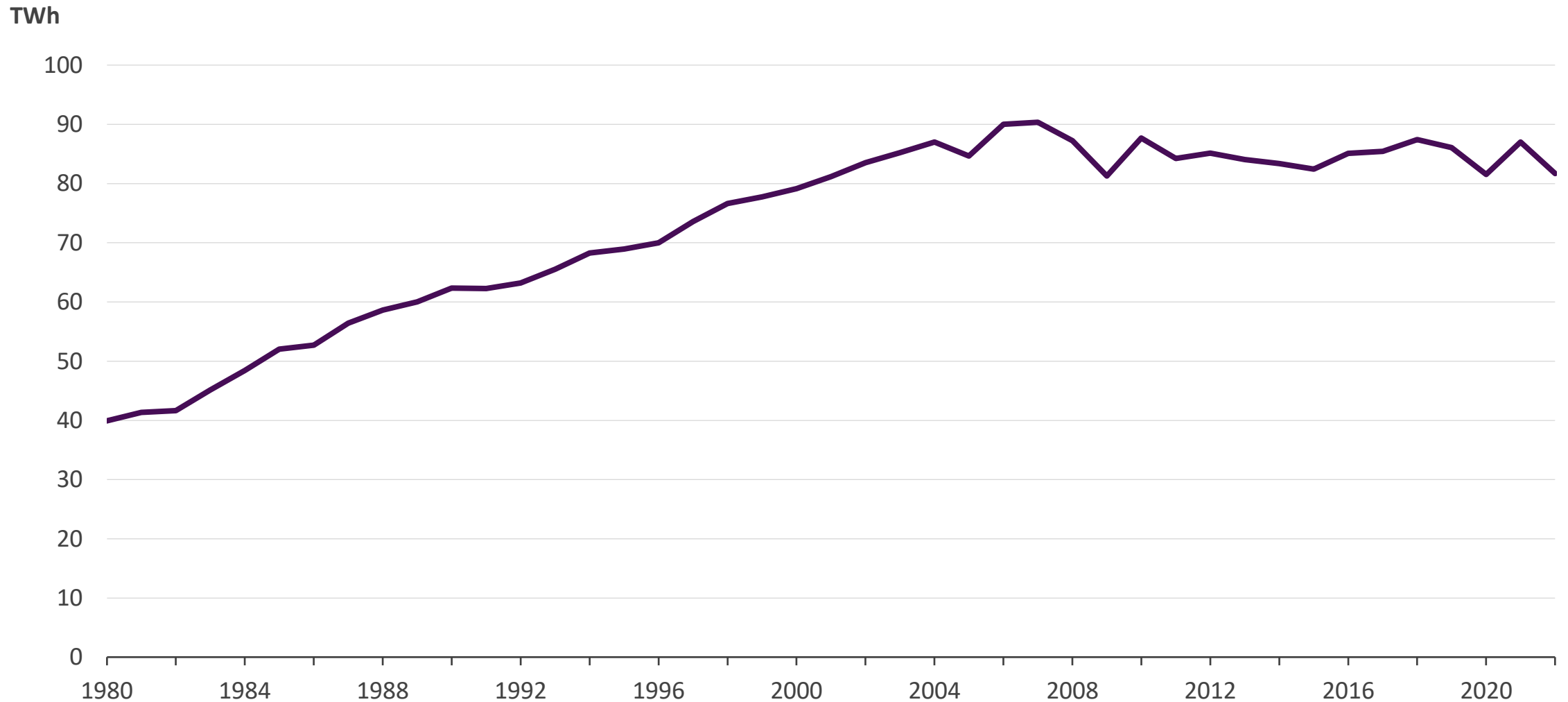


# Energy Year 2022 Electricity

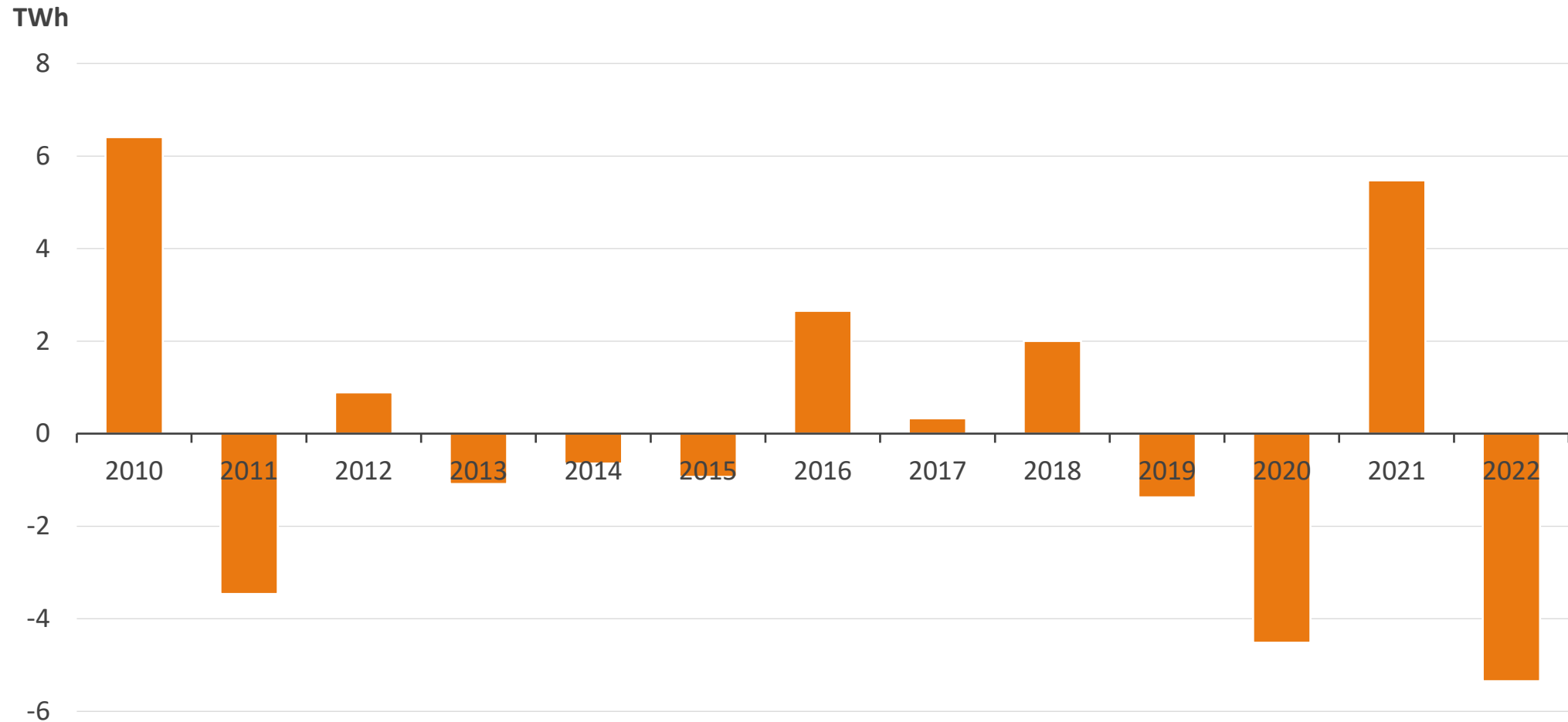
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Finnish Energy  
12.1.2023

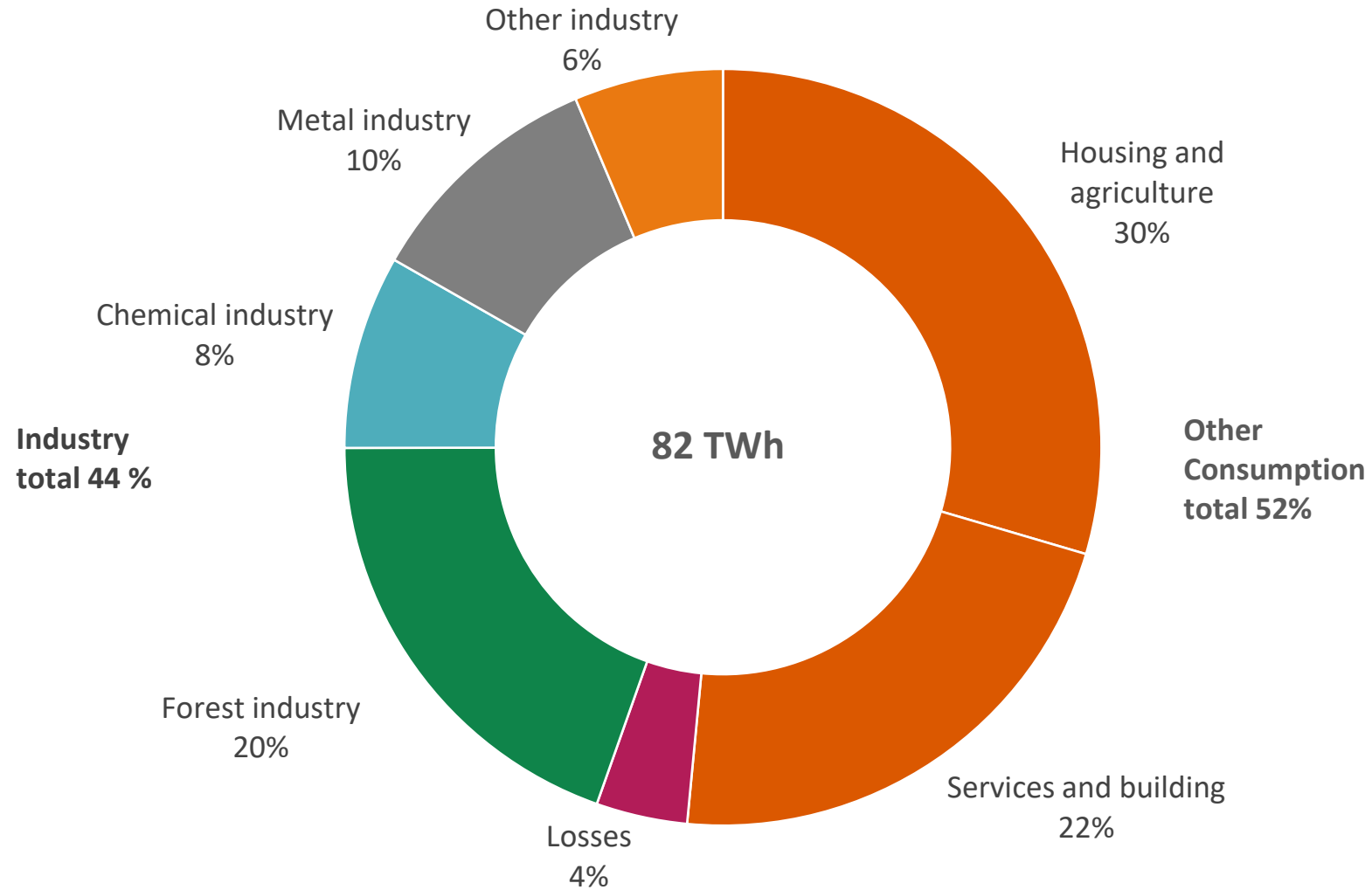
# Electricity total consumption 82 TWh, 6 % decrease compared to 2021



