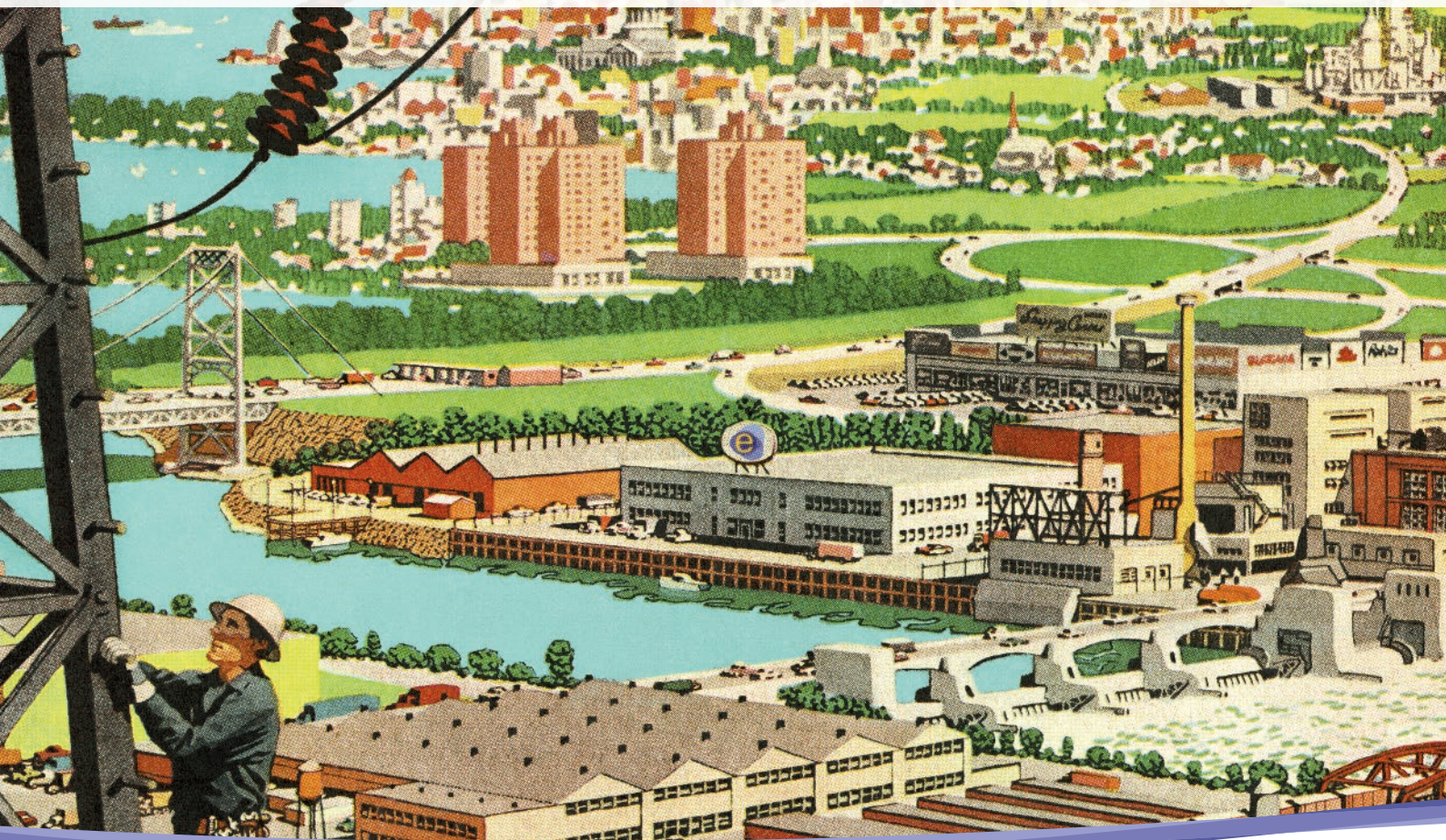


ELECTRICITY IN EUROPE 2015

Synthetic overview of electric system consumption, generation and exchanges in the ENTSO-E Area



European Network of
Transmission System Operators
for Electricity



ELECTRICITY IN EUROPE PROVIDES A SYNTHETIC OVERVIEW OF ELECTRIC SYSTEM CONSUMPTION, GENERATION AND EXCHANGES IN ENTSO-E* DURING A GIVEN YEAR. IT COMMENTS ON THE MAIN EVOLUTIONS IN COMPARISON TO THE PREVIOUS YEAR.

THE 2015 EDITION IS MAINLY BASED ON PROVISIONAL DATA, AS OF APRIL 2016, DELIVERED BY ENTSO-E MEMBERS, AND PUBLISHED ON THE ENTSO-E DATA PORTAL AS “MONTHLY STATISTICS”. IT IS COMPLEMENTARY TO THE STATISTICAL FACTSHEET AND THE YEARLY STATISTICS & ADEQUACY RETROSPECT, WHICH ARE ISSUED ONCE THE DATA IS DEFINITIVE.

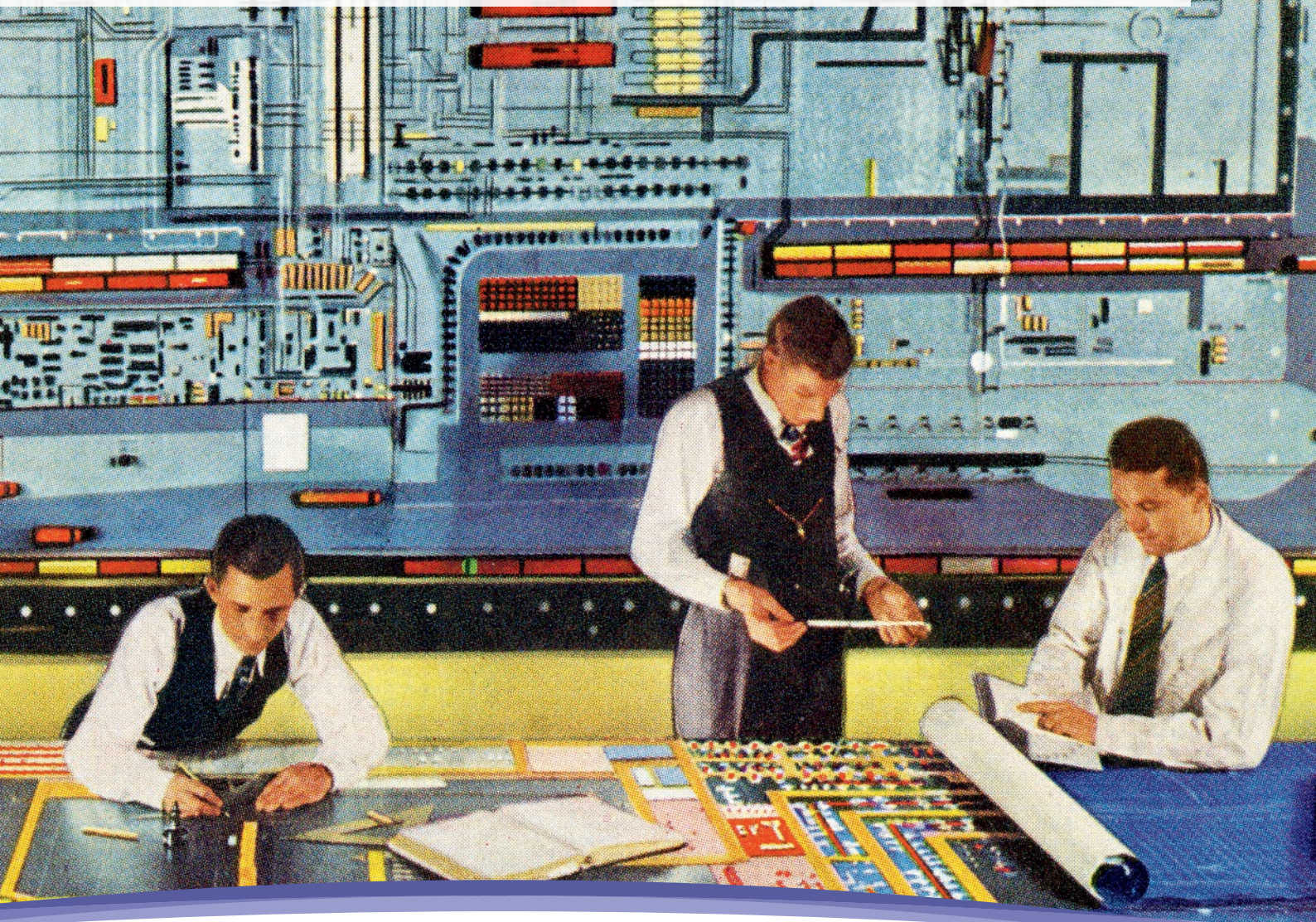
*** IN THIS DOCUMENT, ‘IN ENTSO-E’ MEANS IN THE AREA COVERED BY TSO MEMBERS OF ENTSO-E, I.E., 41 MEMBERS COVERING 34 COUNTRIES.**

