



























The role of wind energy and the system flexibility

Daniel Fraile

WindEurope: Representing the whole wind industry

450
MEMBERS

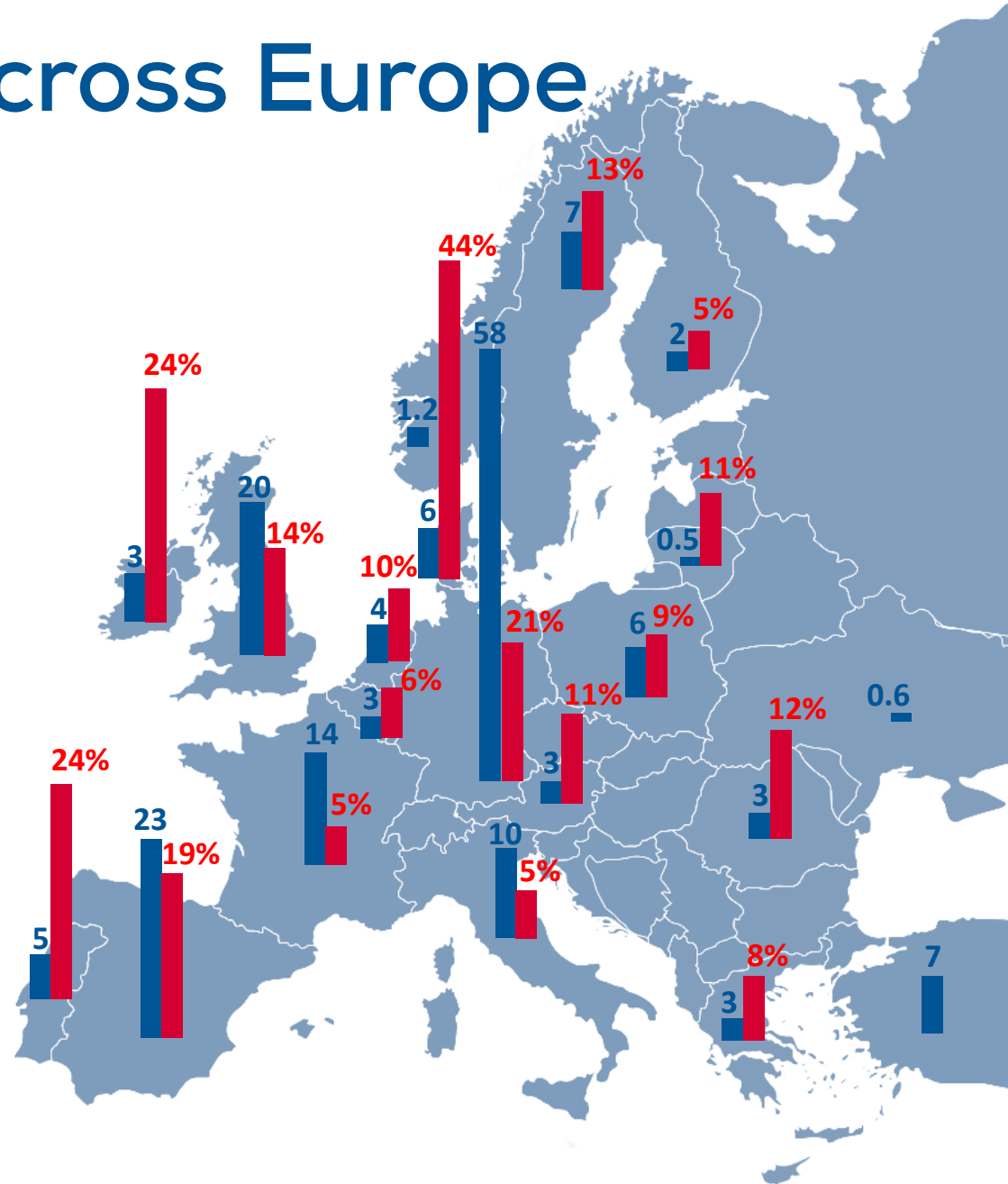
| | | | | |
|------------------------------|------|---|---|---|
| Wind turbine manufacturers | e.g. |  GE Renewable Energy |  |  |
| Wind farm developers | e.g. |  |  |    |
| Power utilities | e.g. |  |  |   |
| Component manufacturers | e.g. |  |  |   |
| Installation / logistics | e.g. |  |  |  |
| Financial services | e.g. |  |  |  |
| Research institutes | e.g. |  |  |   |
| + National wind associations | | | | |