# Electricity consumption decreased from the previous year 5,4 TWh change 2021-2022

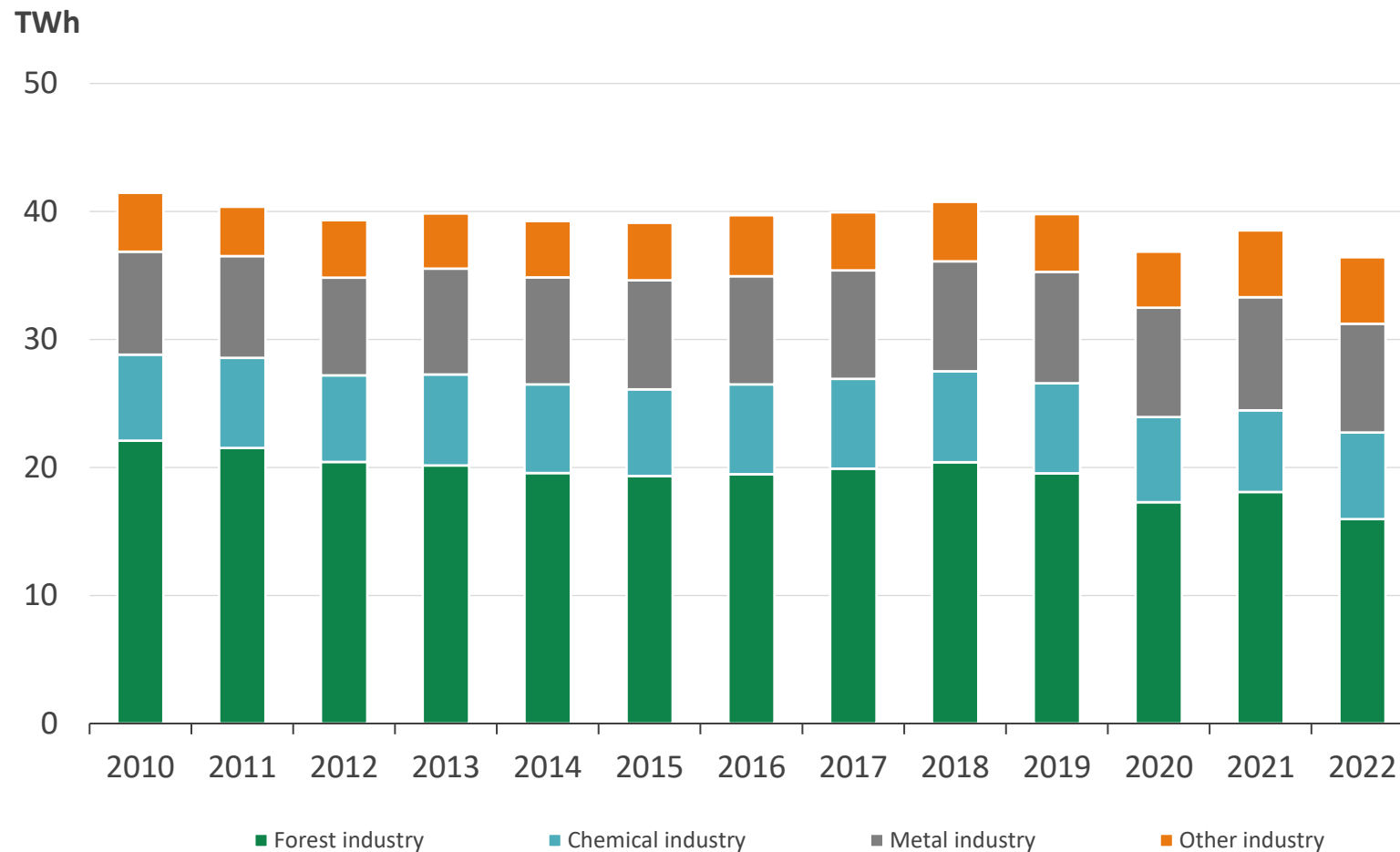


# Electricity consumption 2022

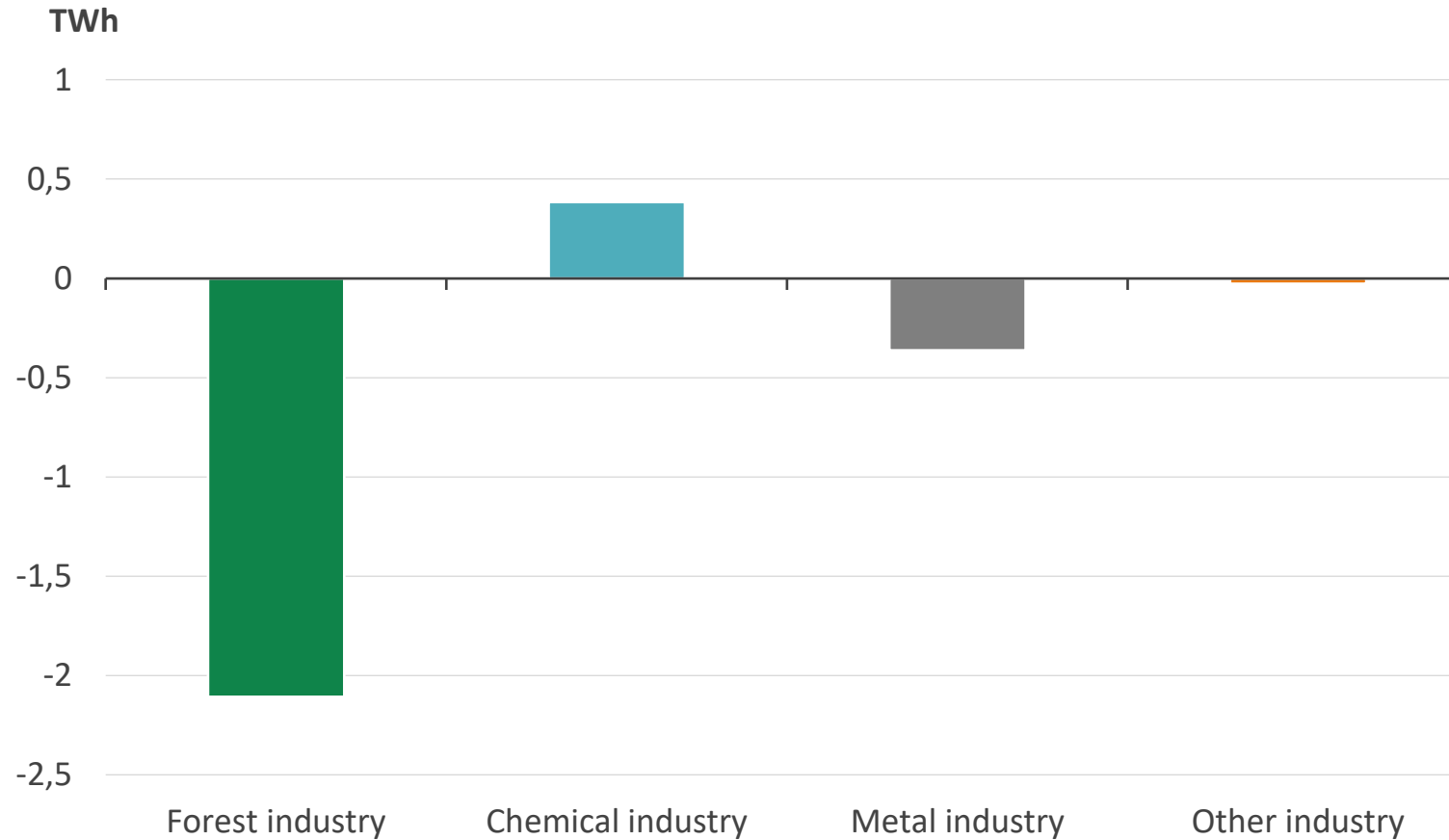


# Electricity consumption of industry decreased 6 percent

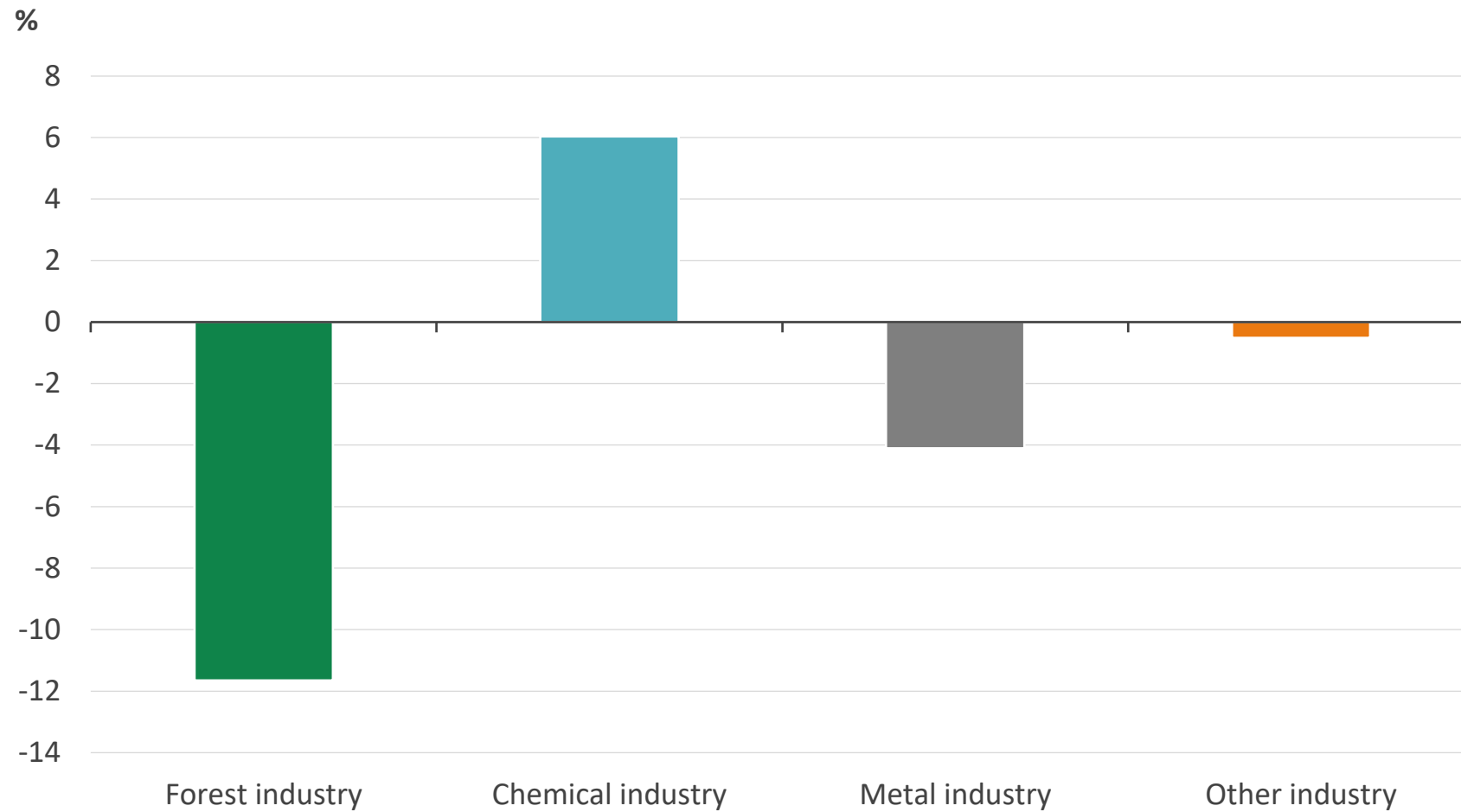
## Consumption total 36 TWh



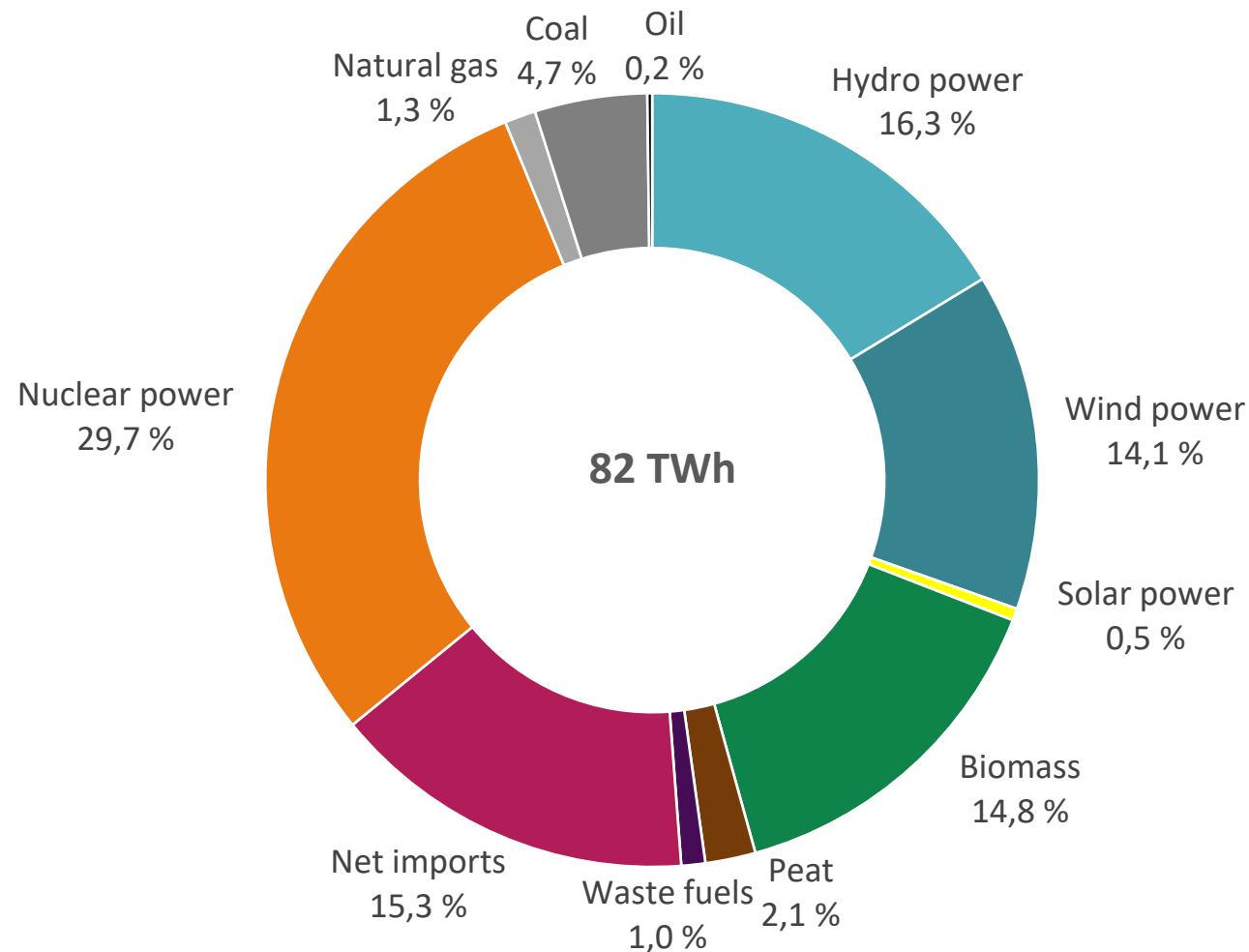
# Industrial electricity consumption 2021-2022: most of decrease in forest industry



# Change of Industrial Electricity Consumption 2021-2022

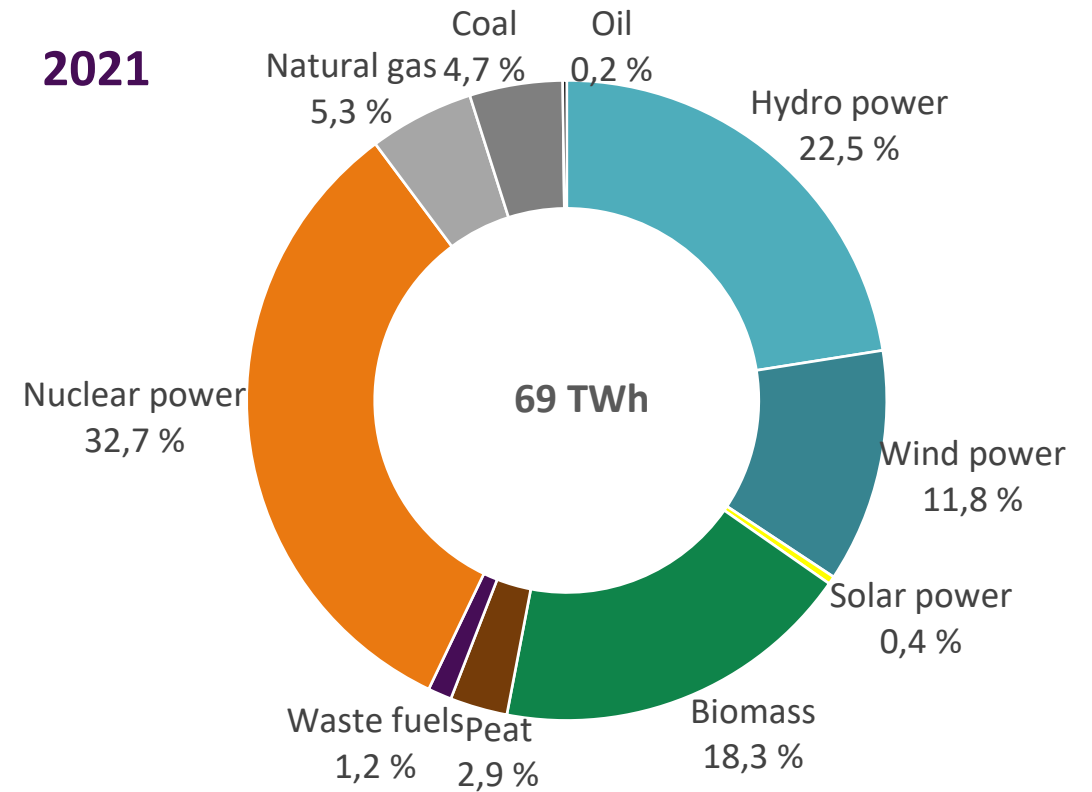
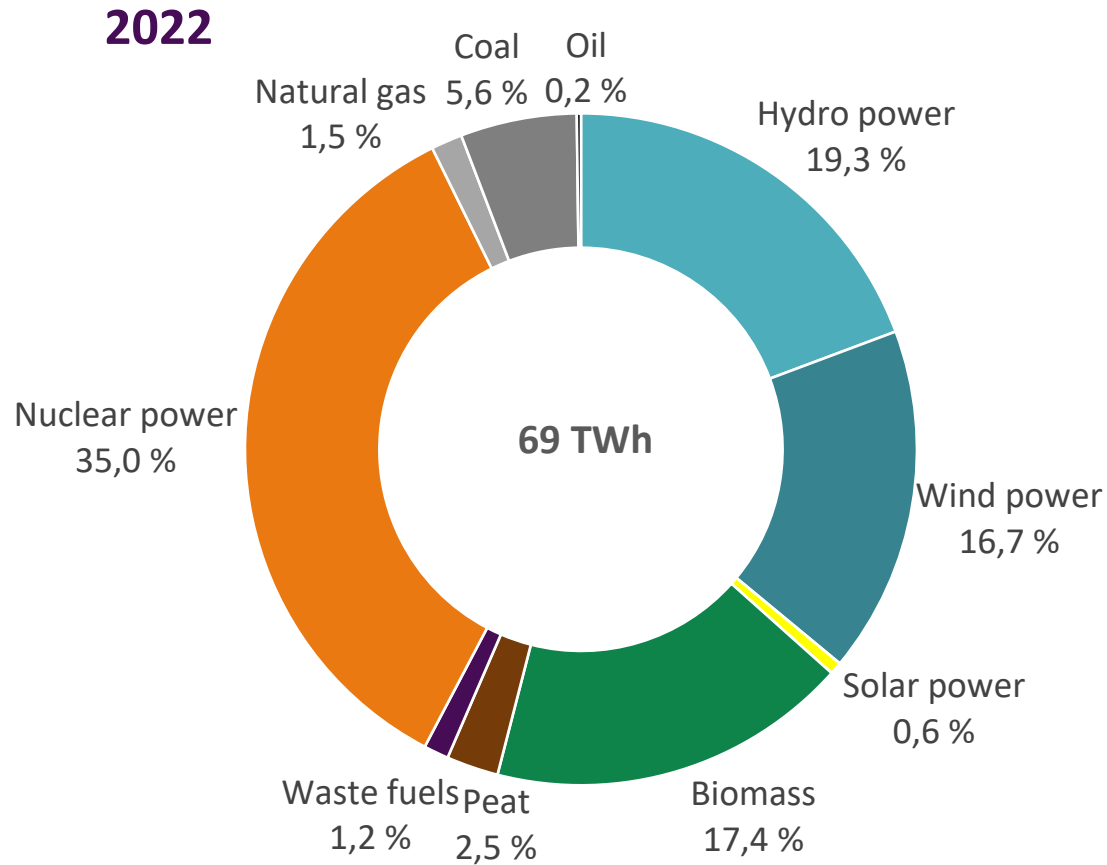