CONTENTS

1. MAIN FACTS: ENERGY TRANSITION IN PROGRESS	4
2. CONSUMPTION	6
EVOLUTION OF OVERALL ENTSO-E CONSUMPTION	6
EVOLUTION OF CONSUMPTION PER COUNTRY	7
3. GENERATION	8
EVOLUTION OF OVERALL ENTSO-E NET GENERATING CAPACITY	8
EVOLUTION OF OVERALL ENTSO-E ENERGY NET GENERATION	9
NET GENERATION PER COUNTRY	10
RENEWABLE NET GENERATION PER COUNTRY	15
4. EXCHANGES	16
EXCHANGE BALANCES PER COUNTRY	17
EXPORTED GENERATION	18
CONSUMPTION FROM NATIONAL GENERATION	18
APPENDIX: DATA SOURCES AND REFERENCES	19
IMPRINT	19

1. ENERGY TRANSITION IN PROGRESS

MAIN FACTS



ENTSO-E ELECTRICITY CONSUMPTION INCREASED IN 2015

After several years of decrease, overall electricity consumption in the ENTSO-E perimeter reached 3,278 terawatt hours (TWh) in 2015. This 1.4 % increase can be explained by the colder temperatures observed in the beginning of the year compared to 2014, and by a slight economic upturn.

In 2015, the peak load of the overall electrical system was reached on 5 February (528 gigawatts (GW)), linked to a cold period, and was higher than the previous year (+6GW). However, this is still below the historical maximum of 557GW reached in February 2012, when an exceptional period of cold weather struck the main part of Europe.

RENEWABLE GENERATION CONTINUES TO INCREASE WHILST HYDRO AND NUCLEAR GENERATION DECREASE

The net generating capacity (NGC) of hydro has been stable for several years. However, in 2015, due to a decrease in rainfall, hydro generation was 6.5 % lower than the previous year. Moreover, the shutdown of nuclear plants (-1.8GW) in Germany and Great Britain have contributed to a reduction of nuclear generation by 2.66 % (-23TWh). The growth in renewable power has mainly been driven by wind generation, which increased by 24.5 % in 2015. The combined effects of the development of wind farms (136GW) and suit-

able meteorological conditions, were substantially responsible for these figures. In total, the capacity of Renewable Electricity Sources (RES) (excluding hydro) amounts to almost 25.8 % of the total NGC of ENTSO-E.

However, to compensate for the reduction in hydro and nuclear and their load growth, the use of fossil fuel resources increased in 2015 by 1.2 %, despite the reduction of capacity (-3.3 %).

INTERCONNECTED NETWORK ALLOWS EXCHANGE BALANCE OF COUNTRIES TO FLUCTUATE FROM YEAR TO YEAR

Even if the structure of exchanges is rather stable, the exchange balance of ENTSO-E countries can fluctuate due to border capacities, market prices, market coupling and development of renewables. In 2015, 12 countries within the ENTSO-E perimeter exported more than 10 % of their annual national generation to neighbouring countries. Fourteen other countries of ENTSO-E imported more than 10 % of their annual internal consumption needs from other ENTSO-E countries.

Exporting countries were mainly situated along a North-East to South-West axis, which is characterised by an energy mix based on hydro, coal and renewables. The ENTSO-E area had an export balance (6TWh) in 2015.

2. CONSUMPTION



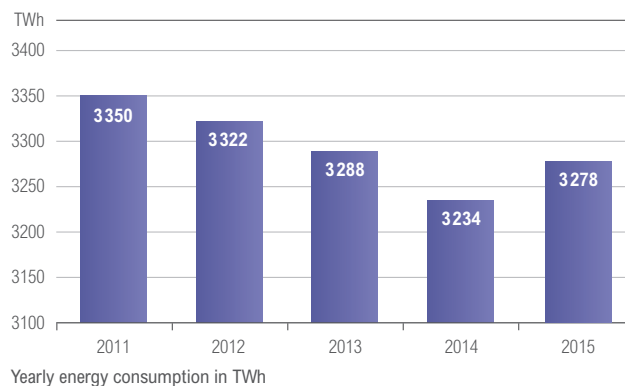
EVOLUTION OF OVERALL ENTSO-E CONSUMPTION

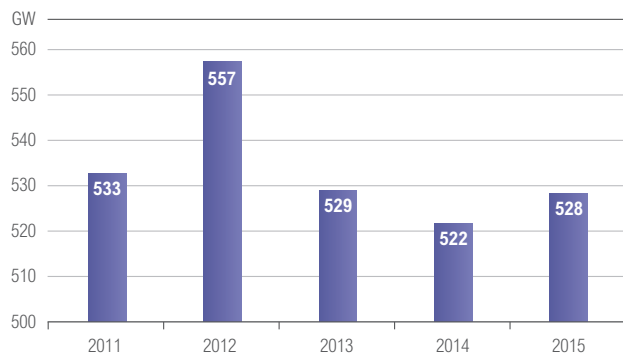
YEARLY ENERGY CONSUMPTION

In 2015, ENTSO-E consumption reached 3,278TWh, which represents a 1.4% increase compared to the previous year. The following reasons may explain this increase:

- Meteorology: average 2015 temperatures were lower at the beginning of the year, and higher in summer;
- Economy: the GDP rose by 1.8% in the EU28 over 2015 compared to 2014 (Source: Eurostat).

We observe an increasing use of electricity (e.g., electric vehicles), despite improvements in energy efficiency of buildings, lighting and appliances.





