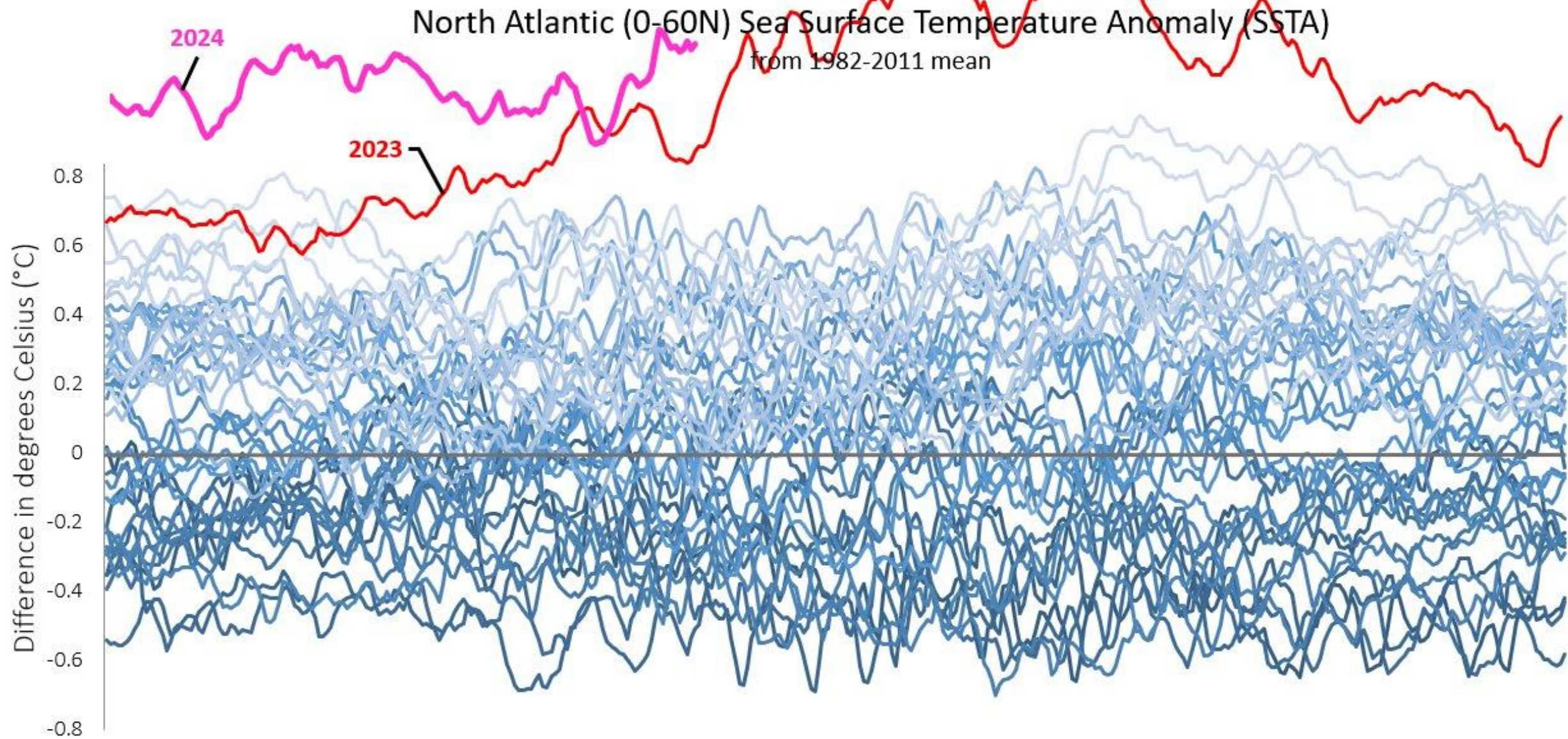
All others 15.4
▲ 1.7% (+0.1% to +3.3%)

China 11.4
▼ 0.9% (-2.3% to +0.4%)

USA 5.1
▲ 1.5% (-1.0% to +4.0%)

India 2.9
▲ 6.0% (+3.9% to +8.0%)

EU27 2.8
▼ 0.8% (-2.8% to +1.2%)



La crescita esponenziale del solare

La potenza fotovoltaica solare installata raddoppia all'incirca ogni tre anni, e quindi decuplica ogni decennio.

Fra un decennio potrebbe essere la principale tecnologia per la produzione di elettricità nel mondo.

Copertina del 20 giugno 2024



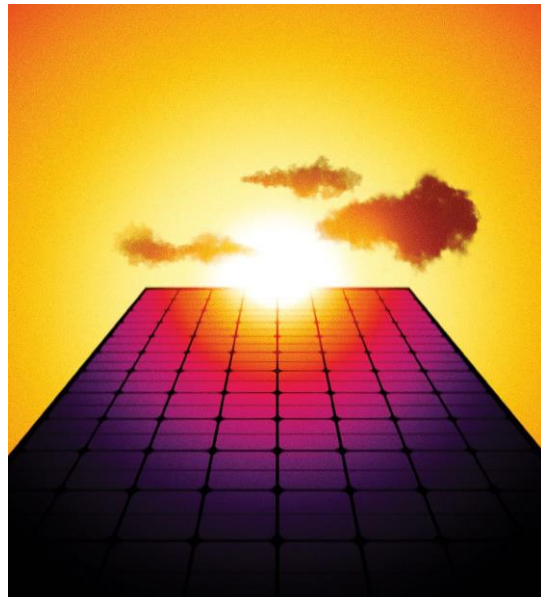
Nel 2004, ci è voluto un anno per installare
1 GW solare nel mondo.

Nel 2010, un mese.

Nel 2016, una settimana.

Nel 2023, un giorno.