# Electricity by energy source and net imports 2022



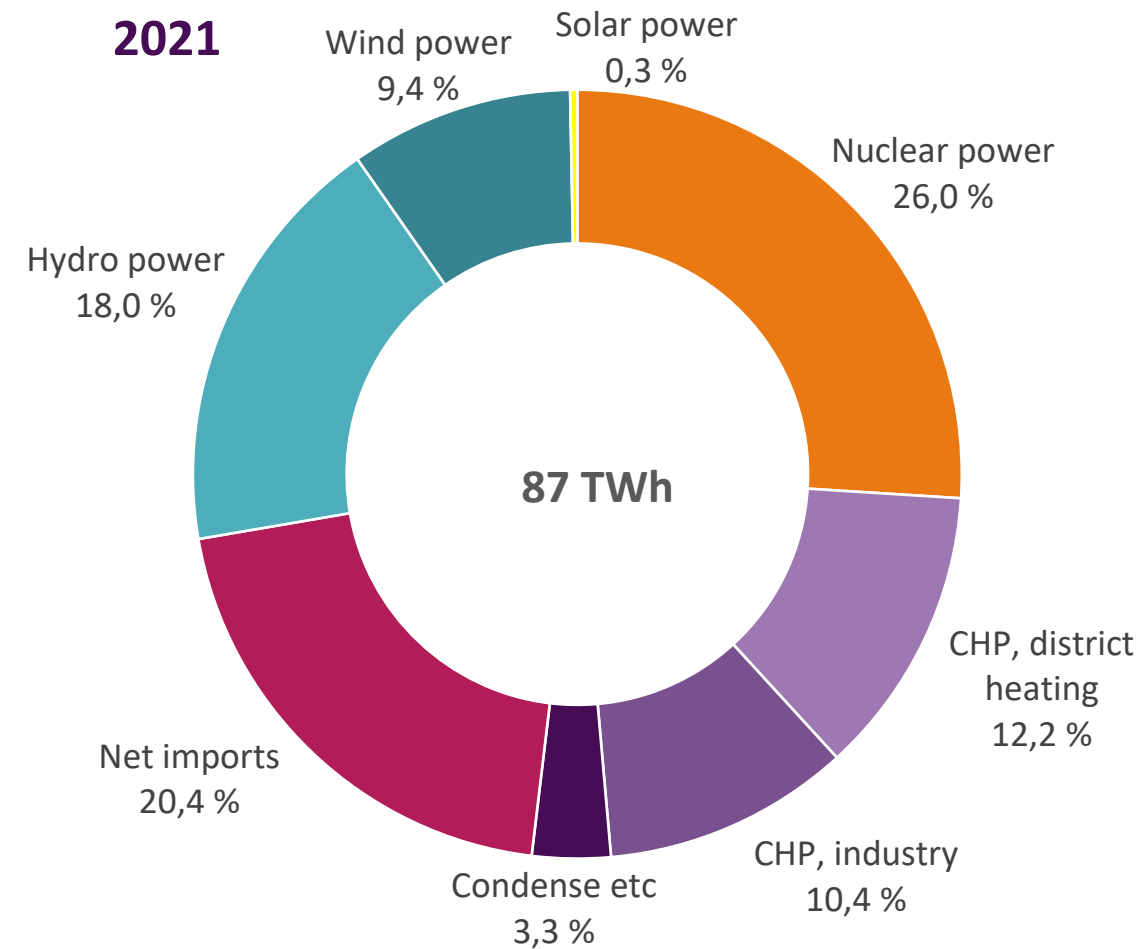
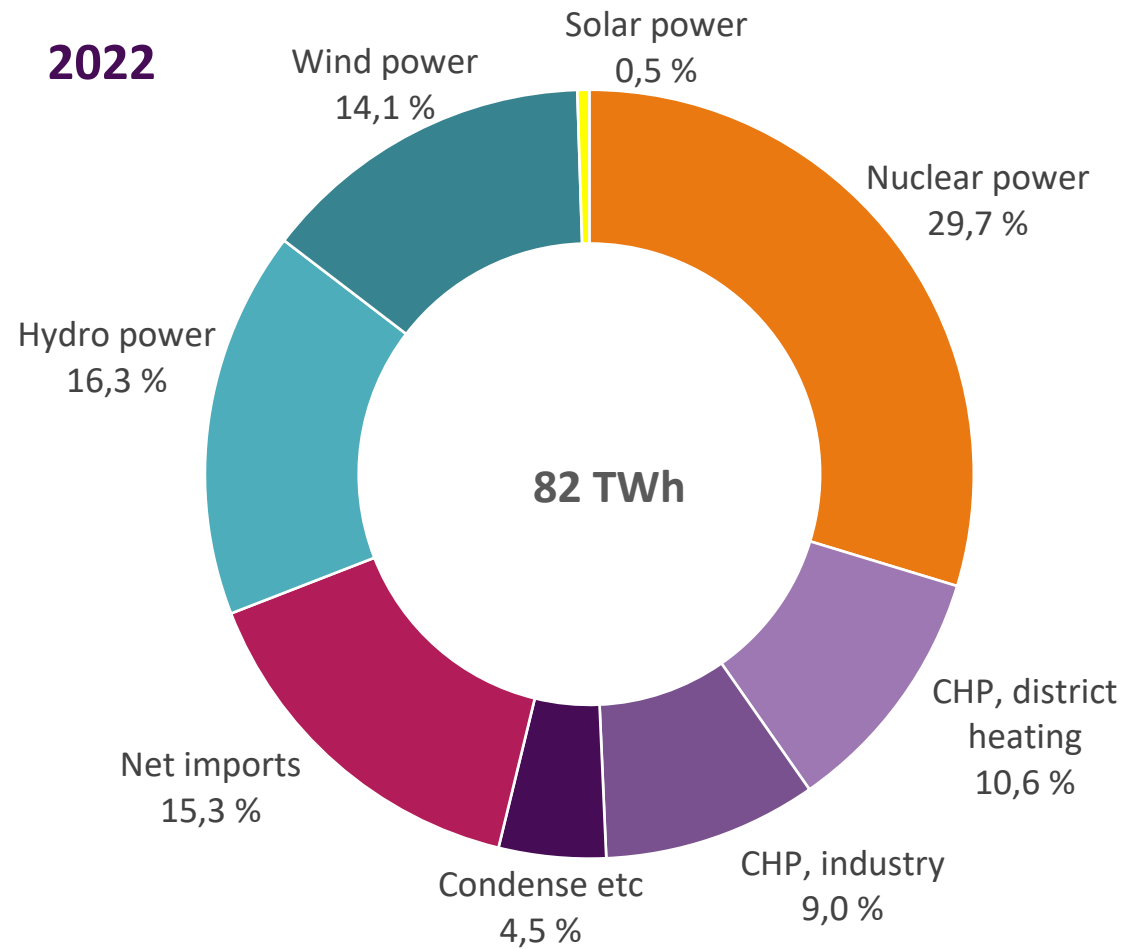


# The share of CO<sub>2</sub>-neutral electricity 89 percent



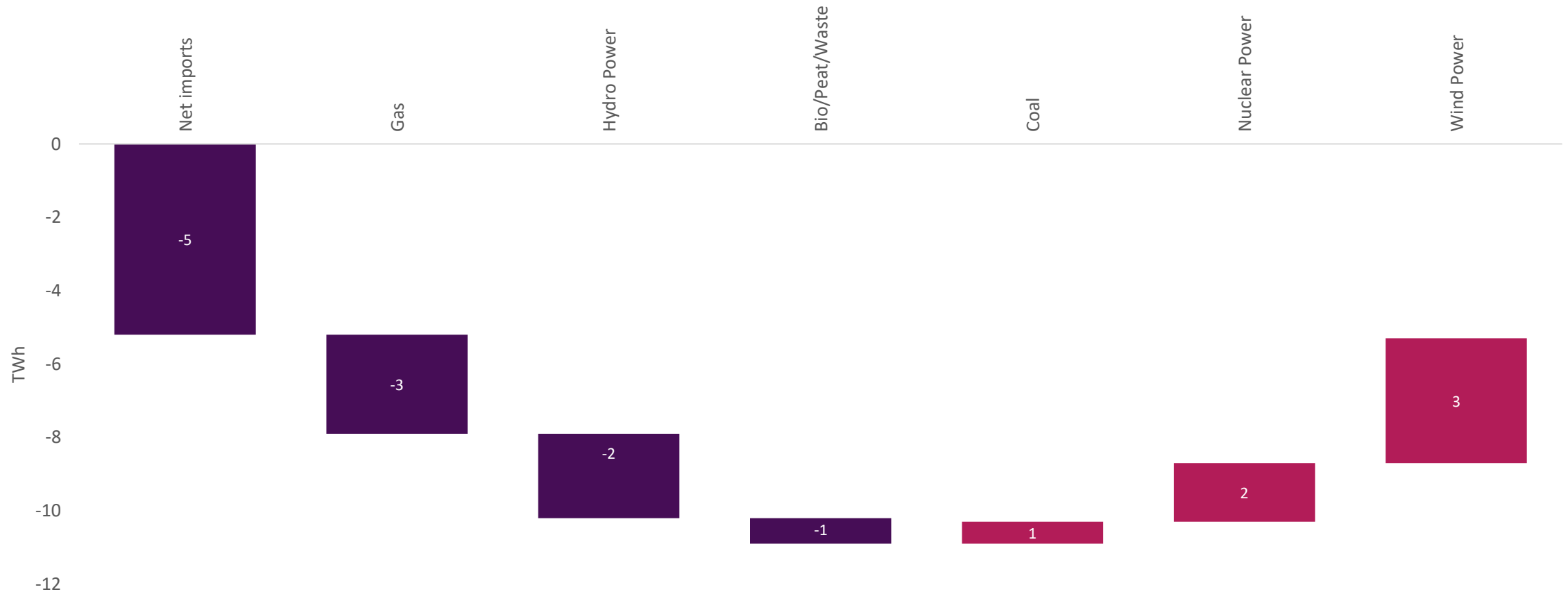
- ✓ Renewable: 54 % (53 % in year 2021)
- ✓ CO<sub>2</sub>-neutral: 89 % (87 % in year 2021)
- ✓ Domestic: 57 % (57 % in year 2021)

# Electricity production in Finland and net imports decreased

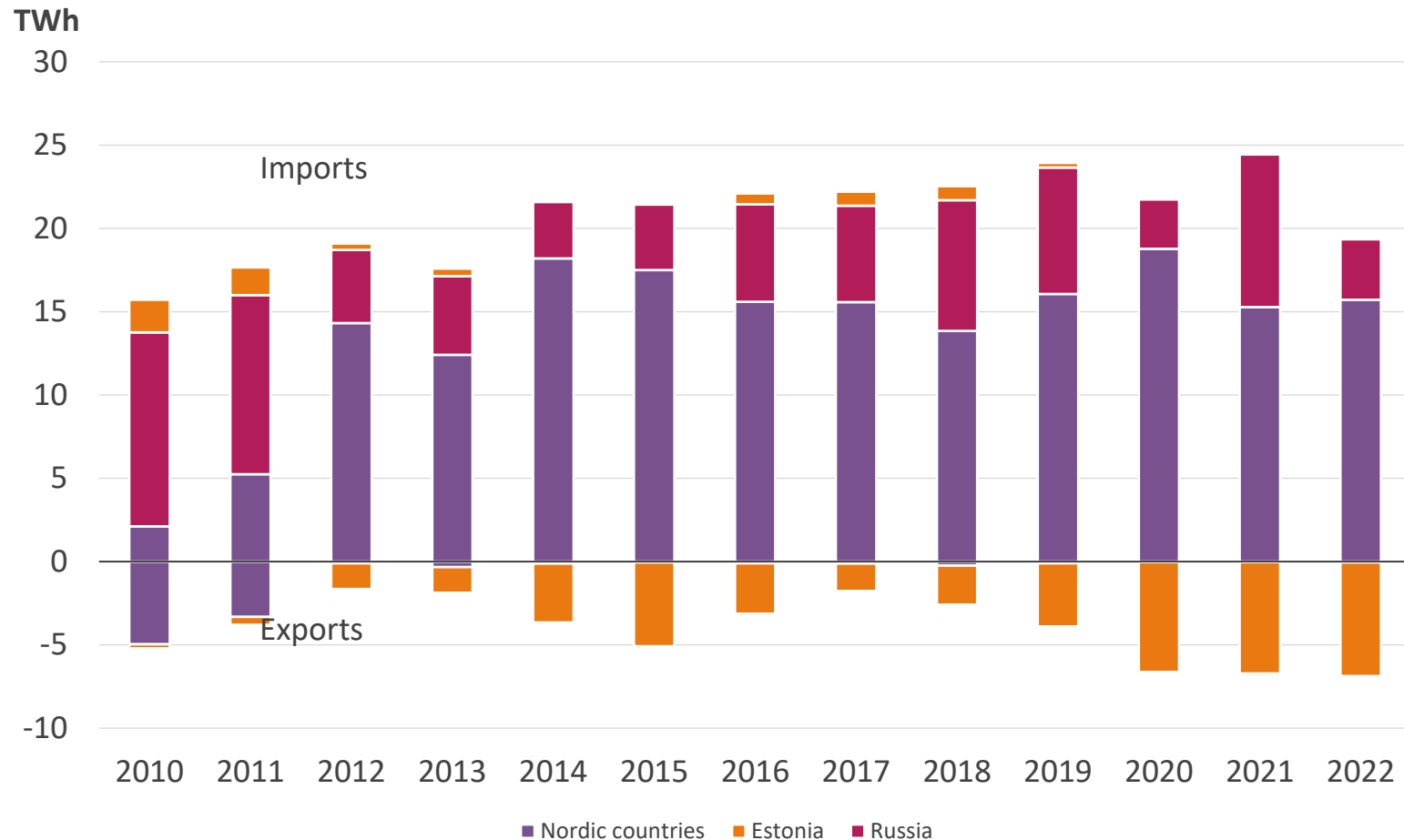


# The end of imports from Russia and Energy crisis changed Energy procurement compared to 2021

Finlands electricity energy source changes 2022 vs 2021



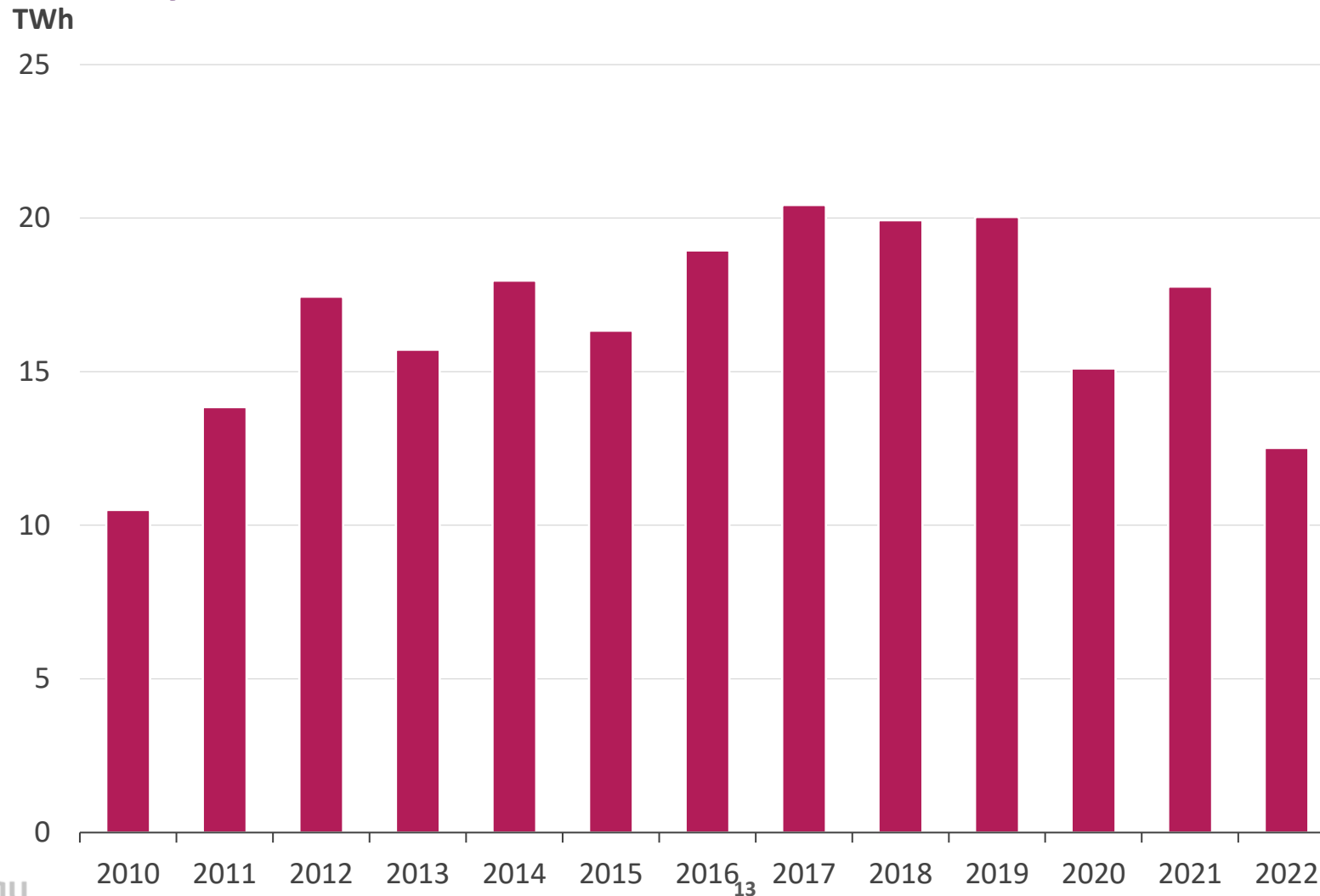
# Net imports of electricity decreased 28 percent (5 TWh)



