Enerdata intelligence + consulting

WEBINAR

February 2022

Are Power Generation Companies' actions aligned with the Paris Agreement?

Introduction

Enerdata

Methodology

Generation companies = GenCos

2015: Paris Agreement as the reference year

Metadata

- Data are taken from the most recent companies' official publications, therefore are validated by specialized audit firms,
- Companies' data focus on electricity, i.e., exclude gas and heat utilities' related-data,
- For the purpose of comparison, some data have been estimated using the best international standards,
- Data are controlled and harmonized to allow comparability between companies and across years.

Technical considerations

- The companies' data correspond to their full scope of operation, including both their domestic and overseas operations.
- Some companies consolidate their whole thermal assets into one single item (called "Thermal"), i.e., not giving the split between the various energy sources burnt (oil, gas, coal/lignite, biomass). Therefore, the data are presented as such to stick with d ata published by companies.

CO_2 emissions data

- CO_2 emissions data correspond to the Scope 1 (direct emissions),
- The carbon factor (also called the carbon intensity of the power generation) is computed as follow:

$$\mathrm{gCO_2/kWh} = \frac{\text{Company's total } \mathrm{CO_2} \text{ emissions (MtCo2)}}{\text{Company's total power generation (TWh)}}$$

Enerdata

Coverage

Coverage rate of installed power capacities by the 60 selected GenCos in 2020

	Number of GenCos	GenCos' capacity (GW)	Coverage rate (%)
Asia	11	1,330	37%
Europe	25	680	53%
CIS	5	150	37%
North Am.	10	330	24%
Latin Am.	2	100	19%
Middle East	4	100	29%
Africa	3	110	46%
World	60	2,790	36%

EnerGreen Scenario

- Our EnerFuture service provides unbiased energy forecasts and country benchmarks with projections going up to 2050 through 3 scenarios:

  EnerBase, the business-as-usual scenario

  EnerBlue, a scenario based on countries' NDCs (close to 3°C)

  EnerGreen, a scenario exploring how to contain global warming under 2°C

- Our scenarios provide different information including power generation forecasts by years and by energy (which have been used in this analysis).

EnerGreen explores the implications of **more stringent energy and climate policies**, with countries fulfilling their NDC commitments and then regularly revising their emissions goals. These changes lead to significant improvements in energy savings and a strong deployment of renewables. In this trajectory, **global temperature increase is limited to 2°C.** This **scenario** now takes into account **Covid-19 impacts.**

Agenda

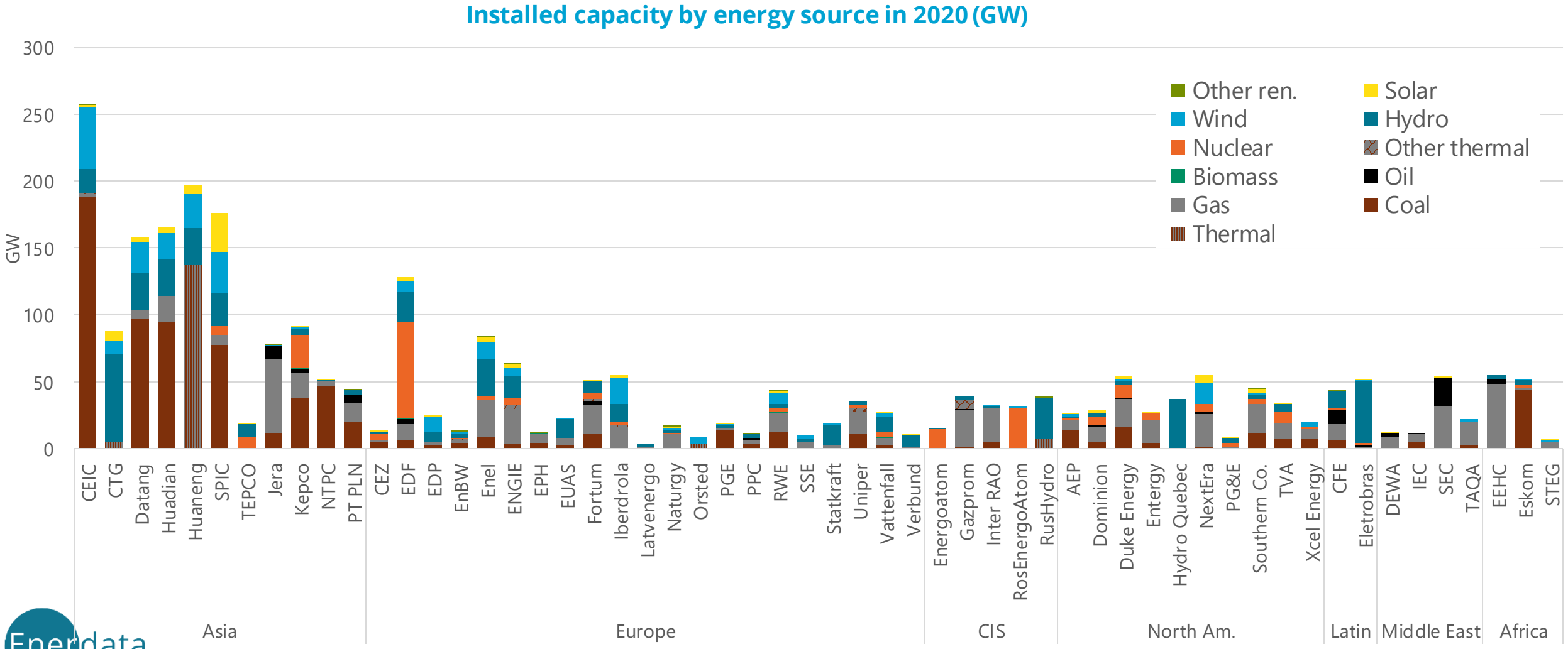
- **Worldwide GenCos' trends**
- **Trends in China**
- **Trends in Europe**
- **On road to Paris Agreement**

