


Electricity cost assessment for large industry in the Netherlands, Belgium, Germany and France

Final report

26.03.2024

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2 Management Summary

3 Energy policy, fundamental and regulatory framework per country

4 Quantification of electricity cost components for large industries 2024

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Introduction, background and objective

- The Ministry for Economic affairs and climate policy of The Netherlands (EZK) is looking to access and analyze electricity costs for industry in The Netherlands, Belgium, Germany and France including market developments, trends and policy action which is driving the electricity cost of energy intense large industry users in these countries until 2030. EZK has asked E-Bridge to carry out a research study on the topic.
- The objective of the study is the analysis and investigation of the status and development of electricity cost for large industrial companies with different load-profiles and flexibility levels.
- The study has focussed on the following outcome and deliverables for Netherlands, Belgium, Germany, France for the years 2024 until 2030:
  - Network costs split between the total network costs per country (bln EUR) and costs for industrial users (EUR/MWh)
  - Taxes, levies, possible subsidies and exemptions
  - Electrical energy costs based on current and forward commodity prices

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Management summary I/IV

Background, scope and target of the study

- This research provides a benchmark of effective electrical energy prices for large industrial customers with connection to the extra high voltage grid.
- The results where derived for baseload industry users with an assumed 1 TWh consumption profile per year, a peak load of 125 MW and 8000 Full Load Hours (FLH) and for large-scale electrolysers with 1,2 TWh consumption, 250 MW peak load and 4800 FLH as an example for flexible users.

Germany, the Netherlands, France and Belgium have very different regulatory frameworks for industrial customers. Additionally, the counties have different decarbonization strategies.

- The reviewed 4 countries Germany, the Netherlands, France and Belgium have all unique and individual energy policies and policies towards large industries. Some countries have introduced more favorable policies and conditions for industry than others.
- All countries share a common goal to reduce CO_2 emissions and increase the share of renewable energy. France's energy policy is still centered around nuclear energy as a key technology. Germany has ambitious renewable energy targets aiming to achieve 100% renewable electricity supply by 2045, has phased out nuclear for the foreseeable future and will shut down coal plants towards 2030.
- Germany, the Netherlands and Belgium are facing substantial challenges to integrate the growing share of renewable resources (requiring grid expansion and additional flexibility) and replace the CO_2 intensive conventional fossil capacity which will be phased out (coal, lignite, old gas plants).
- Particular Germany and the Netherlands have ambitious targets to expand offshore wind installations. This requires substantially larger investments in grid expansion and grid connections relative to Belgium and France.

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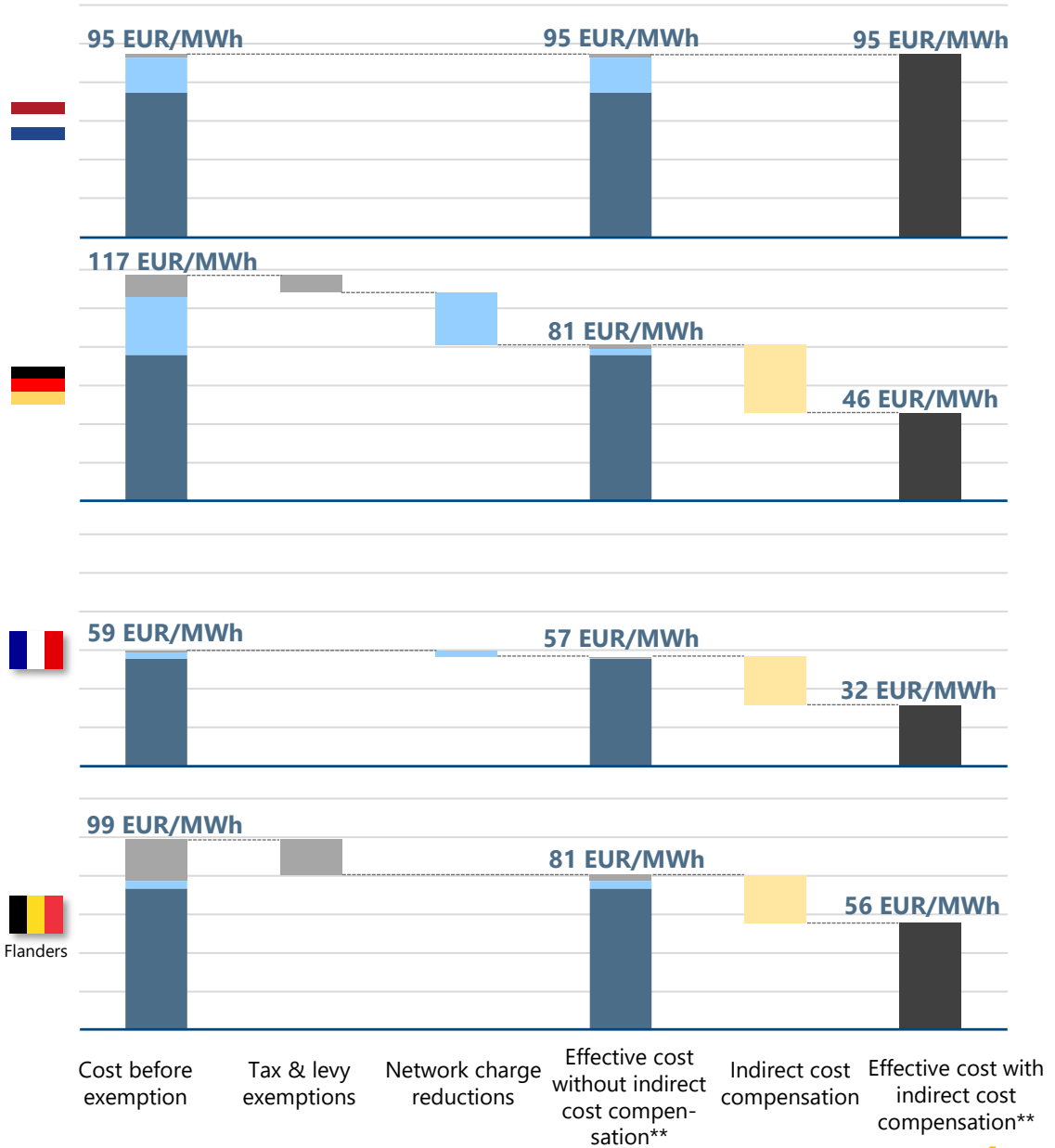
Management summary II/IV

In 2024 large baseload industry users (~ 1 TWh/a) in the Netherlands are paying 14-63 EUR/MWh more for their electricity than their industry peers in the other countries (approx. 95 vs. 32-81 EUR/MWh).

This creates a **competitive disadvantage for large industrial customers in the Netherlands** (with extra high-voltage connection).

There are three main drivers and one additional specific driver for France:

1. **Substantially higher network charges**
2. No reliefs or exemptions on taxes and levies for large industry
3. **Absence of indirect cost compensation since it was terminated in 2023.**
   (Applicable sectors: production of various metals, hydrogen, chemicals, wood and paper)
4. France enables its industrial customers to obtain a large share of nuclear power at a regulated low price through the ARENH scheme.



**Applicable sectors: production of various metals, hydrogen, chemicals, wood and paper

Management summary III/IV

The competitive disadvantage for industrial baseload users in the Netherlands in terms of electrical energy costs will remain substantial until 2030.

- **By 2030 Dutch industry companies are still expected to be paying the highest electricity cost of all investigated countries.** Due to reduced indirect cost compensation and changes in subsidies in the other countries the electricity cost difference is foreseen to be decreasing somewhat (baseload approx. 92 vs. 48-79 EUR/MWh).
- The Netherlands and Germany have large network extension investments, but **the Netherlands has no exemptions and reliefs that will mitigate the increase of network charges** (which also need to refinance offshore connection costs) for large industry companies.
- The strong increase of **network extension investments can lead to almost doubled network charges in Germany**. However, these costs can be **significantly lowered by the reliefs and exemptions**. Additionally, Germany has introduced a **separate levy for offshore connection cost which avoids an increase of network charges due to offshore connection costs**.
- France may still have the lowest costs in 2030 but advantages may shrink. While energy taxes and network charges for baseload industry may continue to remain relatively low, the impact of the ARENH scheme is expected to decline.
- In Belgium, the sharp increase in network charges in the upcoming years drives the overall electricity costs.

Management summary IV/IV

Electrolysers, as an example for flexible users, are facing additional disadvantages in the Netherlands compared to neighboring countries.