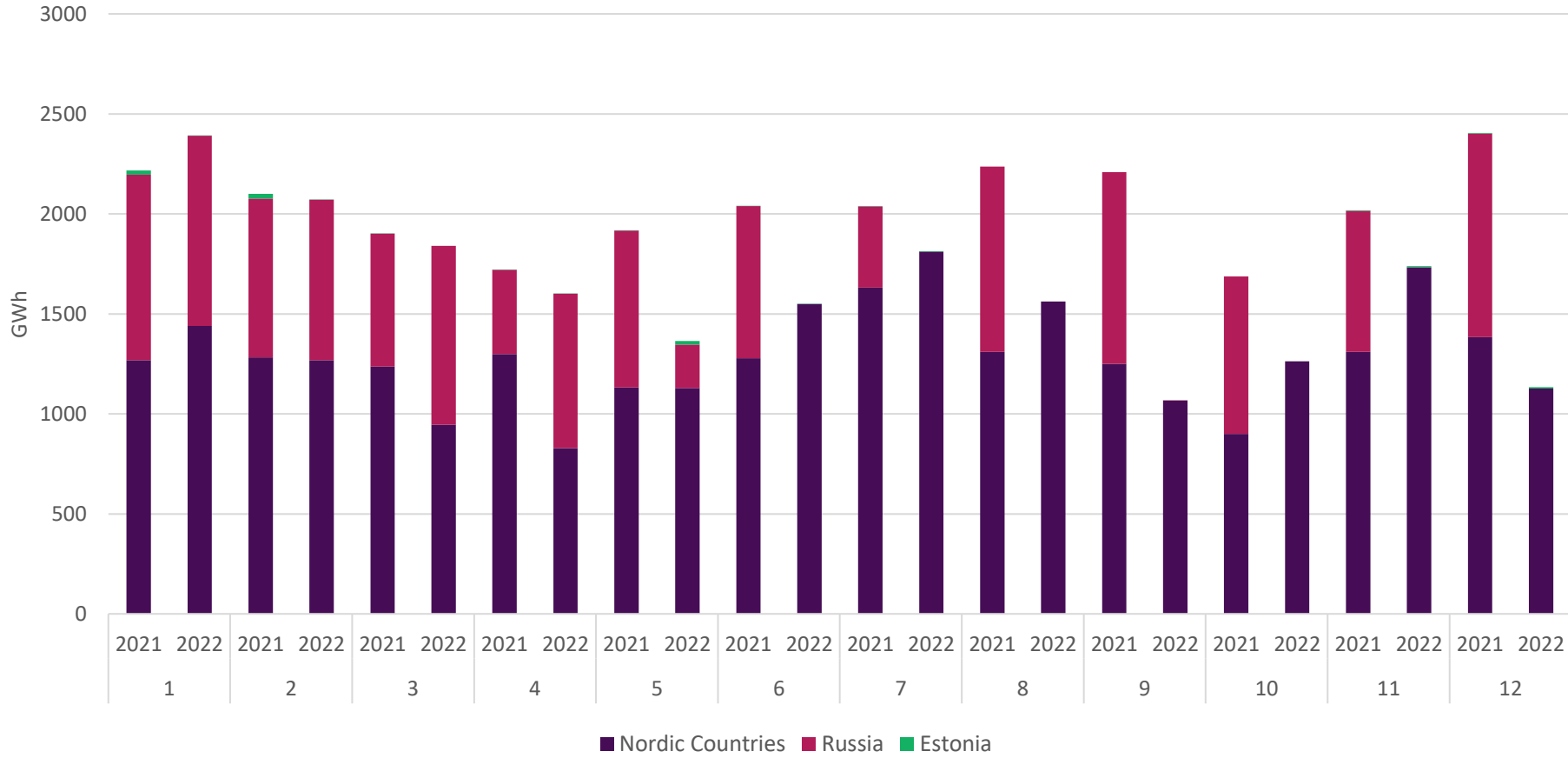
- Imports from Russia ended in May 2022
- Imports from Nordic countries increased 3% (0.4TWh)
- Exports to Estonia increased 2% (+0.1 TWh)