Nel 2024, mezza giornata



FEDERICO BUTERA
GIANNI SILVESTRINI

IL FUTURO DEL SOLE

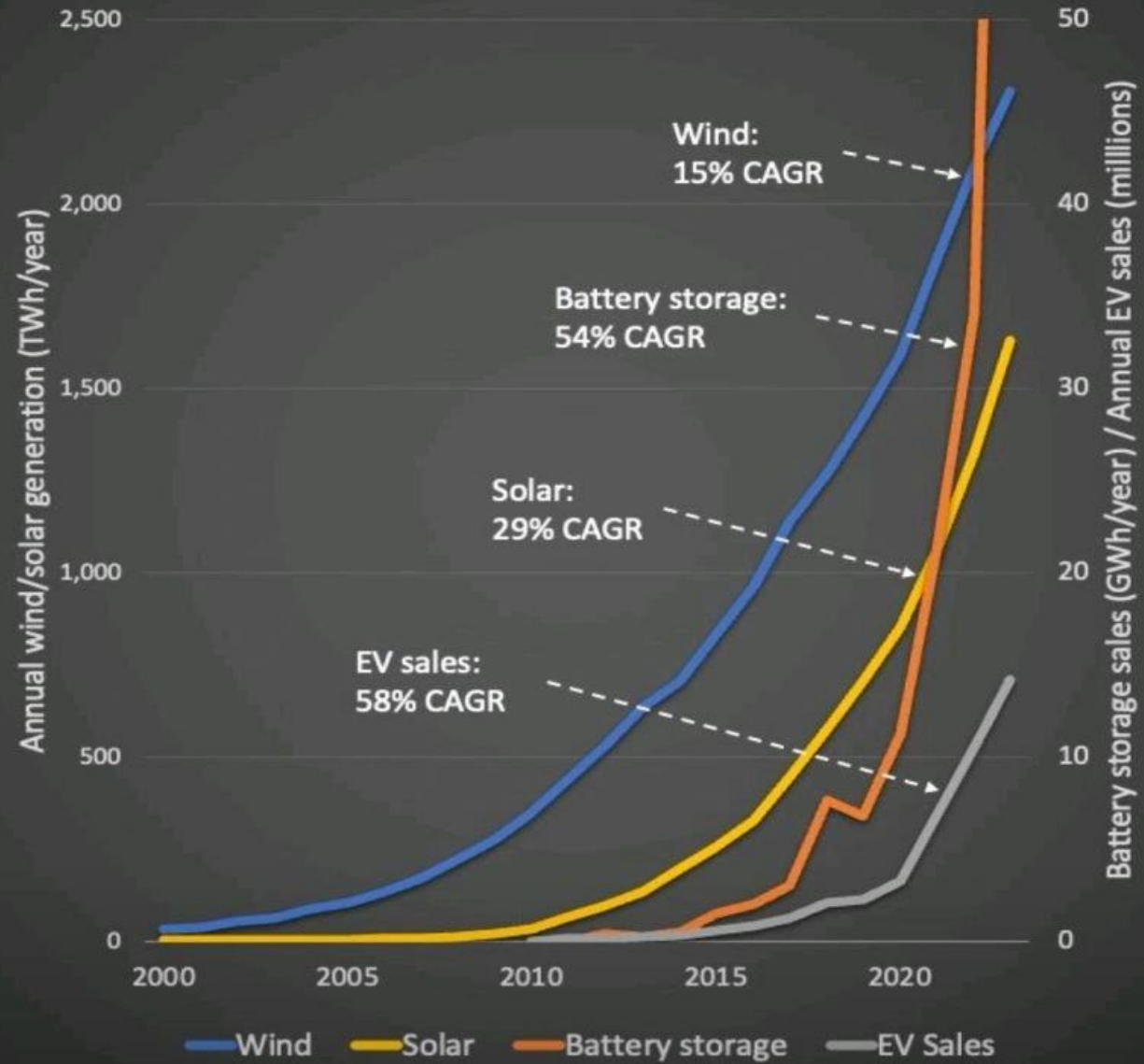
POTENZIALITÀ DELLE FONTI RINNOVABILI
NELLA PRODUZIONE DI ENERGIA ELETTRICA

AMBIENTE E SOCIETÀ



1990

The energy transition is exponential



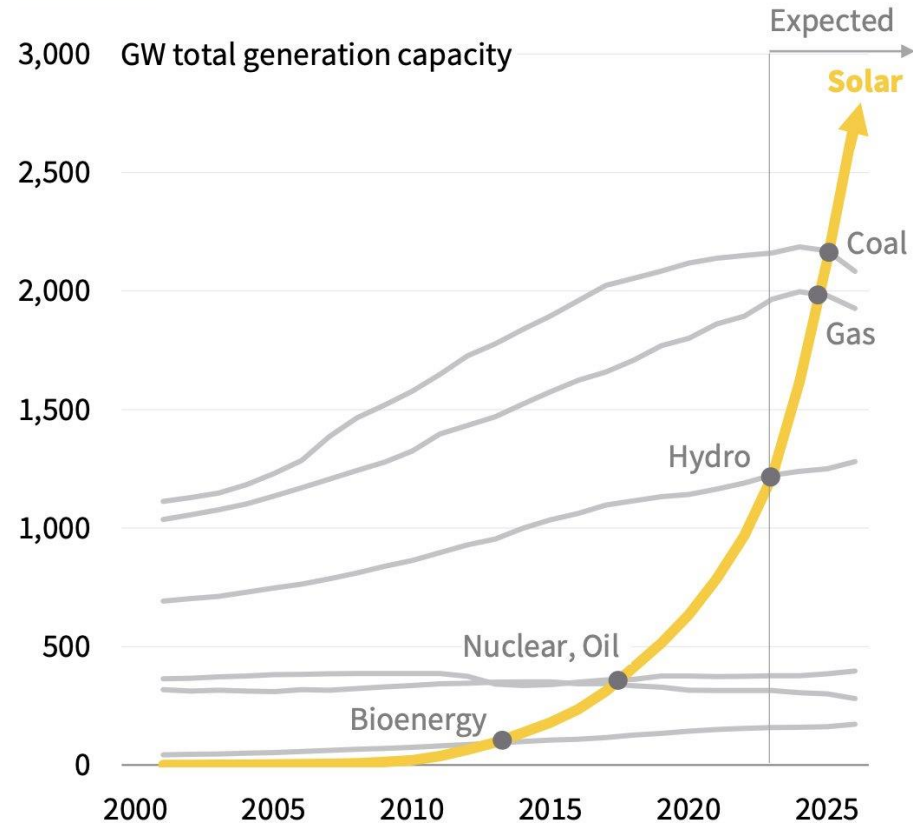
Sources: RMI, BNEF, BP, Ember, EV Volumes
CAGRs shown are from 2012-2022

@gavinmooney

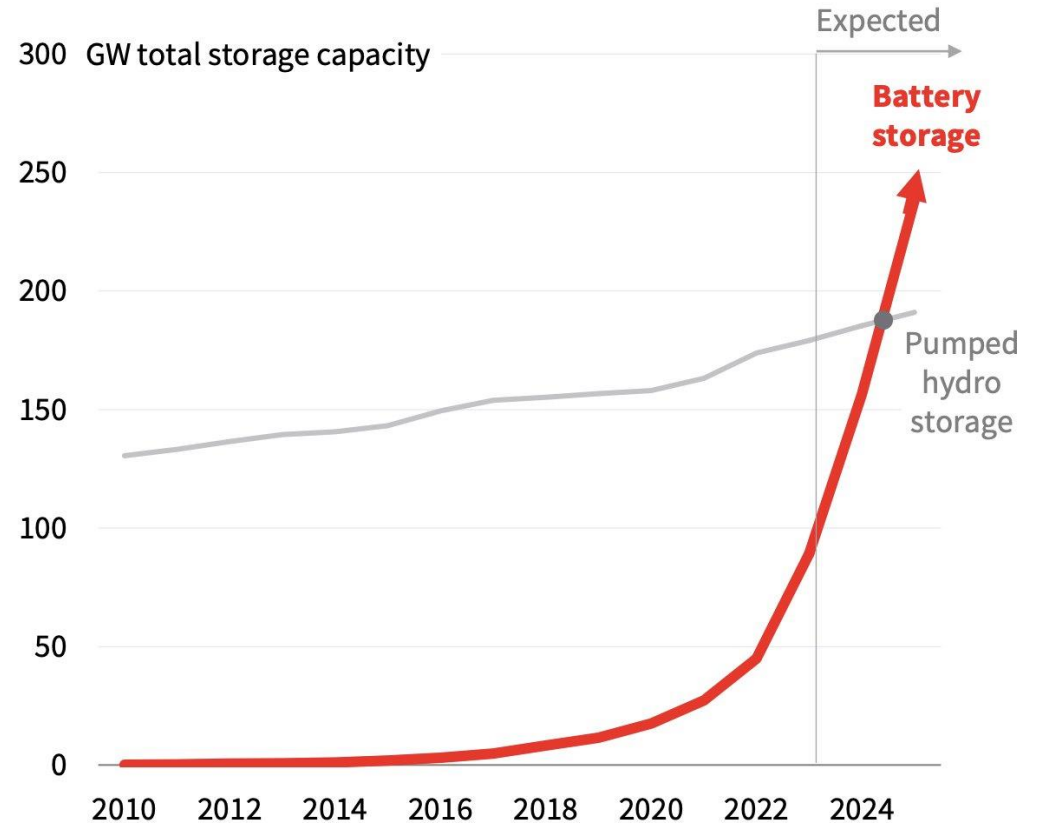
Solar and batteries are taking over

Solar will shortly overtake every other type of capacity, and battery storage will leapfrog pumped hydro

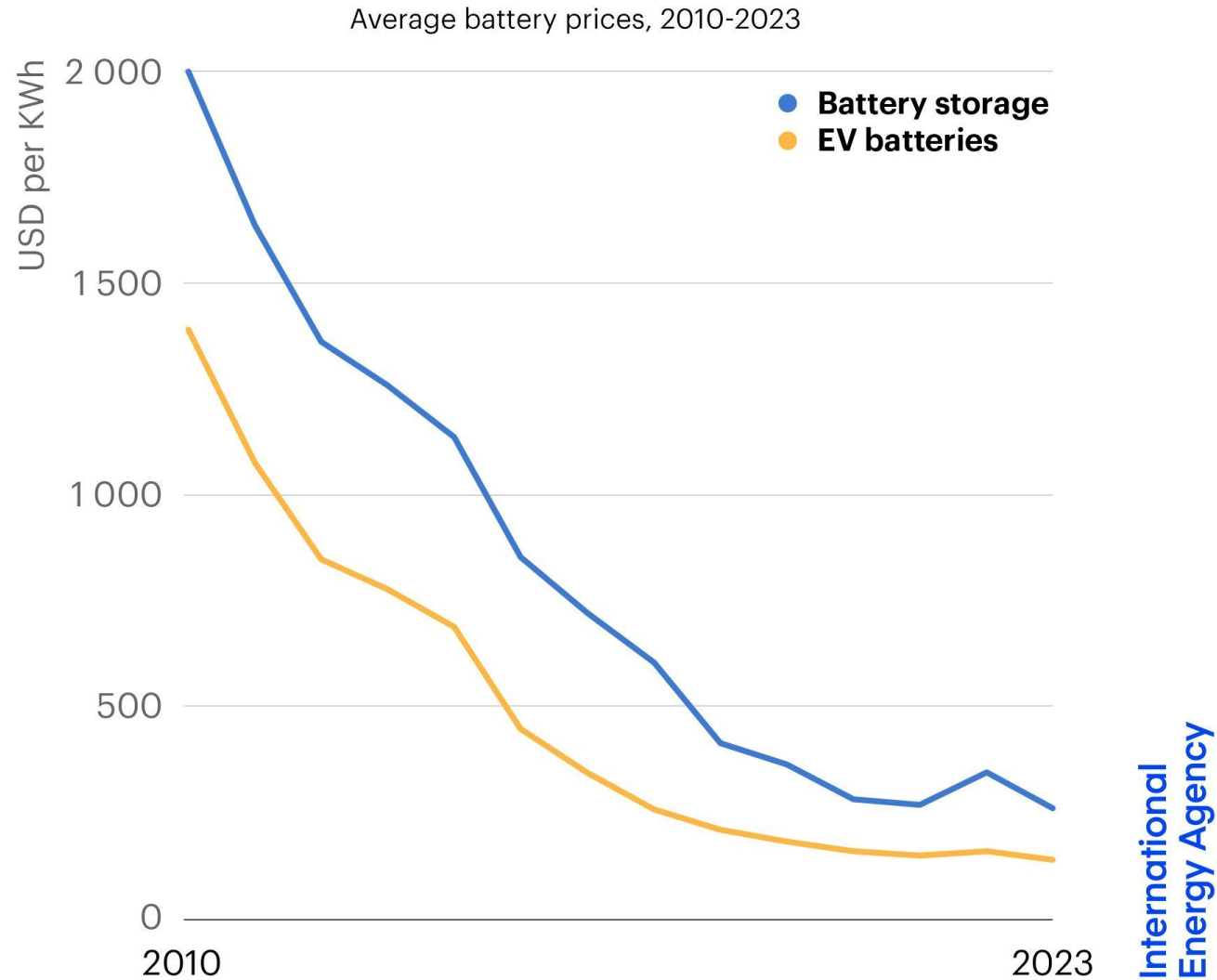
Solar



Batteries



In less than 15 years, **battery costs have fallen by more than 90%**, one of the fastest declines ever seen in clean energy technologies