Maximum peak load in GW

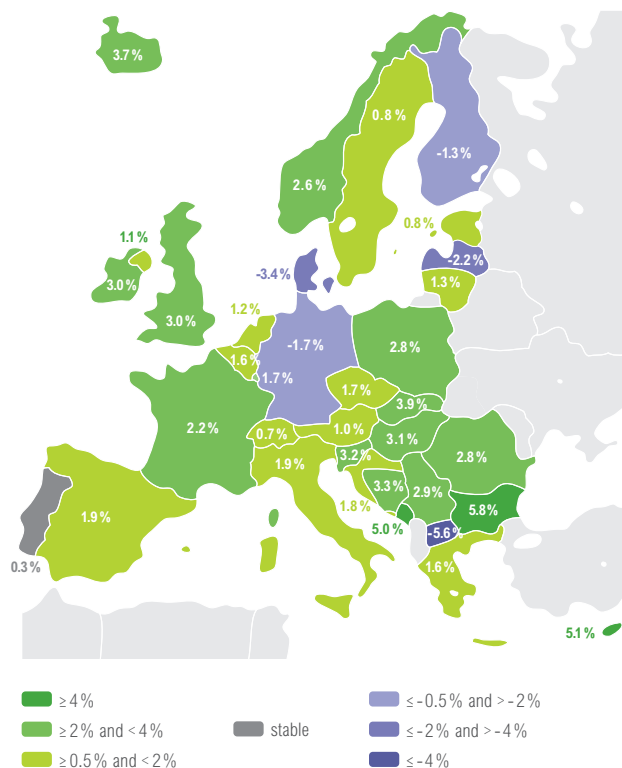
Estimated amount of own consumption is included.

EVOLUTION OF CONSUMPTION PER COUNTRY

The majority of ENTSO-E countries observed an increase of their consumption between 2014 and 2015. For some countries, particularly France, where electric heating is important, this increase can mainly be explained by colder winter weather conditions.

PEAK LOAD

Associated with the cold snap of February 2015, the peak load was higher than 2014 and reached 528GW on 5 February 2015. This peak is comparable to the 2013 peak, and is still 30GW lower than the peak load registered during the cold period of February 2012.



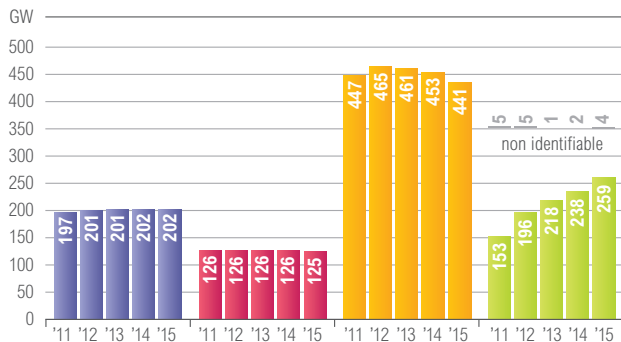
EVOLUTION OF ELECTRICITY CONSUMPTION
BETWEEN 2014 AND 2015

3. GENERATION

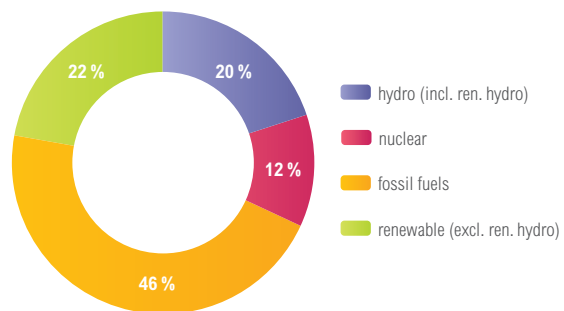
EVOLUTION OF OVERALL ENTSO-E NET GENERATING CAPACITY

By the end of 2015, total ENTSO-E NGC was 1,030GW. Whilst NGC was stable with respect to nuclear and hydro, non-hydro renewable energy sources increased by 20GW (+ 8.6 % compared

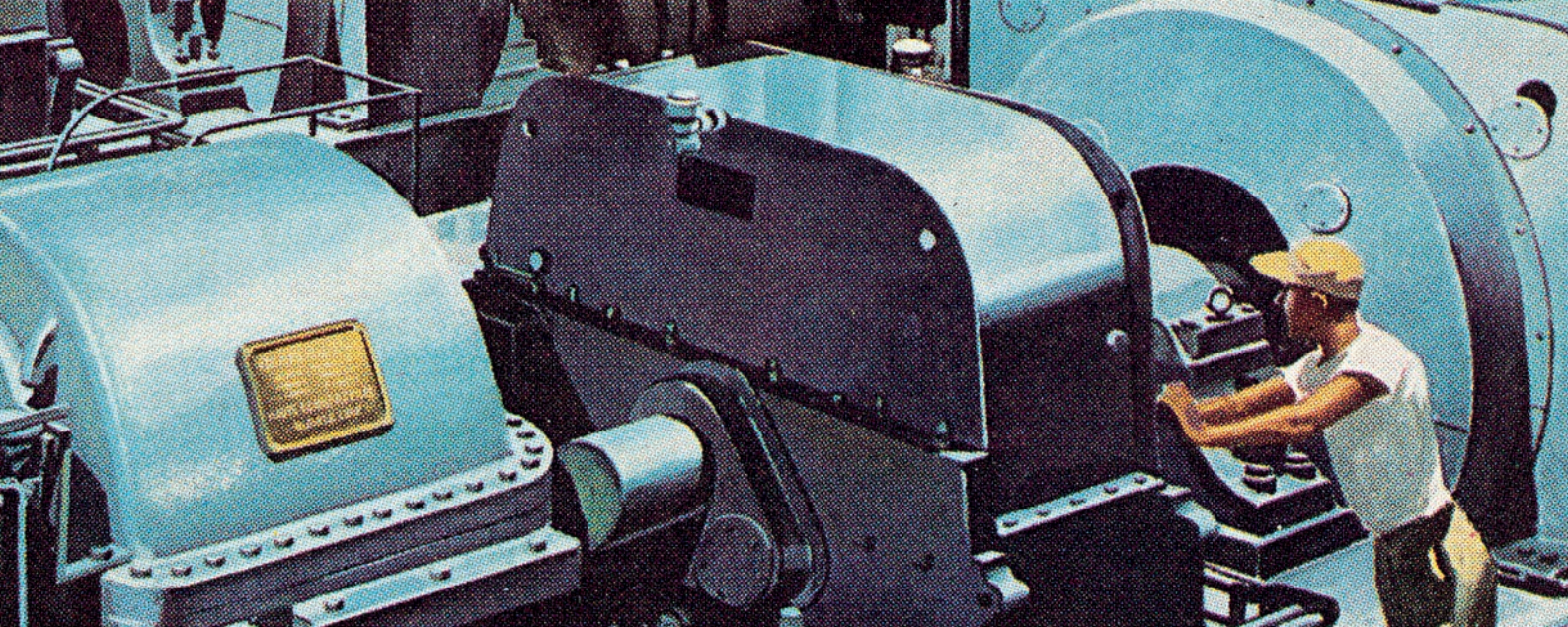
to 2014), and represented 25.1 % of total NGC of ENTSO-E. In contrast, fossil fuel NGC decreased by 3.3 %.