Wind power across Europe

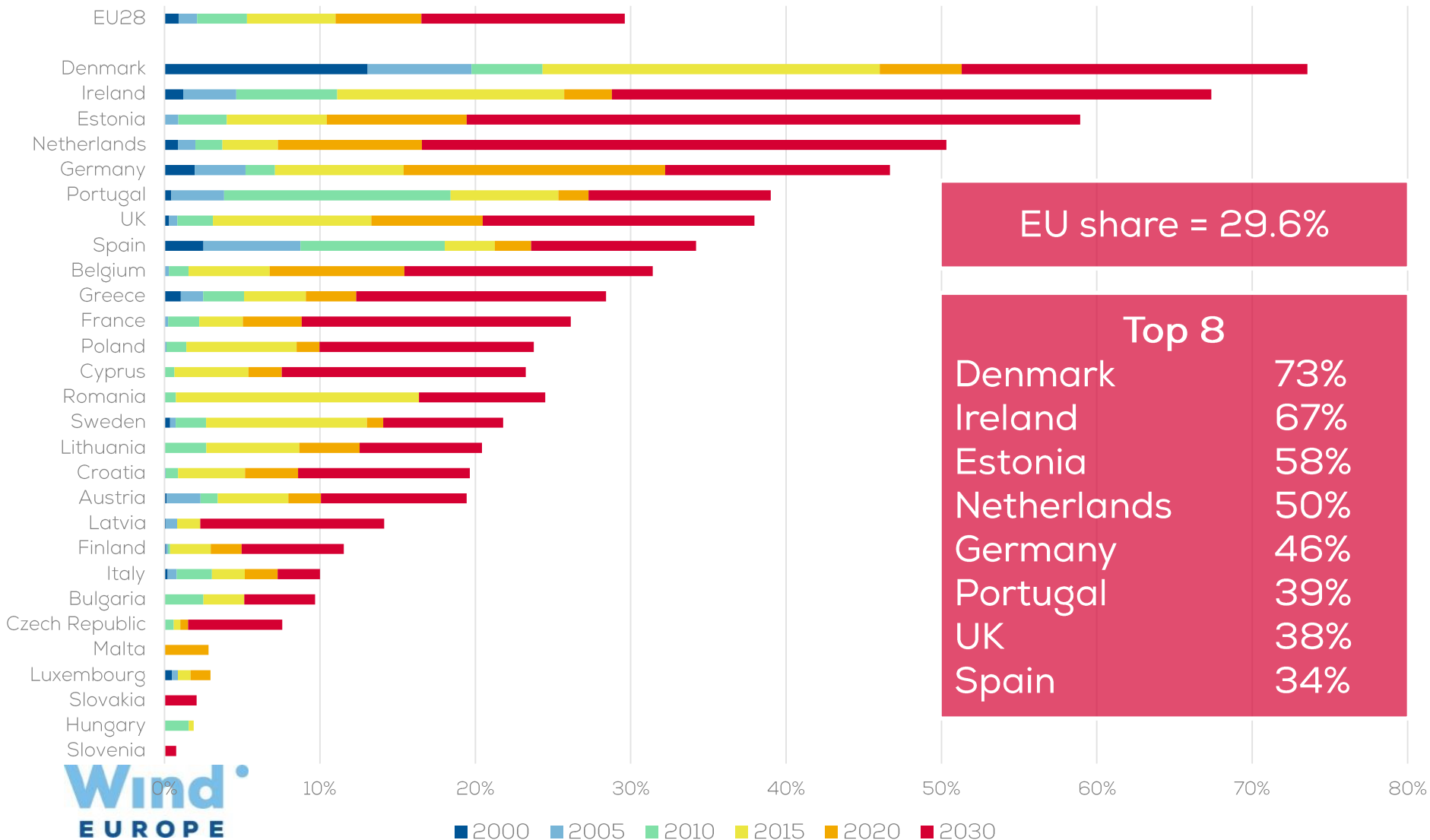
182 GW

By 30 June 2018

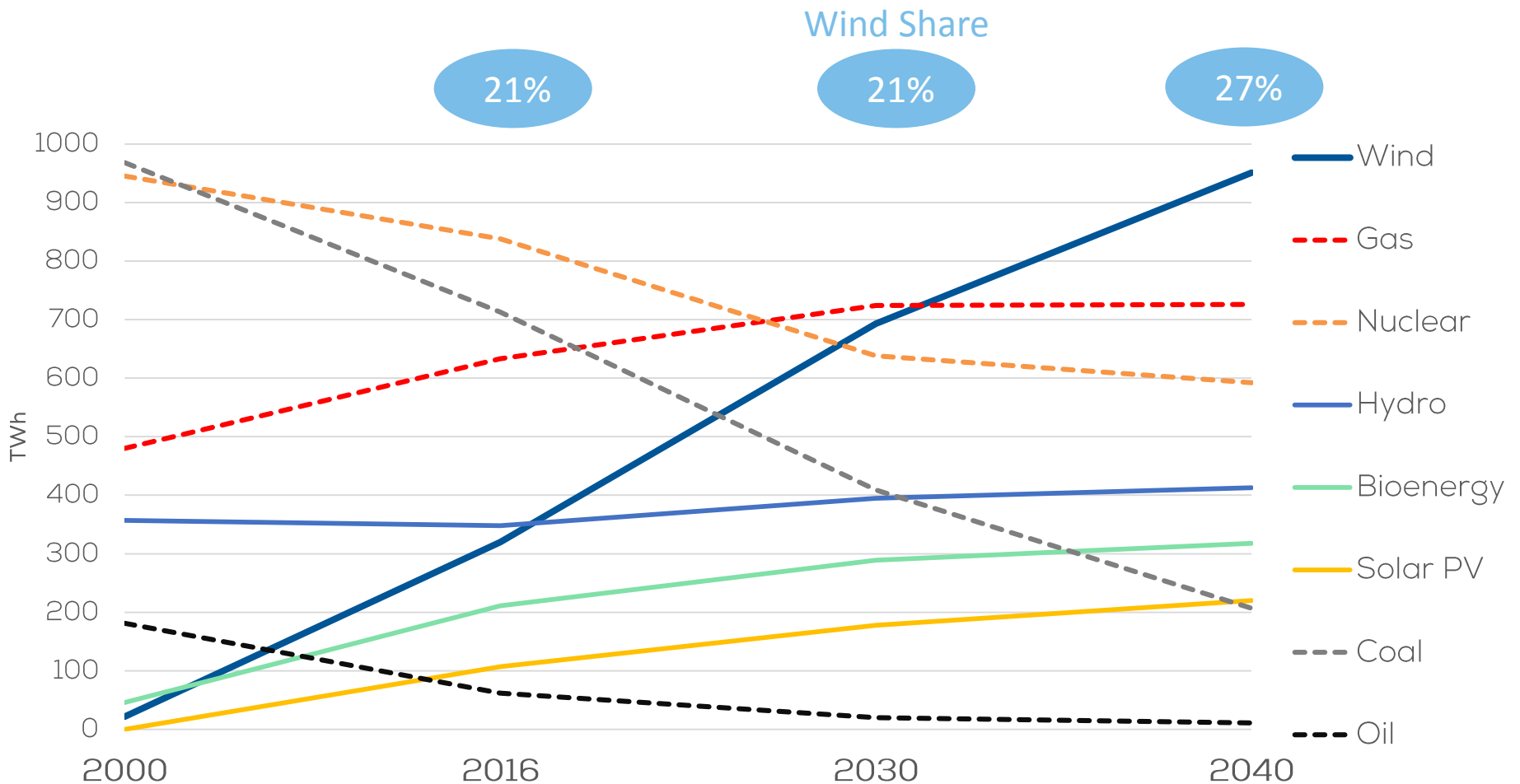
- GW installed
- Wind share of demand



Share of wind in the EU's power demand in 2030



EU's Electricity Mix



Source: WEO 2017, IEA

Wind Power variability

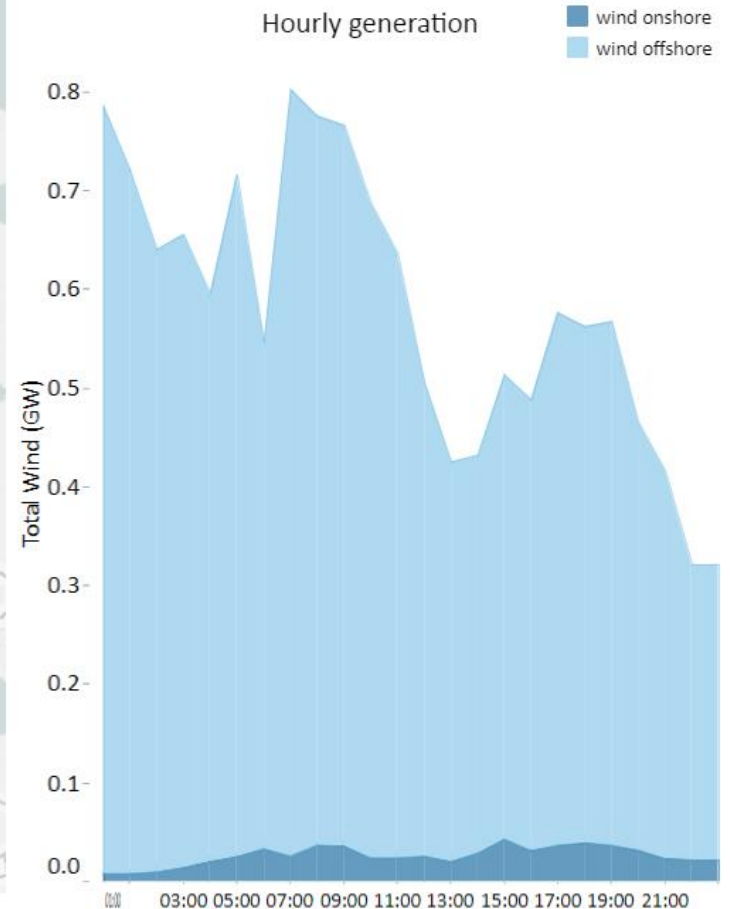
(16 December 2017)