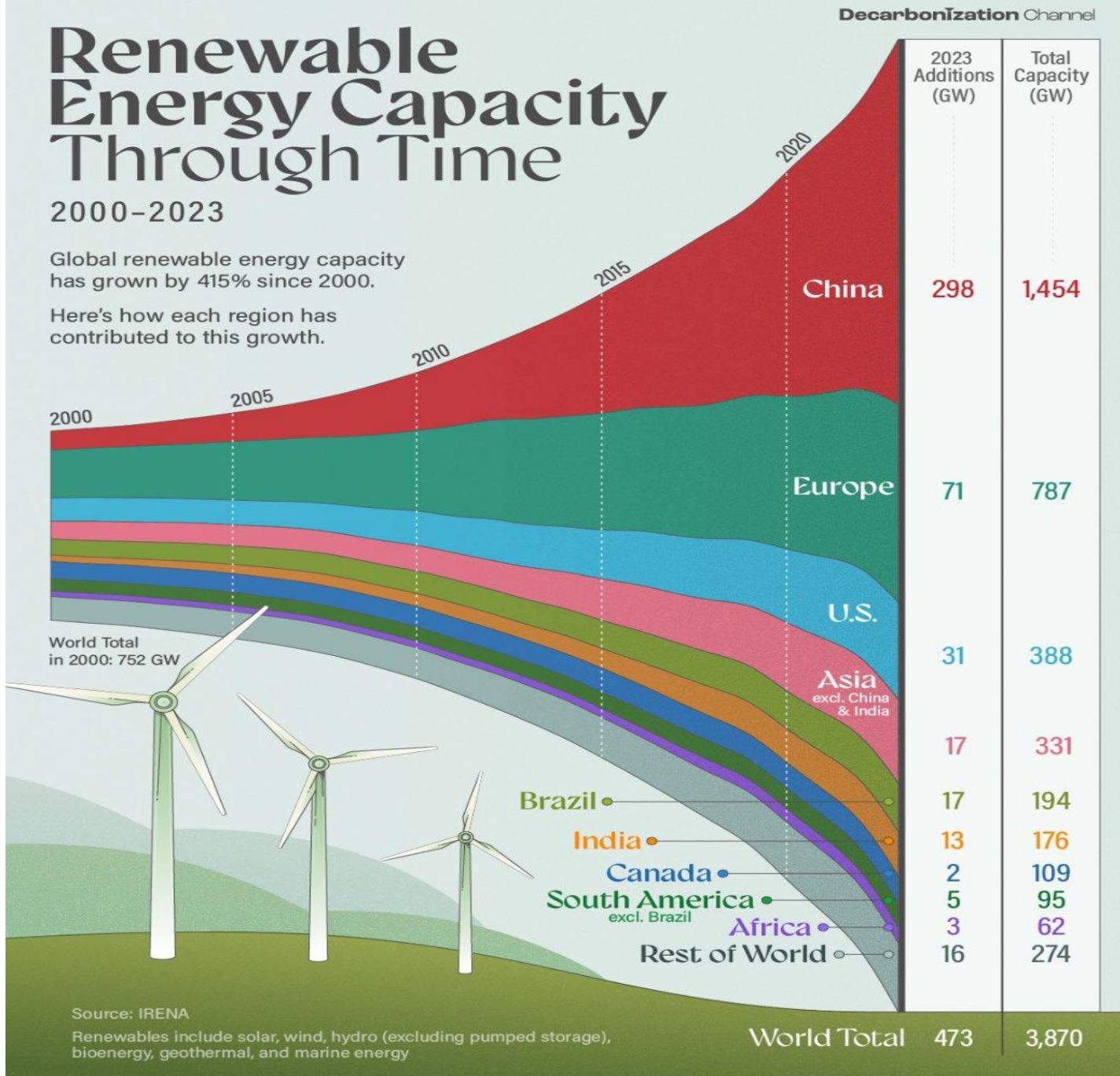


Renewable Energy Capacity Through Time

2000-2023

Global renewable energy capacity has grown by 415% since 2000.

Here's how each region has contributed to this growth.

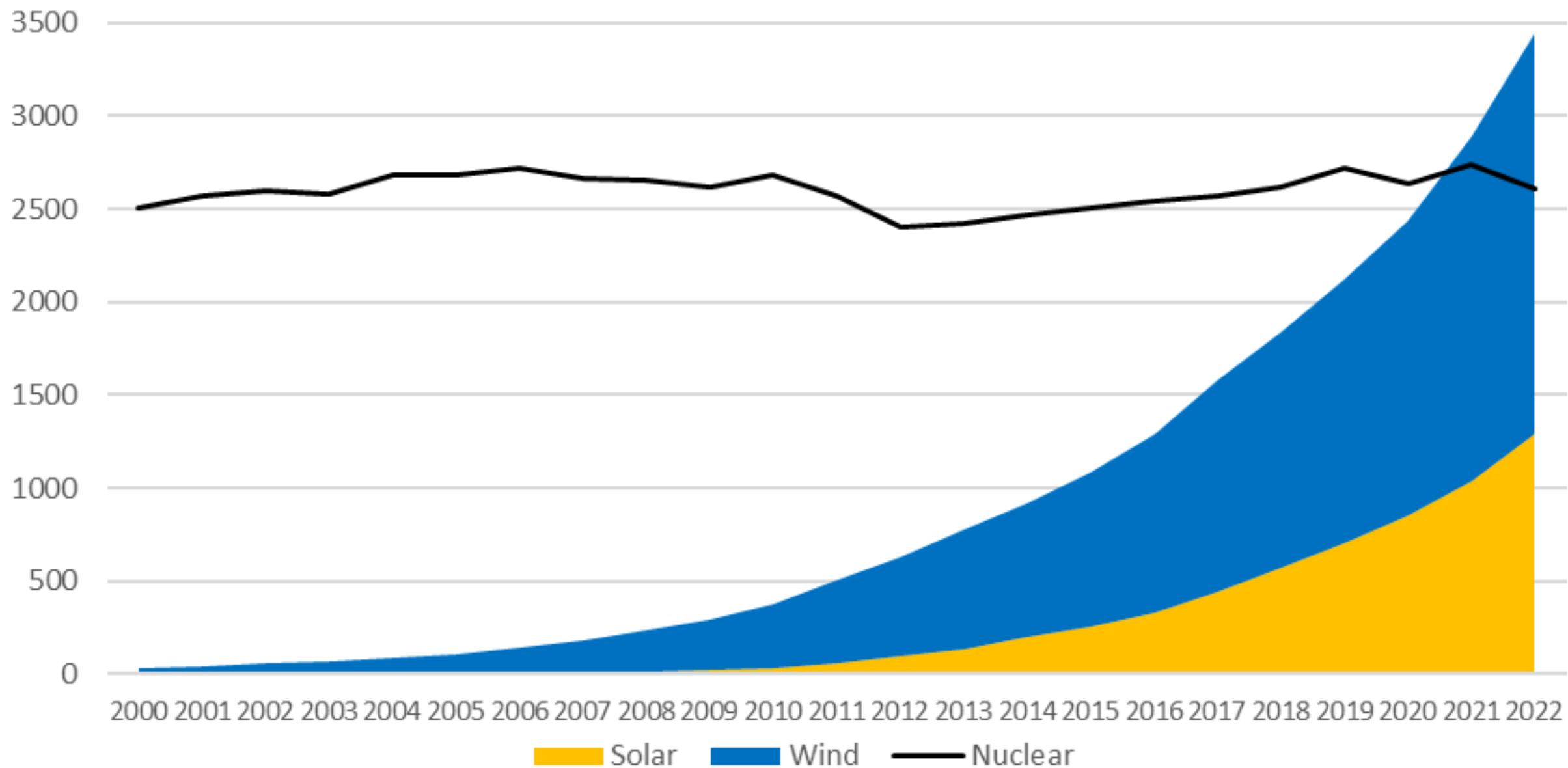


Source: IRENA

Renewables include solar, wind, hydro (excluding pumped storage), bioenergy, geothermal, and marine energy

Global Wind+Solar vs. Nuclear Generation [TWh/y]

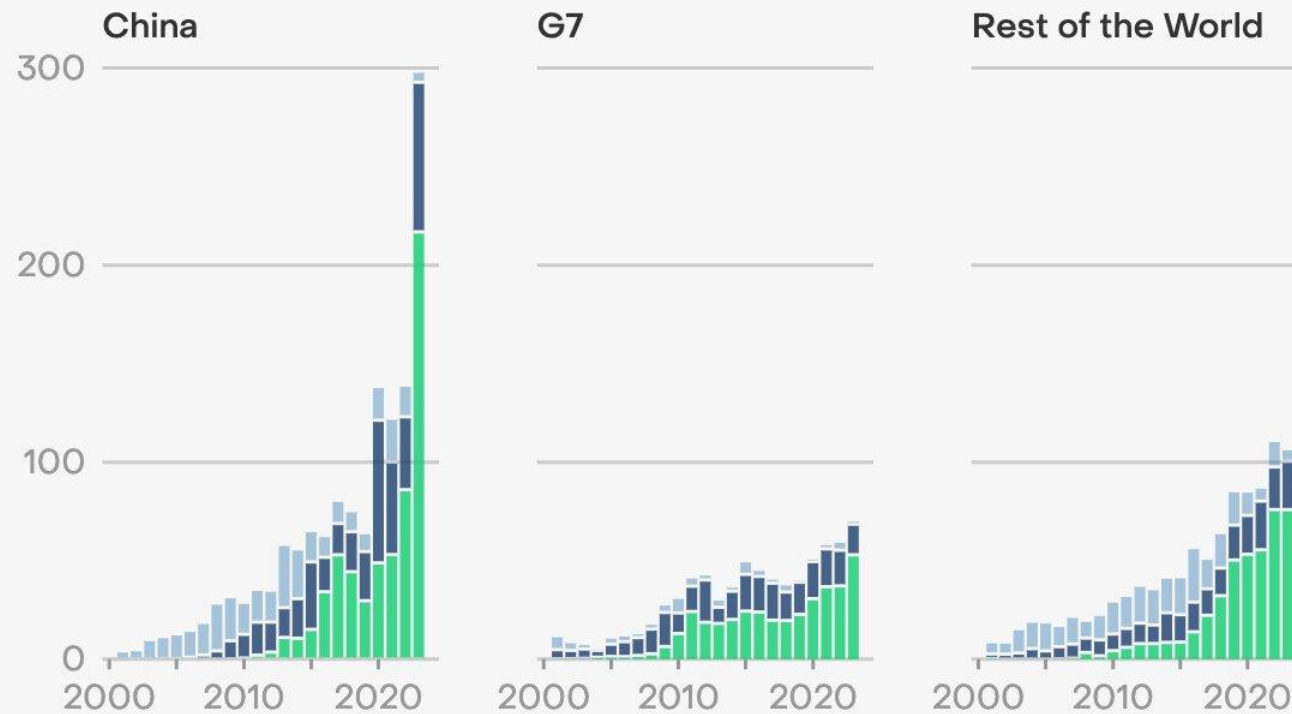
Source: www.ember-climate.org/data-catalogue/yearly-electricity-data



China renewables capacity additions soared in 2023, growing more than four times faster than the G7