- In principle, the same effects as described for the baseload industry customer apply for electrolysers.
- Flexible users like electrolysers can adapt their load in time and can purchase electricity significantly cheaper in times of high RES production than baseload users. This supports RES integration and – typically – is network friendly in addition.
- **In the Netherlands, flexible consumption is leading to higher effective network tariffs as the tariff is mainly capacity based. Hence the structure of the network tariffs potentially hinders RES integration and makes investments in electrolysers less attractive**.
- The Netherlands has currently no reliefs or exemptions for electrolyers in place.
- The **other countries** provide more attractive electricity prices for electrolysers (ca. 30 EUR/MWh vs. 88 EUR/MWh in the Netherlands in 2024) due to
  - **exemptions in taxes and levies**
  - **indirect cost compensations**
  - **Germany does not apply network charges for electrolysers**.
- Without policy interventions, this structural cost disadvantage is expected to remain in place also towards 2030.

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Introduction and approach

In the following chapter the key aspects of the energy policy, the fundamental and regulatory framework are described per country:

- Decarbonization and renewable electricity targets with key policy measures and action
- Development of electricity generation and demand until 2030 with emphasis on renewable energy development
- Investment cost development projections for onshore and offshore extra high voltage network (TSO level) - based on published investment – and network development plans of the TSOs per country
- Cost development estimations for system services, losses and congestion management – based on historical costs and projections until 2030. The further expansion of RES capacity will increase the cost for congestion management. This will partially be offset by grid extensions/enforcement measures and decreasing commodity prices. We therefore assume that the cost for system services and congestion remain fairly constant until 2030 coming already from elevated levels in 2022/2023.
- The methodology and approach for network charges and CO_2 price cost compensation are explained per country.
- For country comparison a separate section is spent on offshore wind. Country targets, investment needs and the instruments for financing are listed.
- Country specific schemes which affect industry electricity cost like the ARENH scheme in France have also been described.
- The applied network charges correspond to the network charges of the respective highest grid level (extra-high voltage level) of each country.

Disclaimer: Network charge projections based on rough estimation

- The precise estimation of future network charges is very difficult and would require a **separate extensive study** since it depends on many input factors. This comprises developments (on the concrete voltage level) of …
  - load and load patterns of user (to derive power and work price components of network charges)
  - investment costs in different asset classes
  - costs for system services, losses and congestion management
  - other operational costs (e.g. maintenance, staff, IT)
  - the specific regulation framework (depreciations and regulatory lifetimes of asset classes, …)
  - and more.
- The estimated network charges in this report are therefore based on a **rough estimation (only for the extra high voltage grid)** taking into account the current charges, the current costs of investment comprising announced investment plans and the costs for system services, losses and congestion management of the last years and approximate expert estimations based on public information and recent project experiences.

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Germany ramping up renewable energy rapidly and has growing need for flexibility

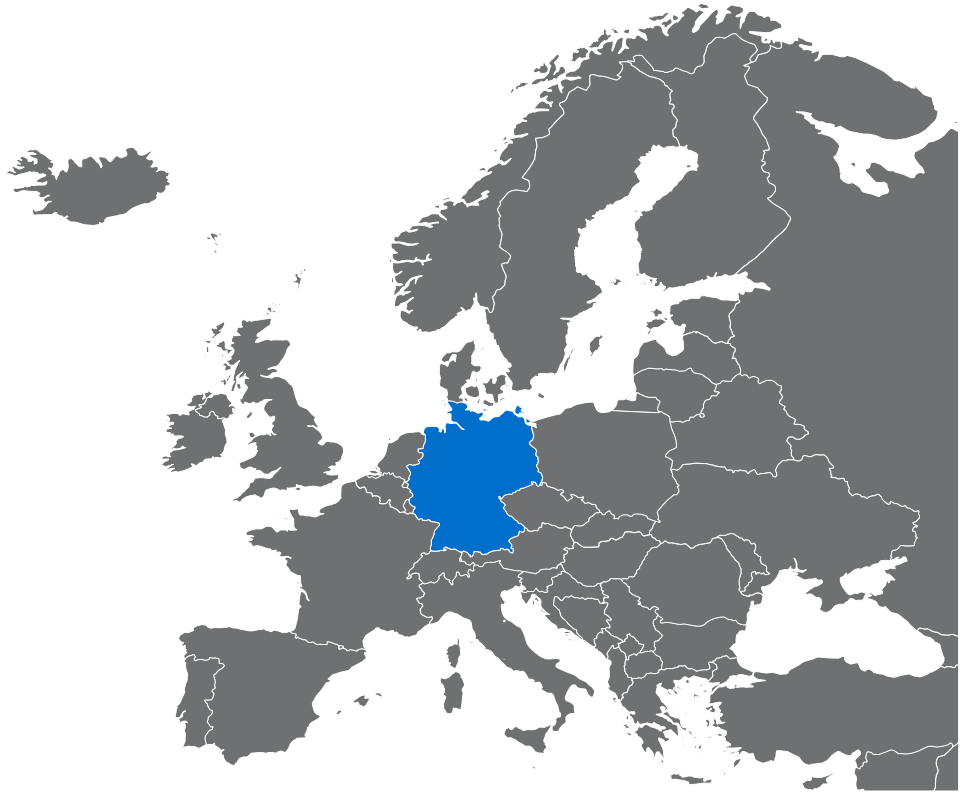
- Germany decarbonization and renewable electricity targets:

	CO_2(GHG) target*	Renewable target*
2023	46%	57%
2030	65%	80%
2045	CO_2 neutral	100%

Germany is promoting a rapidly growing share of (intermittent) renewable generation; capacity target for wind and solar -> 360 GW/2030; 615 GW/2040

Closure of all nuclear, hard coal and lignite plants by 2039. 23 GW of coal and lignite capacity is expected to be closed by 2030.

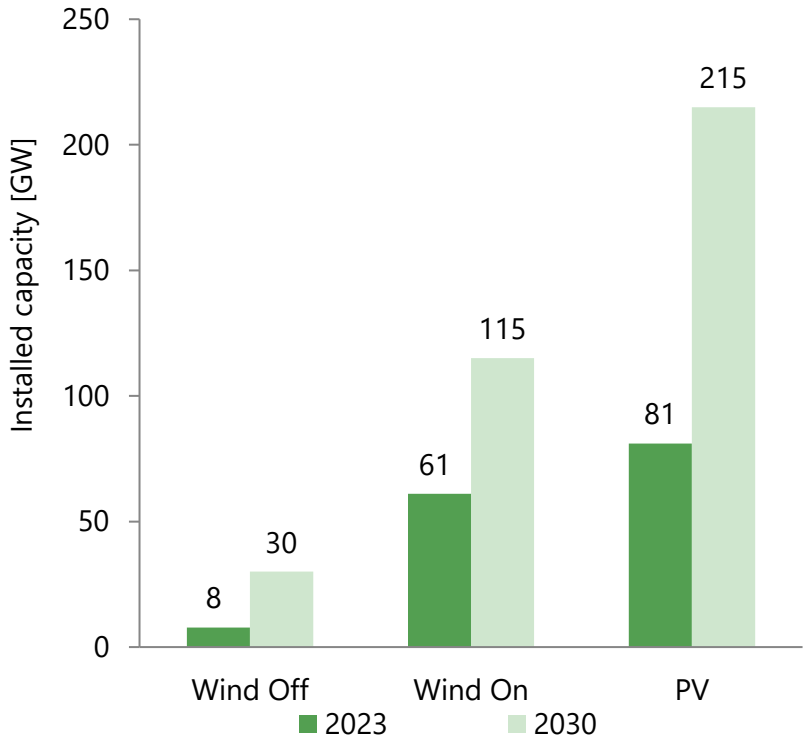
Growing need for grid expansion and flexibility to combat grid congestion and redispatch to balance increasing share of intermitted energy supply