Belgium



Offshore Wind (GWh)
13

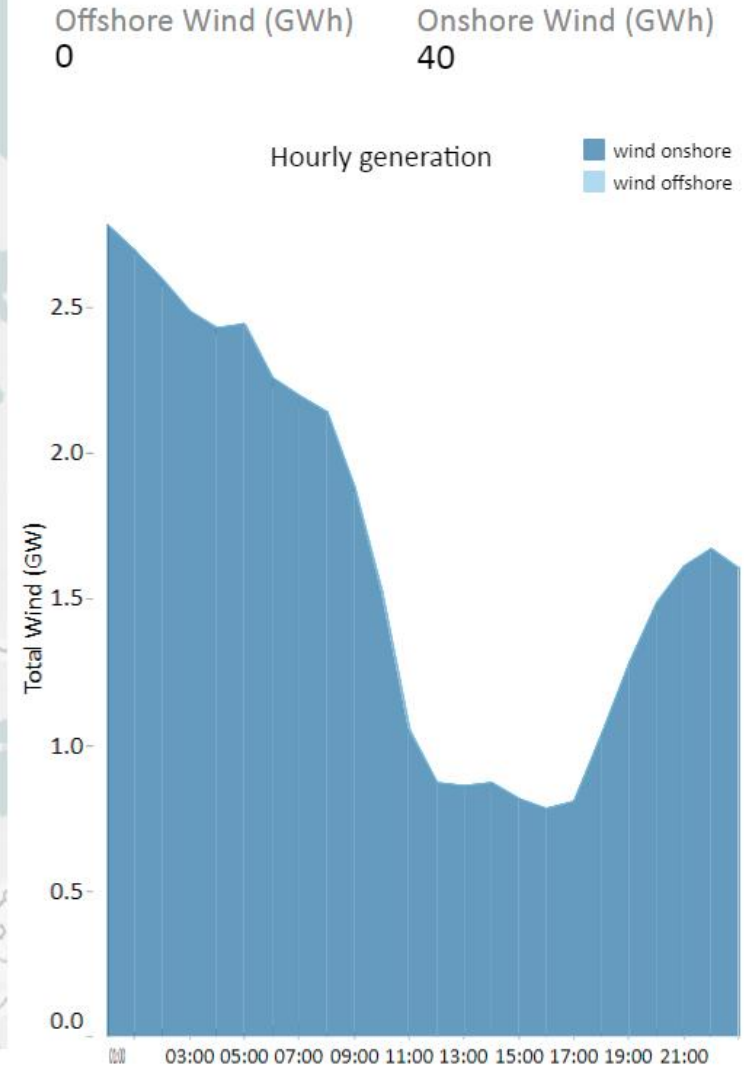
Onshore Wind (GWh)
1



Wind Power variability

(16 December 2017)

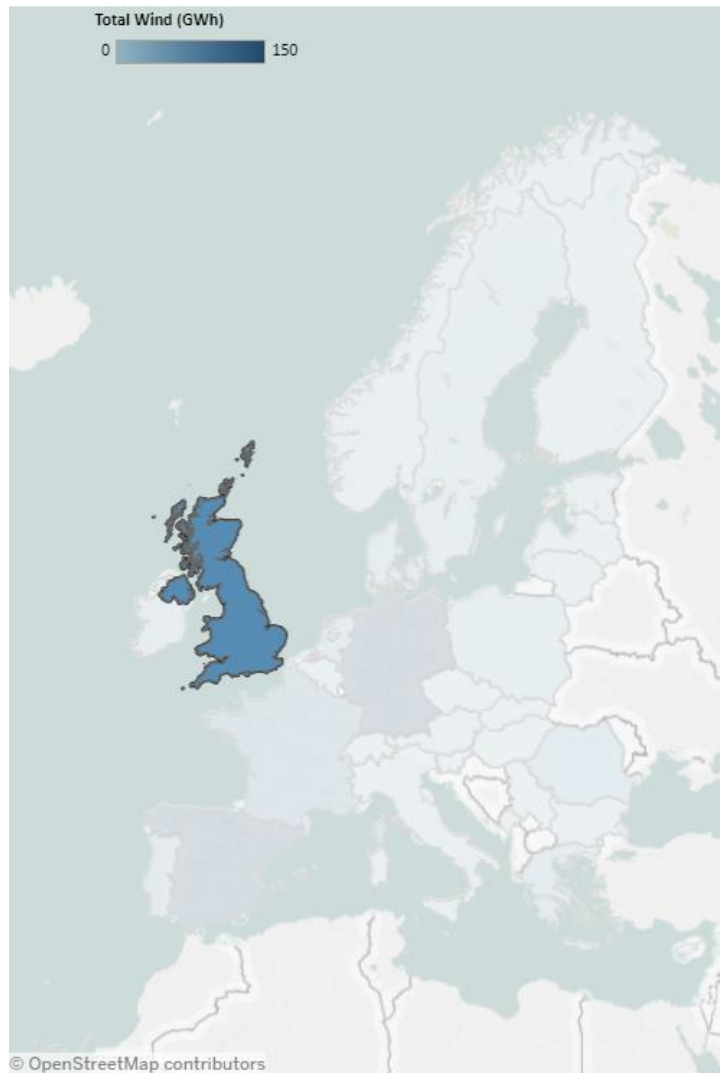
Portugal



Wind Power variability

(16 December 2017)