Annual renewable capacity additions, GW

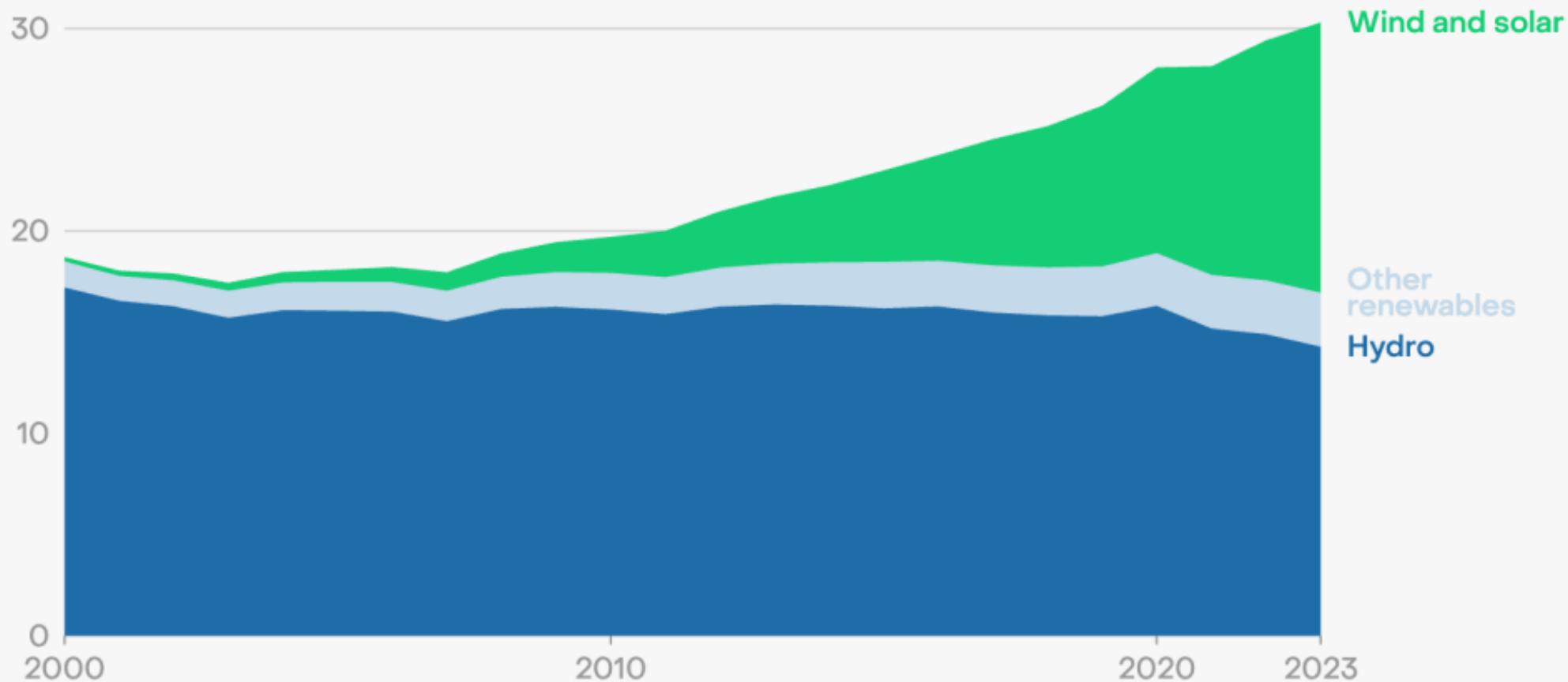
Solar Wind Other renewables



Source: Ember calculation based on IRENA Renewable Capacity Statistics 2024 · G7 includes the seven member countries, not the EU
Rest of the World excludes the G7

Global growth in wind and solar pushed renewables to make up more than 30% of the global electricity mix in 2023

Share of global electricity generation from renewable sources (%)



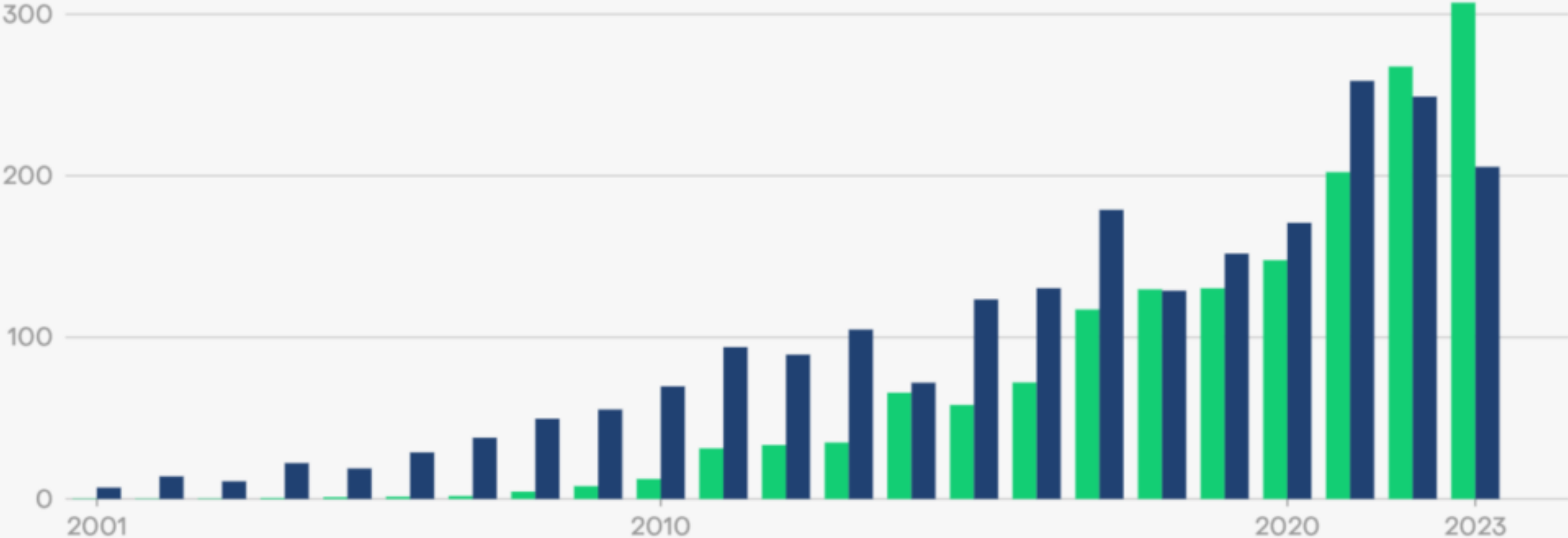
Source: Annual electricity data, Ember

EMBER

Solar outpaced wind generation growth in 2023 for the second year running

Annual change in electricity generation (TWh)

Solar Wind

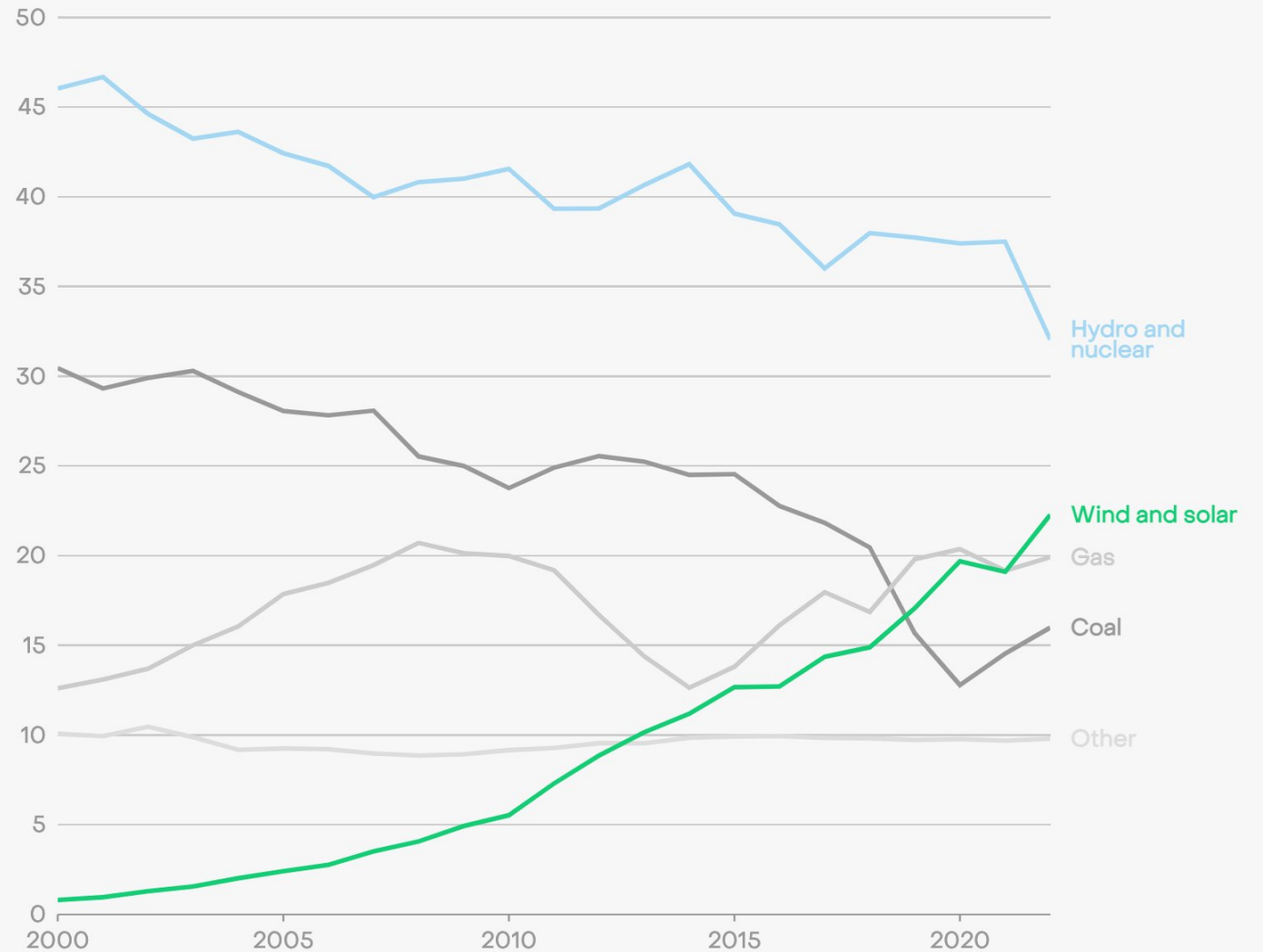


Source: Annual electricity data, Ember

Nel 2023 l'elettricità solare ed eolica ha superato sia quella da gas che quella da carbone nella UE