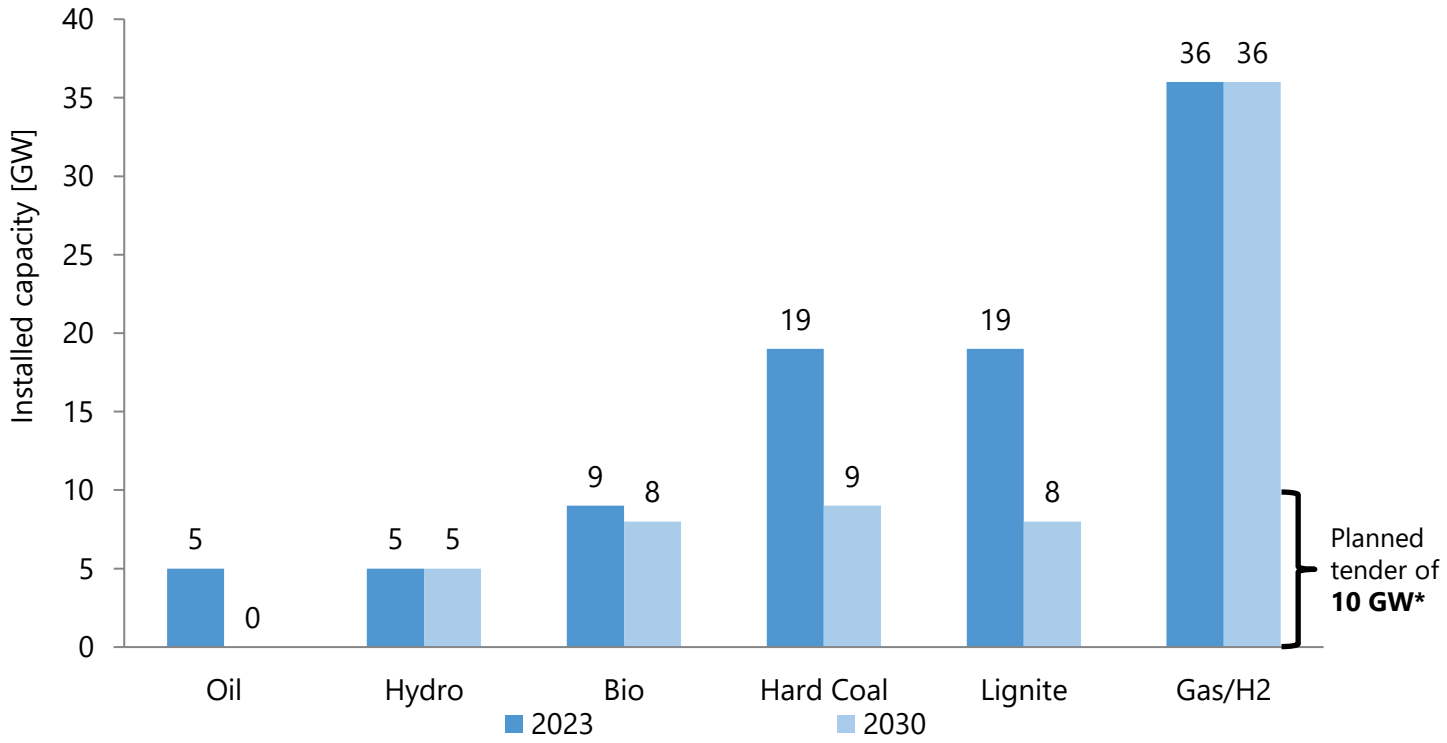
* compared to 1990; 2023 real; renewables: wind and solar

Germany has ambitious targets for increasing renewable energy supply, while it plans to decrease its coal and gas power plant capacity

Development targets for RES



Development of conventional power supply

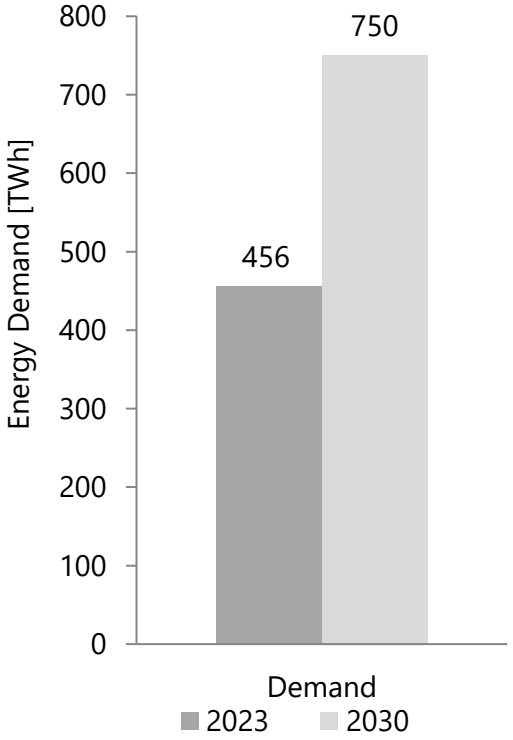


* These 10 GW of H2-ready gas-fired power plants will replace old gas power plants that will be decomissioned until 2030

Sources:
2023: Energy-Charts,
2030: German Government, NECP 2021/2030, NEP 2037 Power Germany

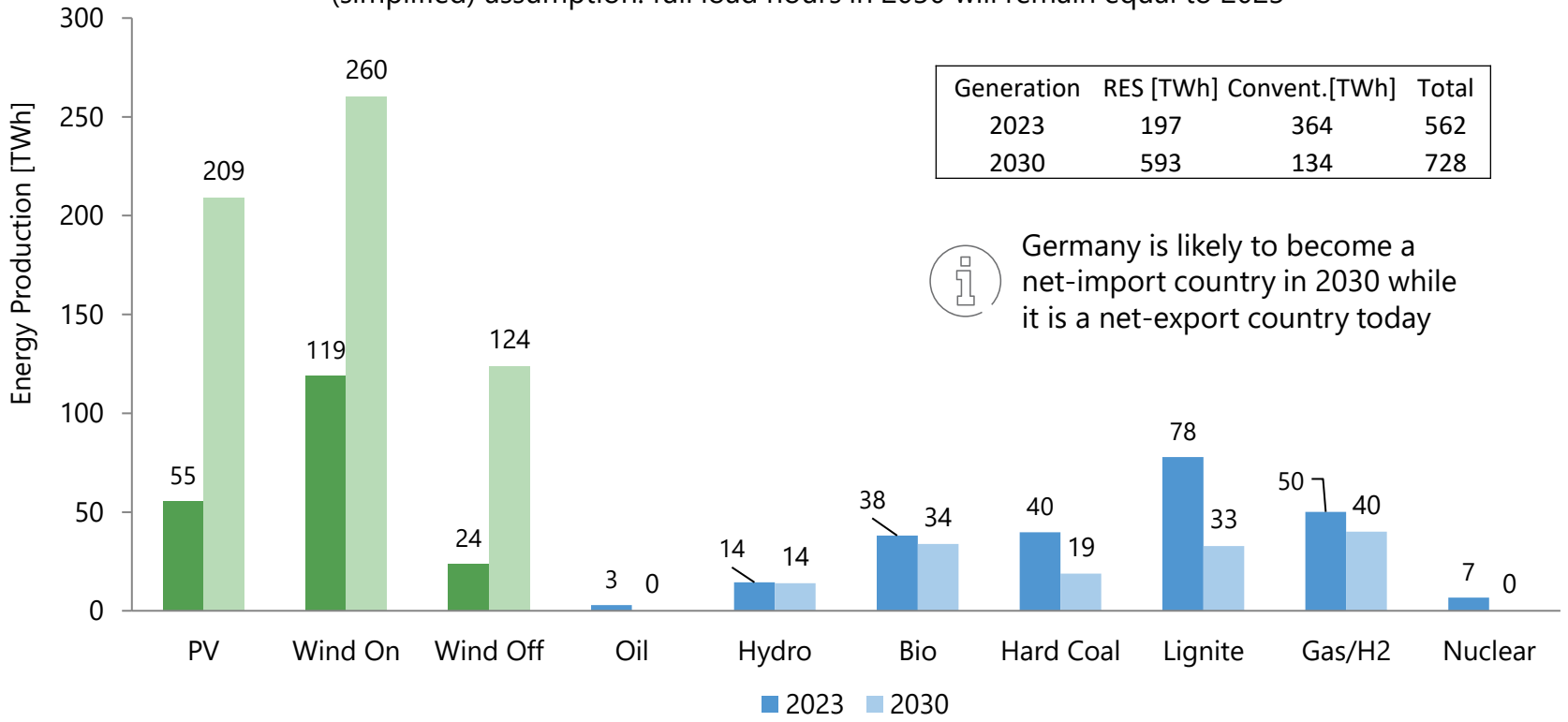
The main share of energy production in Germany (80%) is supposed to come from RES in 2030