UK

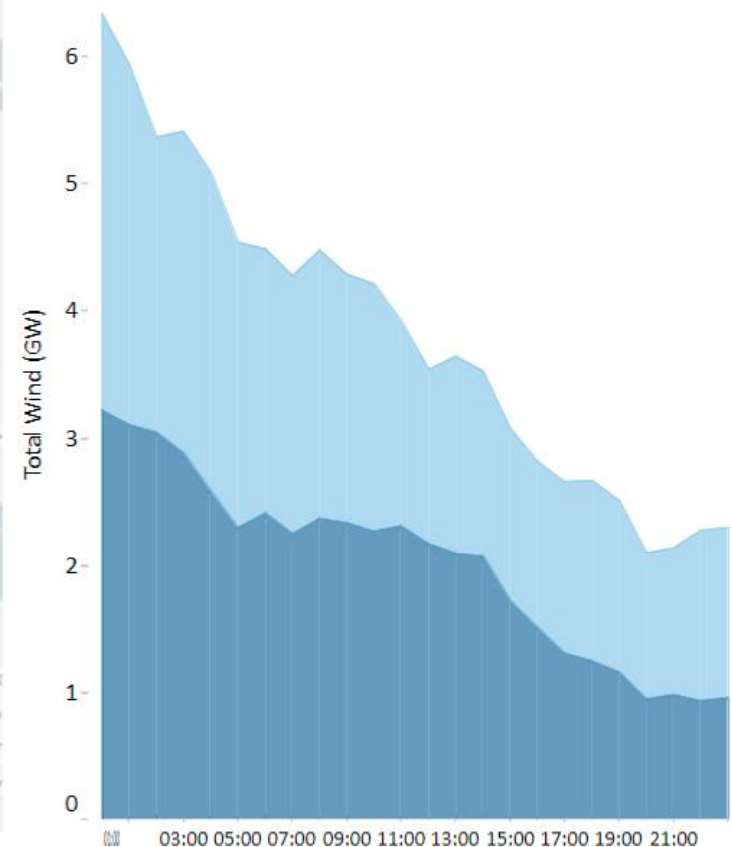


Offshore Wind (GWh)
43

Onshore Wind (GWh)
48

Hourly generation

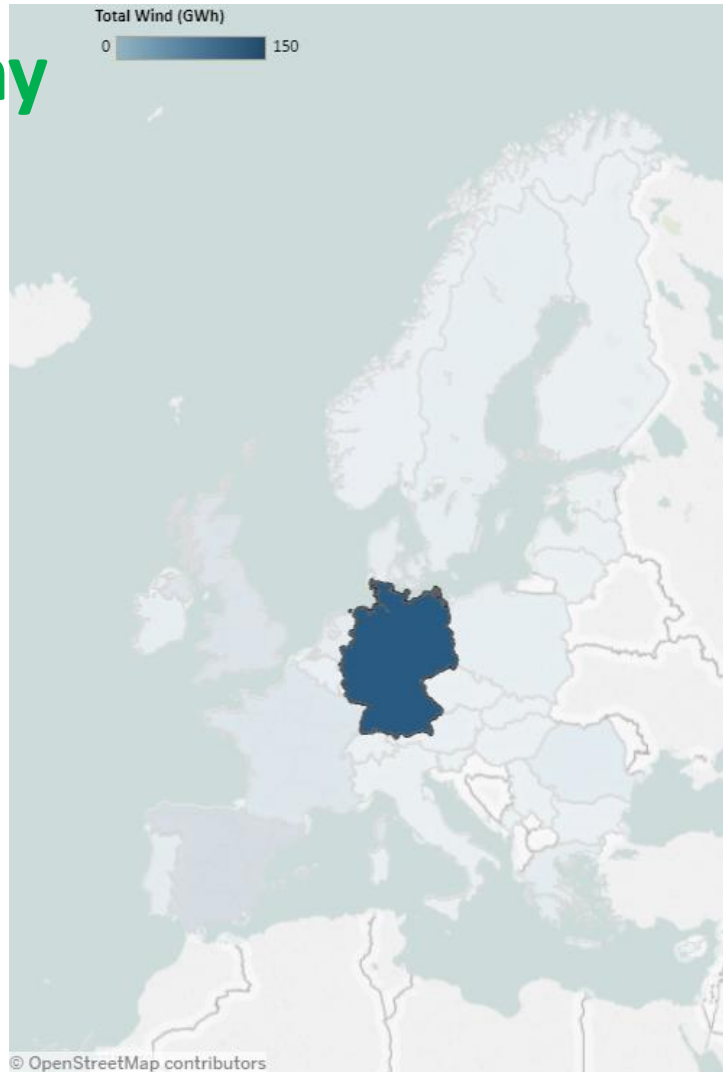
■ wind onshore
■ wind offshore



Wind Power variability

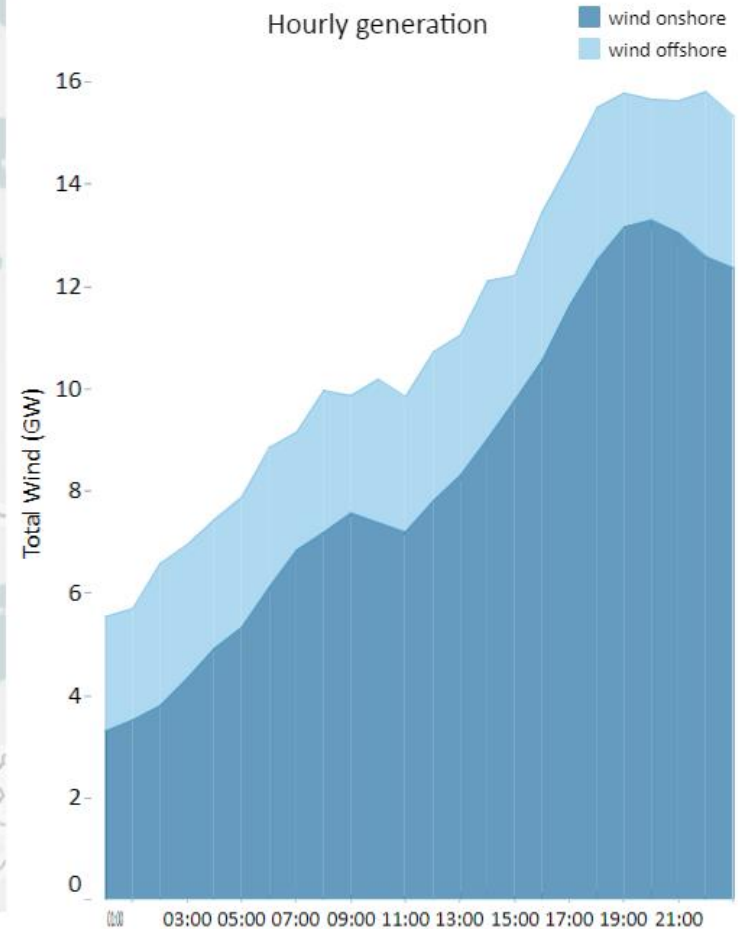
(16 December 2017)