Worldwide GenCos' trends

Enerdata

State-owned Chinese companies are giants

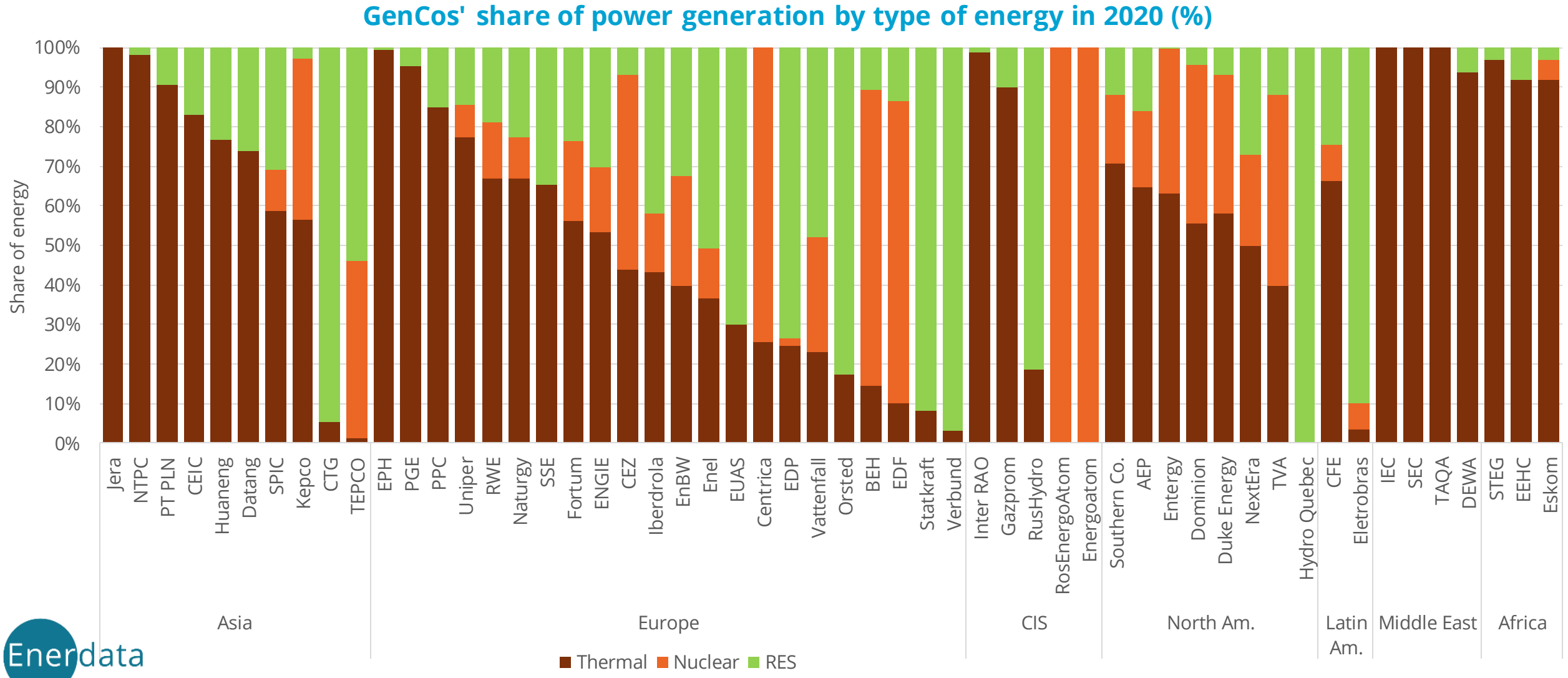
GenCos' installed capacity mix in 2020



Source: Enerdata

Fossil fuels are still the dominant input in most GenCos

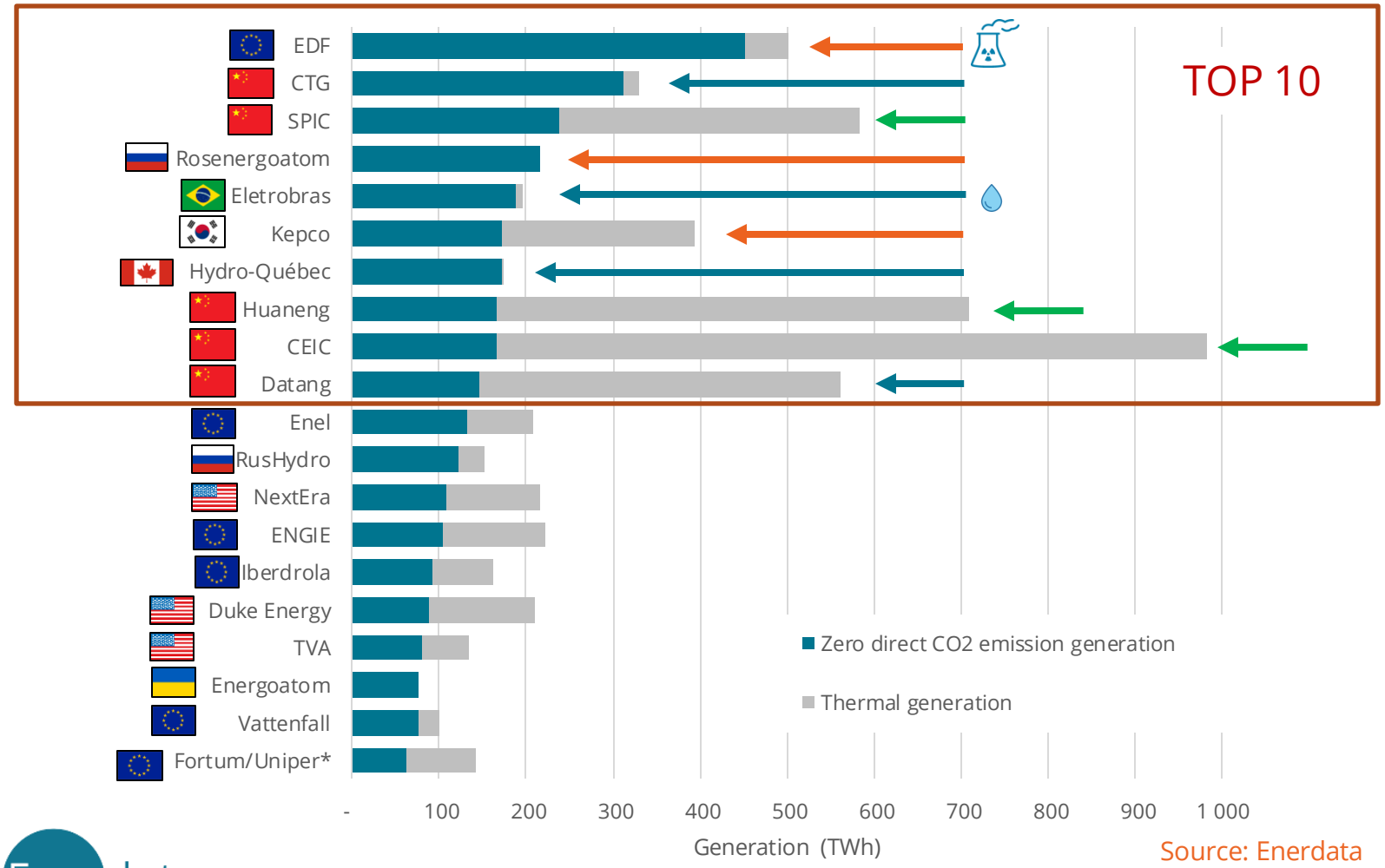
GenCos' power generation mix in 2020



Source: Enerdata

Carbon-free and thermal power generation

Zero direct CO_2 emission producers in 2020 (TWh)



Source: Enerdata

** Fortum/Uniper: Fortum raised ownership in Uniper to >75% in 2020; i.e. data fully consolidated in 2020.*
*** Thermal generation includes biomass.*

Largest emission-free generators produce either via:

Nuclear

- EDF (77%), TOP emission-free generator
- Rosenergoatom (100%)
- Kepco (41%)