# Net imports of electricity

## 12 TWh in year 2022 (-28 %)

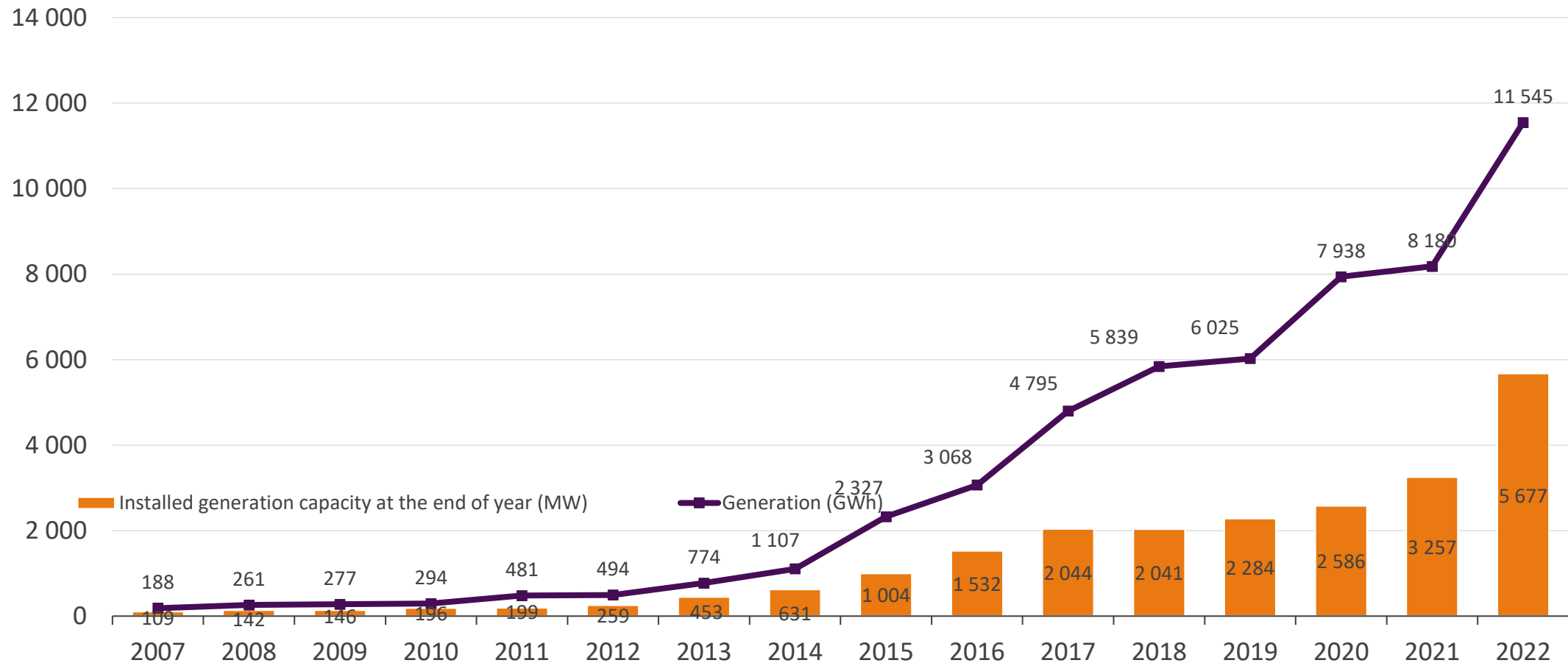


# Electricity imports changed significantly after May

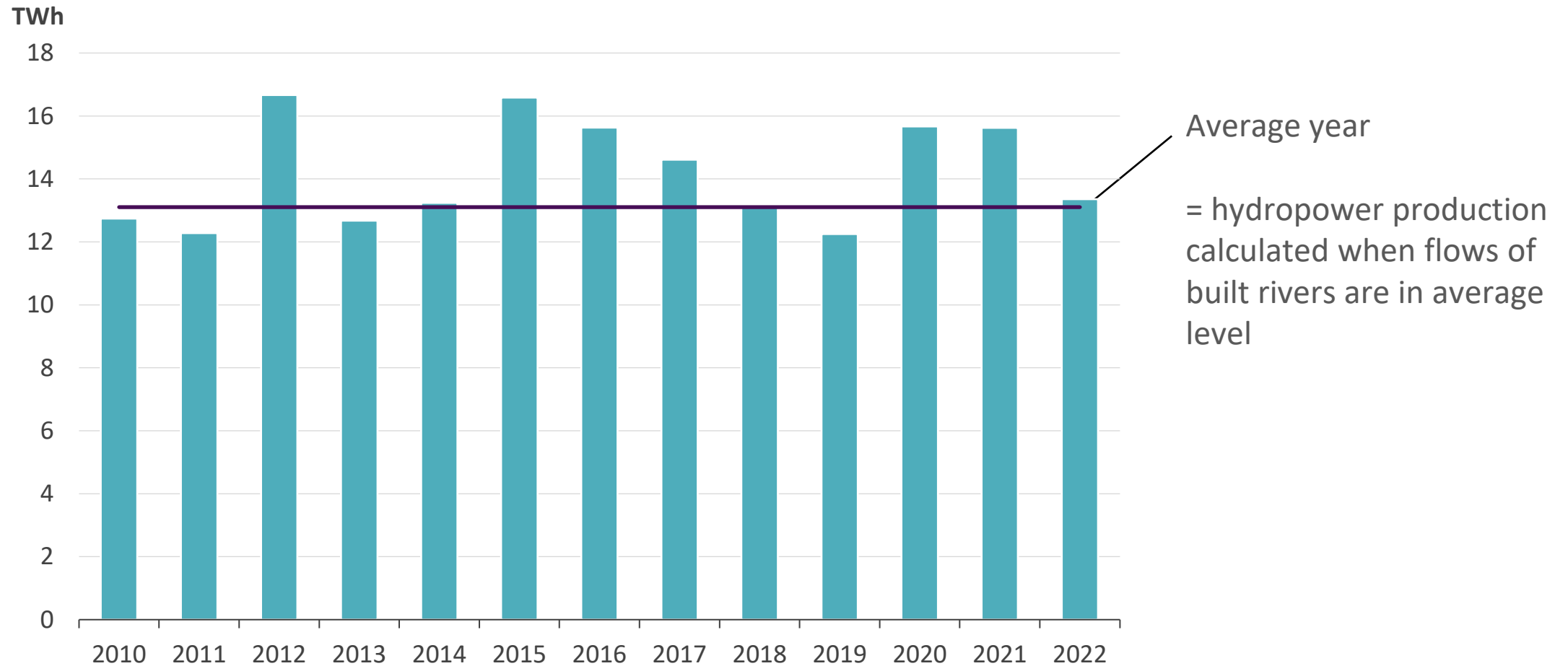


# Wind power grows rapidly: Capacity increased 76 percent and production 41 percent

MW and GWh



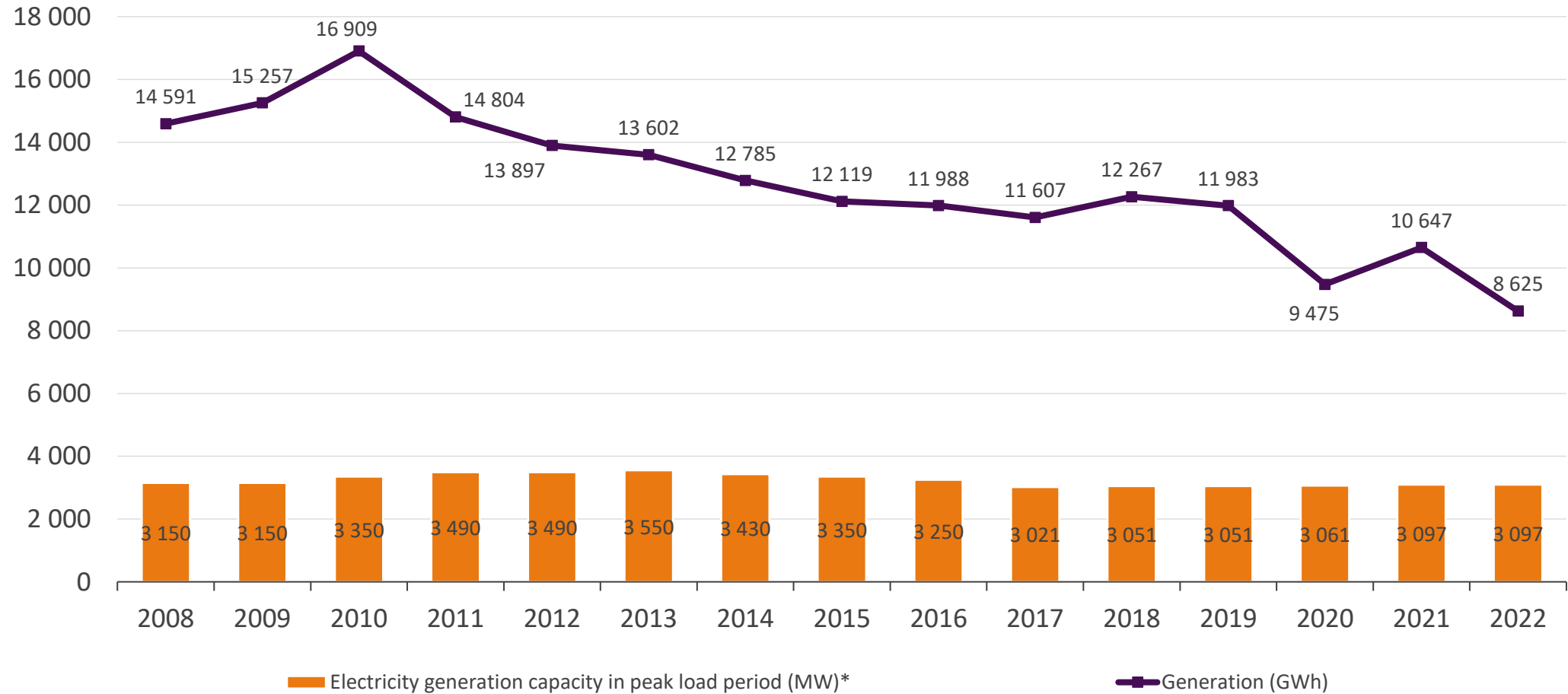
# Hydropower generation





# Generation and capacity of CHP in district heating

MW and GWh

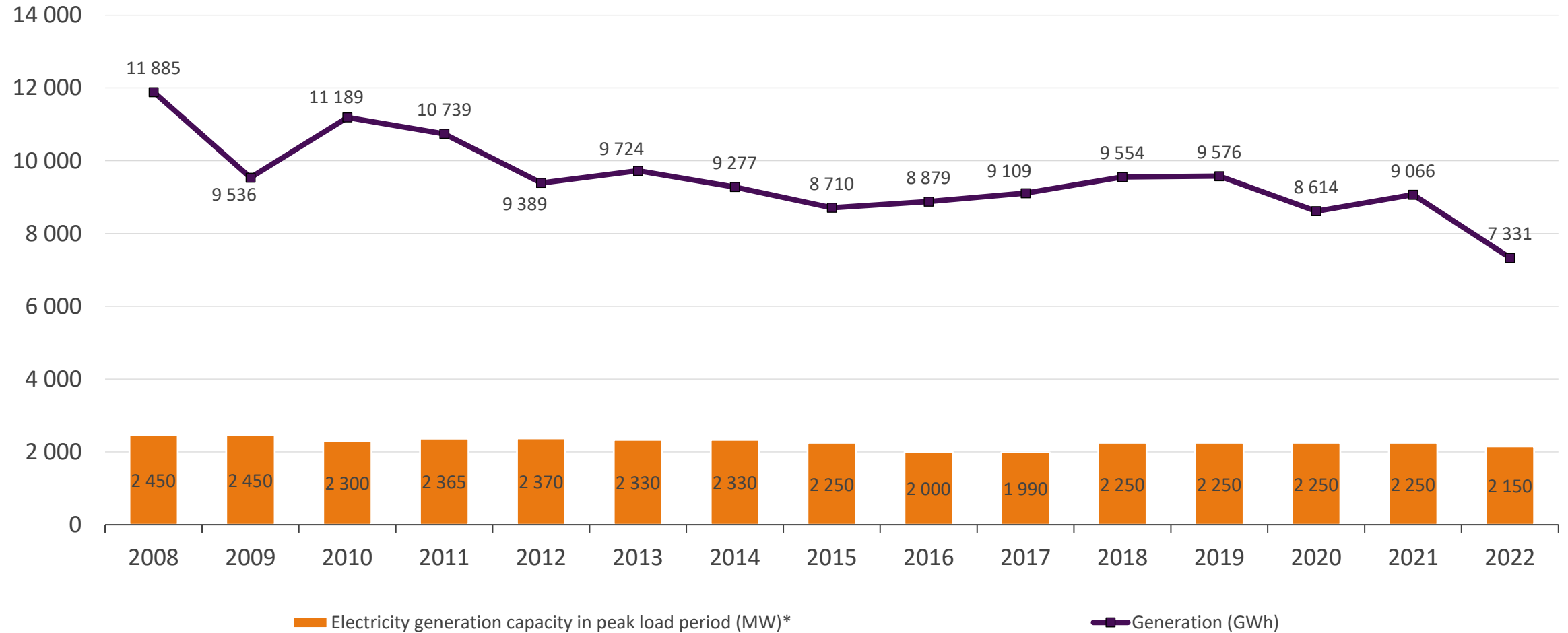


\*Peak load capacity is not included from year 2017

\*Source: Statistics Finland, Energy 2022 table service, table 3.5

# Generation and capacity of CHP in industry

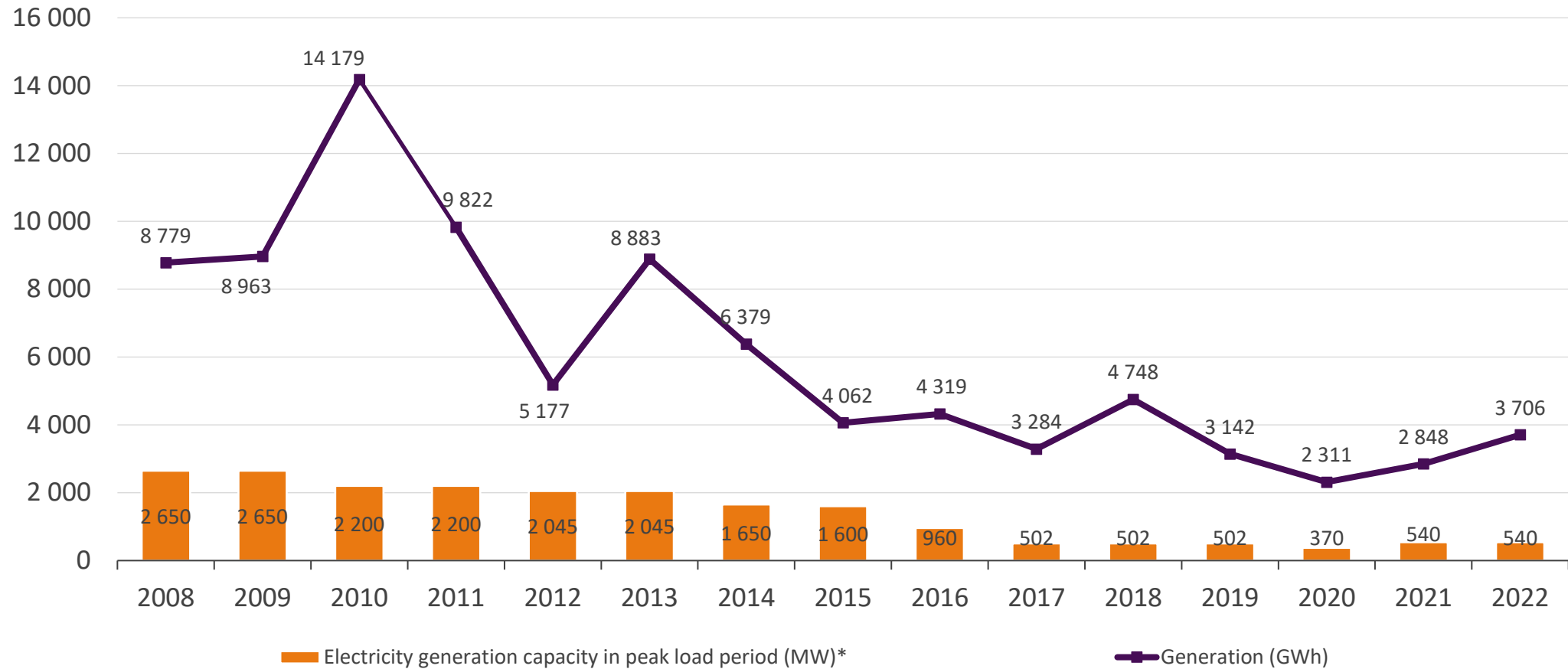
MW and GWh



\*Source: Statistics Finland, Energy 2022 table service, table 3.5

# Generation and capacity of condensing power

MW and GWh

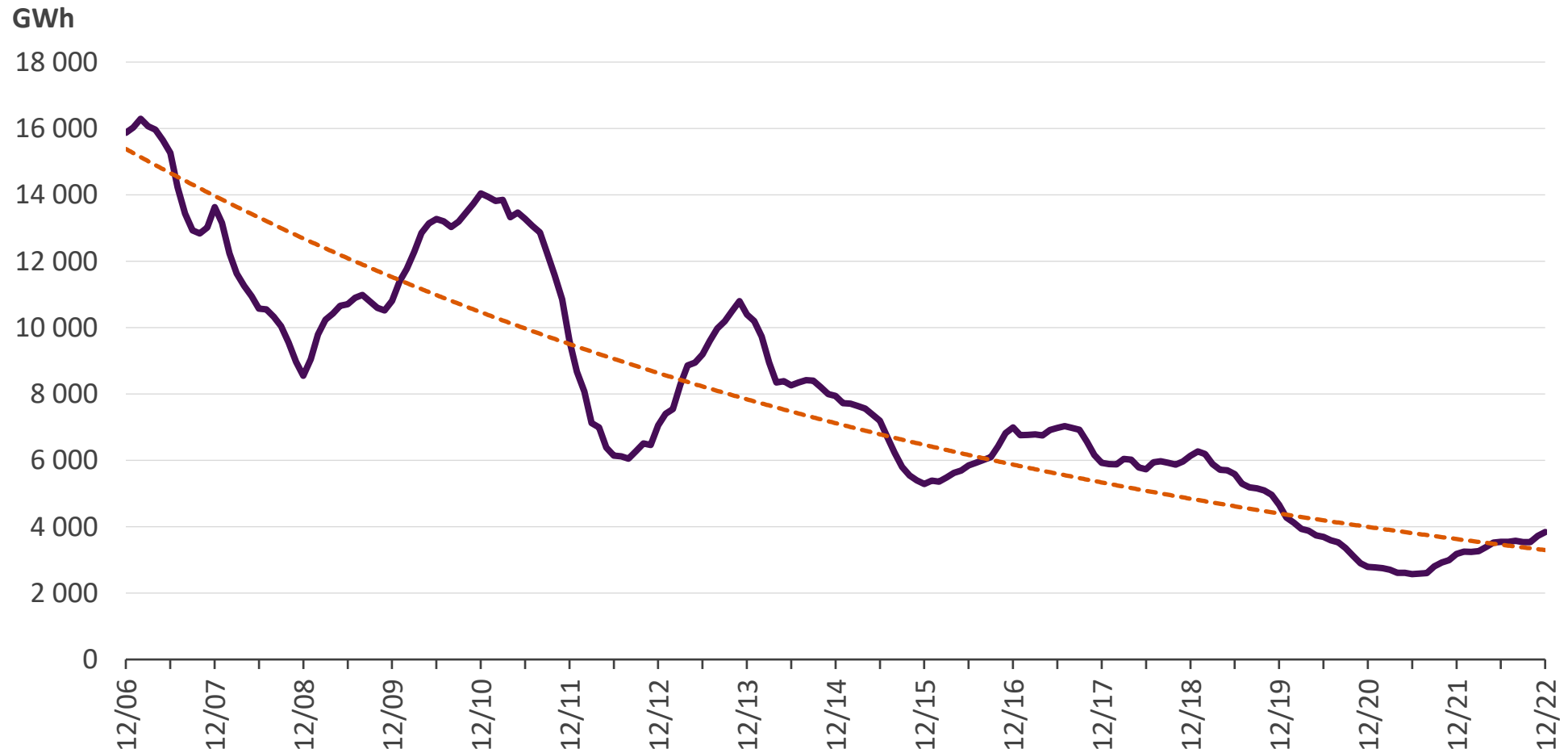


\*Peak load capacity is not included from year 2017

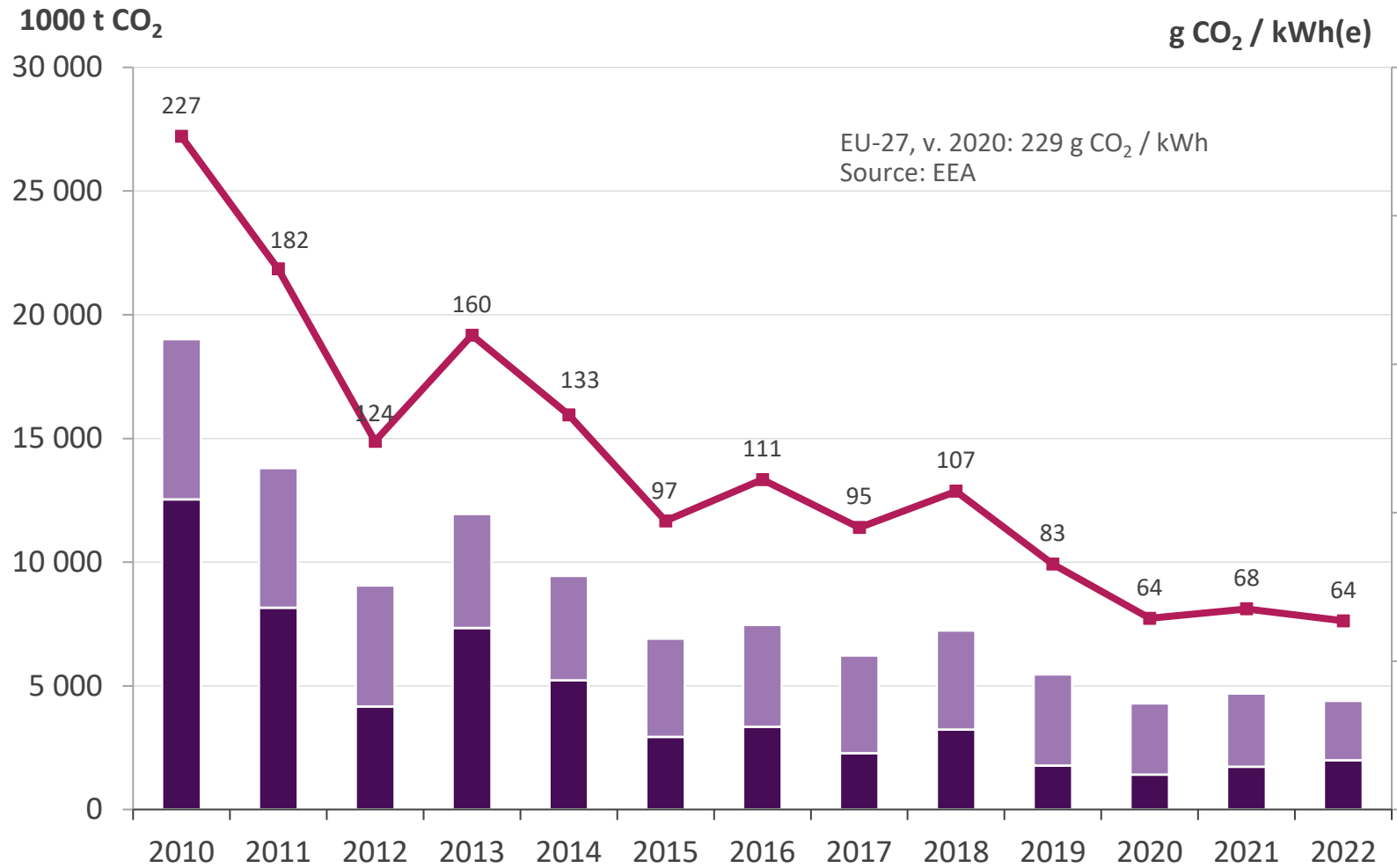
\*Source: Statistics Finland, Energy 2022 table service, table 3.5

# Electricity Generation with Coal

total of moving 12 months



# CO<sub>2</sub>-emissions of power generation-downward trend continues



CO<sub>2</sub>-emissions of power generation:

- 4.4 Mt in year 2022
- 4.7 Mt in year 2021
- 4.3 Mt in year 2020
- 6.9 Mt in year 2015
- 19 Mt in year 2010