Germany



Offshore Wind (GWh)
64

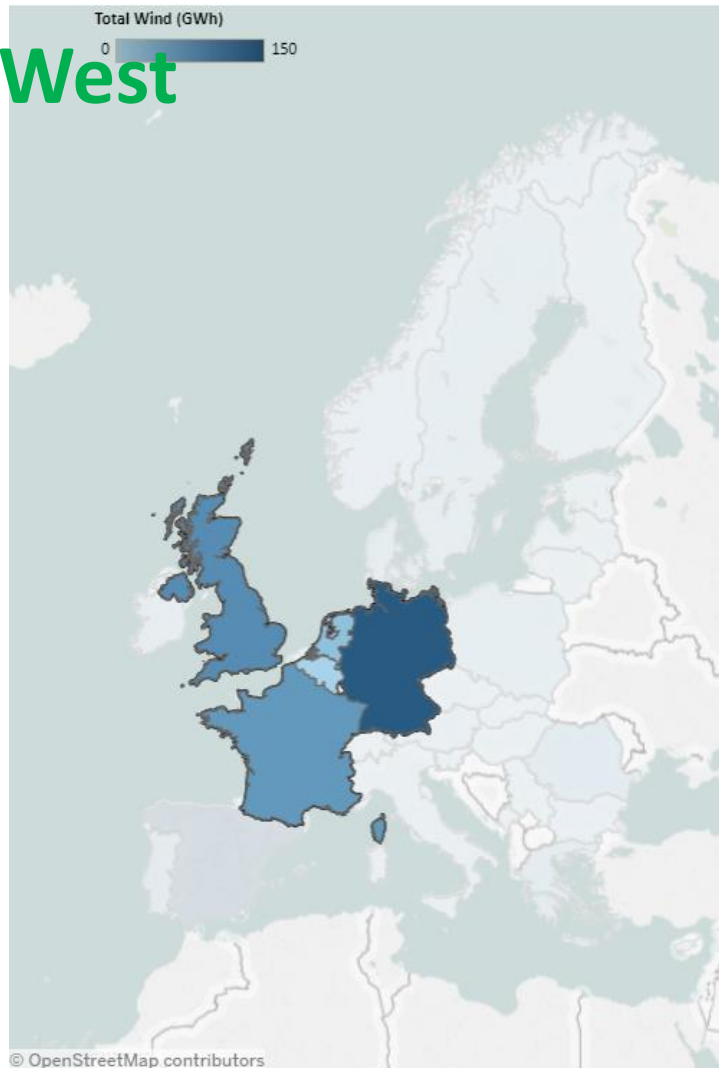
Onshore Wind (GWh)
202



Wind Power variability

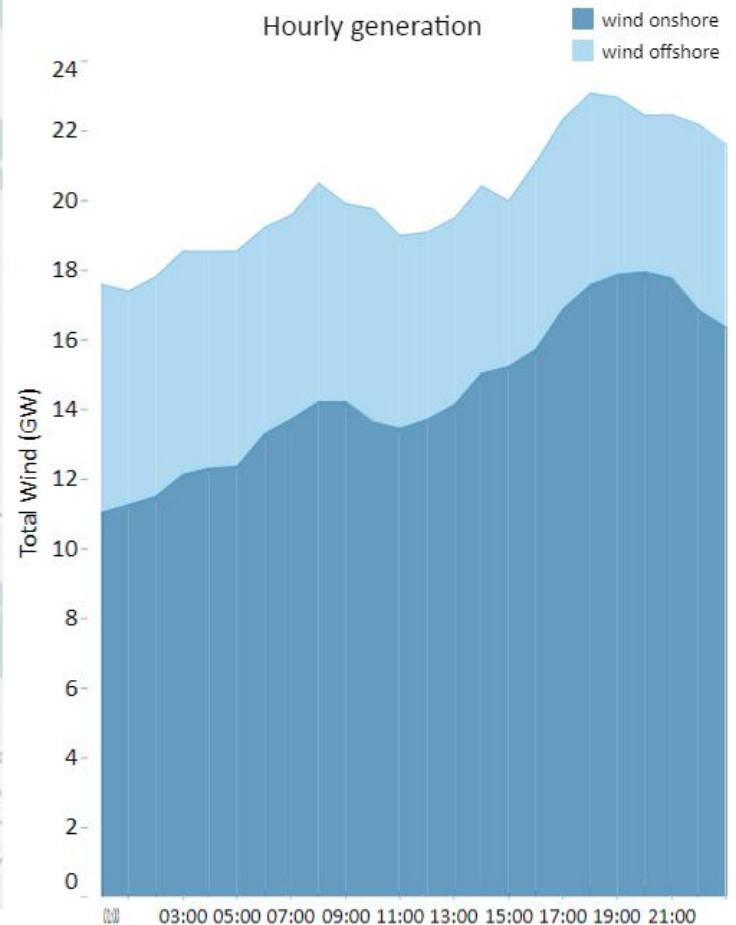
(16 December 2017)