Hydro

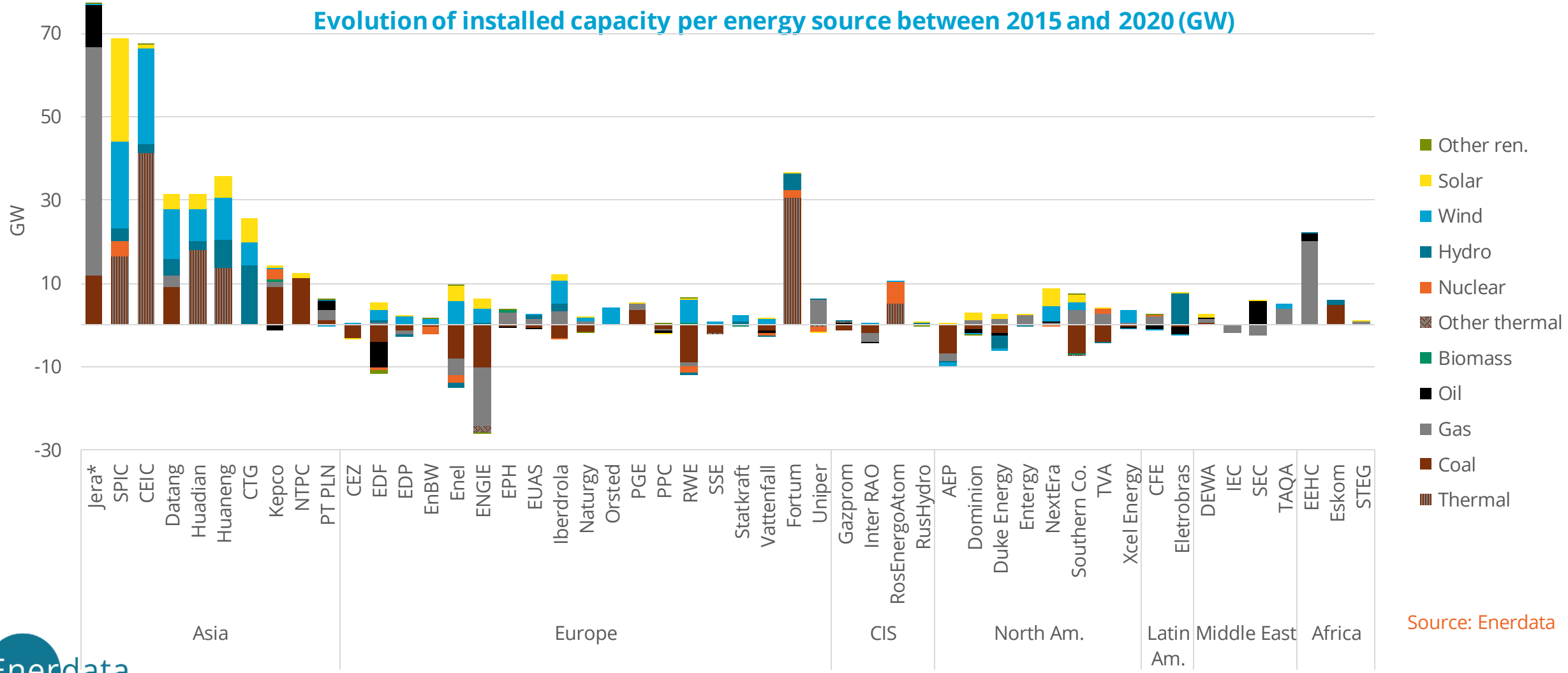
- CTG (95%), Eletrobras (91%), HydroQuébec (100%), Datang (70%), Rushydro

All RES (hydro, solar, wind)

- Chinese companies

Coal phase-out is noticeable in Europe & the US

2015-2020 installed capacity evolution



Source: Enerdata

Enerdata

Jera: Data covering 2016-2020*

GenCos trends in China

Enerdata

Key energy data for Chinese GenCos in 2020

GLOBAL GENERATION FOR THE 6 GENCOS

2020
3,800 TWh

31% from RES*
2% from nuclear*
67% from thermal*

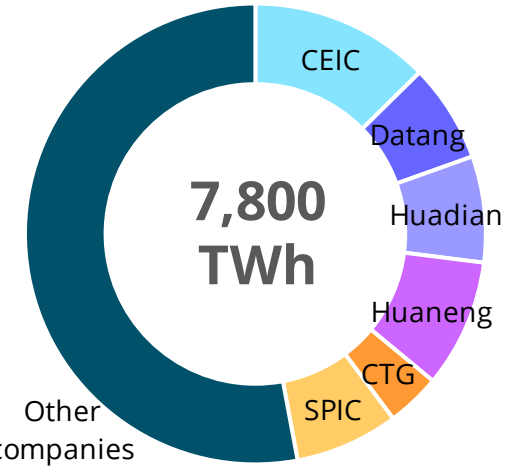
Of which

2020
3,700 TWh

GENERATION BASED IN CHINA

47% Chinese coverage

Total 2020 generation in China reached 7,800 TWh



国家电投 SPIC

Capacity added since 2015:

Solar : + 28 GW
Wind :+ 21 GW

国家能源集团 CHN ENERGY

Power generation increase since 2015

+ 289 TWh

中国华能集团公司 CHINA HUANENG GROUP

Carbon intensity of power generation since 2015

-10%

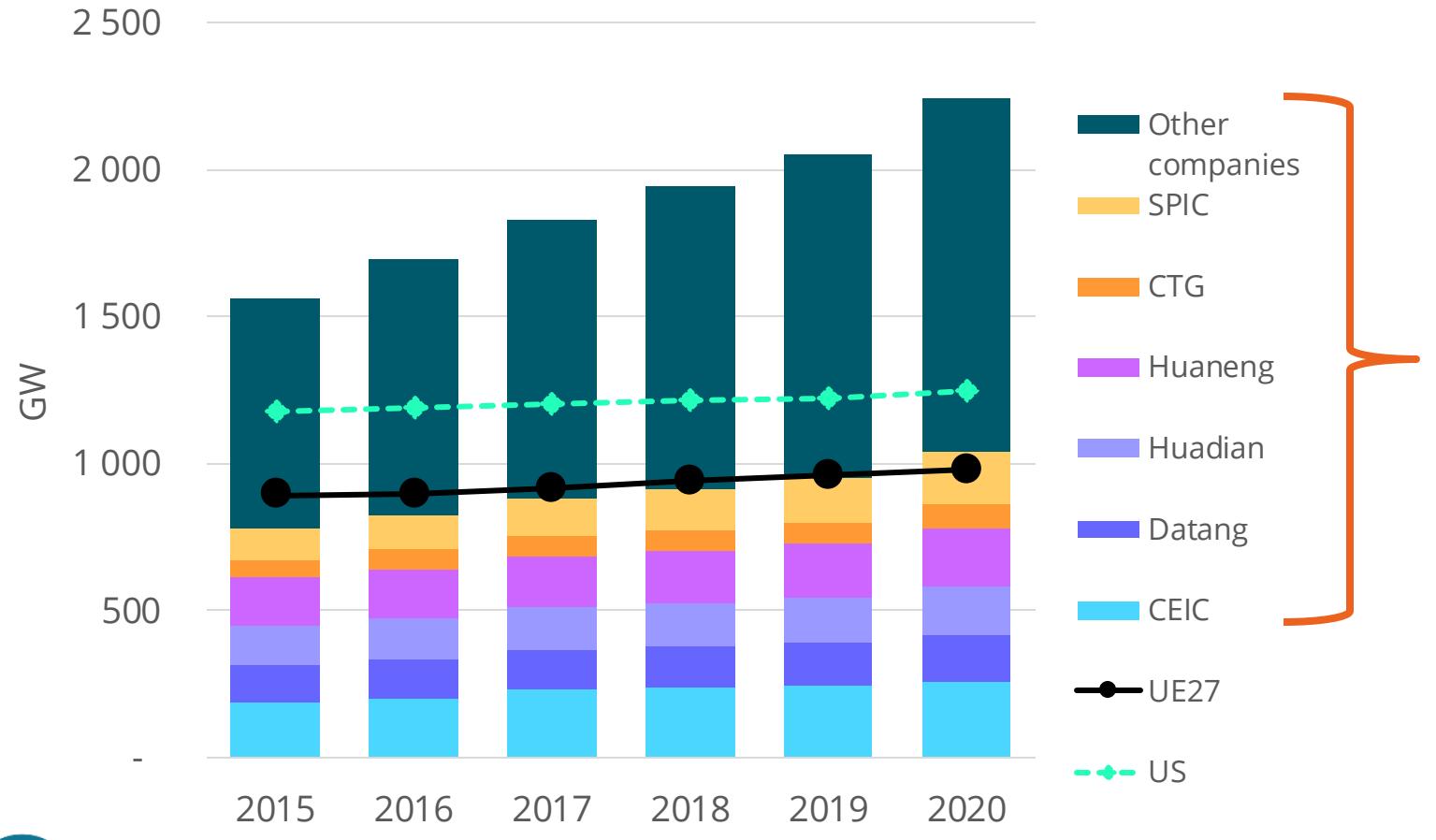
TWh produced by Chinese GenCos in 2020
= Europe as a whole !