Development of demand



Development of energy production

(simplified) assumption: full load hours in 2030 will remain equal to 2023



Generation	RES [TWh]	Convent.[TWh]	Total
2023	197	364	562
2030	593	134	728

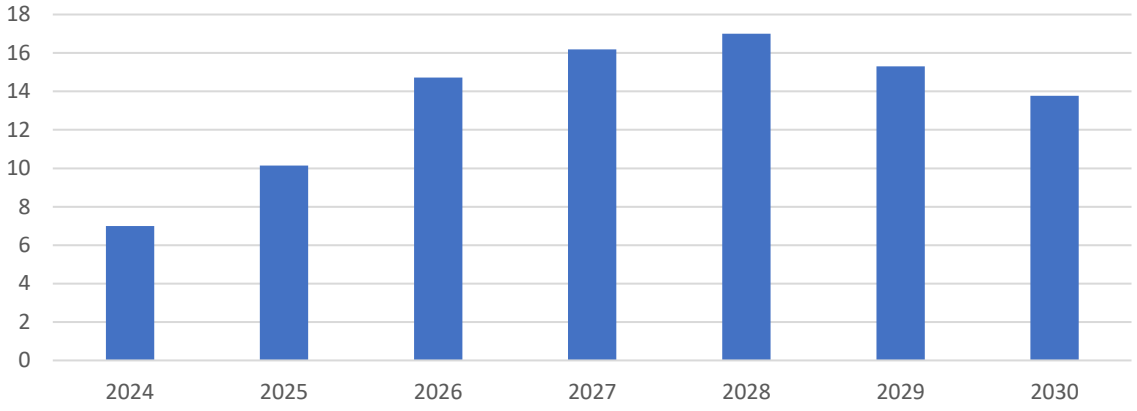
Germany is likely to become a net-import country in 2030 while it is a net-export country today

According to national plans, RES will account for the major part of energy production in Germany in 2030.

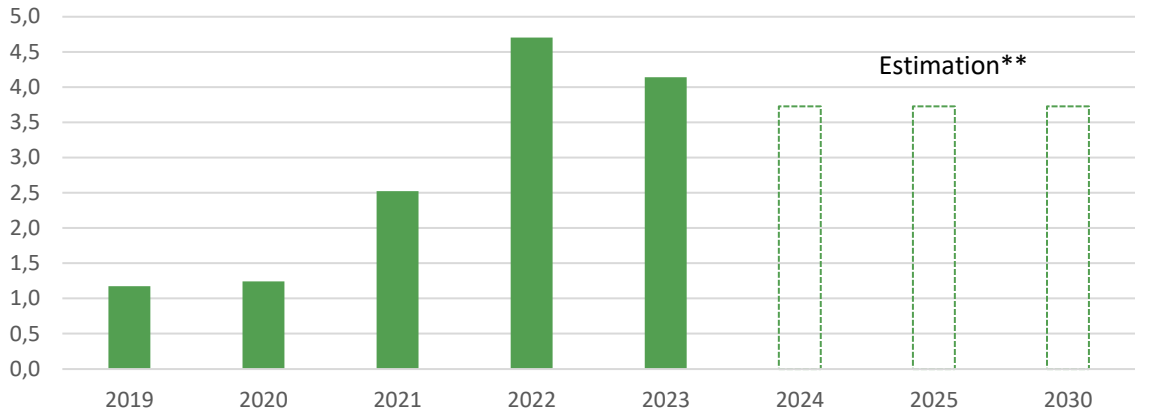
Sources:
2023: Energy-Charts,
2030: German Government, NECP 2021/2030, NEP 2037 Power Germany

Large network investments and expenditures required (high voltage level - TSOs)

Total investment volume [bln EUR/a]*



Costs for system services, losses and congestion management [bln EUR/a]**



Investments:*

- Substantial investments of >10 bln EUR/a into high voltage network planned to facilitate network expansion and enforcement
- According to the network development plan of the grid operators' offshore investments amount to ca. 45 bln EUR, onshore investments to ca. 53 bln EUR.
- Expected **total investments until 2030** amounts to ca. **98 bln EUR.**

Costs for system services, losses and congestion management**

Operational cost of the high voltage network comprise the cost of grid losses; the cost of contracting balancing (reserve) capacity and the costs of redispatch (congestion management)

- Historical cost have been in the magnitude of 1 bln EUR/a
- Since 2021 with the increase of commodity prices and grid congestion operational cost have increased substantially to 4,7 bln EUR/a in 2022.
- Operational cost are estimated to stay elevated at an average of **3,5 - 4.0 bln EUR/a until 2030** driven by a decrease in commodity prices and an increase in redispatch cost.

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* Source: NECP/ NEP 2023;

** Future development uncertain

Fact sheet – network charges in Germany

Network charges (Extra high voltage level)

General information

- Even though Germany has four TSOs, the network charges on TSO level are equal across Germany.

Composition

- The network charges consist of:
  - capacity charge (EUR/kW) which refers to the maximum annual load
  - consumption charge (ct/kWh) which is paid for every kWh consumed
- Source

Amount, annual change, development

- The TSOs set the prices annually, in 2024 they are:
  - Capacity charge: **158,98 EUR/kW*a**
  - Consumption charge: **11,2 EUR/MWh**
- As governmental subsidies expired, network charges doubled from 2023 to 2024.

Network charge reductions / exemptions

- For large consumers (> 10 GWh/a) reductions apply according to Section 19 StromNEV
  - Offtake ≥ 7000 h: 80% reduction
  - Offtake ≥ 7500 h: 85% reduction
  - Offtake ≥ 8000 h: 90% reduction
- Electrolysers are exempt from network charges if they are active before 08/2029

Companies of energy-intensive sectors are applicable to a compensation on the CO_2 component of electricity price

Companies of energy-intensive sectors like i. a. production of various metals, hydrogen, chemicals, wood and paper (see Annex I for full list) are applicable to a compensation on the CO_2 component of the electricity price.

The method corresponds to the method specified by the EU in its guidelines:

- Calculation of the compensation either as a function of production volume or as a function of electricity consumption
  - for some products product-specific electricity efficiency benchmarks exist
  - for the rest of the products a general fallback efficiency benchmark exists
- Compensation is only applicable for energy consumption above 1 GWh/a
- The basic aid intensity is 75% of the indirect emission costs incurred
- Super cap: additional aid is paid for companies which remaining indirect costs (after compensation of 75%) exceed 1,5% of the company's gross value added*. Although a "base amount" of 5% of the relevant EUA forward price, but at least 5 EUR/tCO_2, is excluded from the super cap.
  → Aid intensity for these companies exceeds the basic aid intensity of 75%.
- The compensation is paid for the consumption in the previous year (in 2024 it is paid for 2023).

Requirements:

- Beneficiaries have to implement certain measures identified in their energy management system **or** cover at least 30% of their electricity consumption with renewable sources.
- As of 2023, beneficiaries have to invest at least 50% of the compensation to implement measures identified in the energy management system or decarbonize their production process.

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Sources: [1], [2], [3]

* See Annex IV for definition

Offshore network development in Germany costs billions of euros but is paid by most customers over a separate regime (outside the usual network tariffs)

Capacity and investments until 2030:

- Target 30 GW installed capacity
- Investment volume ca. 45 bln EUR*

Allocation of cost:

- An offshore grid levy is regulated in the ENFG** and is used to cover the costs of constructing and operating the offshore connection lines and corresponding costs of disruptions or delays in the connection of offshore installations.
- The offshore grid levy consists of an ex-post correction for the previous year and the prediction for the coming year.
- It has to be paid by every consumer, but energy-intensive companies can get a relief of 85% while green electrolysers are fully exempt.
- Network operators (4 TSOs) have to publish the offshore grid levy until 25.10. of the calendar year for the next calendar year.