Net generating capacity from 2011 to 2015 in GW



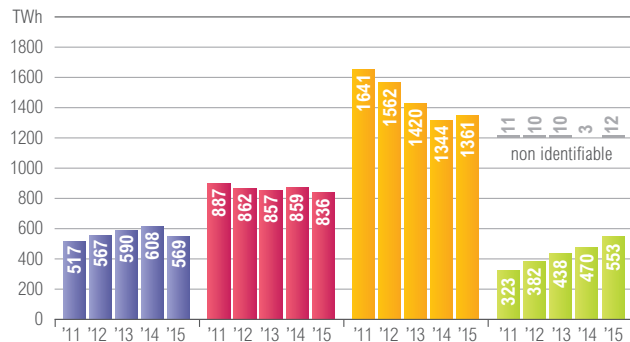
Net generating capacity in 2015



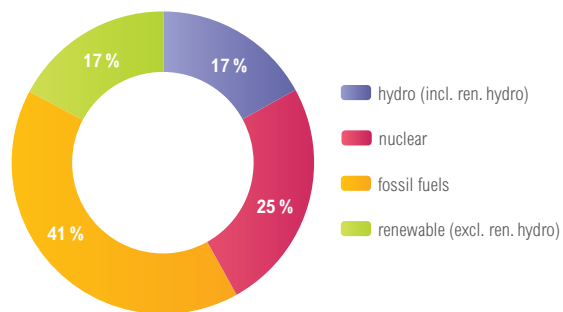
EVOLUTION OF OVERALL ENTSO-E ENERGY NET GENERATION

The low rainfall of 2015 affected hydro generation, which decreased by 6.5%. This decrease, coupled with the reduction of nuclear generation, was partially compensated by the increase

in renewable generation (+17.3%), mainly driven by solar and wind, which increased by 24.6% and 3.1%, respectively. At the same time, fossil fuel generation increased by 1.1%.



Energy net generation from 2011 to 2015 in TWh



Energy net generation in 2015

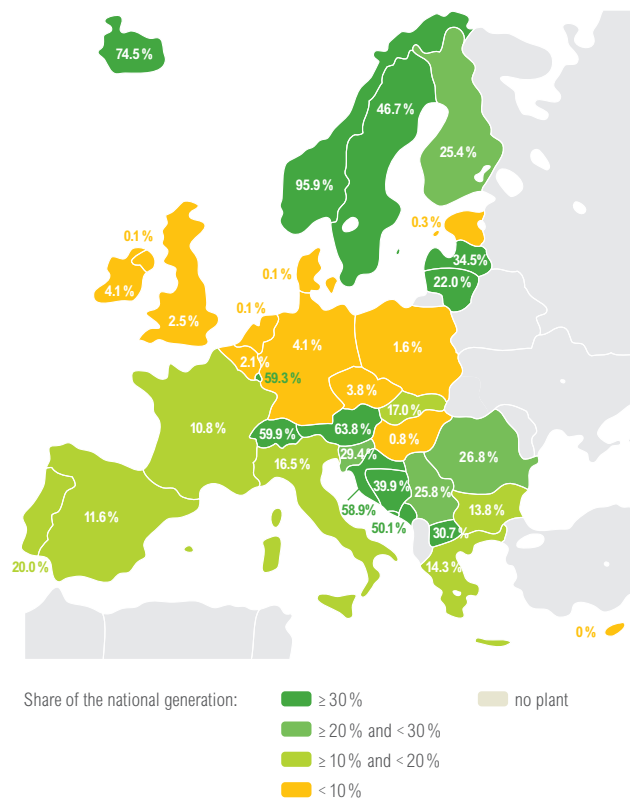
NET GENERATION PER COUNTRY

HYDRO ENERGY

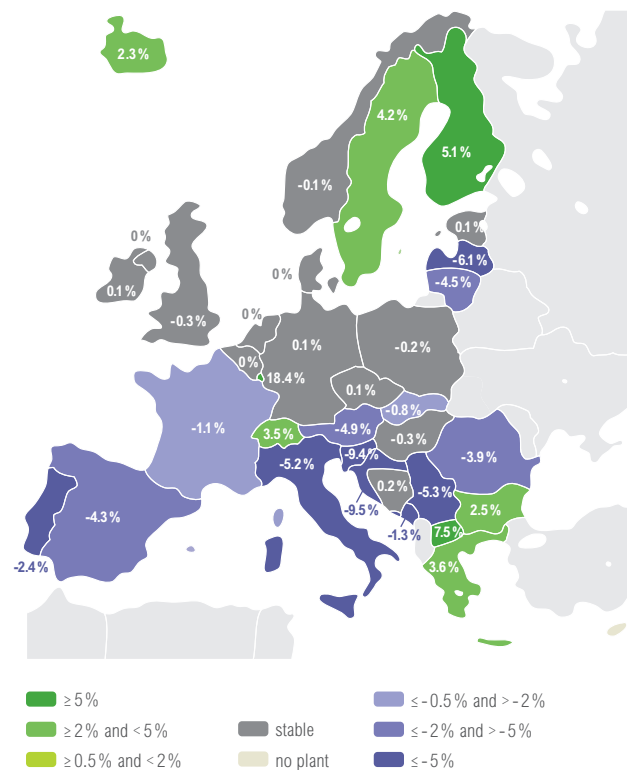
In Europe, hydro power plants are concentrated in the transalpine range, the Carpathians and the Scandinavian countries, where hydro generation represents up to 96% of total national

generation. Although hydro capacities have not significantly evolved further, generation is highly dependent on rainfall, which differs from one country to the next.

SHARE OF HYDRO ENERGY NET GENERATION IN 2015



EVOLUTION OF HYDRO COVERAGE RATIO IN PERCENTAGE POINT



A percentage point (pp) is the arithmetic difference between two percentages (for example going from 4% to 7% is a 3 percentage point increase).

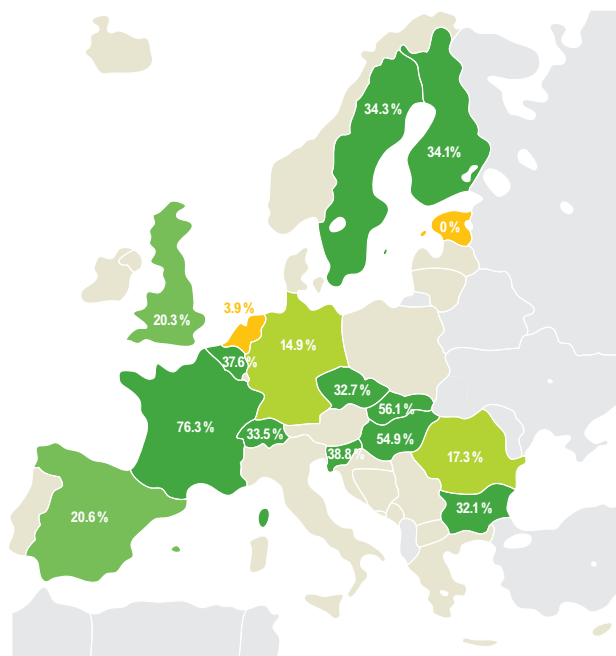
NUCLEAR ENERGY

The total nuclear NGC has been rather stable in ENTSO-E, despite the fact that power plant generation can fluctuate, depending on availability. For example, the unavailability of some reactors in Belgium led to a significant drop of nuclear generation, compared to 2014.