*: Does not include China huadian in shares as generation by energy were not disclosed by the company.

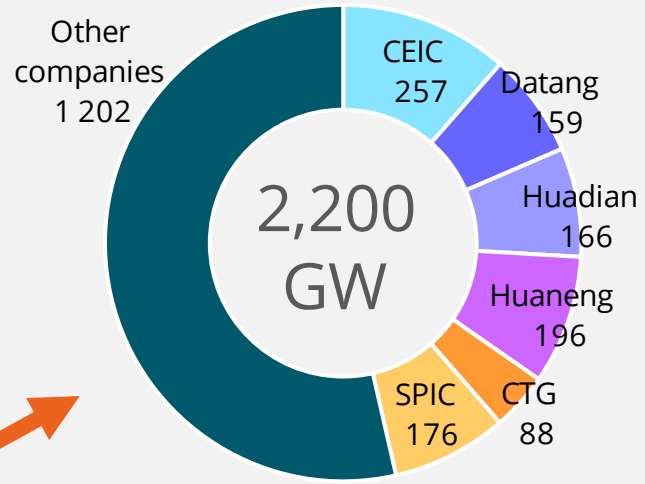
Source: Enerdata

6 largest Chinese GenCos exceed the EU27 installed capacity

Total installed capacity in China, all energy included (GW)



Share of companie's installed capacities in China in 2020 (GW)



In 2020, the 6 Chinese GenCos

- Covered 46% of the total Chinese capacities

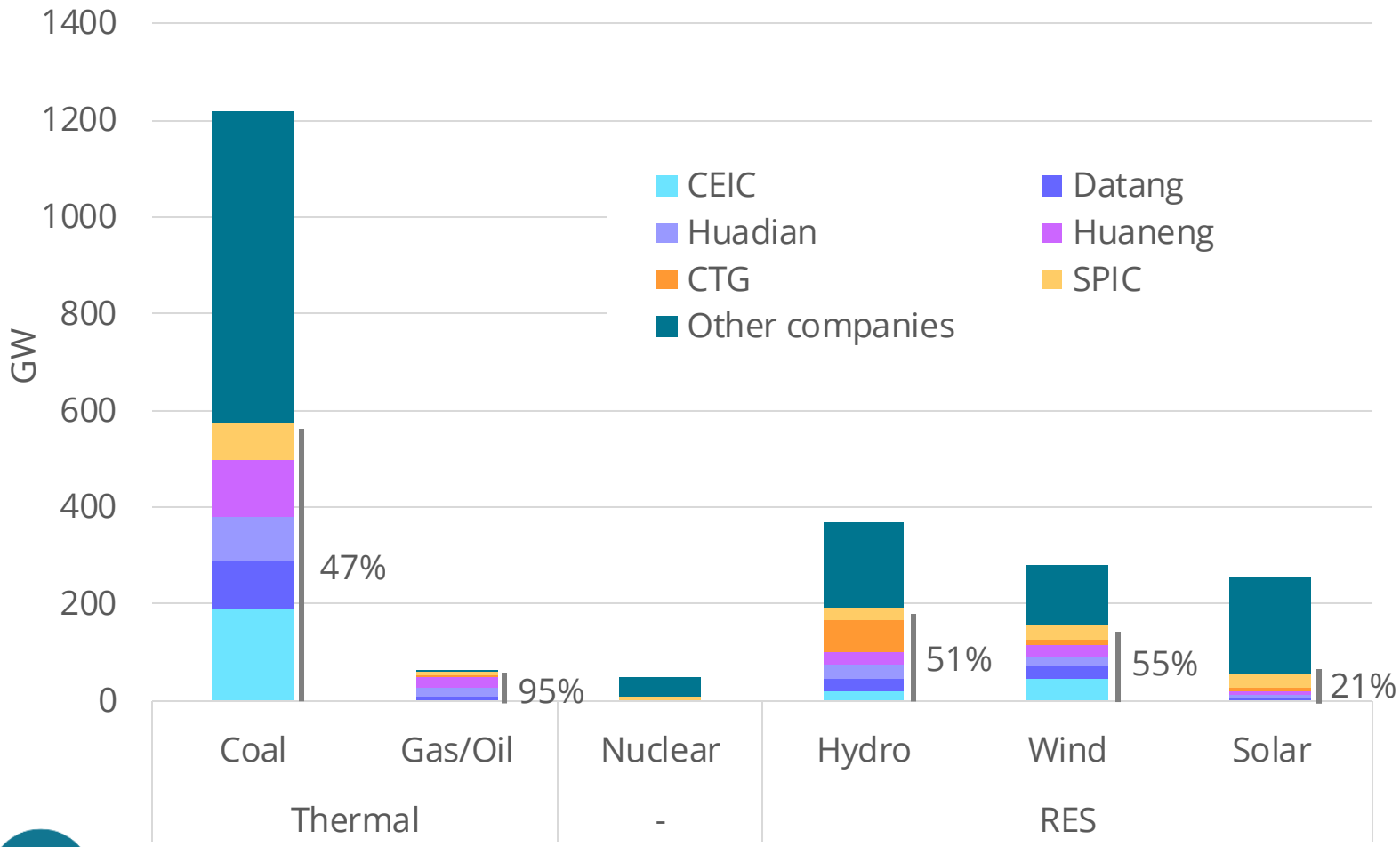
The 6 Chinese GenCos reached EU27 capacities in 2019

- In 2019, the 6 Chinese GenCos held 950 GW, and reached 1,050 GW in 2020

Source: Enerdata

GenCos in China

Relative shares of 6 GenCos in China's capacities in 2020 (GW)