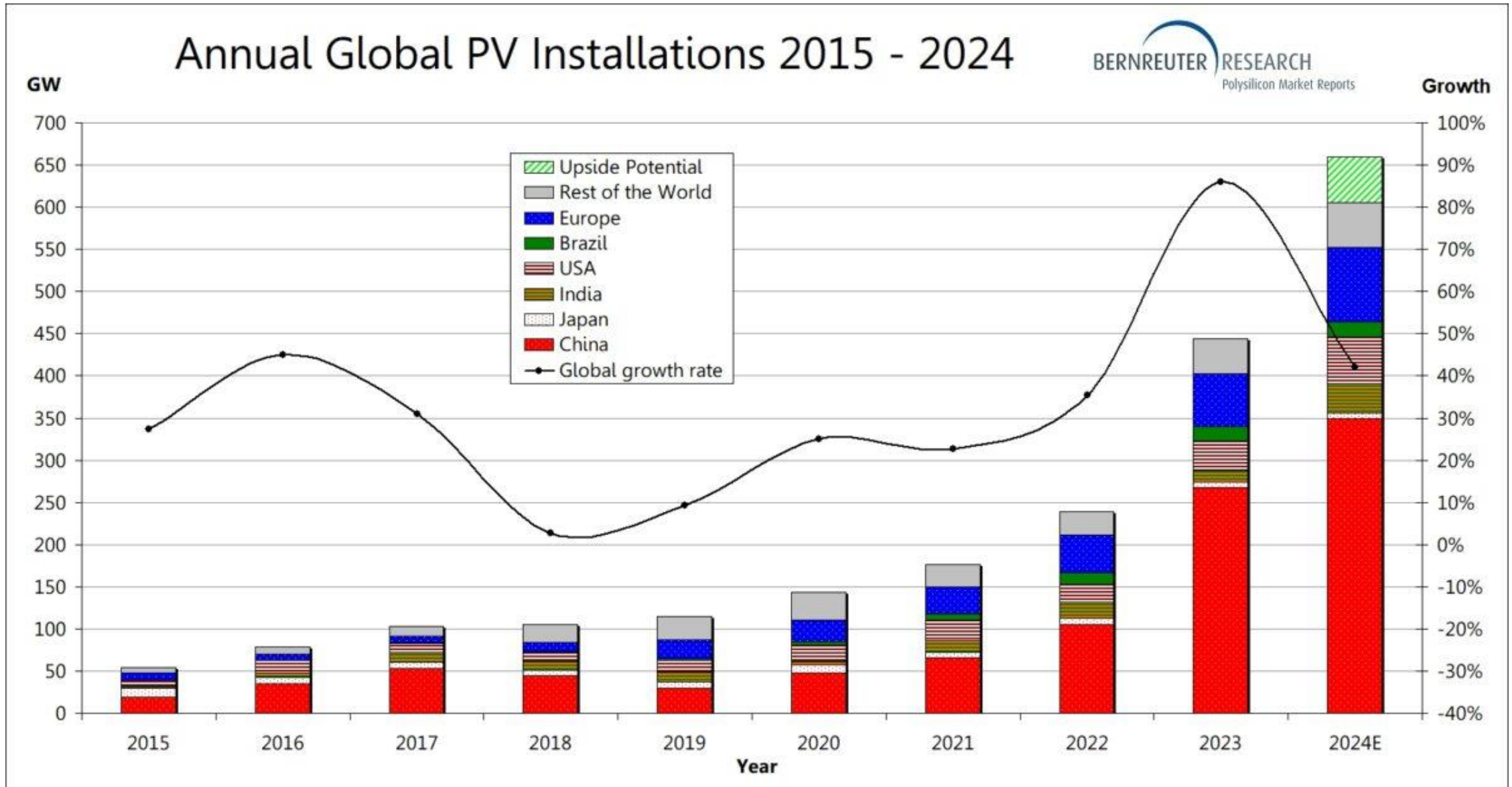
EU wind and solar generated more than gas for the first time

Share of electricity generation (%)



Source: Annual electricity data, Ember

2023 444 GW 2024: 660 GW ?



How California powered itself in April 2024

25k –
megawatts

20k

15k

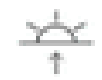
10k

5k

0

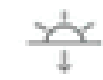
12a.m.

5a.m.



10a.m.

3p.m.



8p.m.