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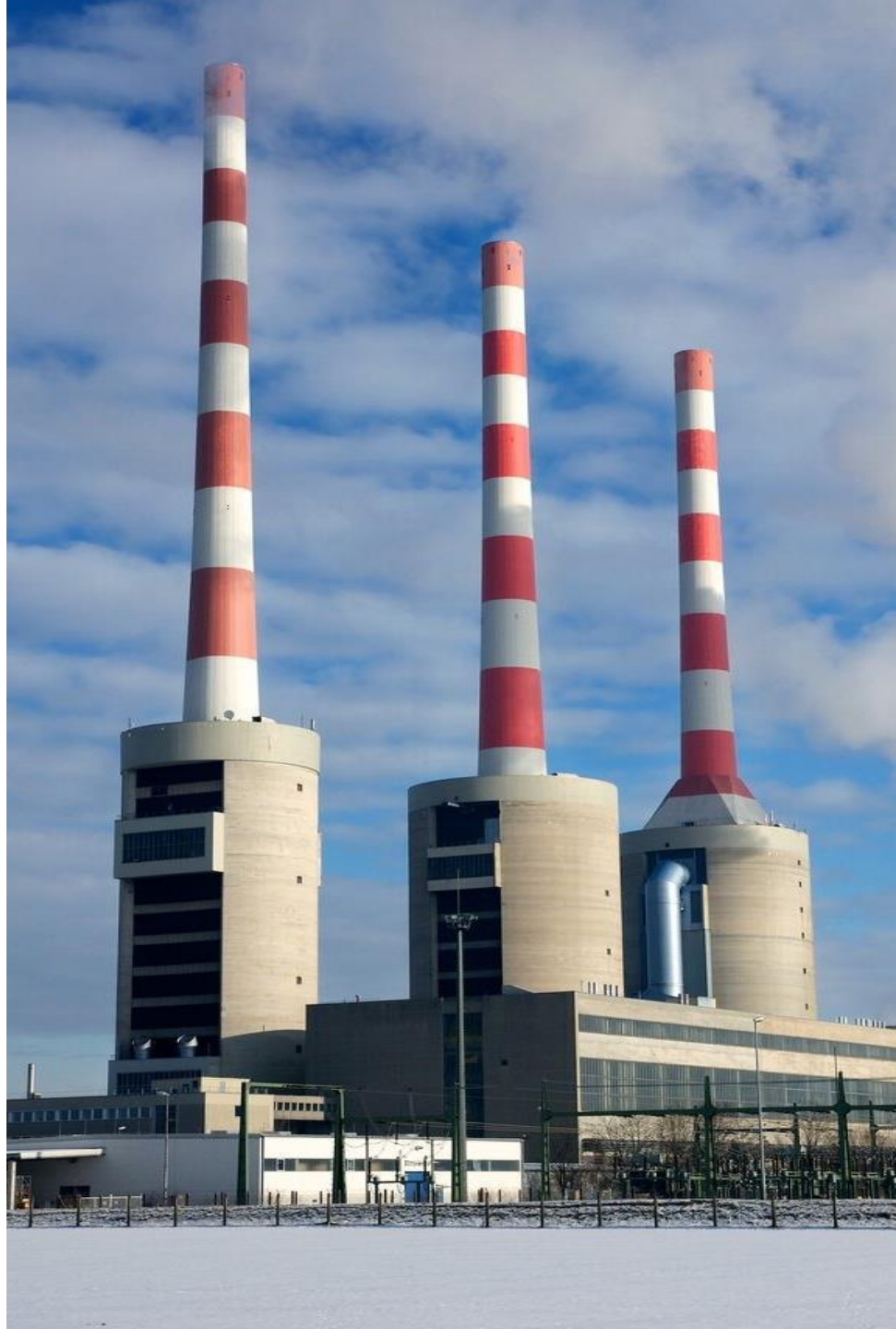
* Network development plan (NEP 2037/2045 (2023)); extrapolated
** EnFG (Energiefinanzierungsgesetz); §§ 10,17

Germany plans the implementation of a capacity mechanism until 2028

- The German government decided to work on concepts for a market based, technology neutral capacity mechanism which should be operational by 2028.
- Final decision of the design of the capacity mechanism should be made until summer 2024.
- 10 GW (4 x 2,5 GW) of H_2-ready gas-fired power plants will be put out to tender in the short term.
- These power plants should switch to entirely hydrogen between 2035 and 2040.
- The tenders will be organised in such a way that the new power plants are fully integrated into the future capacity mechanism.



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The Netherlands accelerating renewable supply rapidly but also facing grid congestion and growing need for grid expansion & flexibility

- Netherlands decarbonization and renewable electricity targets:

	CO_2(GHG) target*	Renewable target*
2023	40%	43%
2030	55%	70%
2050	CO_2 neutral	N.A.**

The Netherlands is promoting the growth (intermittent) renewable capacity particular offshore wind -> capacity target for offshore wind -> 21 GW/2030

Closure of all the remaining hard coal plants by 2030 (4 GW). No plans to close remaining nuclear plant. The Netherlands facing already serious grid congestion in many areas as of 2023.

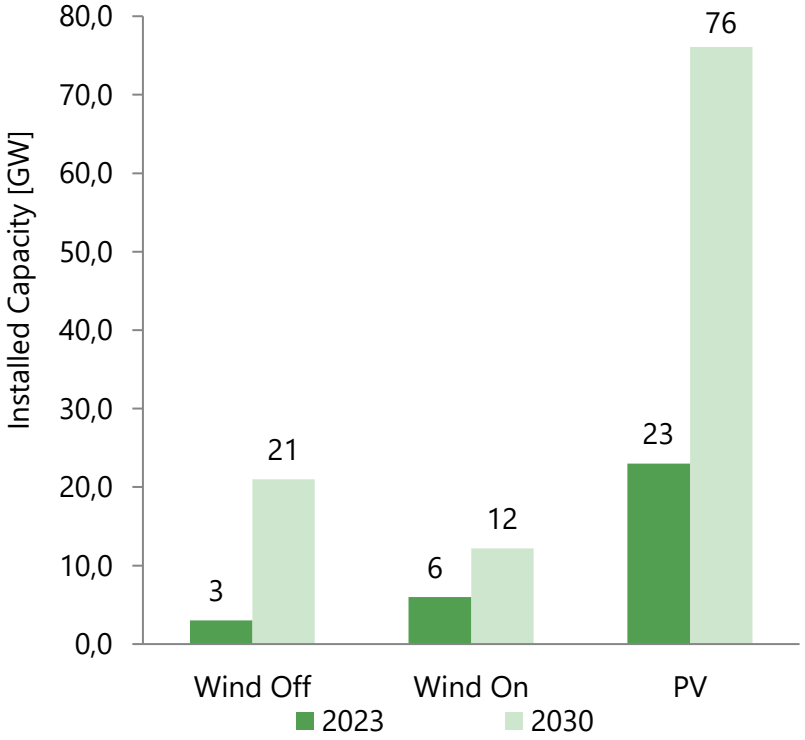
Urgent need for grid expansion and flexibility to combat grid congestion and to fulfill growing electricity demand and integration of renewable supply

* compared to 1990; 2023 real numbers; renewables: wind, solar, biomass

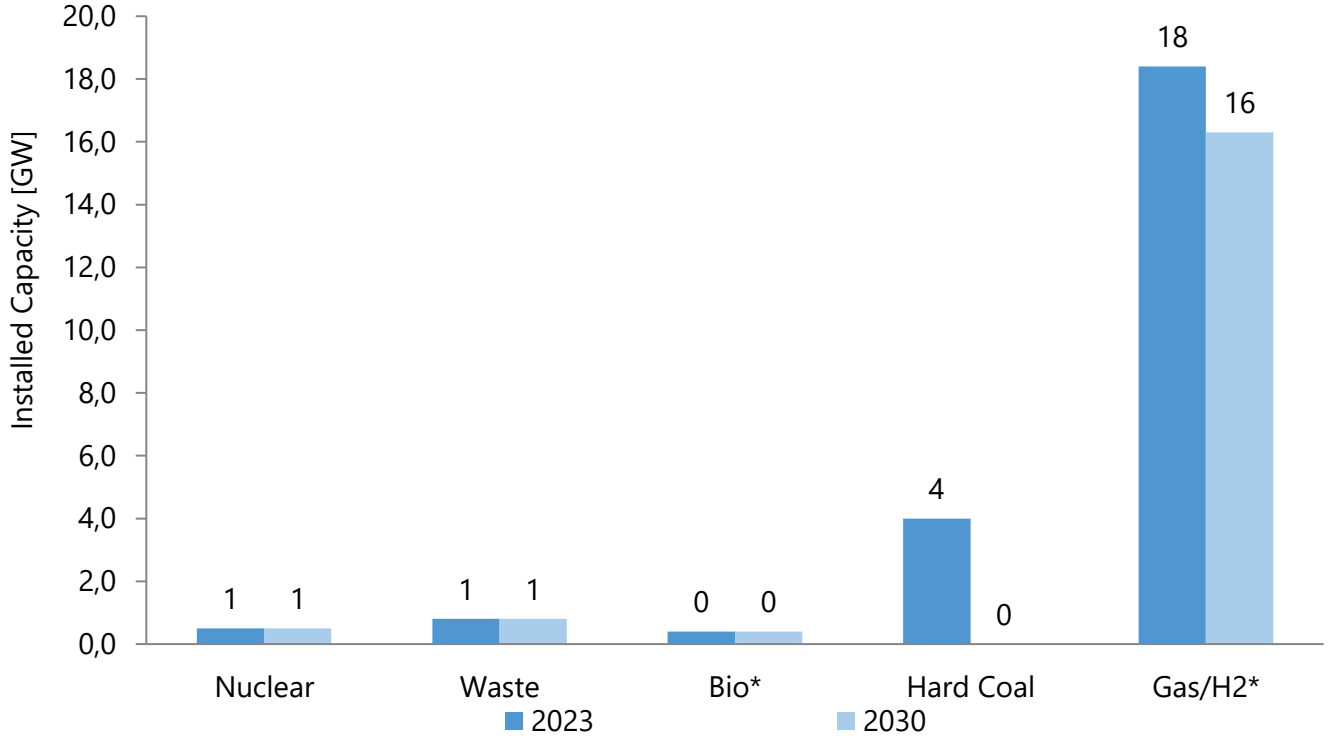
** The Netherlands is aiming to produce CO2-neutral electricity by 2035, with part of the mix being provided by nuclear power plants