Source: Enerdata

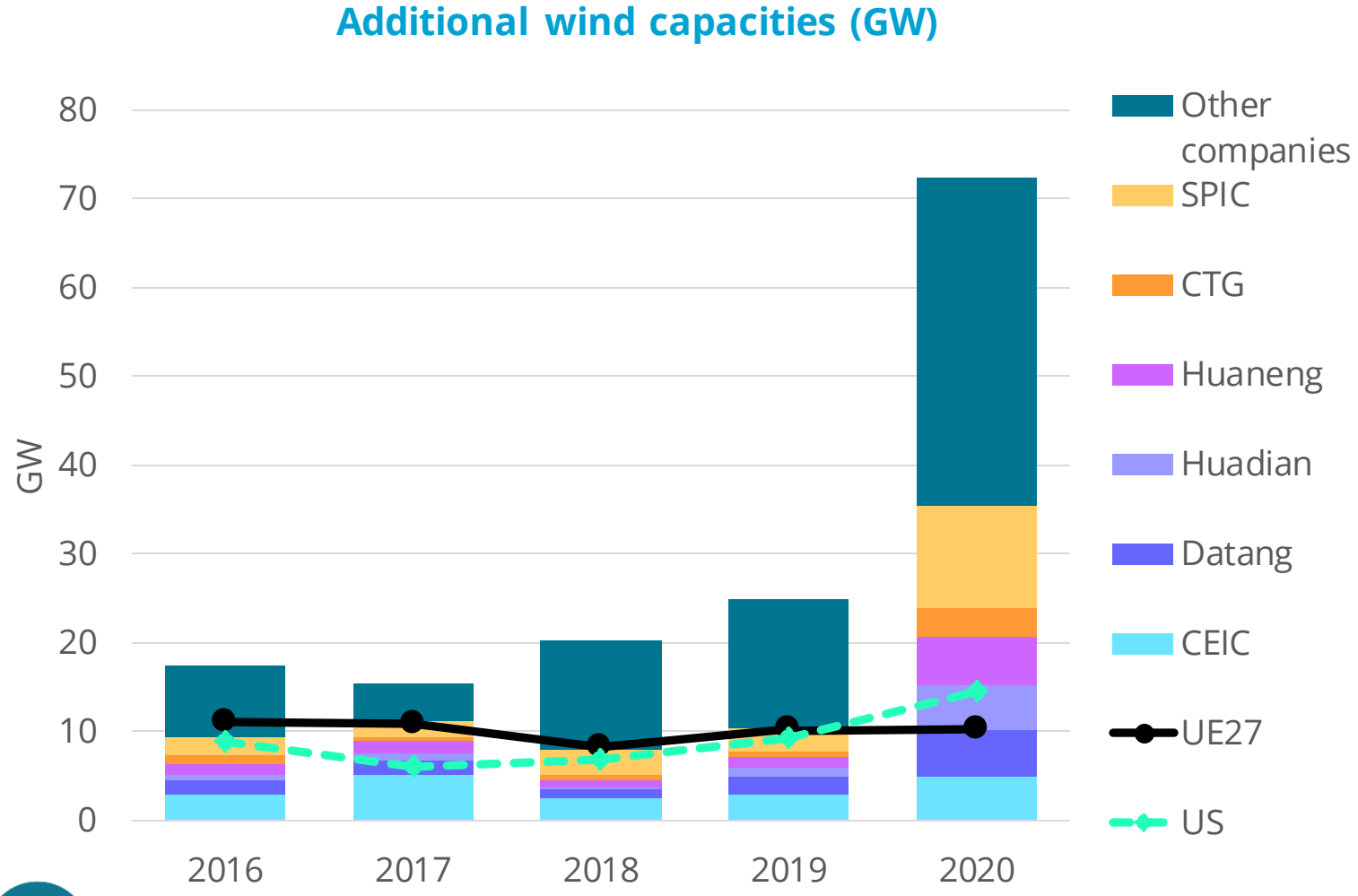
In 2020, the 6 Chinese GenCos

- Covered 46% of the total Chinese capacities, including:
- 49% of China's thermal fleet (~25% coal world capacity),
- 5% nuclear,
- 51% of hydro,
- 39% of total other renewables

Average annual additional capacity since 2015		
6 Chinese GenCos	Thermal	20 GW/y
	Nuclear	1 GW/y
	Hydro	6 GW/y
	Wind	16 GW/y
	Solar	9 GW/y
UE27	Wind & solar	20 GW/y
US	Wind & solar	20 GW/y

Wind addition surged since 2020

Annual wind newly installed capacity



Source: Enerdata

2015-2019

- GenCos installed +9 GW/y
- China installed +16 GW/y

2020

- GenCos installed +35 GW
- China installed +72 GW

2021

- China installed +48 GW, of which 17 GW of wind offshore

To reach Paris Agreement objectives*:

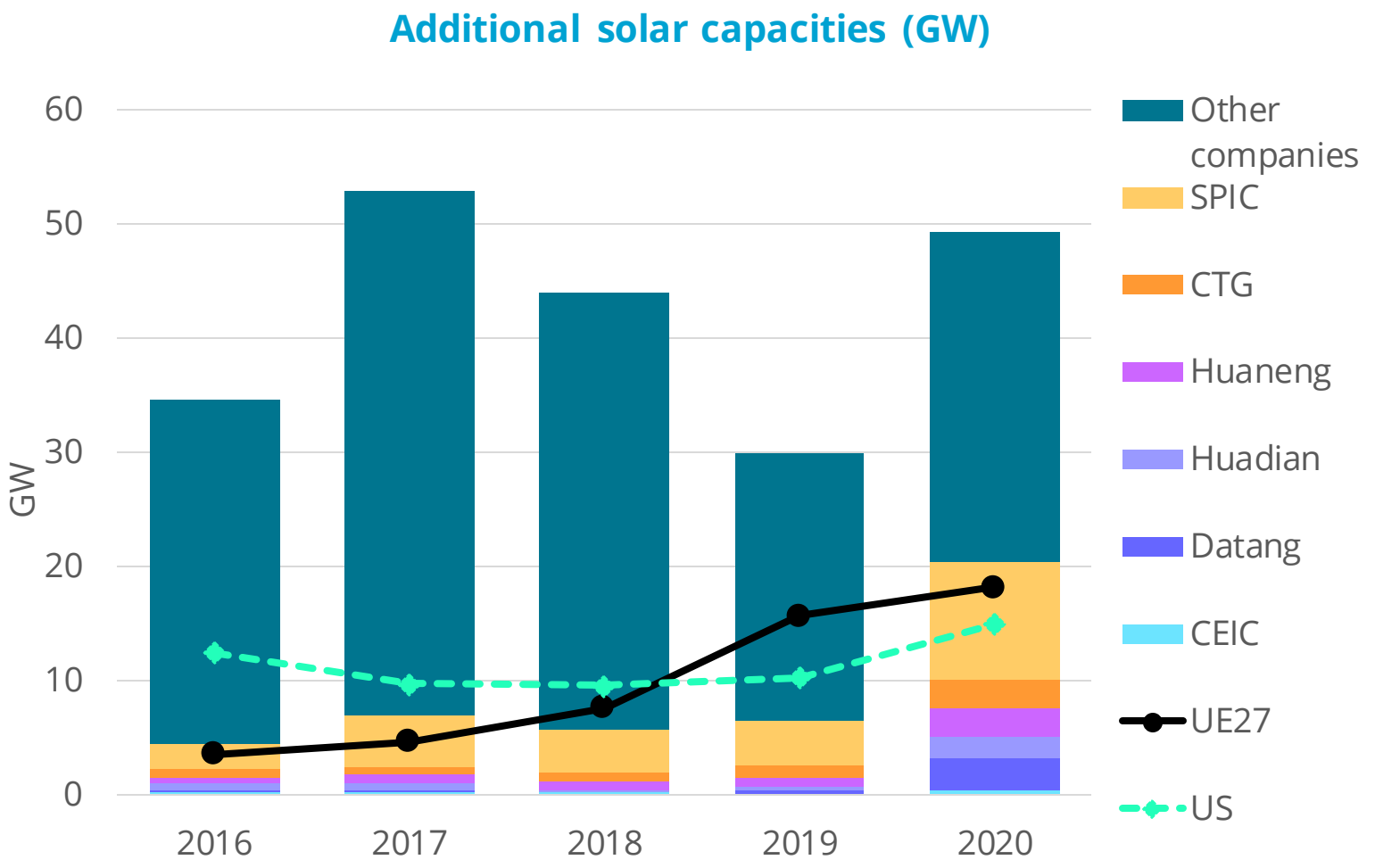
For 2020-2025: +27 GW/y
For 2025-2030: +56 GW/y

** According to EnerGreen scenario*

Enerdata

Solar addition in line with Paris-A.