Peak demand



SOLAR POWER

BATTERIES

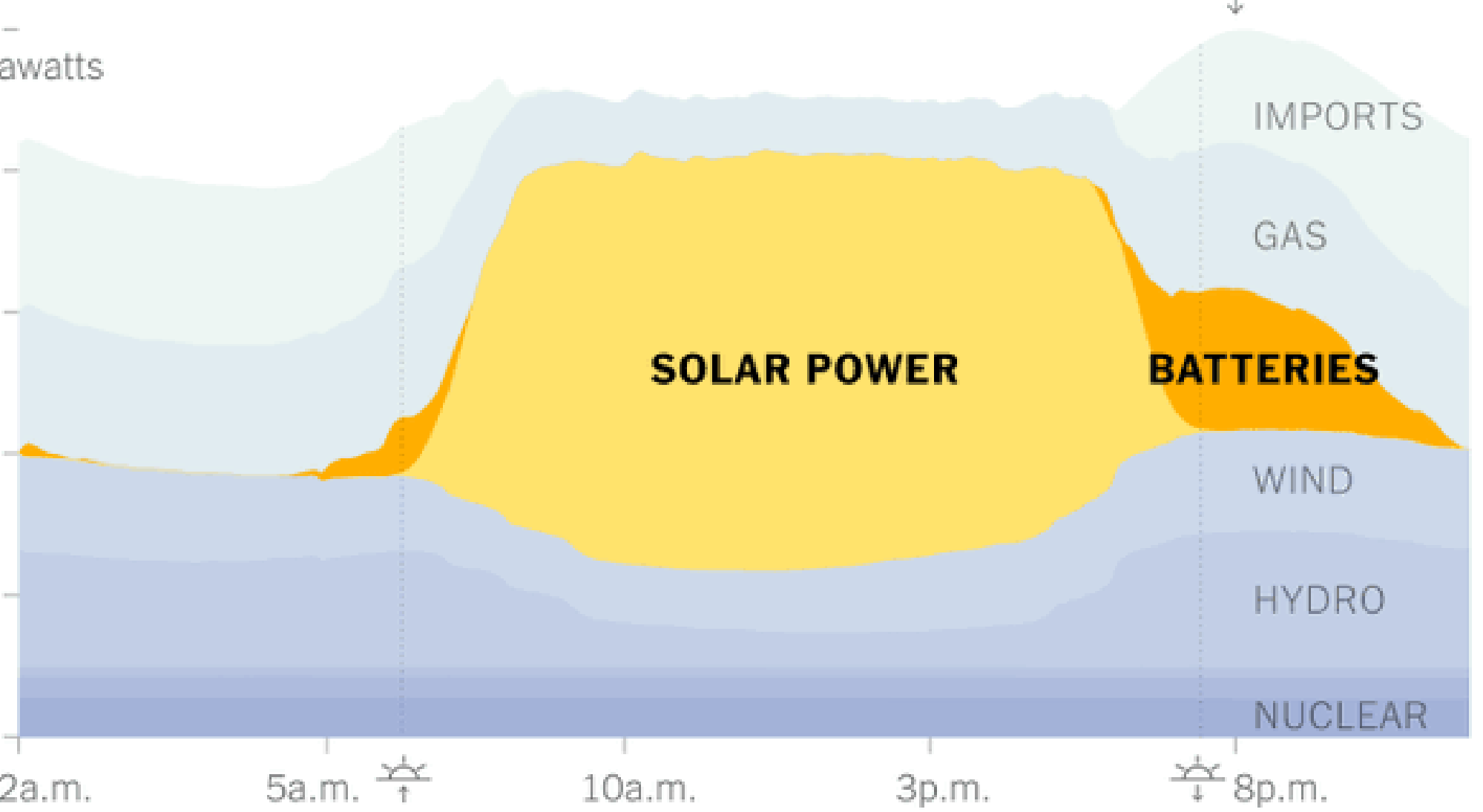
IMPORTS

GAS

WIND

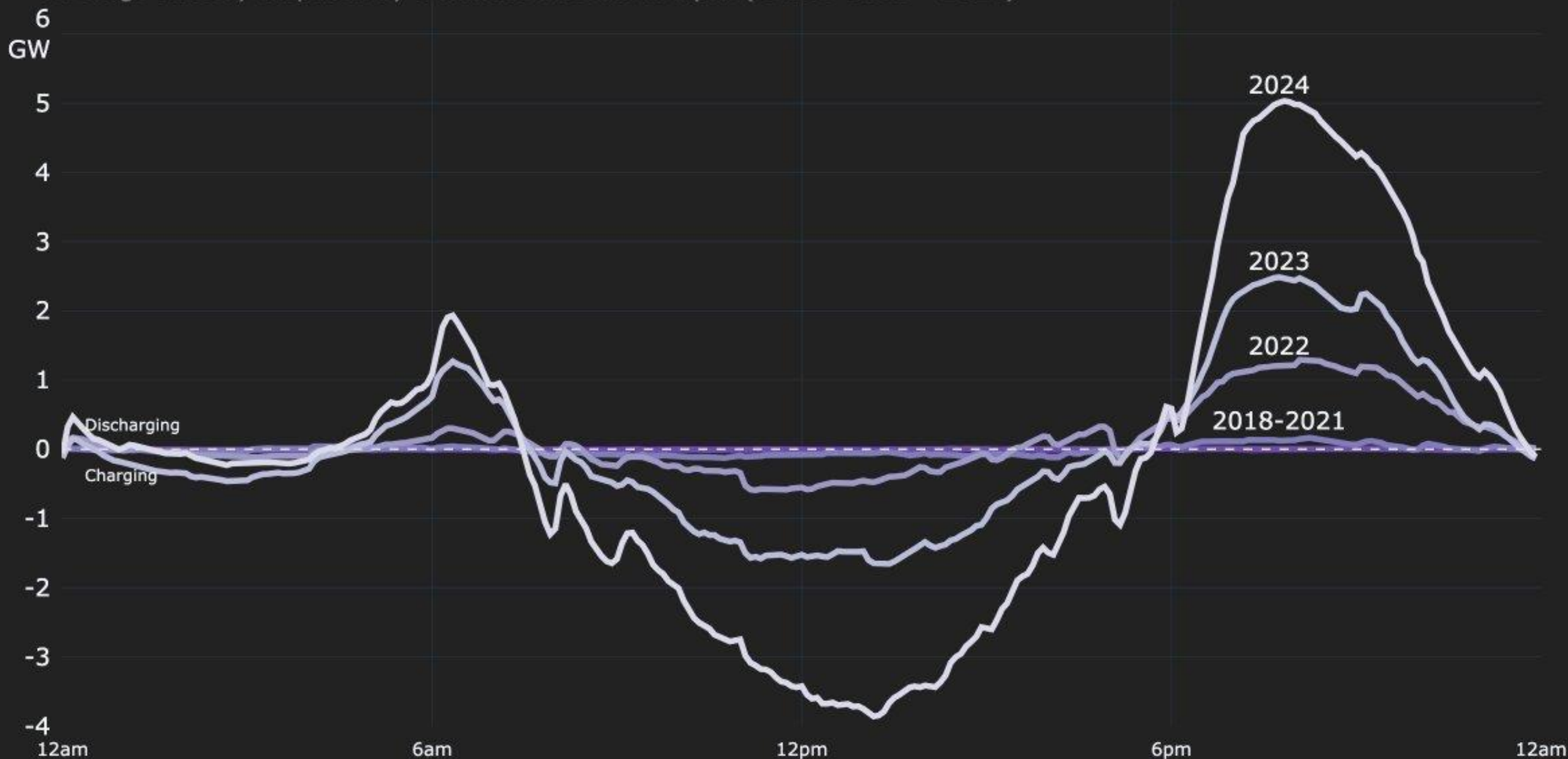
HYDRO

NUCLEAR



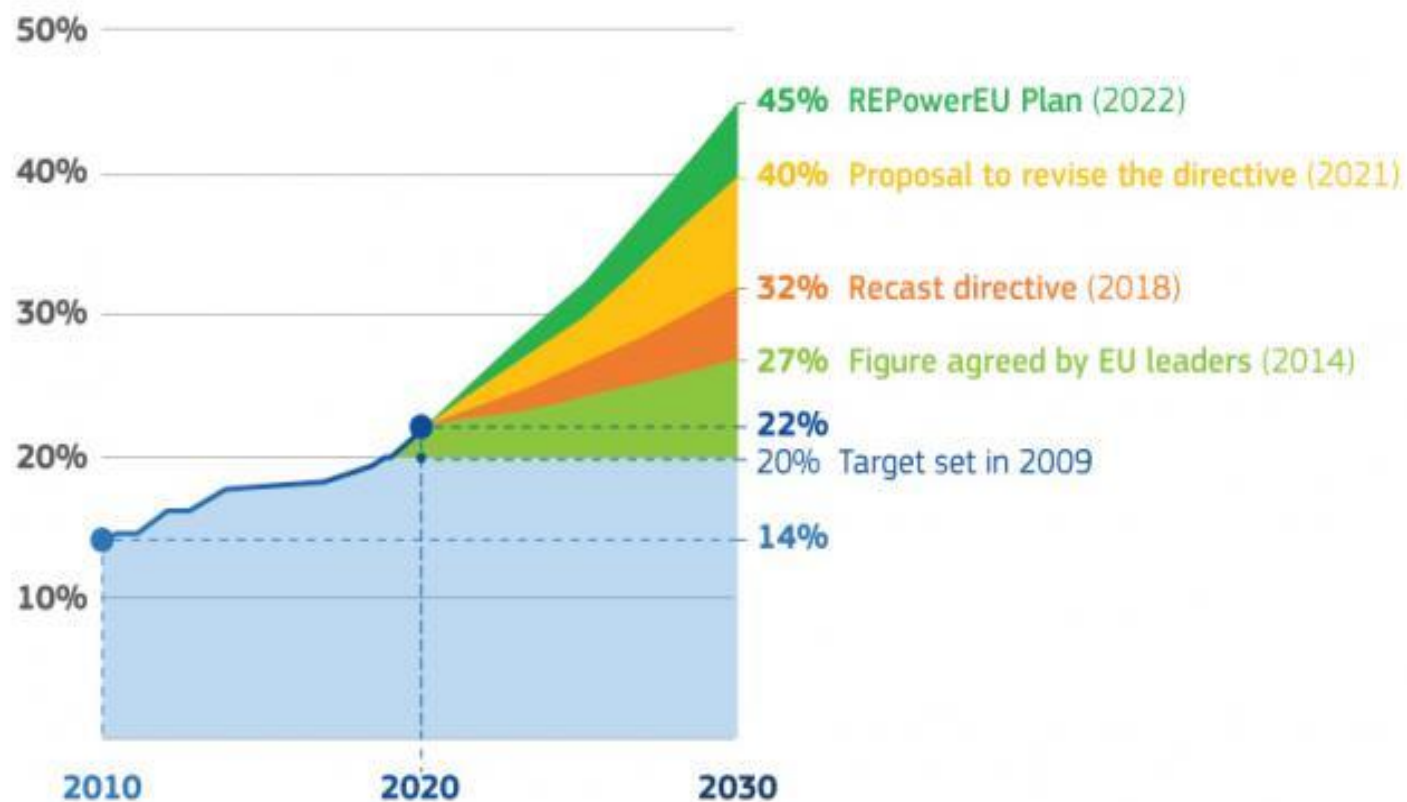
Batteries Taking Charge of the California Grid

Average battery dispatch by 5 minute interval in April (CAISO 2018 - 2024)



La forte risposta UE con un progressivo innalzamento dell'obiettivo 2030 sulle rinnovabili

Evolution of renewable energy targets

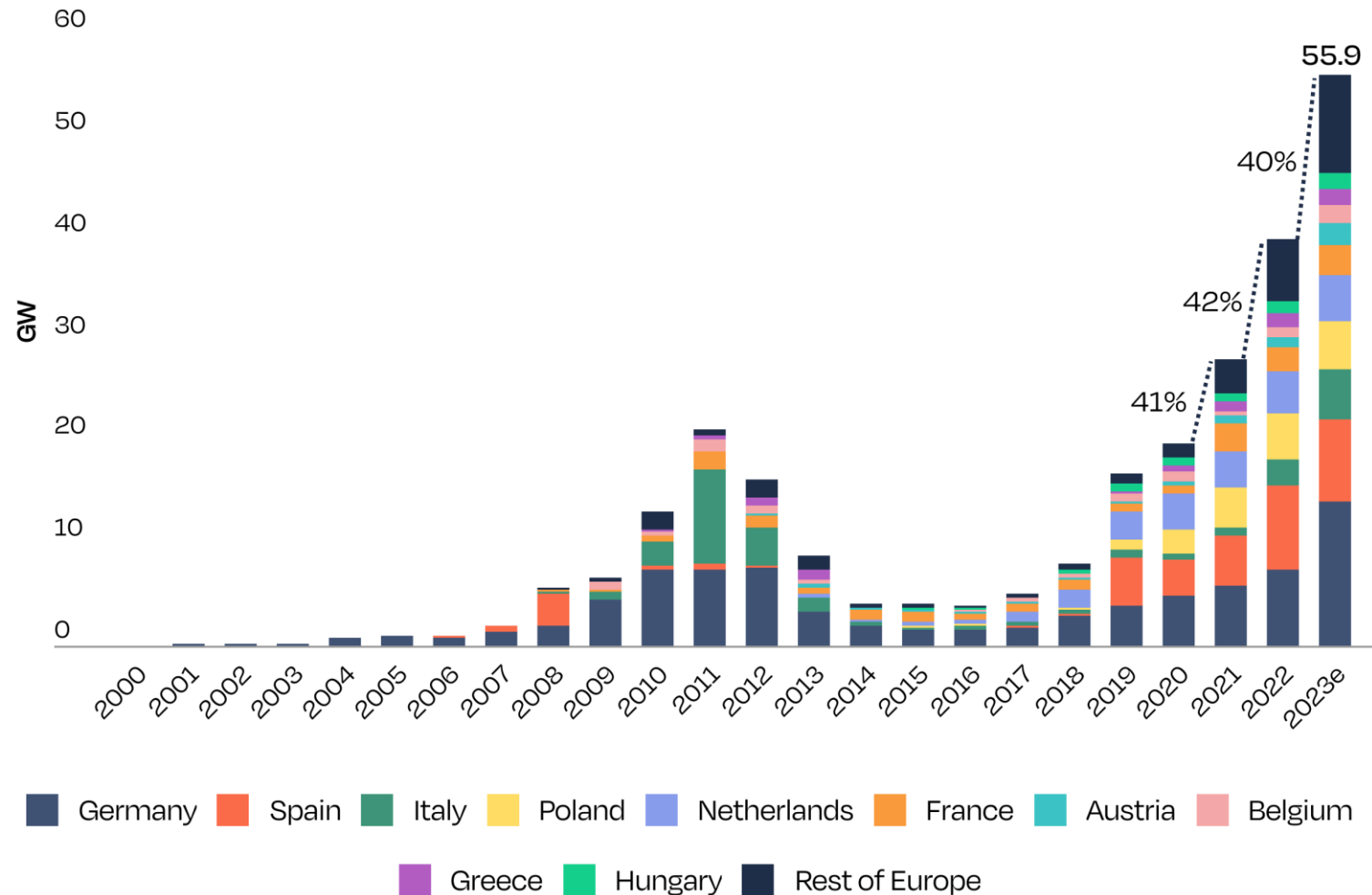


Target 45% consentirebbe di risparmiare 200 mld € nelle importazioni di gas nella UE

Attuale proposta 2030
42,5% dei consumi energetici,
target che implica 60-80% di rinnovabili elettriche