The decreases in nuclear NGC have mainly been linked to shutdowns, such as:

- 1.3GW in Germany (Grafenrheinfeld)
- 0.5GW in Great Britain (Wylfa)

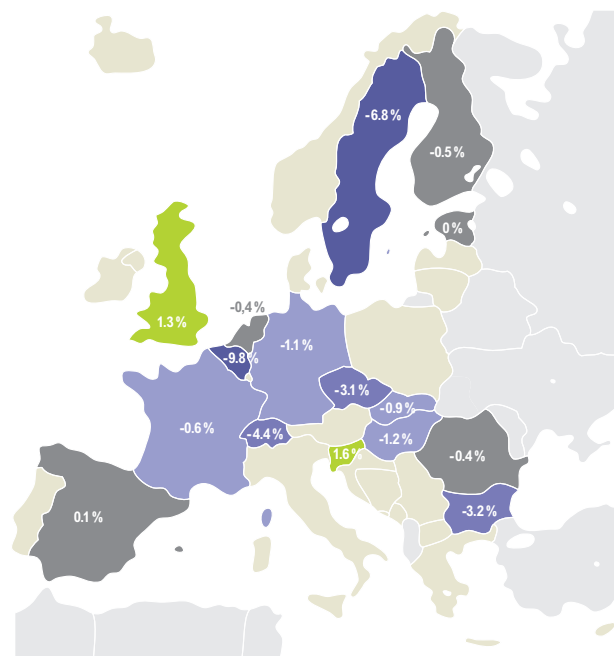
SHARE OF NUCLEAR ENERGY NET GENERATION IN 2015



Share of the national generation:

- ≥ 30%
- ≥ 20% and < 30%
- ≥ 10% and < 20%
- < 10%
- no plant

EVOLUTION OF NUCLEAR COVERAGE RATIO IN PERCENTAGE POINT



Evolution of the nuclear coverage ratio:

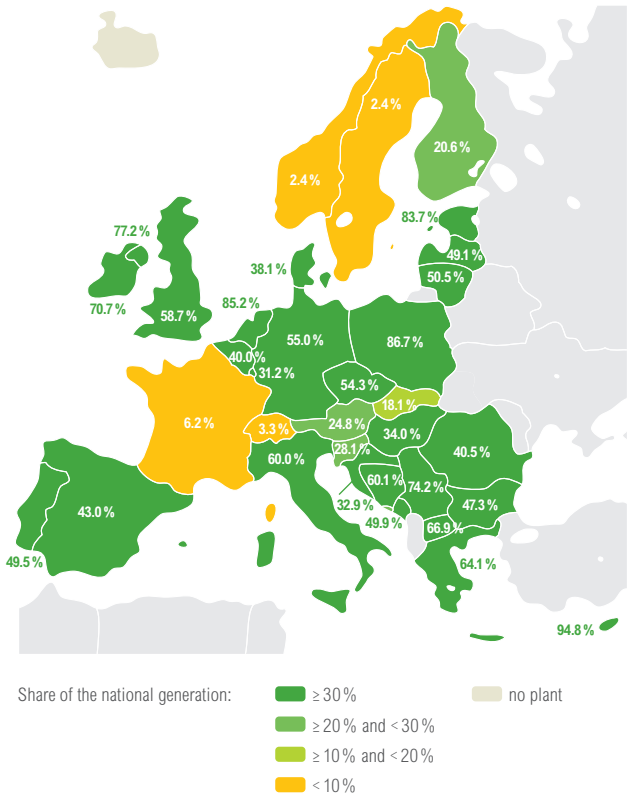
- ≥ 5%
- ≥ 2% and < 5%
- ≥ 0.5% and < 2%
- stable
- no plant
- ≤ -0.5% and > -2%
- ≤ -2% and > -5%
- ≤ -5%

FOSSIL FUEL

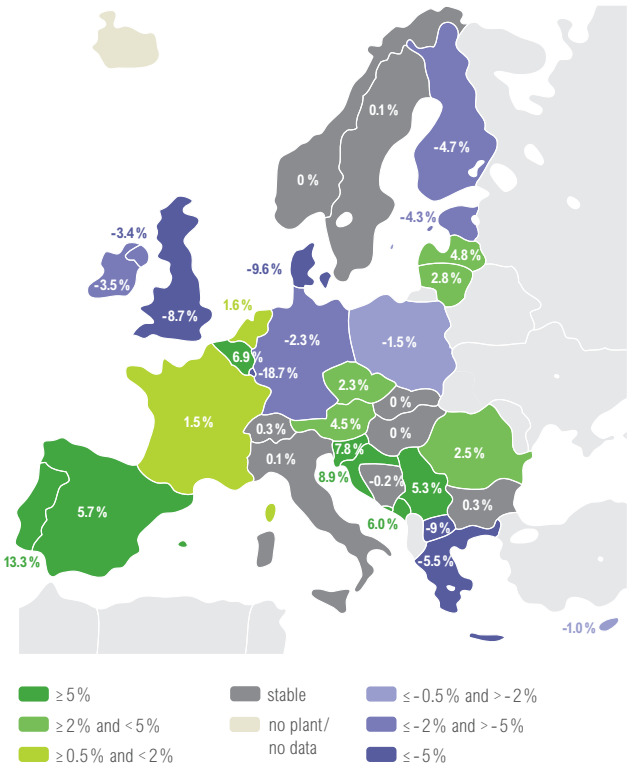
Historically, fossil fuels have been the main electricity generation source for countries with no hydro resources or nuclear plants. In recent years, the share of electricity generation from fossil fuels has decreased in all European countries, associated with the development of RES generation, and the shutdown of some thermal

plants which do not meet European environmental standards. However, in 2015, fossil fuel generation increased, mainly due to a decrease in hydro and nuclear generation.

SHARE OF FOSSIL FUELS ENERGY NET GENERATION IN 2015



EVOLUTION OF FOSSIL FUELS COVERAGE RATIO IN PERCENTAGE POINT



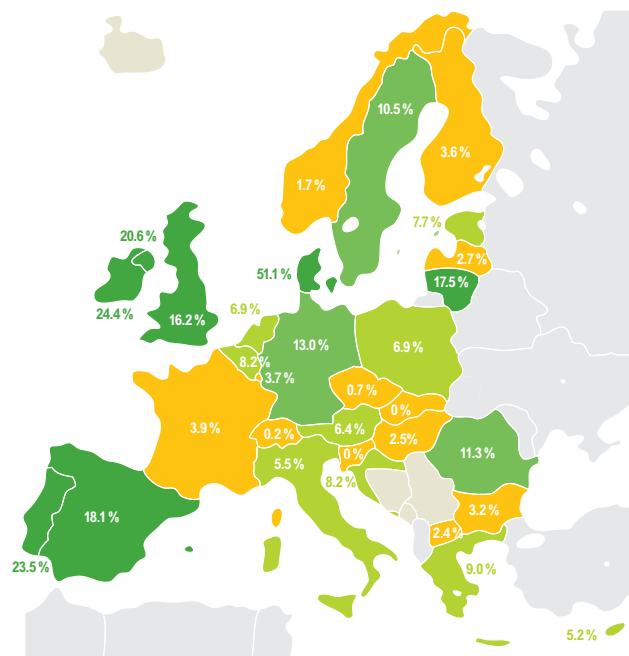
WIND ENERGY

The evolution of electricity generated from wind (+24.5%) is influenced by:

- the evolution of capacities, which are generally increasing throughout the ENTSO-E. Indeed, in 2015, wind NGC reached 136 GW (+10%);
- the weather conditions of a specific year and specific country.