Annual wind newly installed capacity



Source: Enerdata

Big 6 in solar

- smaller share in wind market

2015-2020

- GenCos installed +9 GW/y
- China installed +42 GW/y

2021

- China installed +53 GW solar

To reach Paris Agreement objectives:

For 2020-2025: +50 GW/y
For 2025-2030: +60 GW/y

** According to Energreen Scenario*

GenCos trends in Europe

Enerdata

Key energy data for European GenCos in 2020

2015-2020

Renewables: +22% (120 TWh)

Thermal: -26% (-280 TWh)

GLOBAL GENERATION FOR THE 25 GENCOS

2020
2,200 TWh

32% from RES
30% from nuclear
37 % from thermal

Of which

2020
1,600 TWh

GENERATION BASED IN EUROPE

43% of Europe power generation

Total power generation in Europe in 2020 = 3,700 TWh

EDF

Carbon-free share in power mix in 2020

90%

Ørsted

Carbon factor reduction since 2015

- 74%

enel

Solar + wind since 2015

+9 GW
+20 TWh

ENGIE

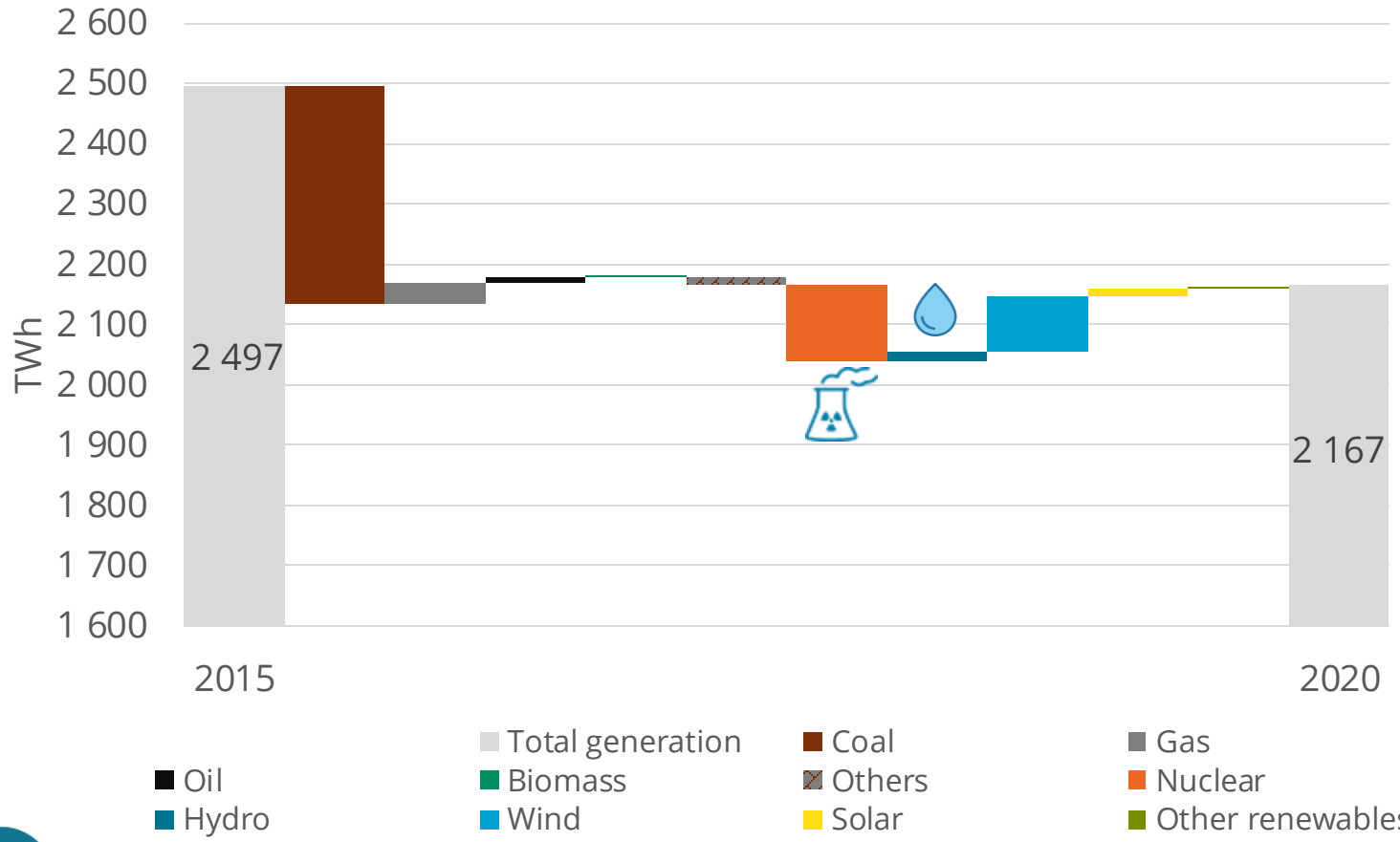
Thermal capacity disposal since 2015

-26 GW

Source: Enerdata

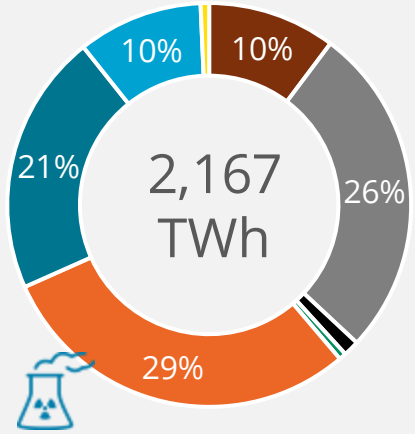
European GenCos have chased-out coal from their mix

Power generation evolution for the 25 selected European GenCos since 2015 (TWh)



Source: Enerdata

European GenCos Power mix in 2020 (TWh)