Central West



Offshore Wind (GWh)
135

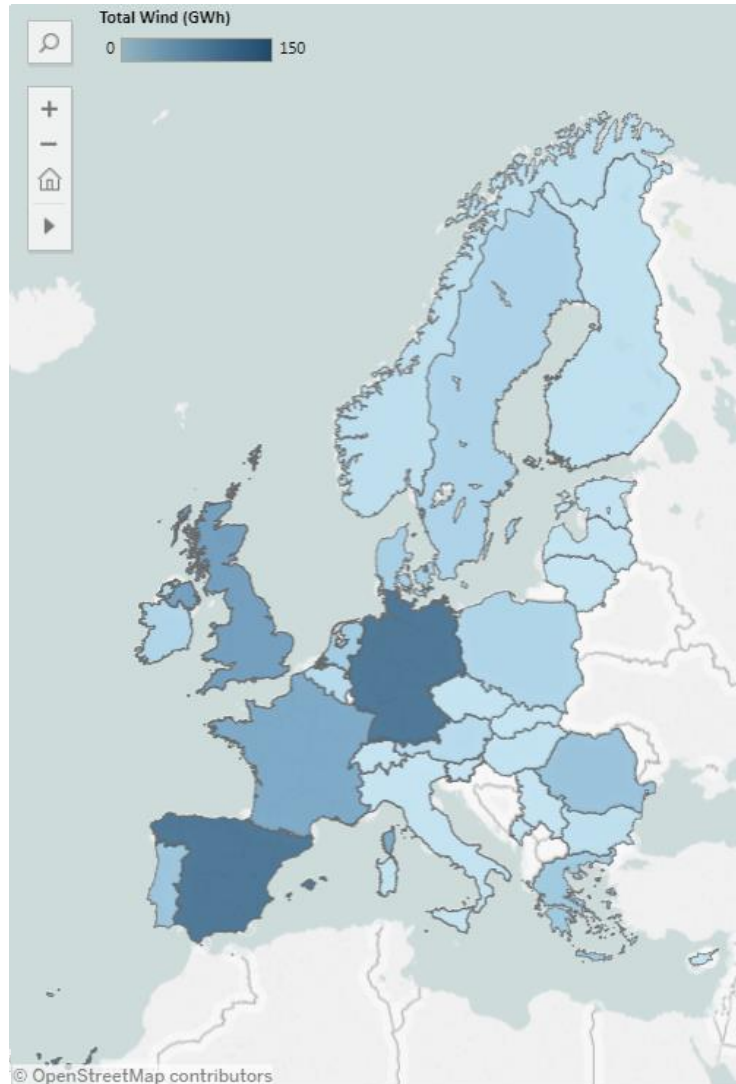
Onshore Wind (GWh)
348



Wind Power variability

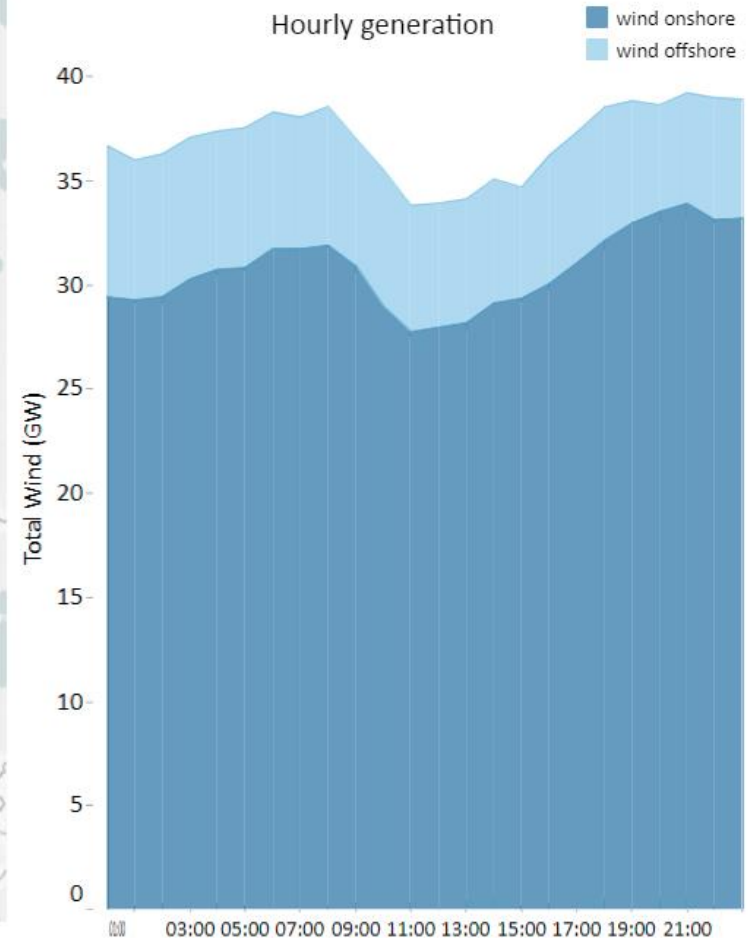
(16 December 2017)