L'Europa solare ha ripreso a correre

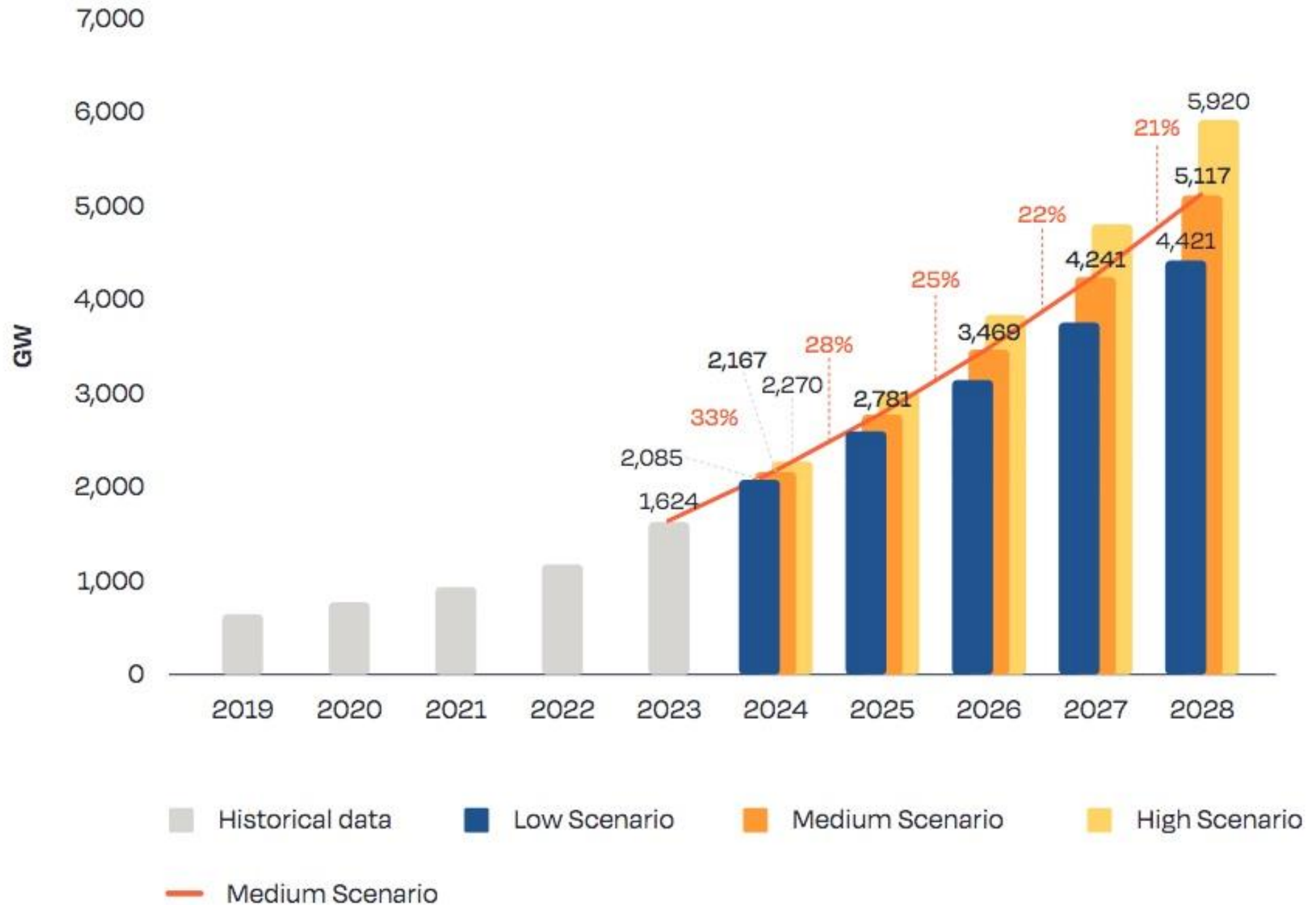
EU-27 Annual Solar PV Installed Capacity, 2000-2023



SOURCE: European Market Outlook for Solar Power 2023-2030

UE

SPE 24

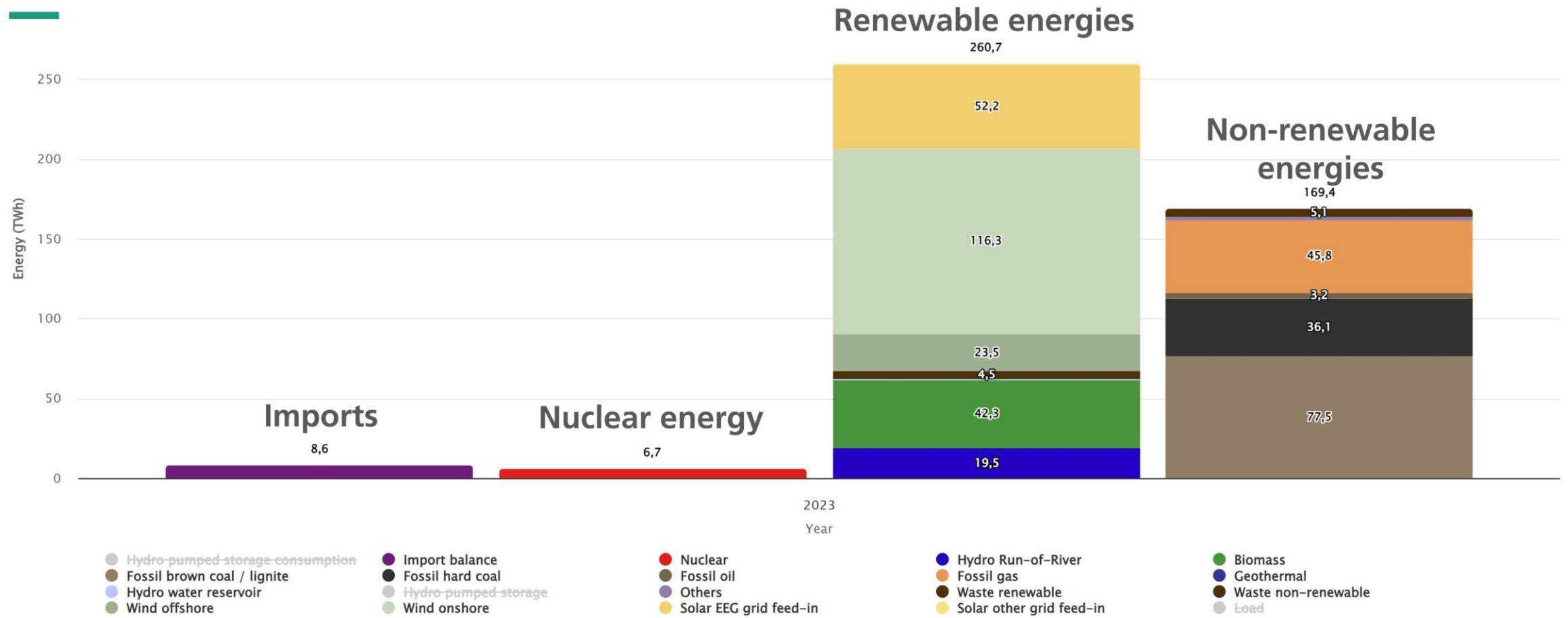


Germany Share of renewables in the load was 57.1% in 2023

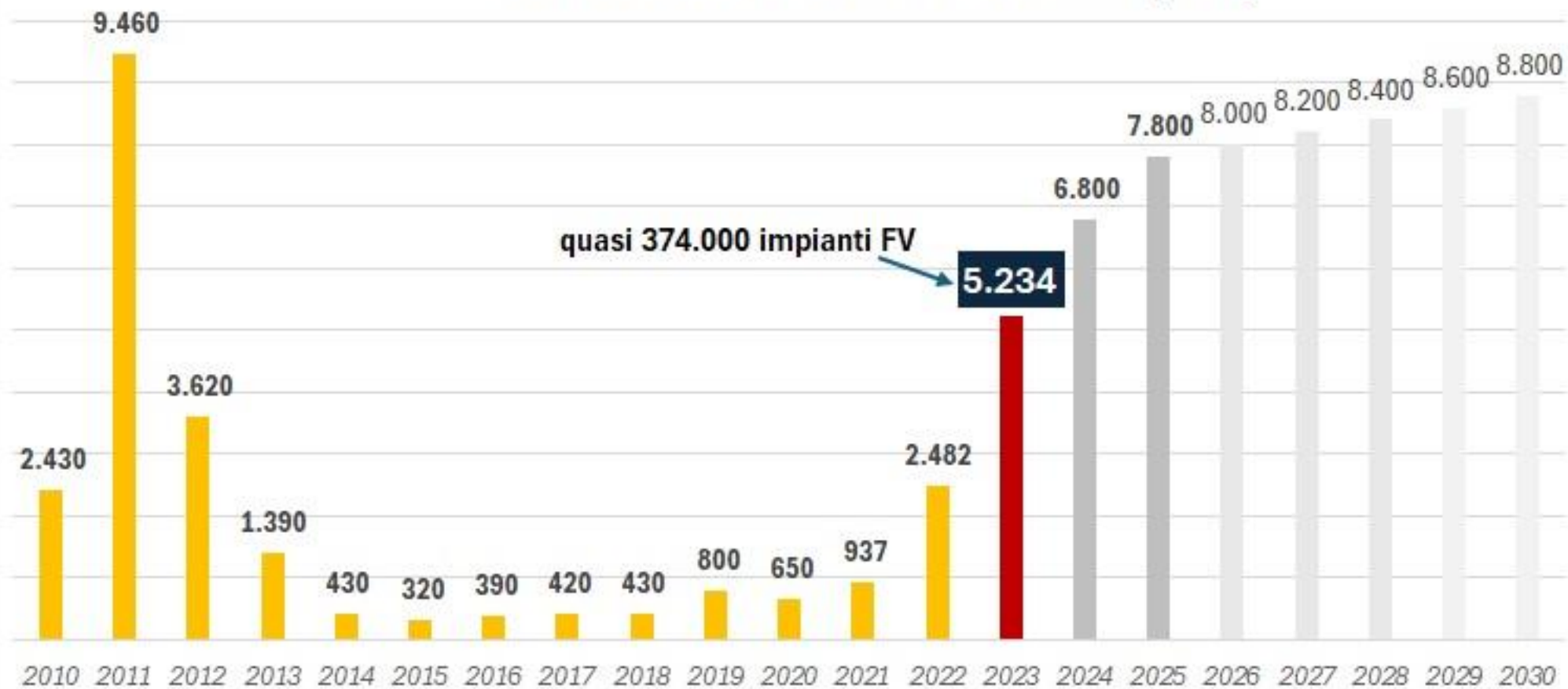
[Fraunhofer Institute for Solar Energy Systems ISE](#)