The Netherlands has ambitious targets for increasing renewable energy supply, while it plans to phase out coal plants

Development targets for RES



Development of conventional power supply

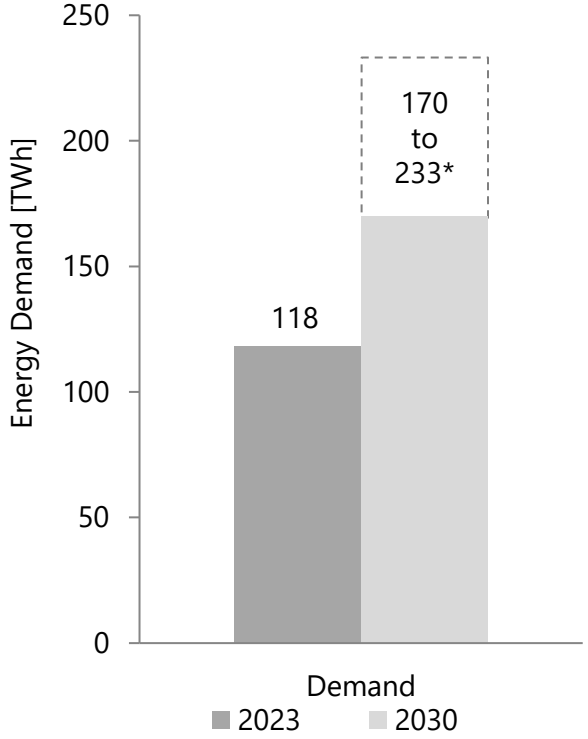


* Source: TenneT (p. 47)

Sources:
2023: Energy-Charts,
2030: NECP 2021/2030, TenneT

The energy supply will rely mainly on RES complemented by energy from gas-fired power plants

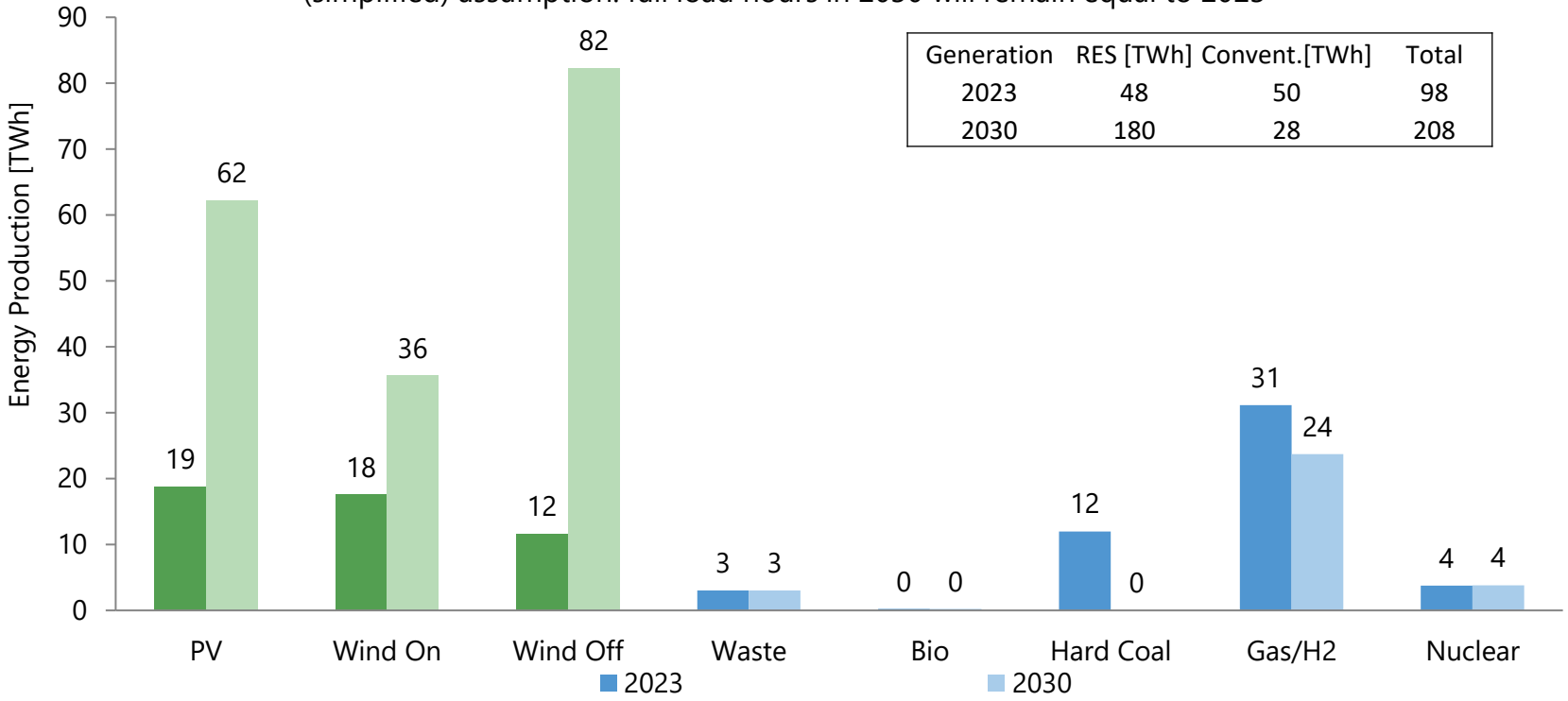
Development of demand



Development of energy production

(simplified) assumption: full load hours in 2030 will remain equal to 2023

Generation	RES [TWh]	Convent.[TWh]	Total
2023	48	50	98
2030	180	28	208



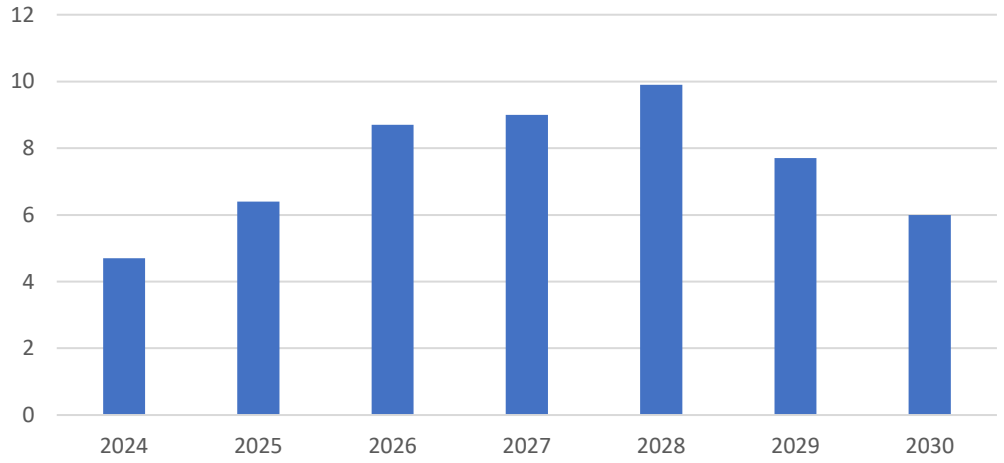
The Netherlands plans to rely especially on energy production from offshore wind, more than the other countries analysed in this study