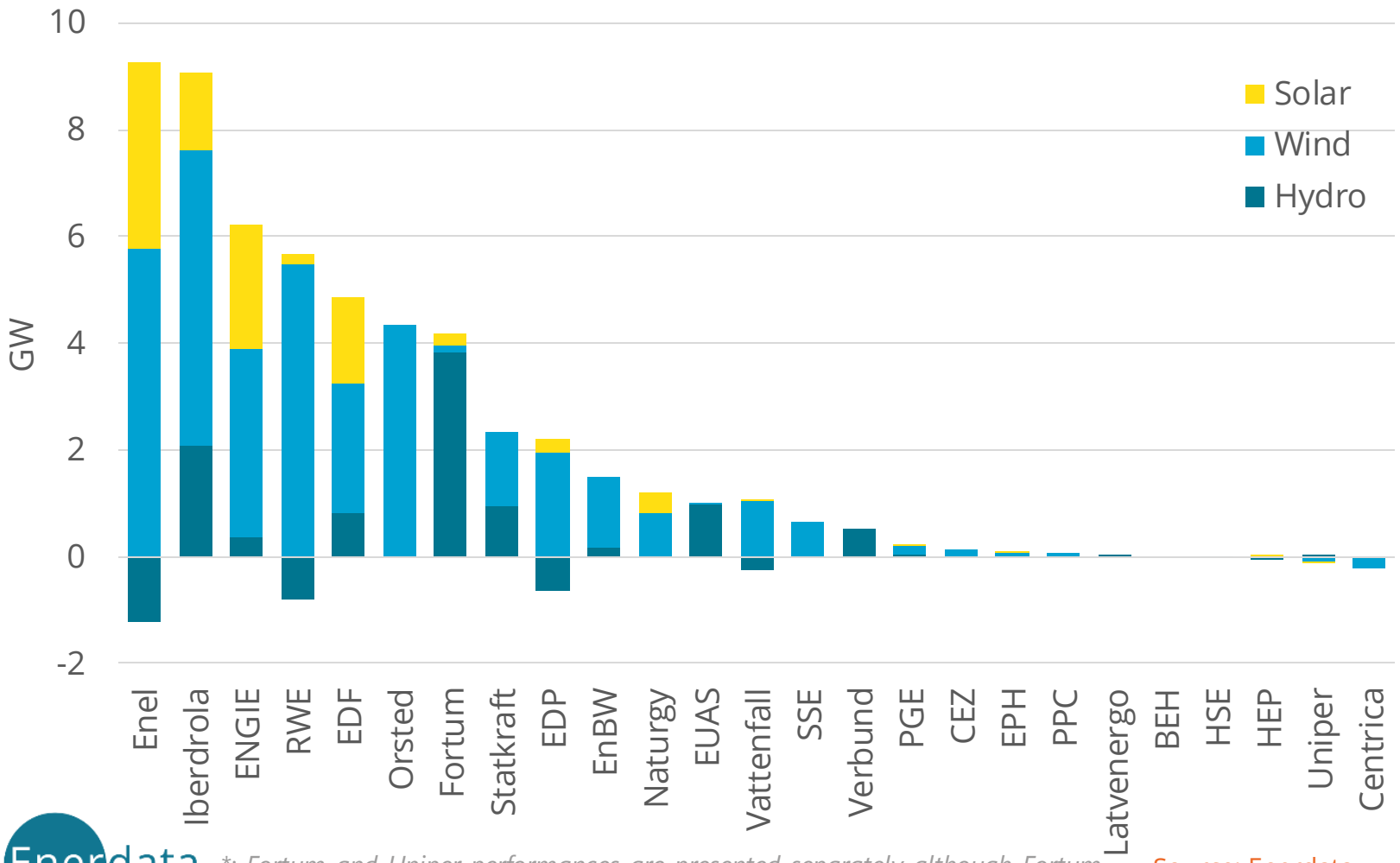
Thermal generation evolution

- The whole thermal share drop from 47% in 2015 to 39% in 2020
- Coal-fired generation dropped by 13% percentage points since 2015
- Share of gas increased to 27%
- Nuclear: closures and outages

Wind's share is growing

- Rapid penetration of wind in GenCos power mix, including offshore wind, reaching 10% in 2020.
- Limited growth for solar power from 3 TWh in 2015 to 15 TWh in 2020.

Wind is the preferred technology



Source: Enerdata

*: Fortum and Uniper performances are presented separately although Fortum acquired Uniper in 2020.

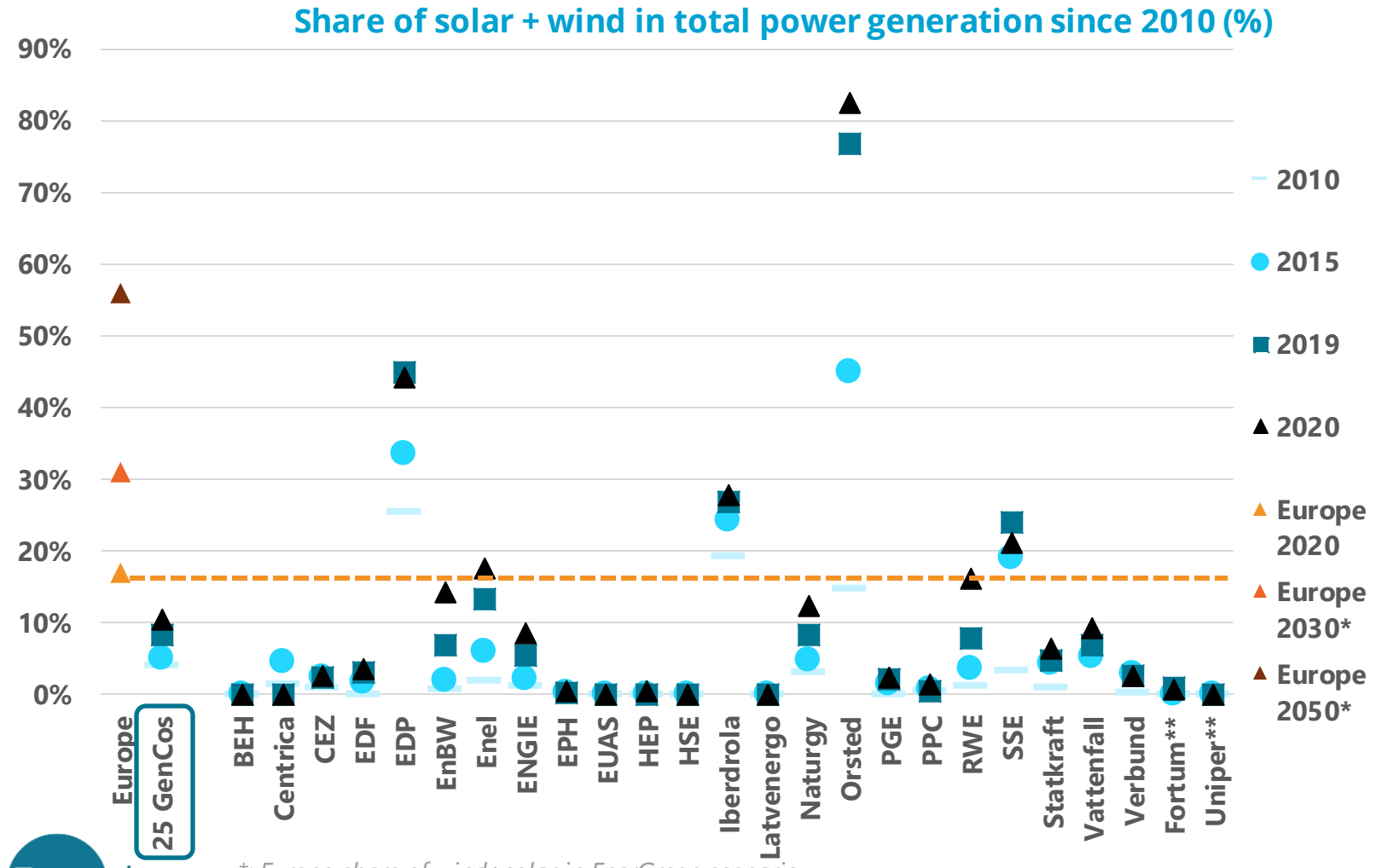
Wind drives the growth

- Wind capacity addition by European GenCos' (34.5 GW) since 2015 = 50% of Europe newly capacity (70 GW), only 15% for solar
- Northern-based (Ørsted, RWE through Innogy, Iberdrola through SSE) GenCos have massively developed offshore wind
- Solar growth for South European GenCos in home markets and Americas

Market leaders

- Enel and Iberdrola added 9 GW of renewables capacity since 2015
- Ørsted strongly promotes offshore wind technologies al across the world
- Enel, ENGIE, Iberdrola: strong growth in Latin America and the USA
- Acquisition of Innogy has accelerated RWE transition to renewables
- Hydropower assets are subject to asset swaps (EDP, EDF/Edison, Enel)

Solar+wind: few GenCo's exceed Europe average



*: Europe share of wind+solar in EnerGreen scenario
**: Fortum and Uniper performances are presented separately although Fortum acquired Uniper in 2020.