In 2015, the wind generation of Germany, Spain and Great Britain accounted for 57 % of total wind generation of the ENTSO-E (310TWh).

SHARE OF WIND ENERGY NET GENERATION IN 2015

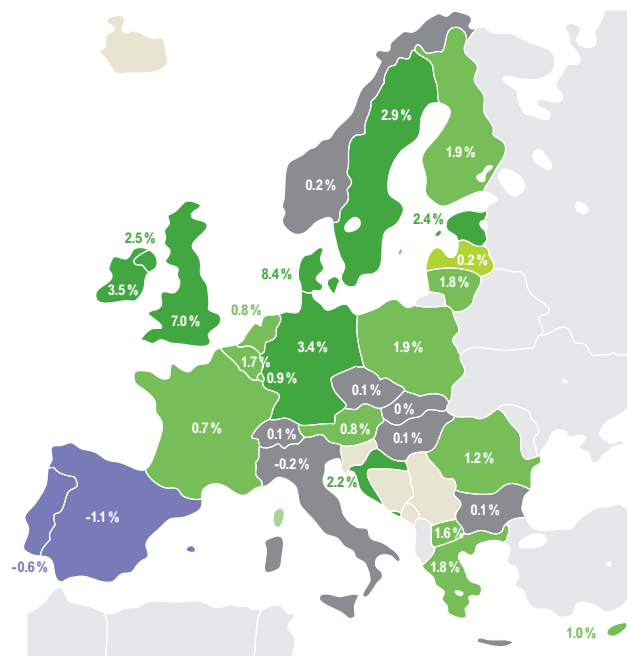





Share of the national generation:



no plant/
no data

EVOLUTION OF WIND COVERAGE RATIO IN PERCENTAGE POINT



 $\geq 2\%$
 $\geq 0.5\%$ and $< 2\%$
 $\geq 0.2\%$ and $< 0.5\%$

stable
no plant/

no data

■ stable
 ■ no plant/
no data
 ■ $\leq -0.2\%$ and $> -0.5\%$
 ■ $\leq -0.5\%$ and $> -2\%$
 ■ $\leq -2\%$

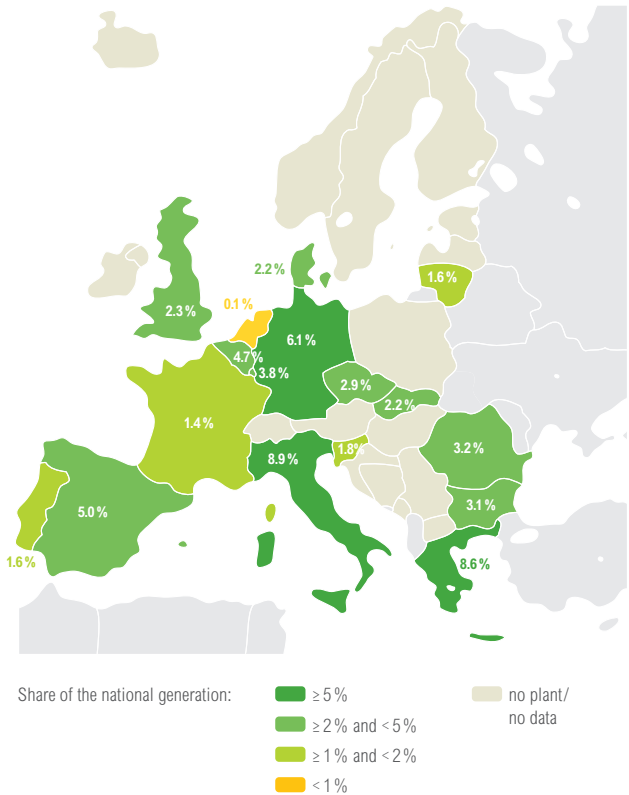
- $\leq -0.2\%$ and $> -0.5\%$
- $\leq -0.5\%$ and $> -2\%$
- $\leq -2\%$

SOLAR ENERGY

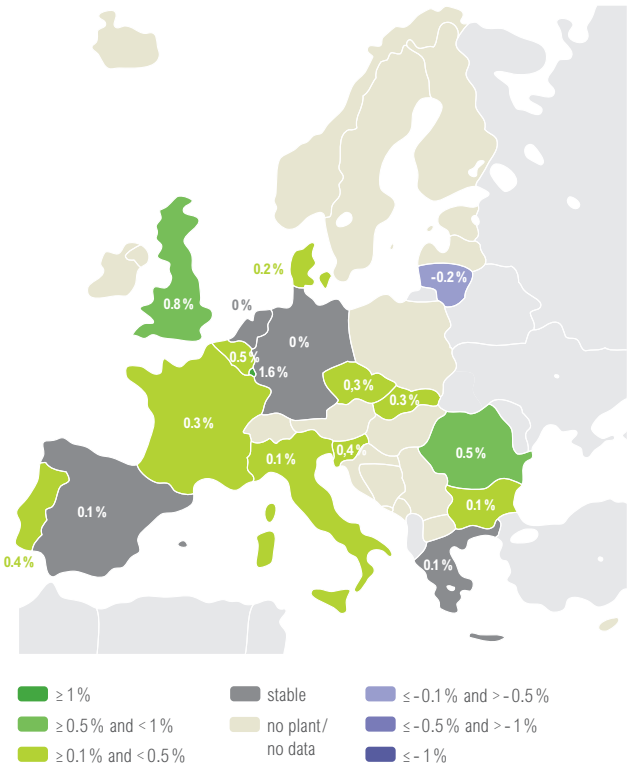
Solar energy generation rose by 6 % in 2015. Similar to wind, it was triggered by an increase in capacity (+7 %) and weather

conditions. Germany, Italy and Spain represent 71 % of total ENTSO-E solar generation (102TWh).