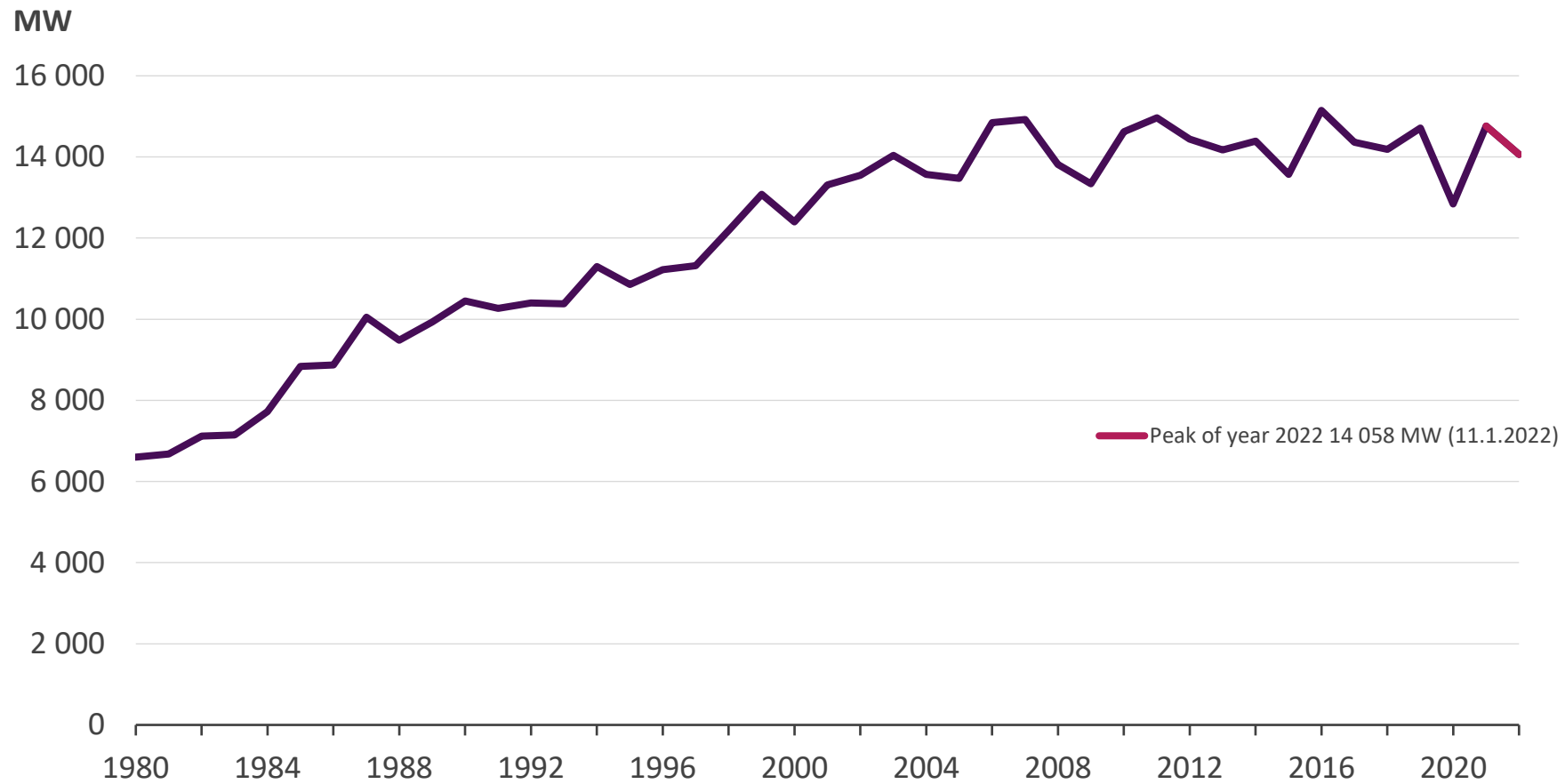
→ 2022 vs. 2021 **-6 %**

→ Emissions **-39 %** in last 5 years

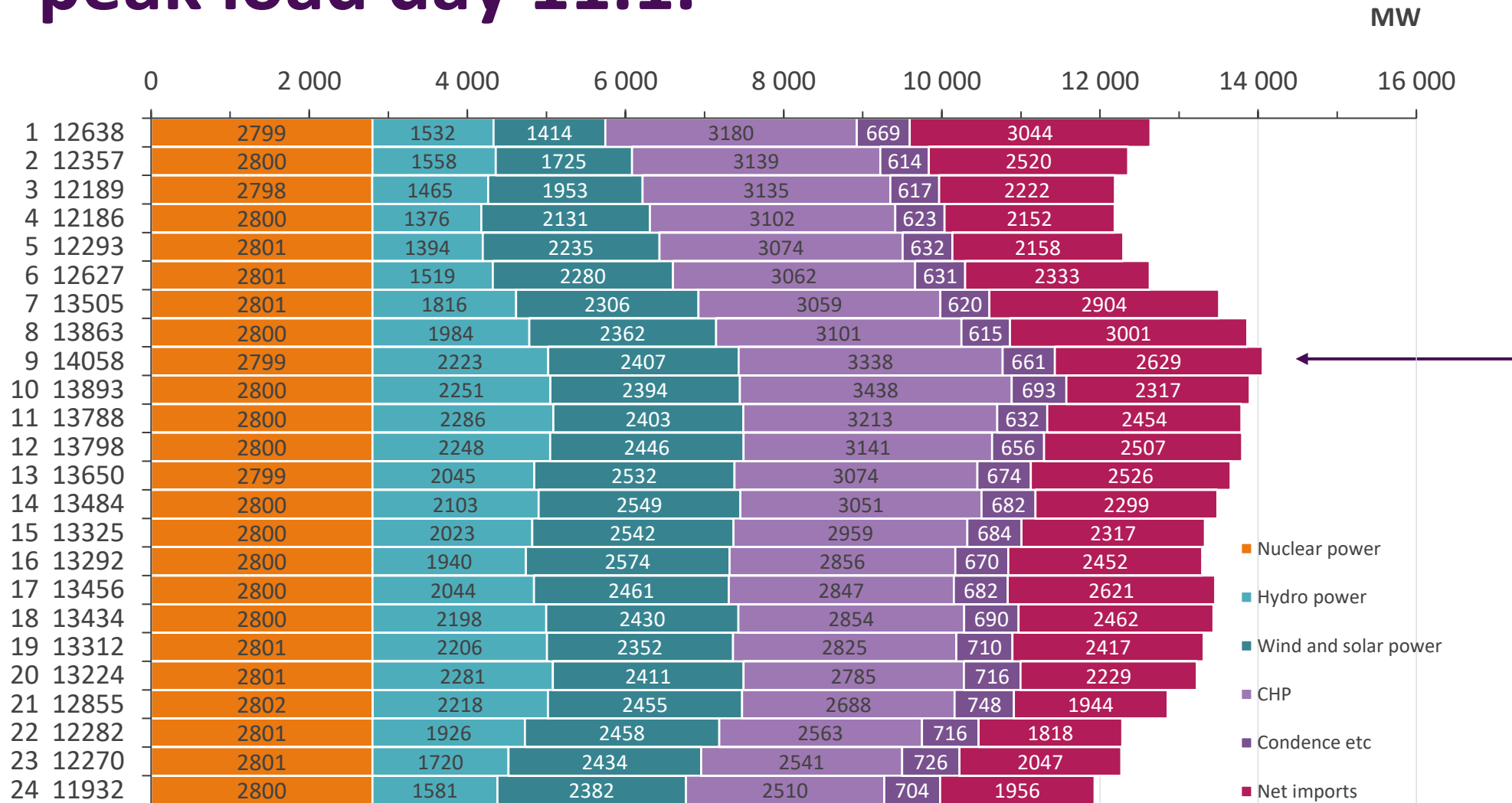
→ Emissions **-77 %** vs 2010

# Peak loads of electricity

## maximum electricity MW

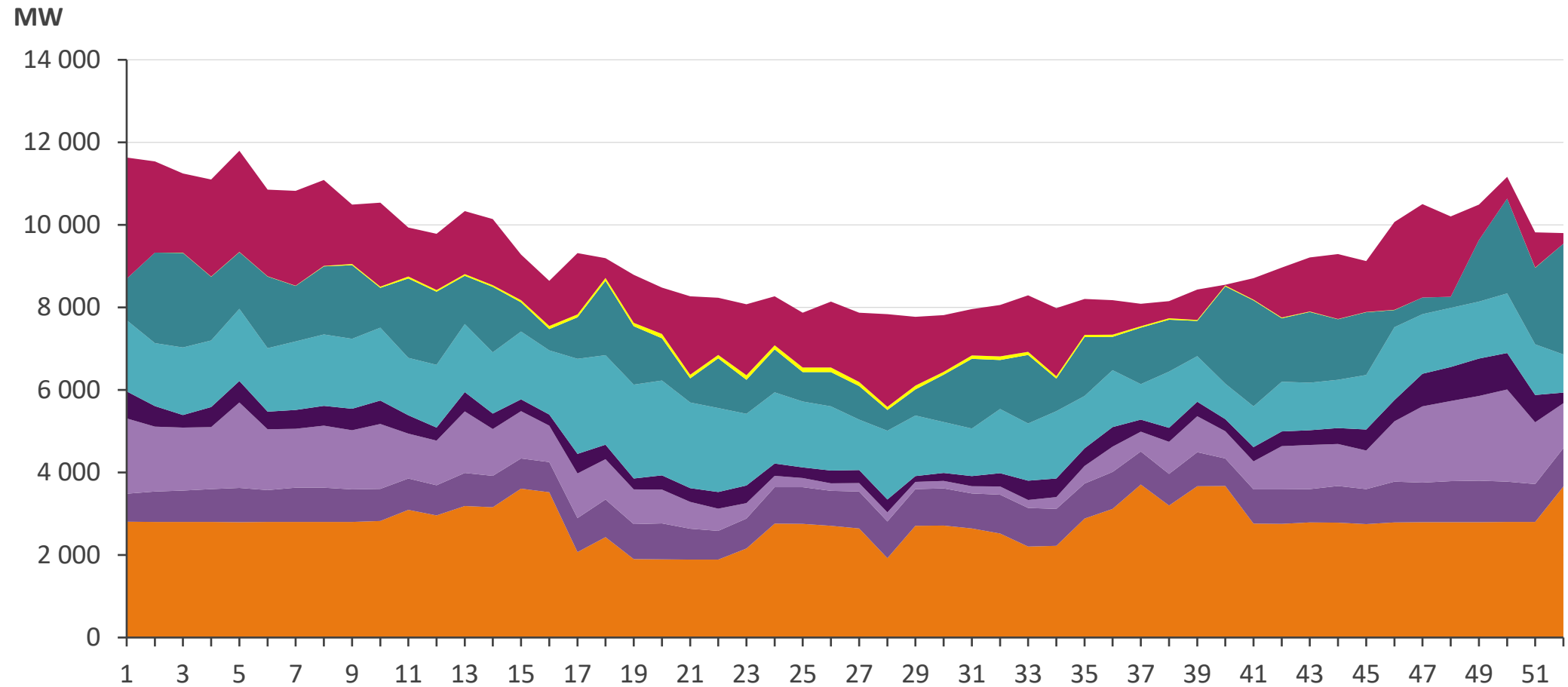


# Electricity supply hourly in year 2022 peak load day 11.1.



# Variation of Electricity Production and Imports in 2022

## average week power



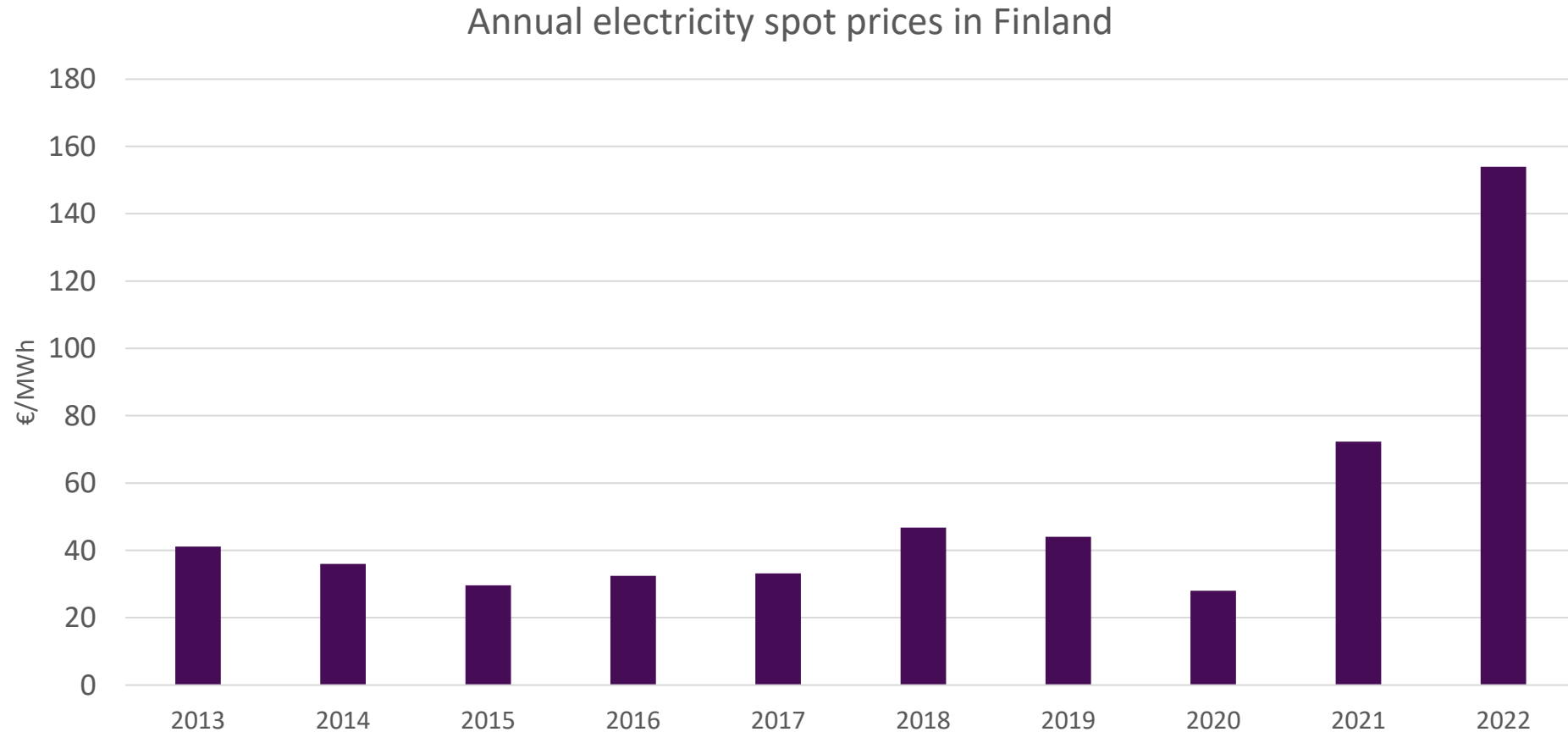


The background features a grey gradient with faint, stylized icons of energy infrastructure and nature. At the top, there are clouds and an airplane. In the middle, the main text is centered. At the bottom, there are icons of houses, power lines, trees, wind turbines, and a dam.

# Electricity spot markets are in an unprecedented rise and change

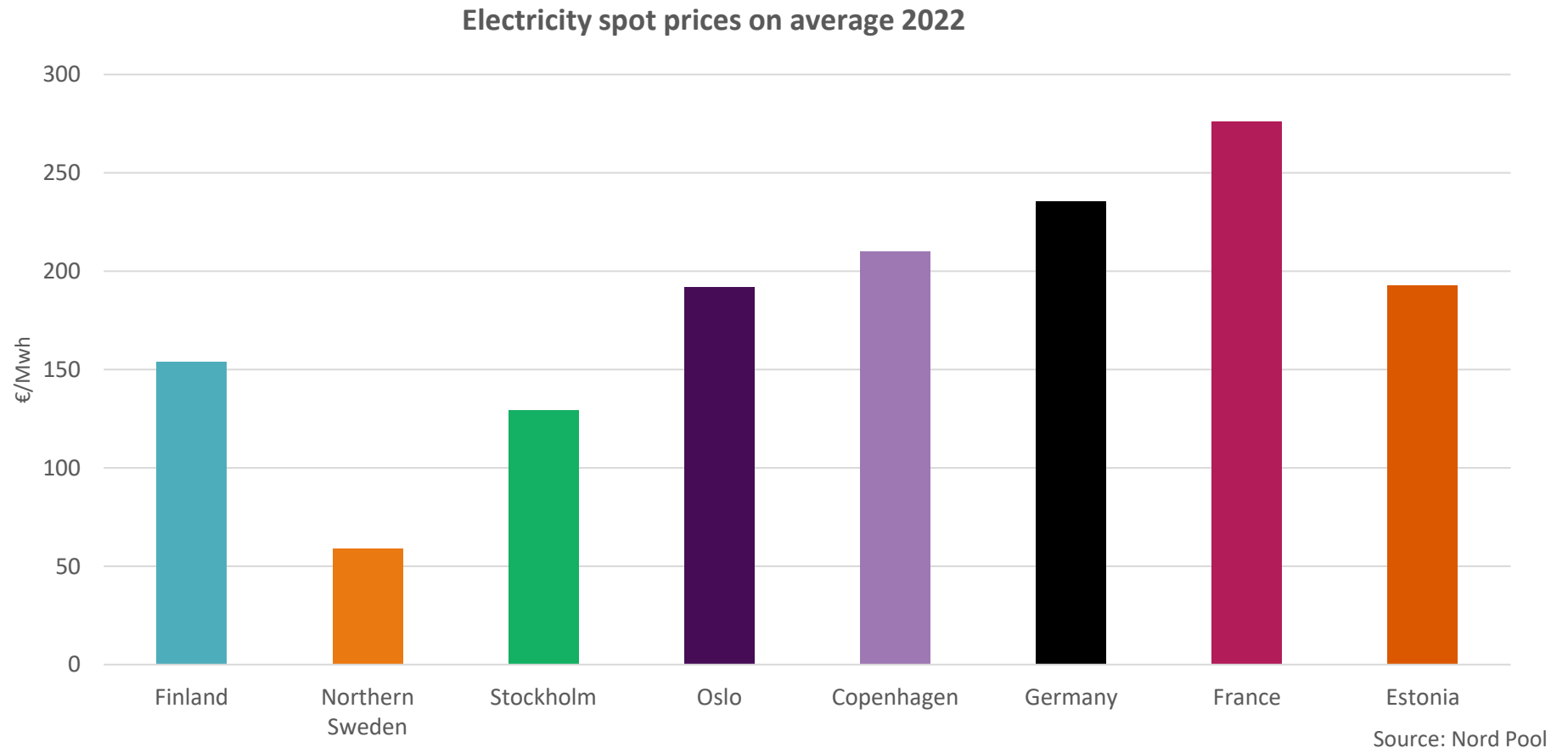
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# In 2022, wholesale electricity price in Finland was considerably higher than in the previous years