Europe



Offshore Wind (GWh)
149

Onshore Wind (GWh)
738



11.6%

of EU's electricity demand

24.3%

average capacity factor

44% 26% 22% 22% 17%



Highest wind energy
penetration rates

152.9 GW

onshore wind capacity

10.1%

onshore wind in EU's power demand

22.5%

average onshore wind capacity factor

15.8 GW

offshore wind capacity

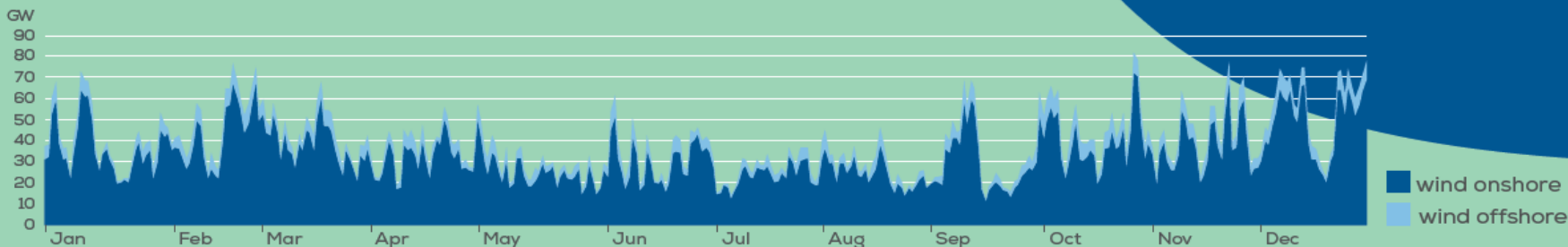
1.5%

offshore wind in EU's power demand

41.7%

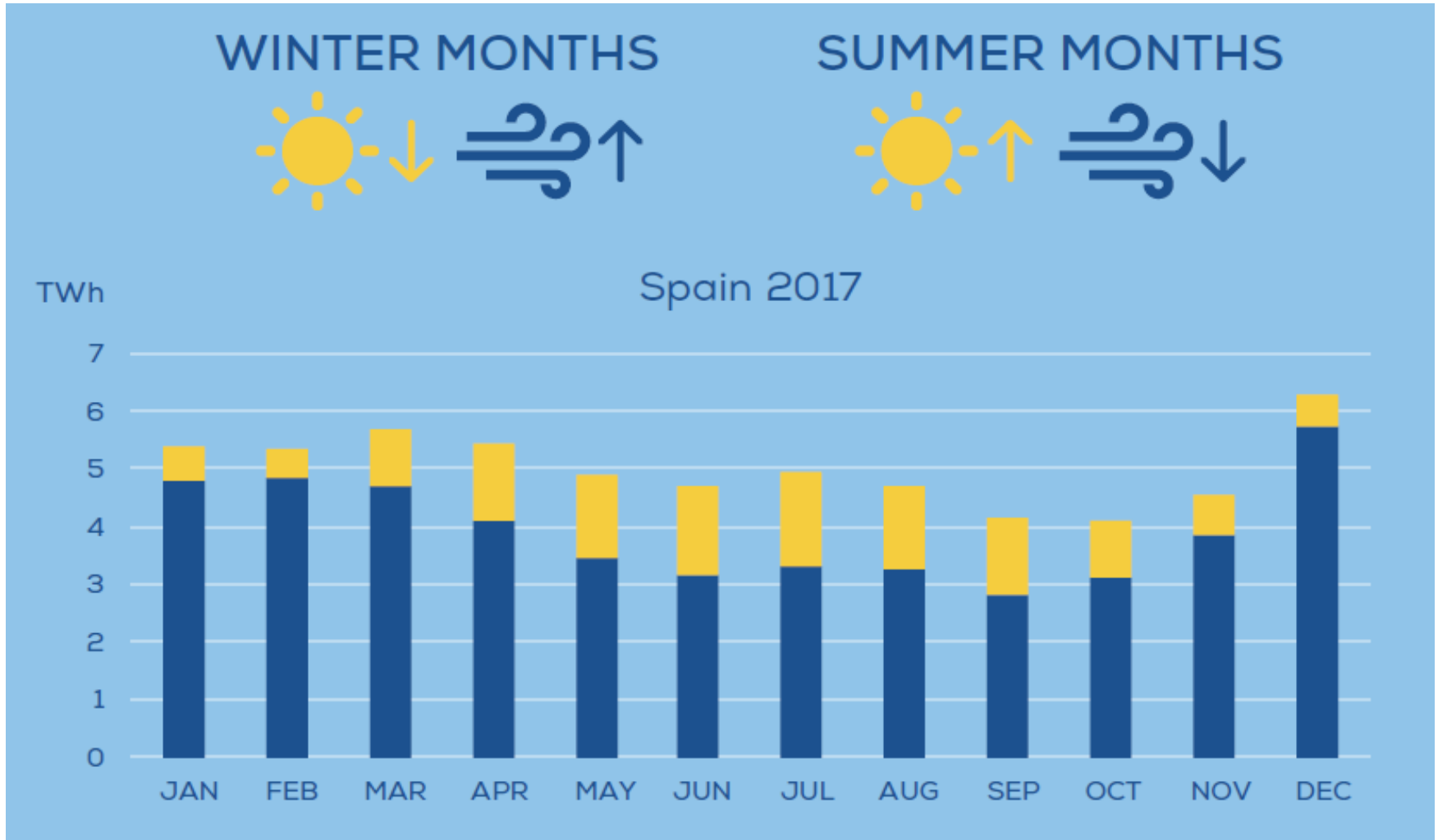
average offshore wind capacity factor

European wind energy
generation in 2017



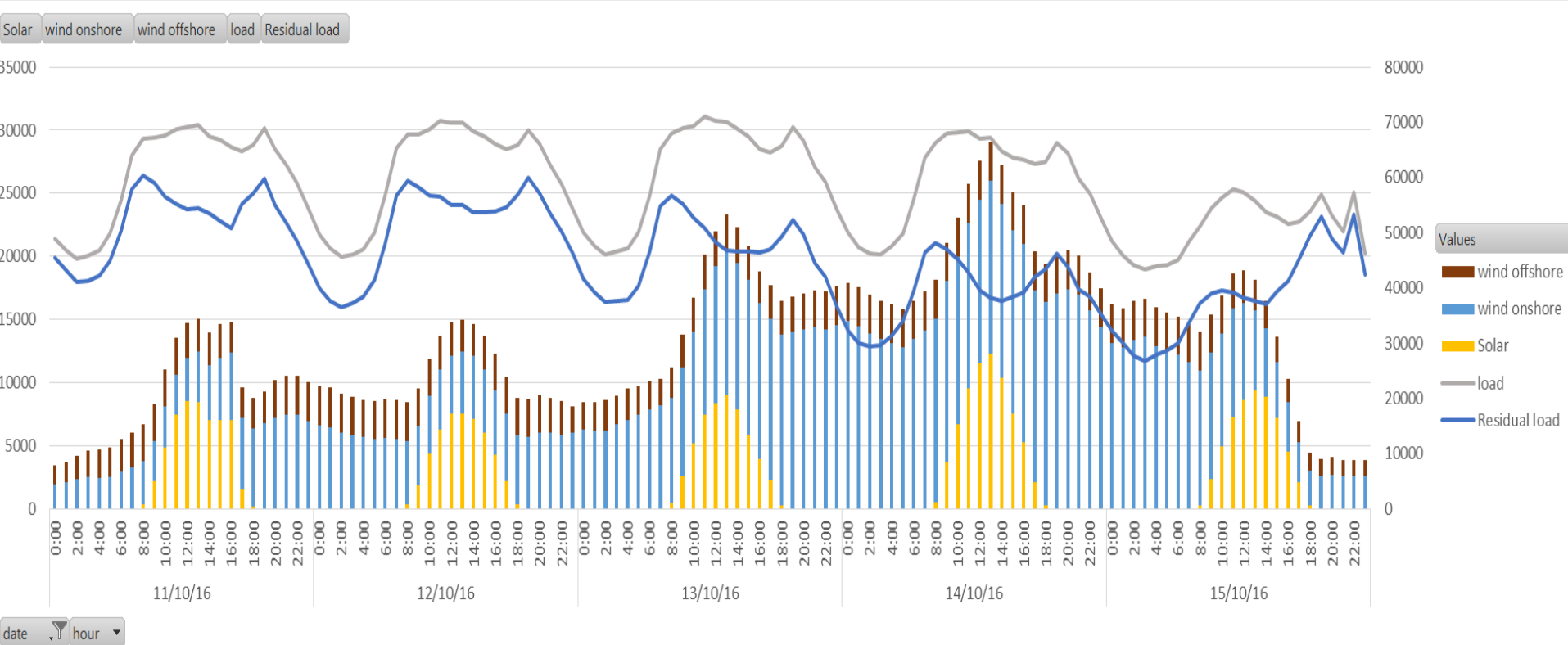
How much wind was in Europe's electricity yesterday? Find out more on: windeurope.org/dailywind

The value of diversification



Finding the right renewable technology mix

- Solar PV and Wind energy are complementary sources, even at the daily/hourly resolution, reducing dispatching cost*