SHARE OF SOLAR ENERGY NET GENERATION IN 2015



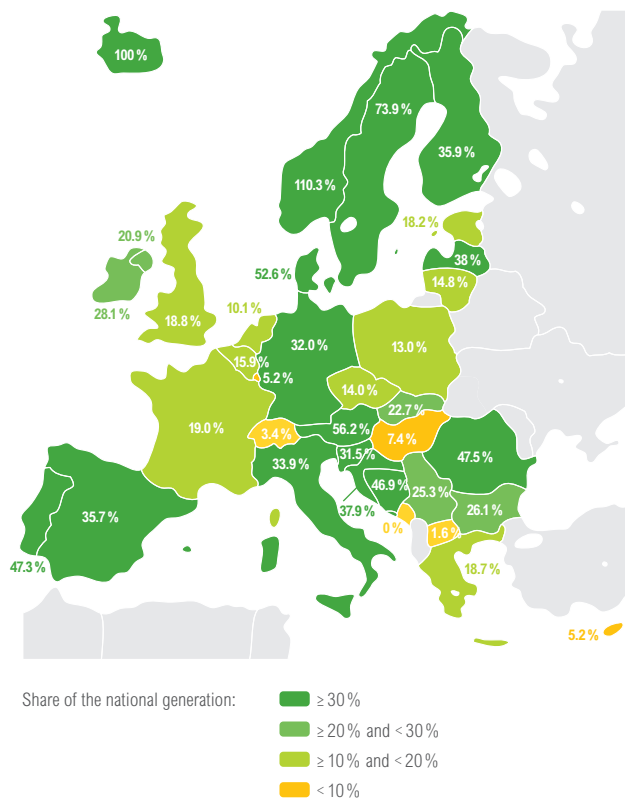
EVOLUTION OF SOLAR COVERAGE RATIO IN PERCENTAGE POINT



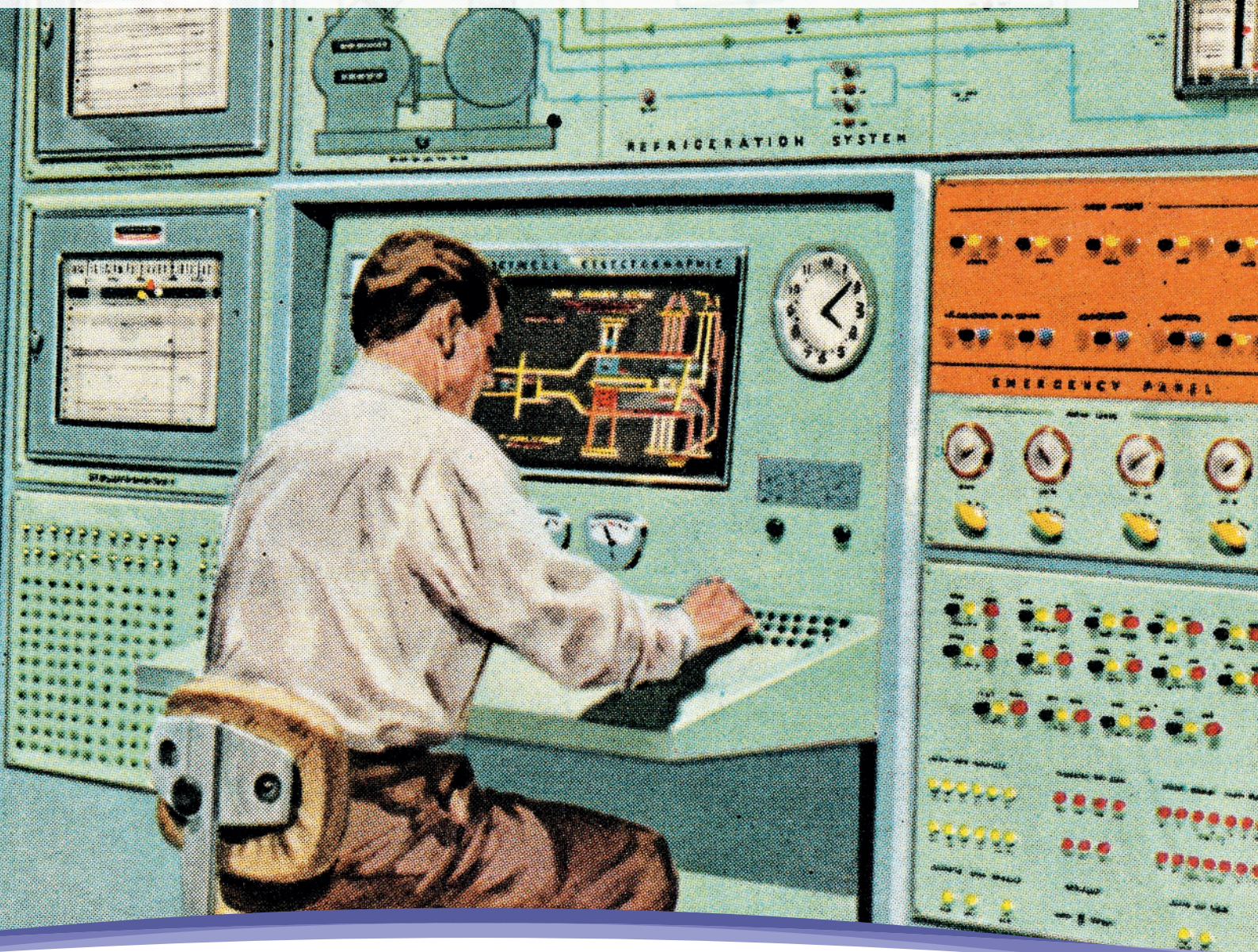
RENEWABLE NET GENERATION PER COUNTRY

Renewable generation covers 31.8 % of overall ENTSO-E electricity consumption. Without hydro generation, renewable generation, mainly solar and wind, represents 16.9 % of total ENTSO-E consumption.

SHARE OF CONSUMPTION COVERED BY RENEWABLE GENERATION IN 2015



4. EXCHANGES

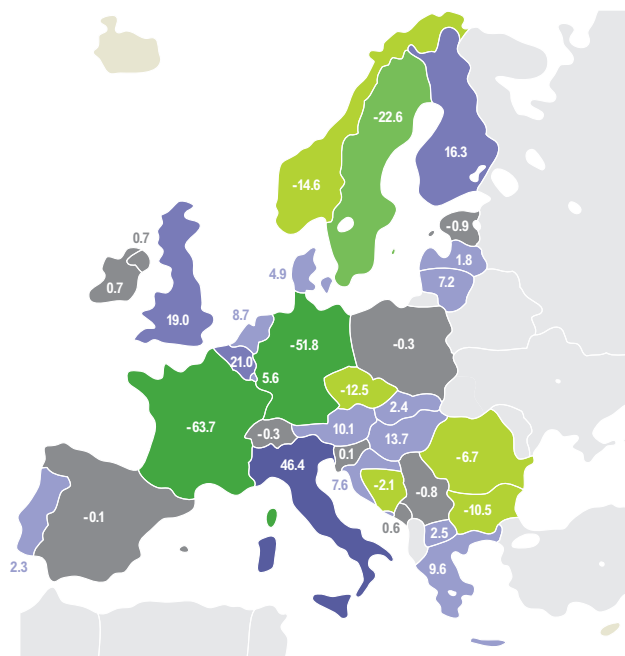


EXCHANGE BALANCES PER COUNTRY

The exchange balance of a country can fluctuate from year to year, linked to border capacities, market coupling and price influences, even if some countries are structurally importing or exporting. The balance of electricity exchanges is the balance between the energy physically flowing in and out of a country. It equates to the balance

of commercial transactions of each country (exports minus imports). However, in an interconnected system where electricity disperses through various paths, the energy's physical flow through a specific border between two countries usually differs from the commercial energy transactions between these two countries.