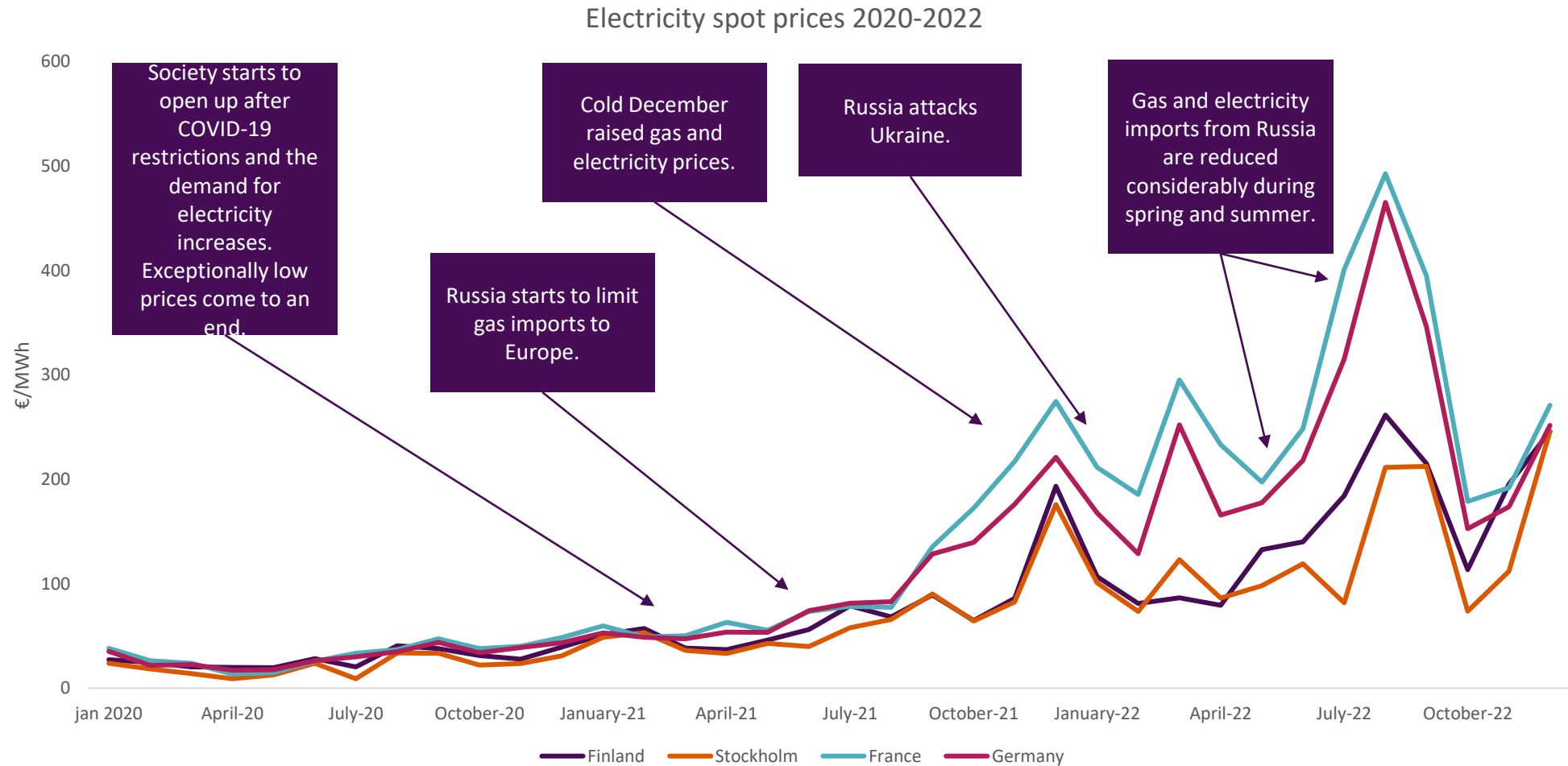


Source: Nord Pool

# Price of electricity in Finland was the second-lowest in the entire EU – great price differences compared to Central Europe

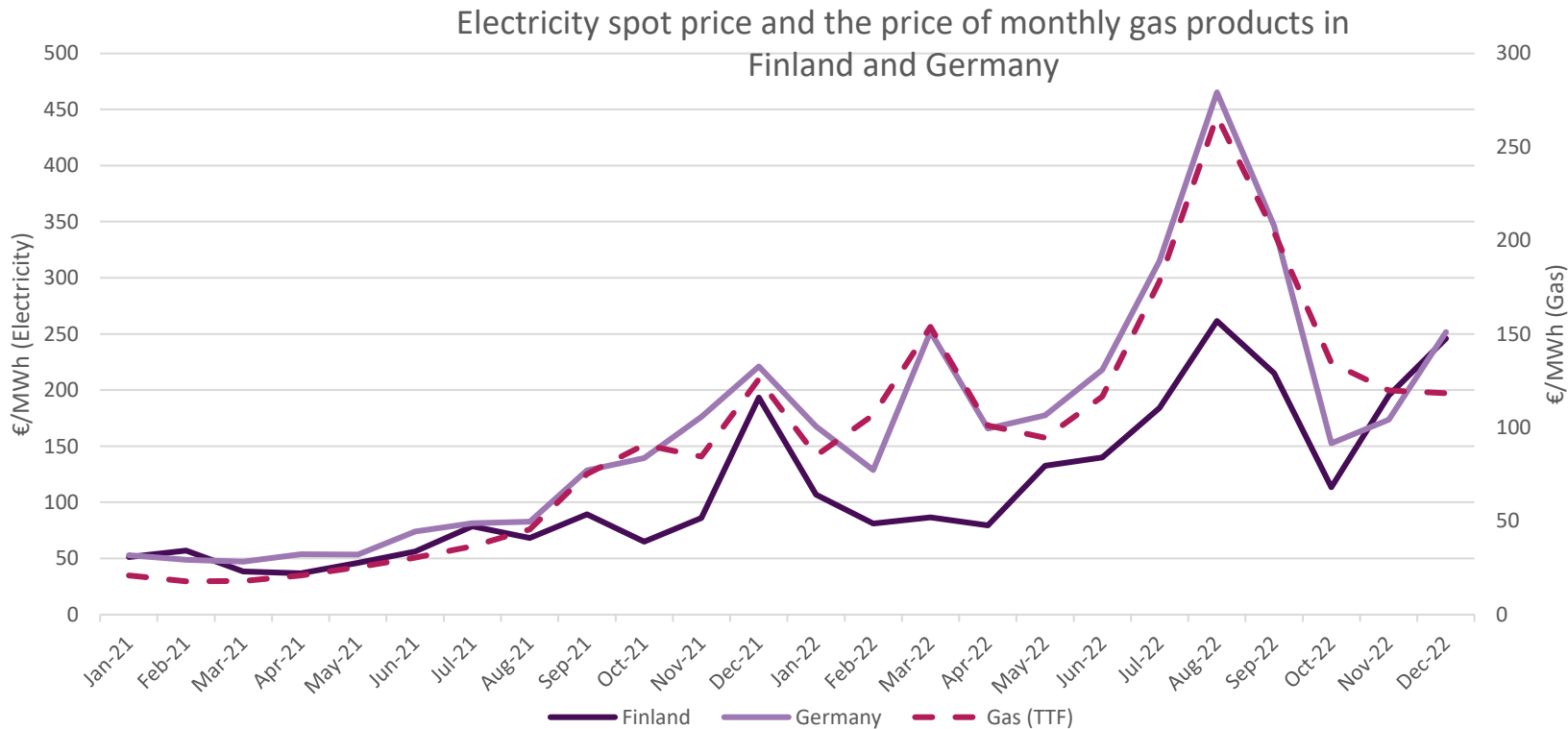


# Electricity prices rose in Europe mainly due to the reduced amounts of Russian natural gas and other energy in the market



Lähde: Nord Pool

# Price of electricity has followed the price of natural gas, which has multiplied in Central Europe

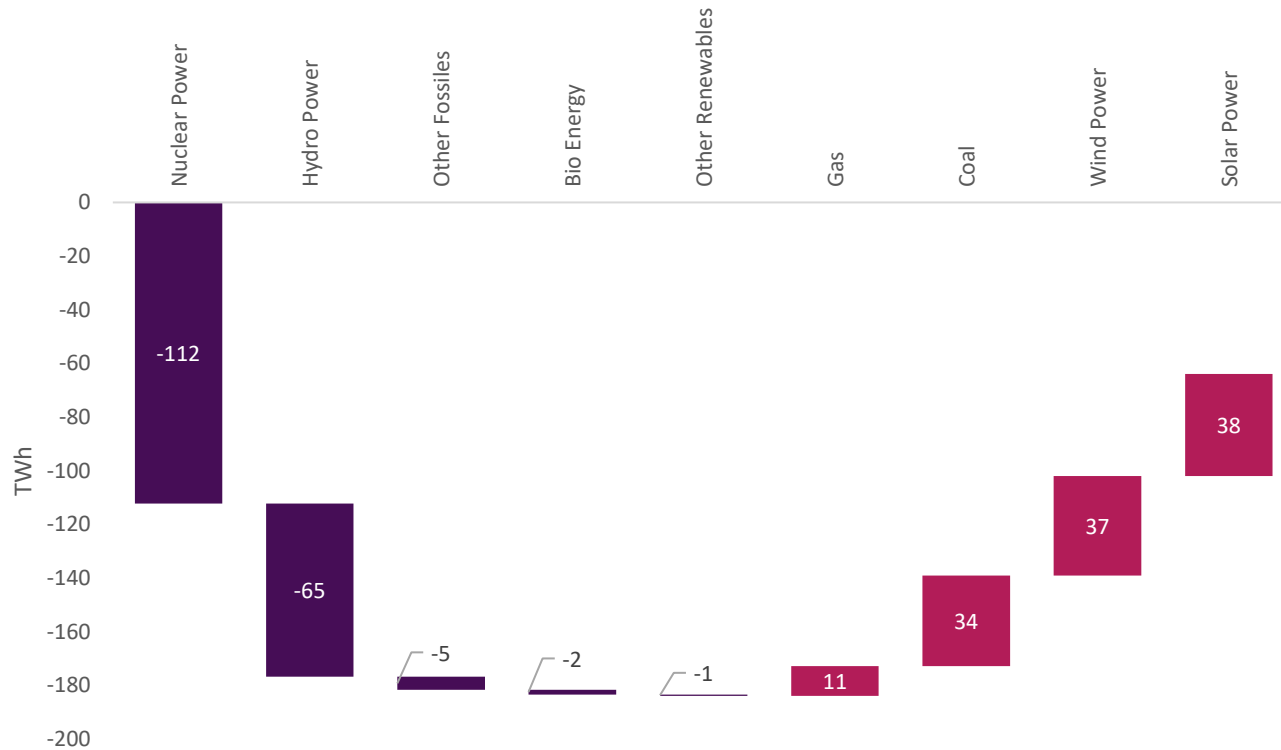


- The price of natural gas has increased 20–30-fold from the low prices in 2020.
- About 20% of electricity in the EU is produced with natural gas. In many countries this share is much higher.
- For the time being, gas is a necessary fuel with respect to sufficient electricity supplies.
- The wholesale price of electricity in Finland partly follows the Central European prices, but not in full. When there is plenty of Nordic production on offer, our price level falls considerably lower.

Sources: Nord Pool & Trading Economics

# In addition to gas, the hot and dry summer and challenges in nuclear power plants also contributed to the crisis

Change in electricity production by production form 2022 vs. 2021  
January-November



Sources: Bruegel & Ember

- The rise in electricity prices is also partly explained by the reduced supply of nuclear and hydro power.
- There are a number of faults and maintenance issues especially in French nuclear power plants, due to which production has plummeted.
- The dry year has reduced the supply of hydro power.
- Reduced use of electricity and increased production of wind and solar power have not been enough to meet the shortfall in nuclear and hydro power.
- It has been necessary to utilise more coal power in electricity production, and even the hugely expensive natural gas has been slightly more in demand than in the previous year.

# Electricity spot prices by country 2022

Prices in Norway, Denmark, Sweden and Italy are from the price areas of the capital cities

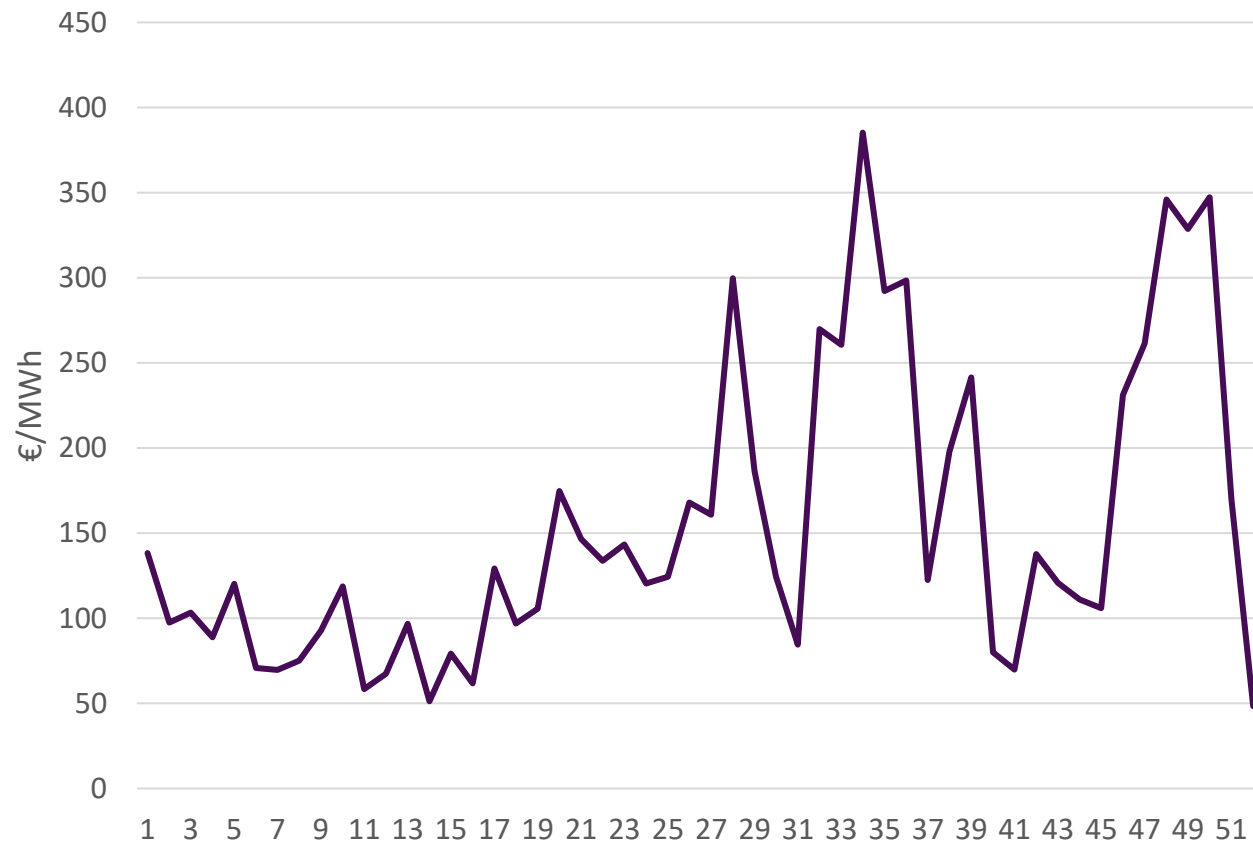


## High prices are not only a Finnish phenomenon

- Prices have been very high throughout Europe.
  - The electricity wholesale market is common, i.e. pricing takes place according to supply and demand in the entire region.
  - Electricity is transmitted in the grid towards a higher price.
  - Electricity transmission links are not enough to ensure the same price in all areas.
- The prices have been highest in countries that have a lot of production based on fossil fuels or not enough own production capacity.
- Sweden has had the lowest prices, and Finland has imported a lot of electricity from Sweden. Correspondingly, electricity has been exported from Finland to Estonia.