Sources:
2023: Energy-Charts,
2030: NECP 2021/2030, TenneT

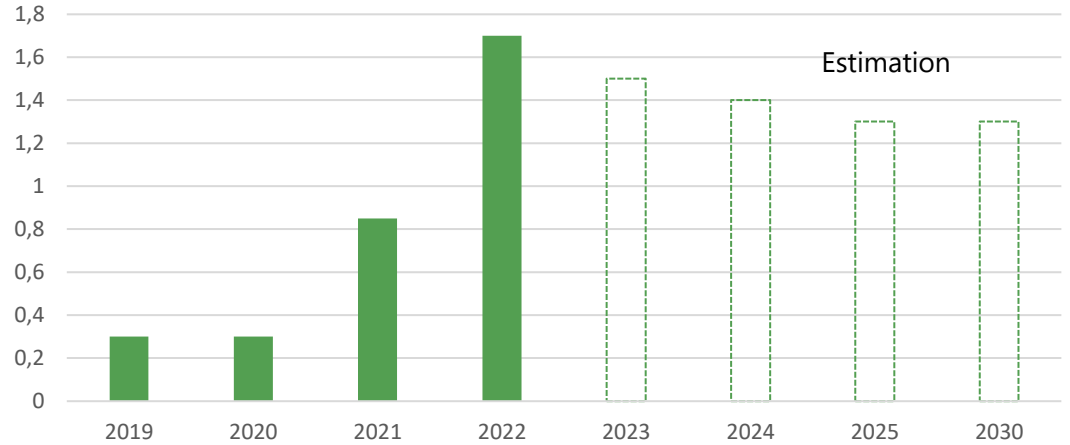
*TenneT, depending on scenario

Network investments and operational cost at high voltage level (TenneT)

Total investment volume (on & offshore) [bln EUR/a]*



Costs for system services, losses and congestion management [bln EUR/a]**



Investments:*

- Substantial investments of >4 bln EUR/a into high voltage network planned to facilitate network expansion and enforcement
- According to TenneT offshore grid investments are estimated at ca. 4,5 bln EUR/a; onshore grid investments at ca. 3,5 bln EUR/a.
- Expected **total investment** until **2030** amounts to ca. **52 bln EUR**.

Costs for system services, losses and congestion management**

- Operational costs of the high voltage network comprise the cost of grid losses; the costs of contracting balancing (reserve) capacity and the costs of redispatch (congestion management).
- Historical costs have been in the magnitude of 0,3 bln EUR/a.
- Since 2021 the increase of commodity prices and grid congestion operational cost have increased substantially to 1,7 bln EUR/a in 2022.
- Operational costs are estimated to stay elevated at an average of **1-1,5 bln EUR/a until 2030** driven by a decrease in commodity prices and an increase in redispatch cost.

* Source: TenneT ontwerpinvesteringsplan Januari 2024

** TenneT tariff prognosis 26.4.2023; future development uncertain

Companies of energy-intensive sectors were eligible to a compensation on the CO_2 component of electricity price

Companies of energy-intensive sectors, like i. a. production of various metals, hydrogen, chemicals, wood and paper (see Annex I for full list), were applicable to a compensation on the CO_2 component of the electricity price until the abolishment of the compensation scheme in 2023.

The method corresponded to the method specified by the EU in its guidelines:

- Calculation of the compensation either as a function of production volume or as a function of electricity consumption
  - for some products product-specific electricity efficiency benchmarks existed
  - for the rest of the products a general fallback efficiency benchmark existed
- The basic aid intensity was 75% of the indirect emission costs incurred
- Compensation was only applicable for energy consumption above 1 GWh/a
- The compensation was paid for the consumption in the previous year

Requirements:

- Beneficiaries had to reduce their greenhouse gas emissions by 3% per year compared to 2020 level
- Beneficiaries had to cover at least 30% of their consumption from carbon-free sources **or** invest at least 50% of their compensation in reductions of their emissions.

→ The Netherlands had a compensation of the indirect costs from the ETS in place, but the scheme was abolished in 2023 and is therefore no longer active

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Sources: [1], [2]

Fact sheet – network charges in the Netherlands

General information

- On TSO Level, there is no variable charge that is depending on the actual amount of Energy (kWh) used.
- Two different TSO network levels exist:
  - Extra high voltage level (EHS)
  - High voltage level (HS)
    → not relevant for this study

Composition

- Vastrecht: Fixed basic fee EUR/Year)
- Fixed charge depending on the contracted capacity (EUR/Year)
- Variable charge depending on the monthly peak (EUR/kW/month)
- Periodical connection tariff: Fixed Fee for covering the costs for managing the connection (EUR/year)
- Source

Network charges (Extra high voltage level)

Amount, annual change, development

- Vastrecht (fixed charge): **12.478,96 EUR/a**
- Contracted capacity: **60,65 EUR/kW*a**
- Charge on monthly peak: **6,91 EUR/kW**
- Periodical connection tariff: individual fee depending on connection of consumer

Network charge reductions

- No reductions apply in the Netherlands

Development of the offshore grid in the Netherlands costs billions of Euros and is paid by the customers over the network tariffs

Capacity and investments until 2030:

- Target 21 GW installed capacity
- Investment volume ca. 32 bln EUR*

Allocation of cost:**

- Costs for the offshore grid development phase II (completion in 2024 to 2030) are settled and paid back within the regular network tariffs of TenneT (just like regular onshore grid tariffs).
- During the construction phase only capital costs will be allocated in the network tariffs.
- When in operation also depreciation costs and maintenance costs will be allocated in the tariffs.

* Source: Ontwerpinvesteringsplan Net op zee 2024-2033; TenneT 2024; extrapolated

** ACM Methodebesluit Netbeheerder van het Net op Zee 2022-2026;

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France has set renewable energy targets but also replacing aging nuclear power plant fleet; Capacity Remuneration Mechanism introduced in 2020

- France decarbonization and renewable electricity targets:

	CO_2(GHG) target*	Renewable target
2023	25%	29%
2030	50%	45%**
2050	CO_2 neutral	N.A.

France passed the renewable acceleration bill in 2023; capacity target for offshore wind->18 GW/ 2035; onshore wind->35GW/ 2030; PV-> 60GW/030

Nuclear power dominating electricity supply (2023/67%). Plan to replace to be closed reactors by 2030 (4-6) and build additional 8 to meet CO_2 targets. Introduced CRM auctions in 2020 to secure supply in winter peak times.

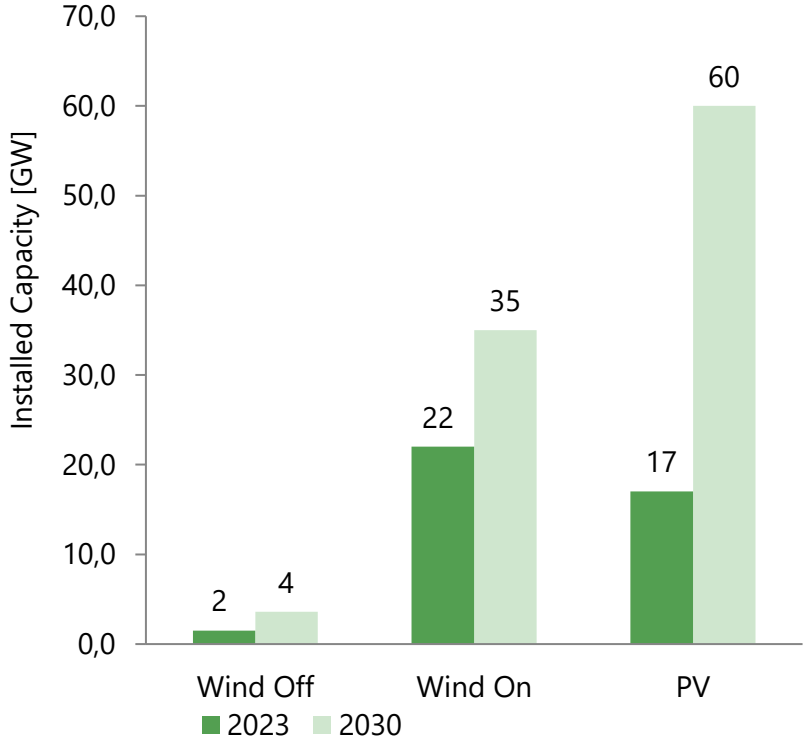
Need for grid expansion to integrate renewable supply. CRM market introduced for security of supply adequacy. Nuclear capacity to be expanded to meet CO_2 target and rising electricity demand