EXCHANGE BALANCES IN 2015



Exporting balance:

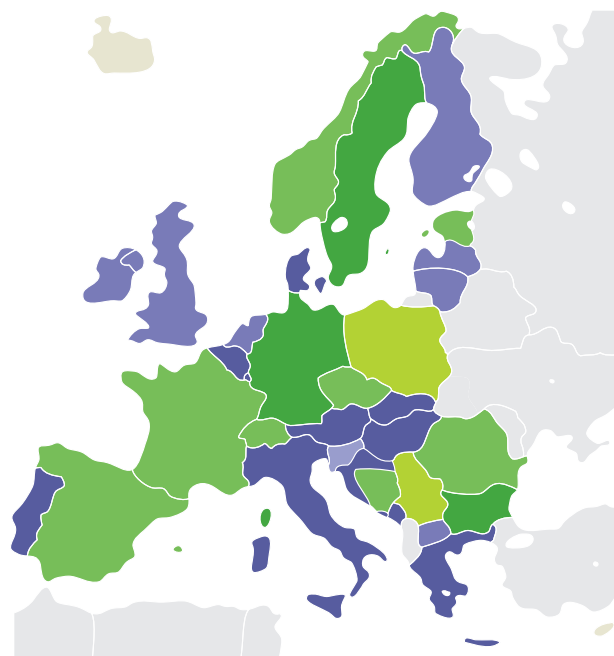
- dark green: ≤ -30 TWh
- light green: ≤ -15 TWh and > -30 TWh
- yellow: ≤ -1 TWh and > -15 TWh

- grey: balanced
- light blue: isolated

Importing balance:

- dark blue: ≥ 1 TWh and < 15 TWh
- medium blue: ≥ 15 TWh and < 30 TWh
- dark blue: ≥ 30 TWh

EVOLUTION OF EXCHANGE BALANCES BETWEEN 2014 AND 2015



Balance:

- dark green: more exporting
- light green: less exporting
- yellow: becomes exporting

- grey: stable
- light blue: isolated

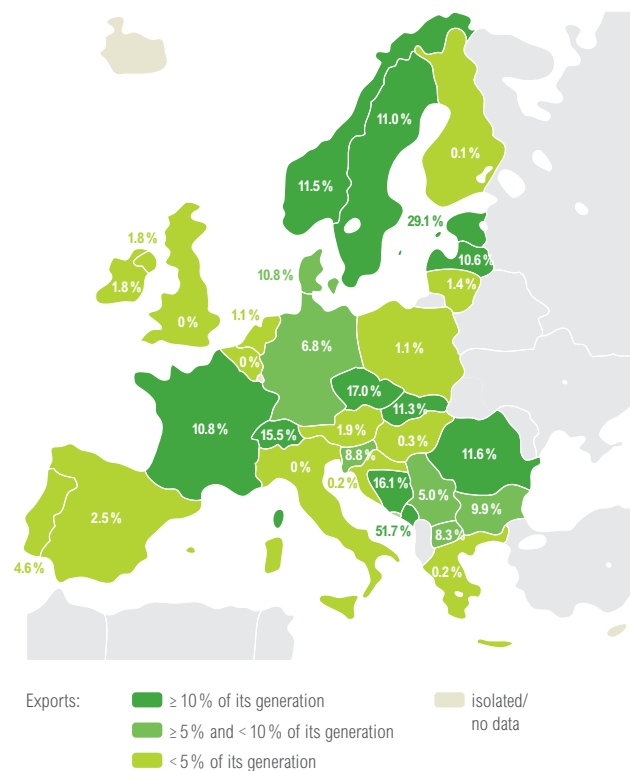
Balance:

- light blue: becomes importing
- medium blue: less importing
- dark blue: more importing

EXPORTED GENERATION

The share of electricity generation of a country which is physically exported to its neighbours, is the ratio between the country's net exports and generation. In 2015, 12 countries of ENTSO-E's perimeter exported more than 10 % of their annual national generation to neighbouring countries. This includes exchanges of each country with its neighbours, both within and outside of ENTSO-E.

SHARE OF YEARLY GENERATION EXPORTED

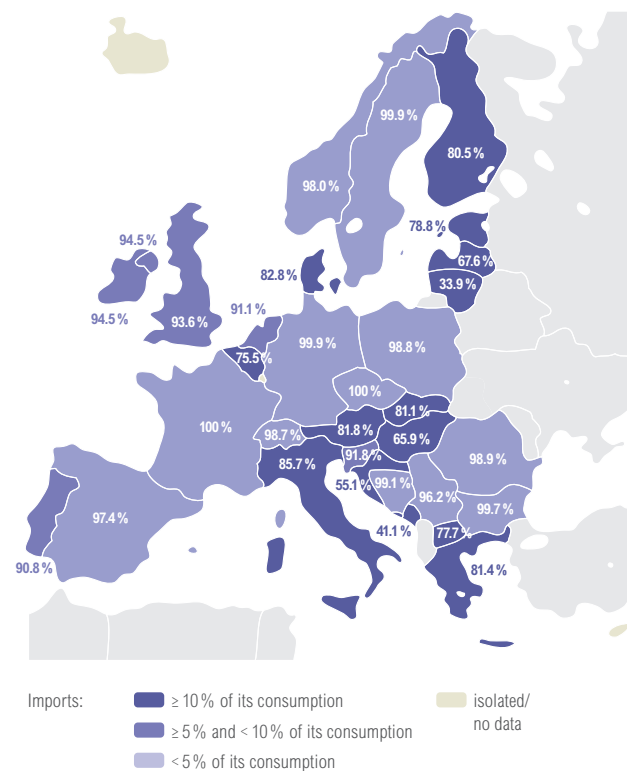


These two Figures are based on "net exports" and "net imports" calculations, excluding transit and loop flows. Net balance of exchanges per country are calculated on an hourly basis.

CONSUMPTION FROM NATIONAL GENERATION

For each country, the ratio between its imports and its consumption represents the share of its yearly consumption, which is covered by physical imports from its neighbours. In 2015, 14 ENTSO-E countries imported more than 10 % of their annual internal consumption needs from other ENTSO-E countries.

SHARE OF YEARLY CONSUMPTION COVERED BY NATIONAL GENERATION



Adding net balances separately, whether positive or negative, gives the amount of net exports and imports of the country. Exports and imports can be driven by market conditions or adequacy needs.

APPENDIX: DATA SOURCES AND REFERENCES

SOURCE OF DATA:

Data for 2015 is taken from ENTSO-E's monthly statistics, whereas data from 2014 is based on ENTSO-E's yearly statistics. Data used for consumption, generation and exchange balance figures in Chapters 2, 3 and 4, page 17 is taken from ENTSO-E's data portal: www.entsoe.eu/data/data-portal/

Data used for “net export” and “net import” calculations in Chapter 4, page 18 is taken from the ENTSO-E transparency platform (data pre-5.1.15): <https://transparency.entsoe.eu/>

Pages 10 to 14: A percentage point (pp) is the arithmetic difference between two percentages (for example going from 4% to 7% is a 3 percentage point increase). In this document, all percentage points represent the evolution of coverage rate.

OTHER RELATED ENTSO-E PUBLICATIONS:

Monthly statistics:

www.entsoe.eu/publications/statistics/monthly-statistics/

Statistical Factsheet:

www.entsoe.eu/publications/general-publications/memo-entso-e-facts-figures/

Yearly Statistics & Adequacy Retrospect (YS&AR):

www.entsoe.eu/publications/statistics/statistical-yearbooks/

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IMPRINT

PUBLISHER:

ENTSO-E AISBL,
Avenue de Cortenbergh 100
1000 Brussels – Belgium

DESIGN:

DreiDreizehn GmbH, Berlin
www.313.de

Publishing date: June 2016

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