Public net electricity generation

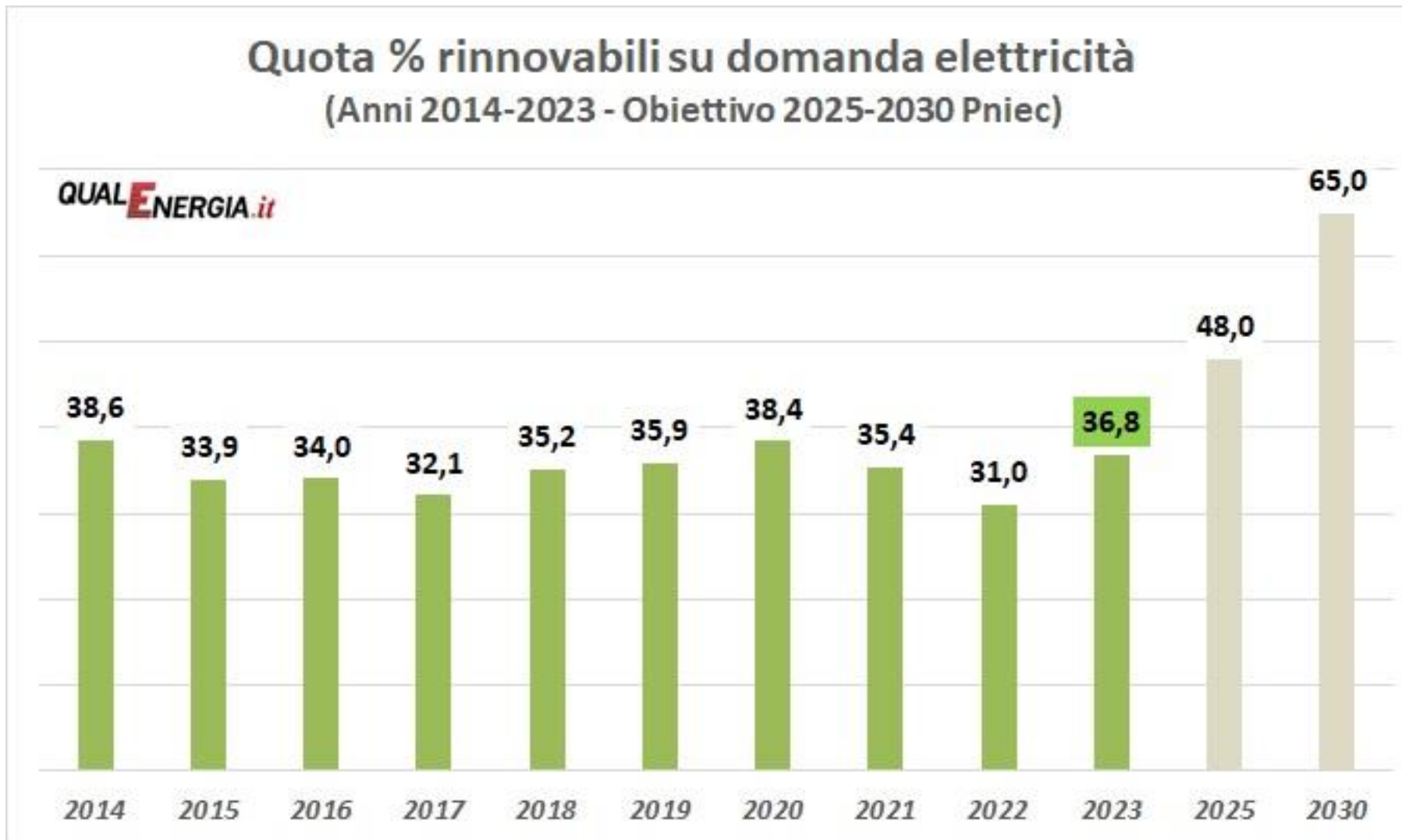
Year 2023



FOTOVOLTAICO INSTALLATO ANNUALE IN ITALIA (MW)



E sul fronte della generazione elettrica?



2013-2021
Media 0,8 GW

2022
2,5 GW solari

2023
5,2 GW solari

Genn - Apr 24
39,6%

Consumi di energia elettrica in Italia

Maggio 2024

24,7 mld kWh

Maggio 2024

+1,9%

SU MAGGIO 2023

+1,1%

SU GENNAIO-
MAGGIO 2023

125,9 mld kWh

Gennaio-
Maggio 2024

Consumi
industriali*

+1,4%

SU MAGGIO 2023

*Indice IMCEI

84,7%

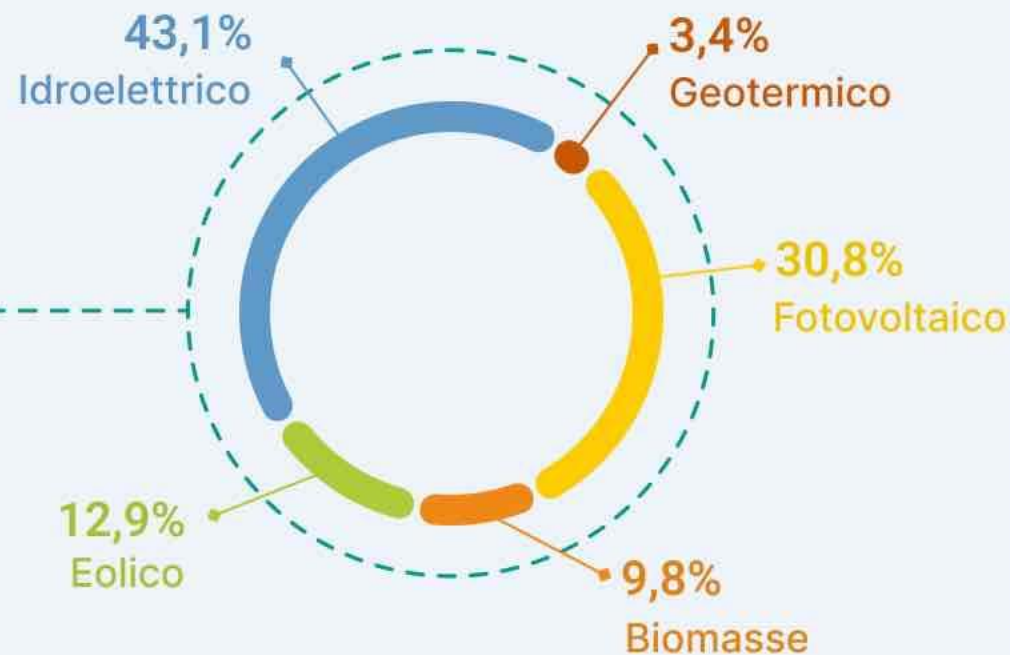
Produzione
nazionale

15,3%

Energia
scambiata
con l'estero

52,5%

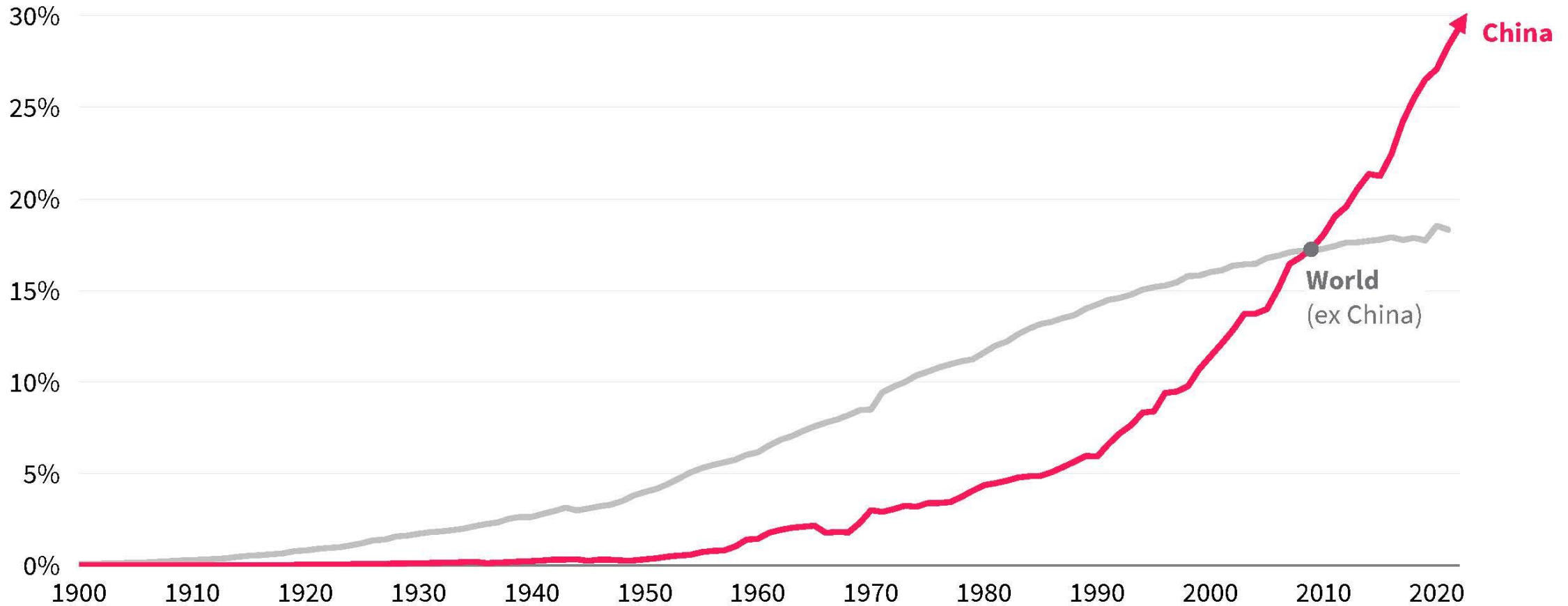
Copertura
rinnovabili della
domanda



China has become the first major electrostate

China has been electrifying at 10 percentage points per decade, nine times faster than the rest of the world

Electricity share of final energy



Share of electric cars in China priced higher or lower than conventional alternatives, 2018 & 2023

Global EV Outlook 2024