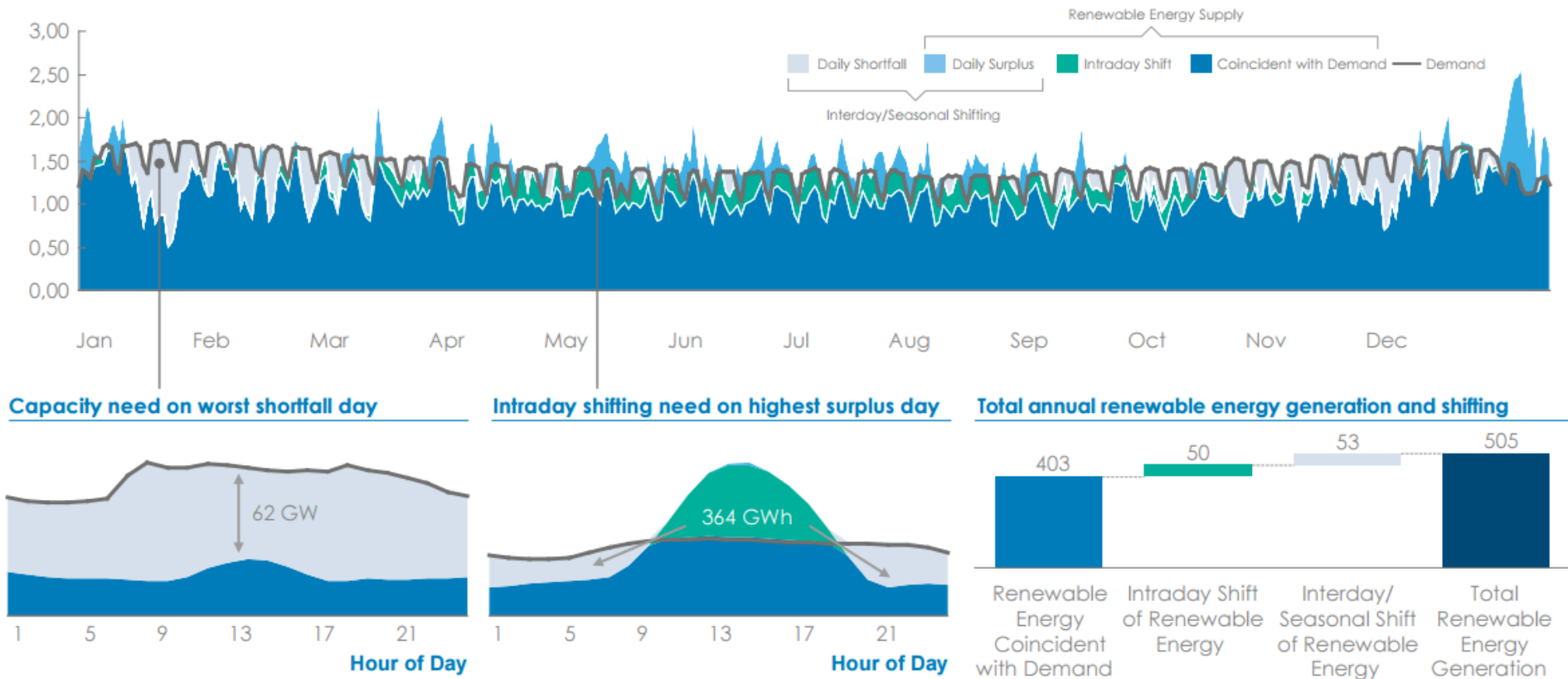


Energy shifting and seasonal storage: 25% of load

In a near-total-variable-renewable power system, annual shifting needs could represent about 25% of total load in a country like Germany

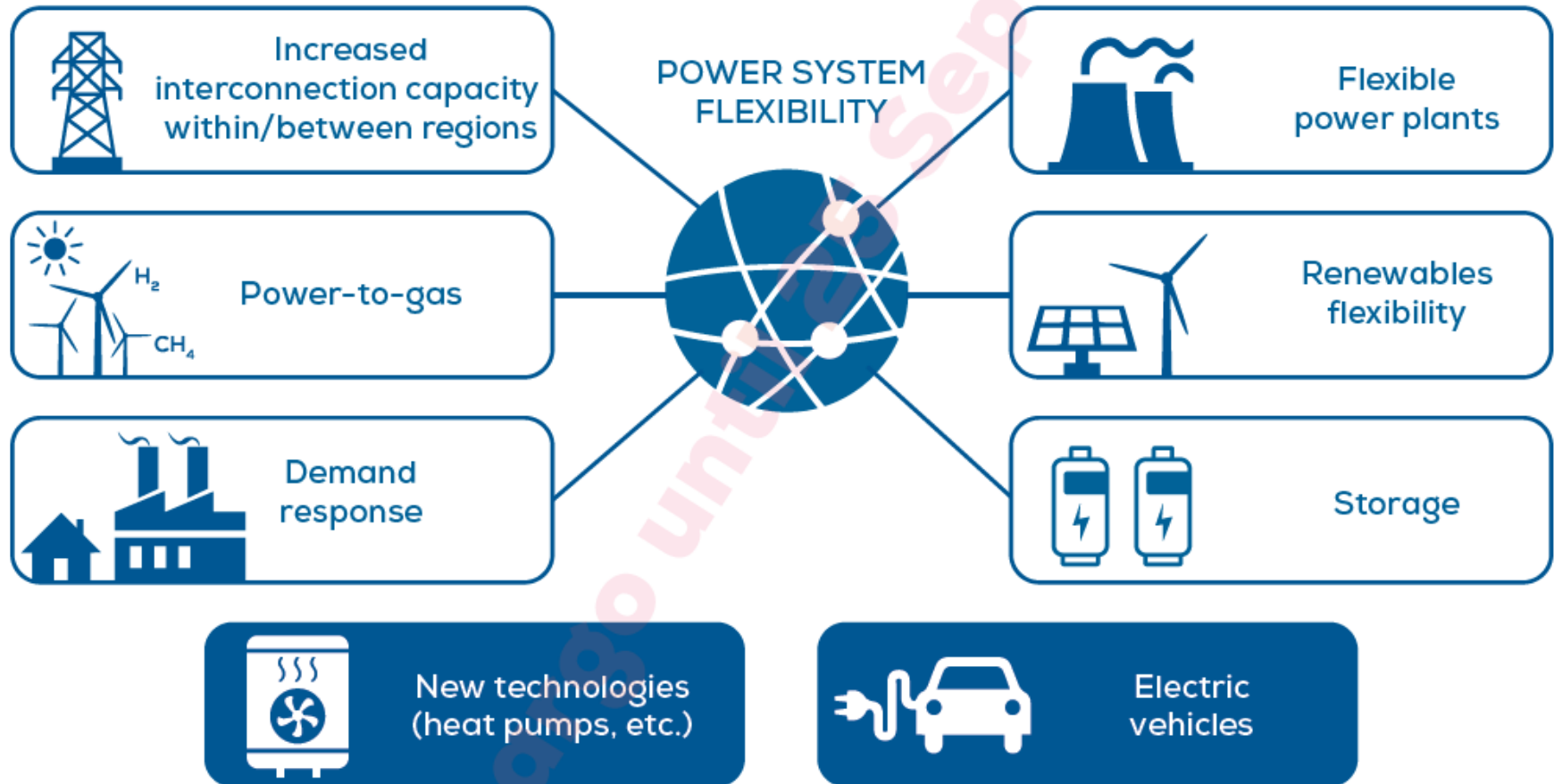
Example: Germany, Variable Renewable Energy System


Variable Renewable Energy Generation: 64% Wind, 34% Solar, 2% Run of River Hydro, Daily TWh



SOURCE: Climate Policy Initiative (2017), Low-cost, low-carbon power systems: How to develop competitive renewable-based power systems through flexibility.

The system will need a lot of flexibility





Wind Energy and the Electrification of Europe's Energy System

25 September



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