# Electricity price fluctuations have been high this year – highest prices seen in August and in early December

Weekly electricity spot prices in Finland in 2022

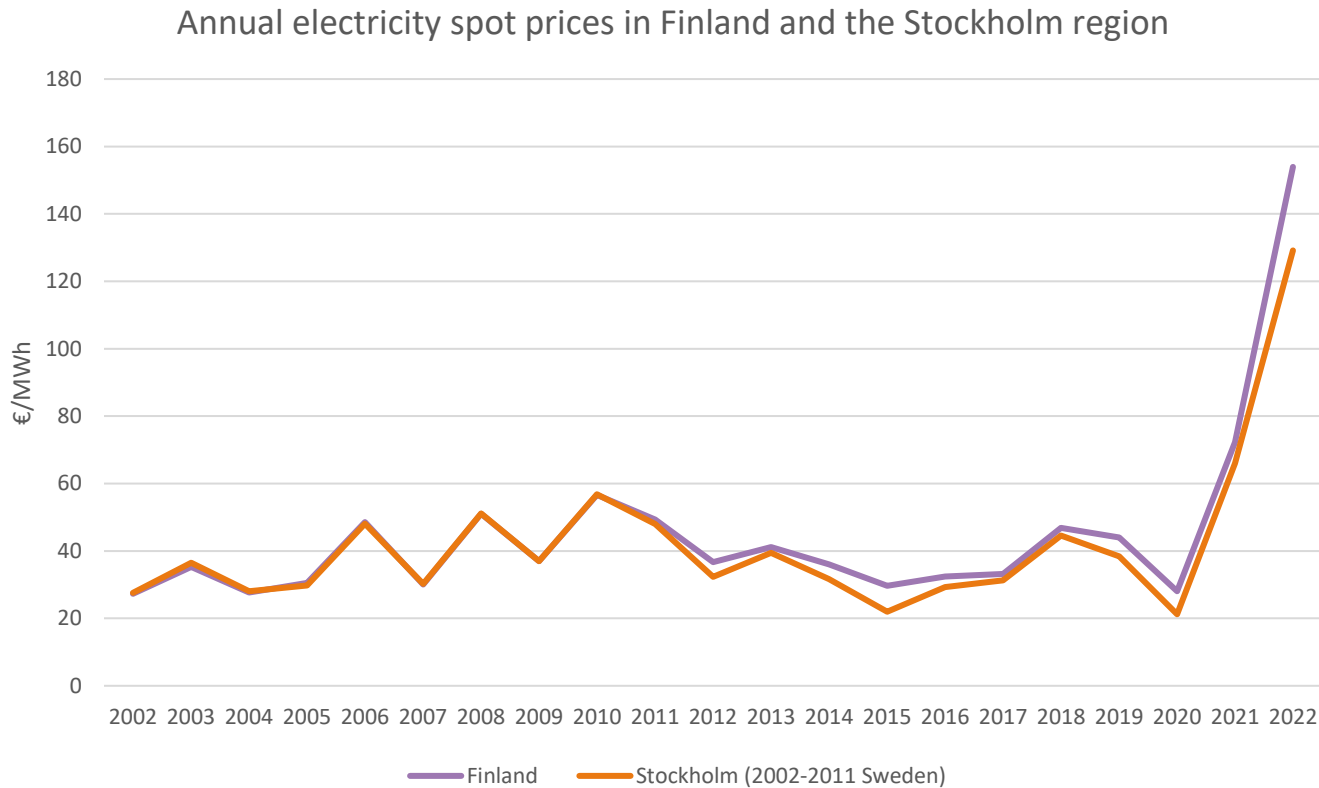


- In January–April, Finland had the lowest wholesale electricity prices in Europe together with Sweden.
- The prices increased when electricity imports from Russia stopped and gas became more expensive.
- In late November and early December, the weather was widely cold with low winds in Central and North-West Europe.

Lähde: Nord Pool



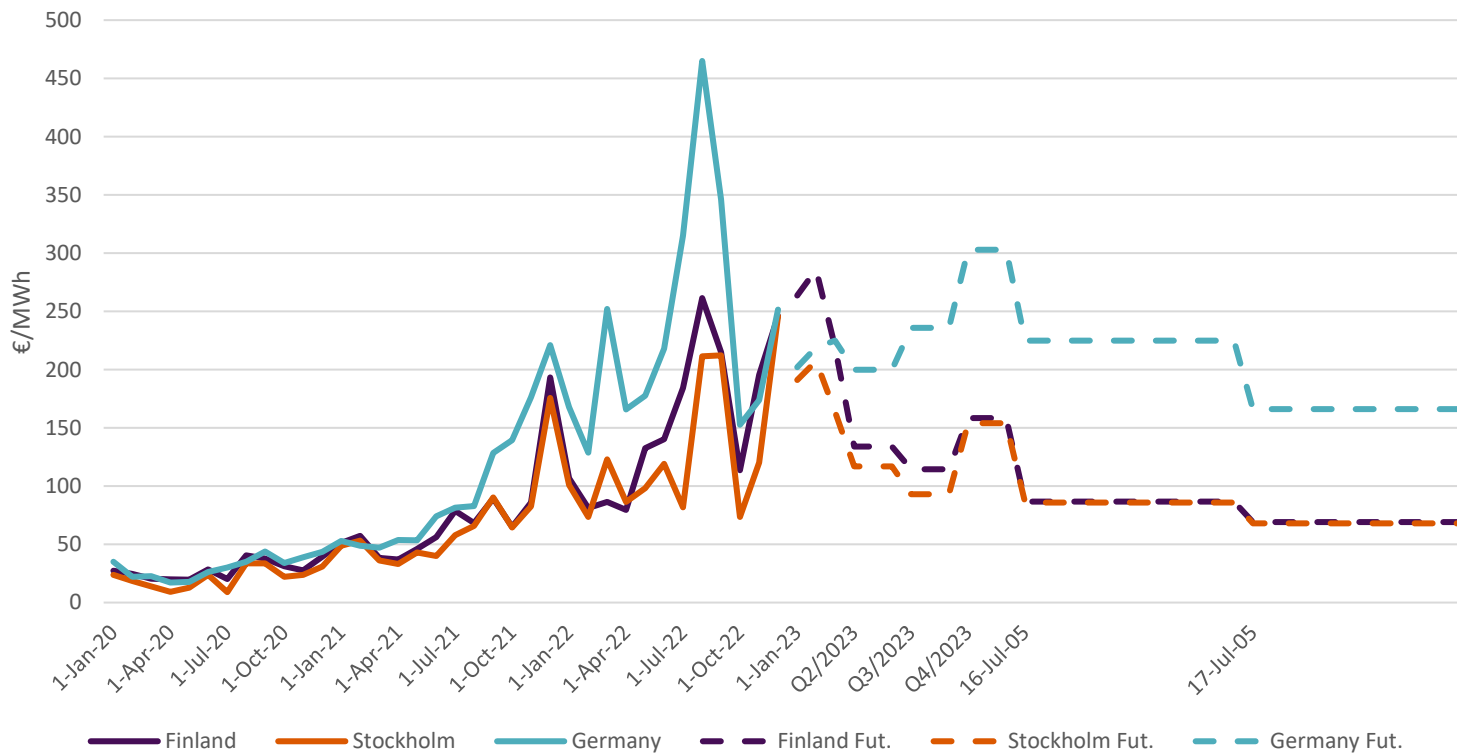
# Price difference between Finland and Sweden grew further



- The reason for the price difference between Finland and Sweden is the insufficient transmission capacity to transmit lower-priced electricity to the neighbouring country.
- In the past few years, Finland has usually imported a substantial volume of electricity from Sweden.
- The challenge for Finland is that our production capacity is not sufficiently high. In sub-zero temperatures during high demand or low winds, the prices can rise extremely high even if electricity prices in Sweden were lower.
- Increasing own power production and growing the transmission capacity will reduce the price difference.

# Outlook for electricity prices is promising especially in terms of Finland and Sweden

Actual electricity spot prices & futures



Future prices from 29.12.2022

Sources: Nord Pool, Nasdaq OMX & EEX

- Future electricity deliveries are traded on the electricity derivatives market.
- The price outlook is declining in Finland and Sweden.
- In Germany, high prices seem to be continuing.
- The situation in Finland and Sweden is explained by the fact that we have a constant plentiful supply of new electricity production. Moreover, we are not dependent on gas in electricity production which would keep prices at a constantly high level.

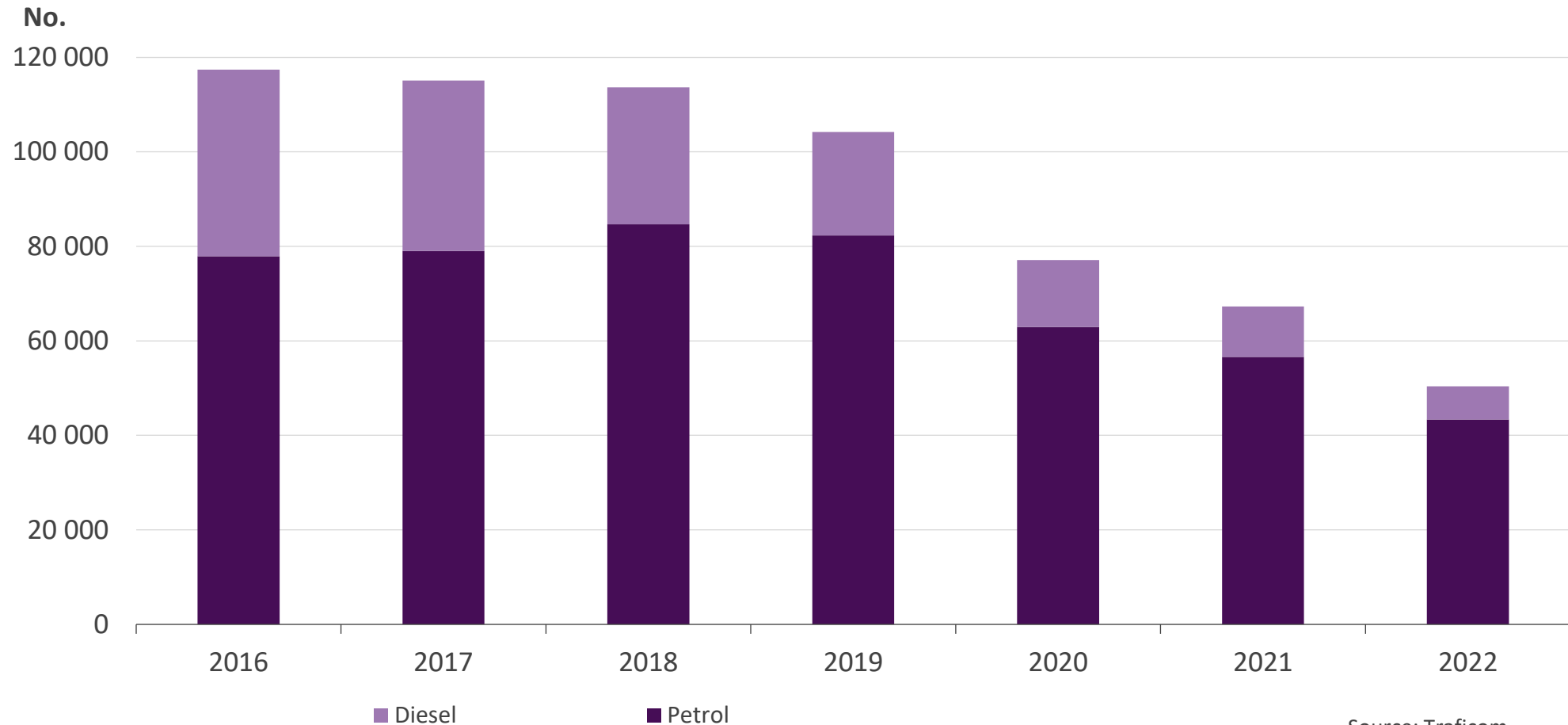


# The low carbonization of traffic is progressing

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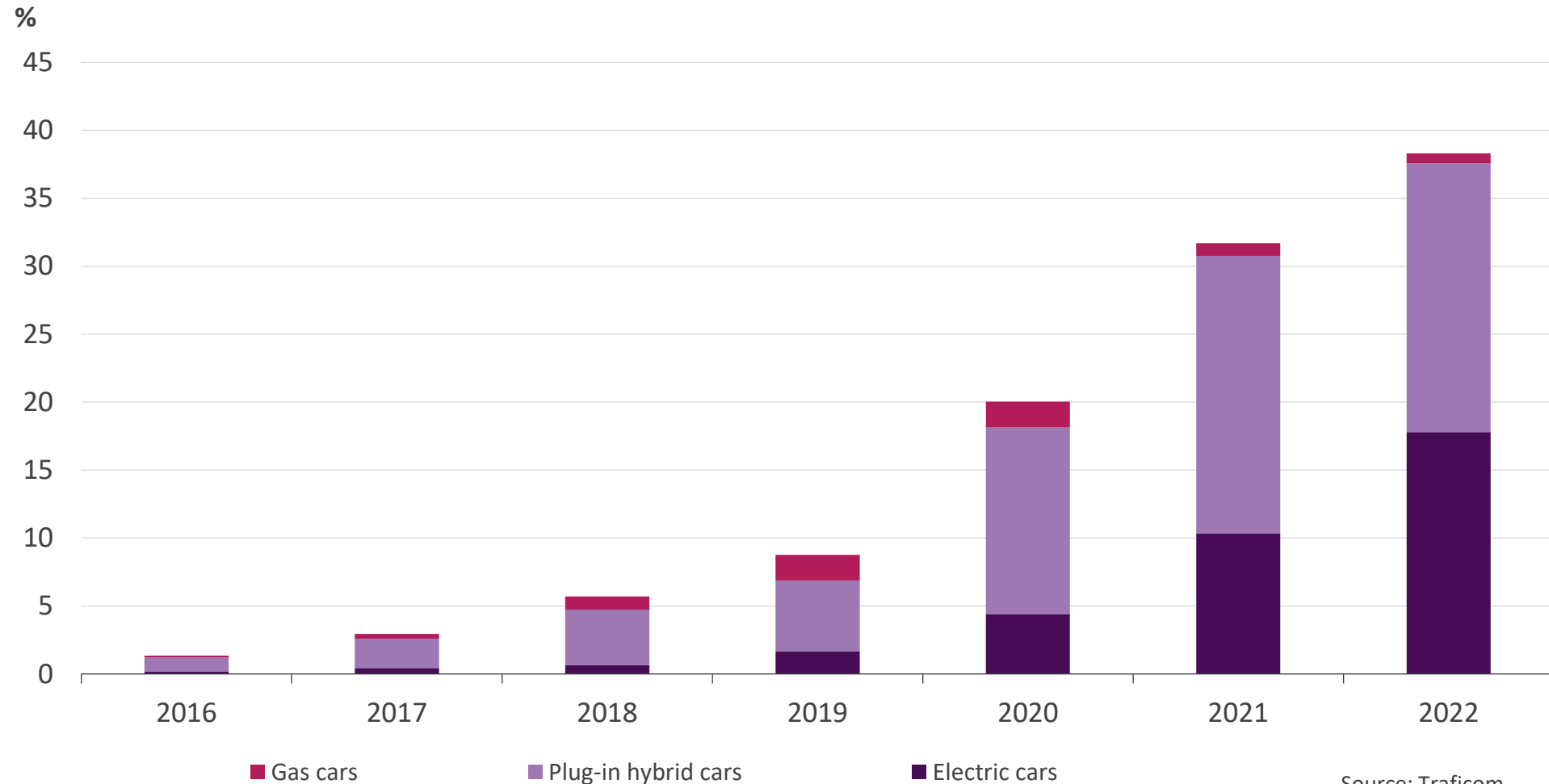
# Petrol and diesel car sales in Finland

(new passenger cars, plug-in hybrid cars not included)



Source: Traficom

# Alternative power sources for the first registration of passenger cars



# Alternative power sources in passenger cars in traffic by end of the year