Source: Enerdata

EU average

- 25 GenCos' share of solar + wind in total power gen. reached 11% in 2020, much lower than Europe average of 17%.
- Most of the utilities have a lower share of solar + wind than the EU average
- Only EDP, Enel, Iberdrola, Ørsted and SSE have RES shares above the EU average

Various trends in RES growth

- Noticeable growth for Ørsted, EDP, Enel, RWE (Innogy acquisition) and EnBW, and to a lesser extent for ENGIE, Naturgy and Vattenfall
- Numerous utilities have not yet engaged a transition toward solar and wind technologies

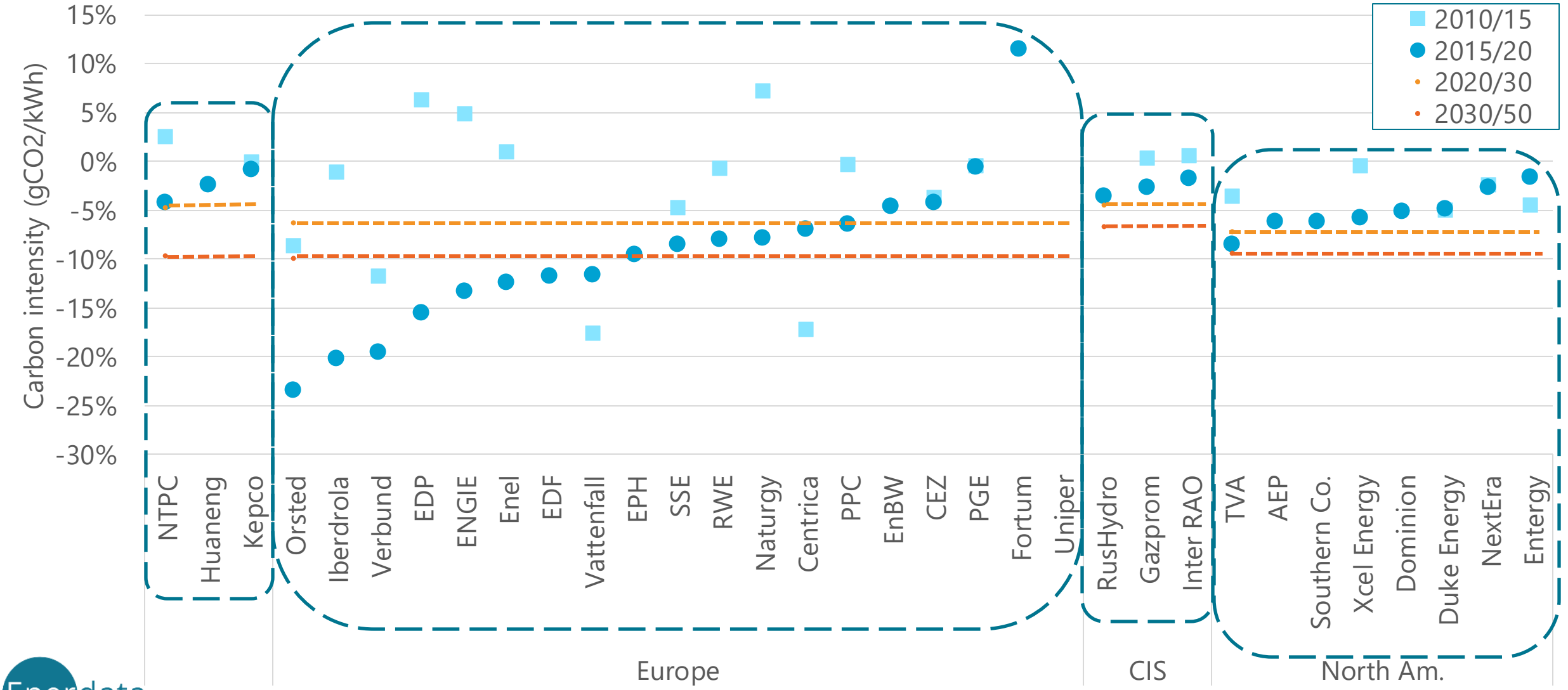
Scenario EnerGreen

- Solar + wind to reach 31% of total of power generation in Europe in 2030, and 56% in 2050
- Ørsted & EDP already exceeded EnerFuture Europe 2030 milestone in 2020

On the road to Paris Agreement ?

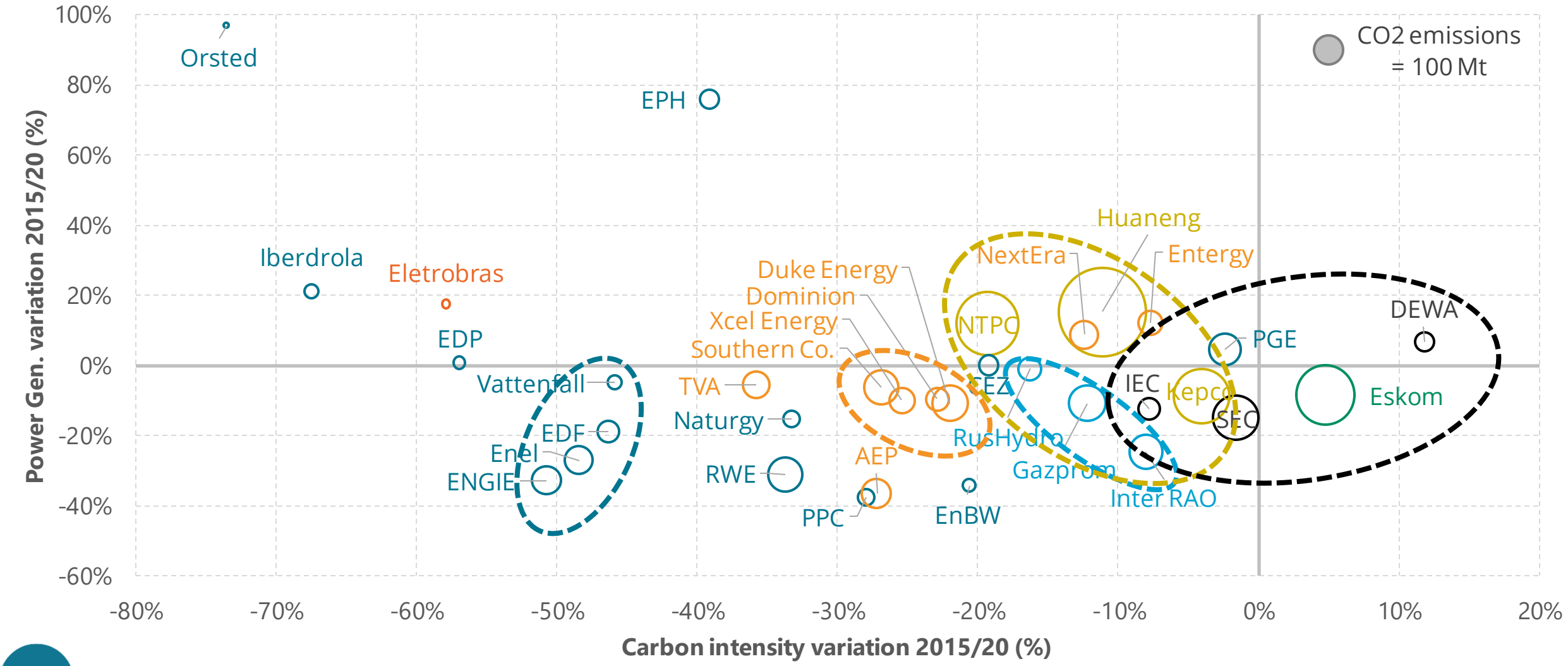
Enerdata

Carbon intensity reduction speed



Enerdata

Power generation & carbon intensity: 2015 vs 2020



Enerdata

Conclusion

Enerdata