* compared to 1990; 2023 real; renewables: wind, solar

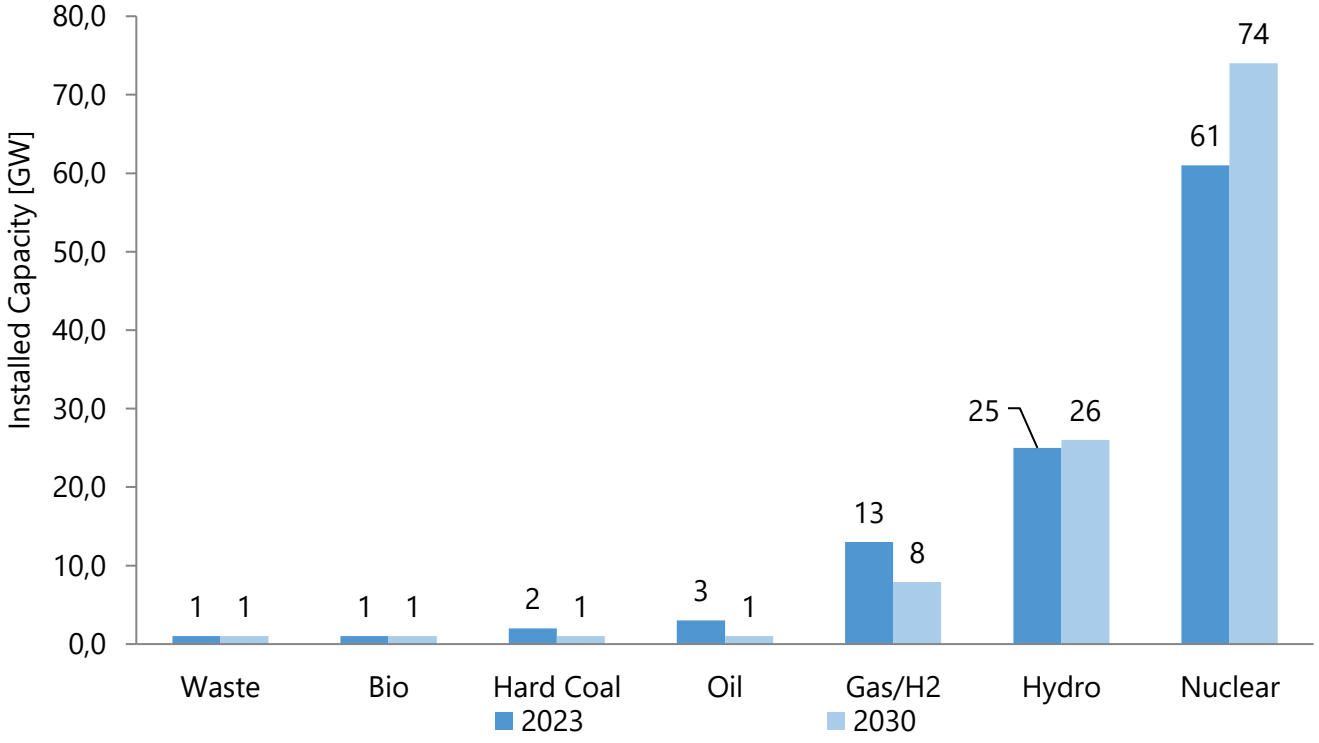
** expected; target N.A.

France plans to increase renewable energy supply especially from PV but will also increase its nuclear generation capacities

Development targets for RES



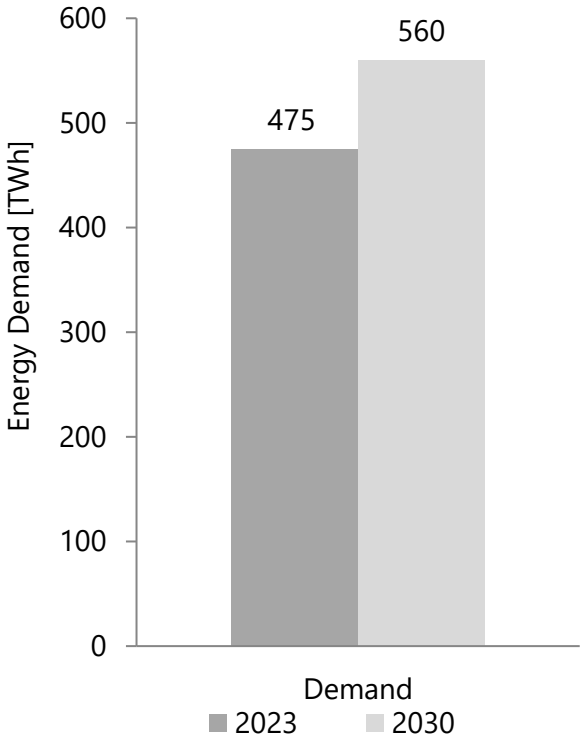
Development of conventional power supply



Sources:
2023: Energy-Charts,
2030: NECP 2021/2030

France’s energy production relies mainly on nuclear energy, PV and onshore wind

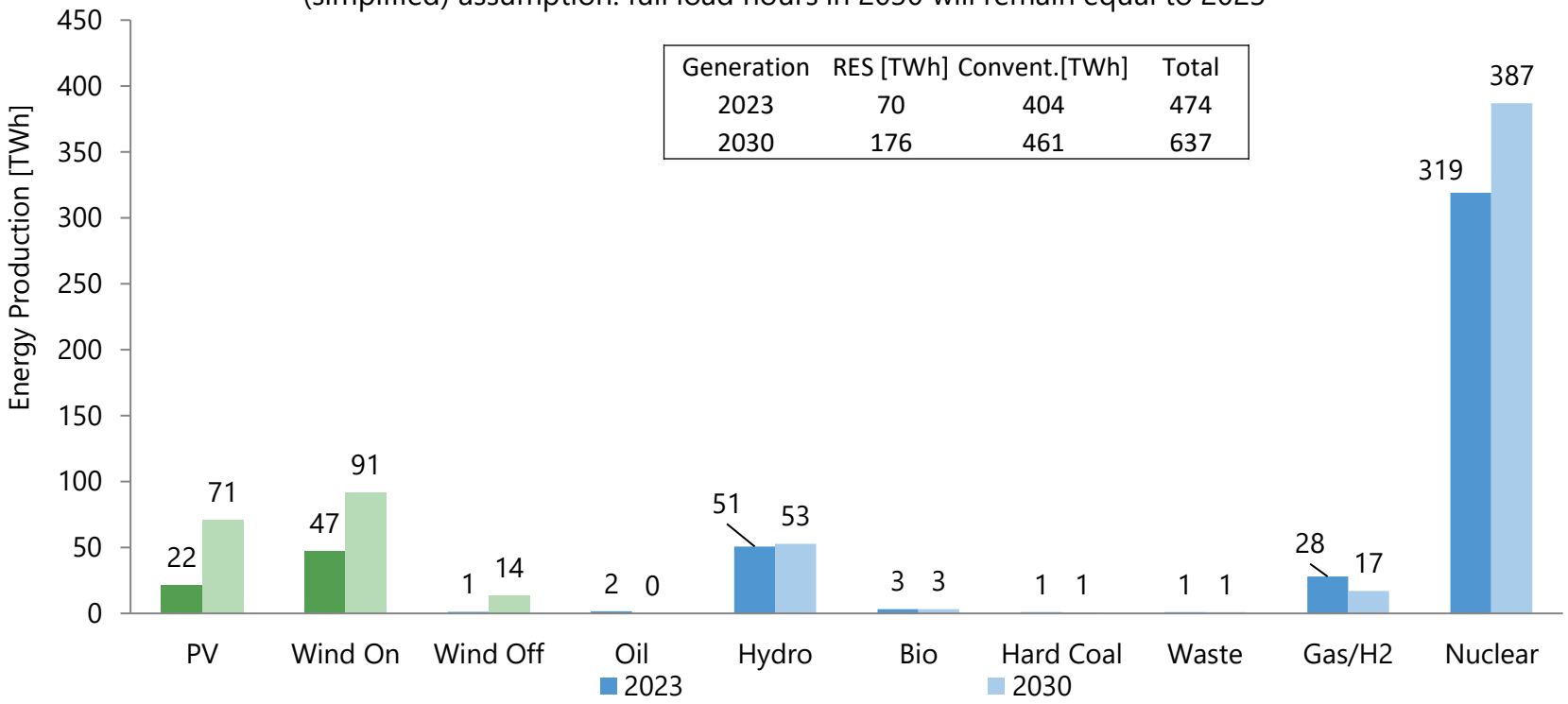
Development of demand



Development of energy production

(simplified) assumption: full load hours in 2030 will remain equal to 2023

Generation	RES [TWh]	Convent.[TWh]	Total
2023	70	404	474
2030	176	461	637

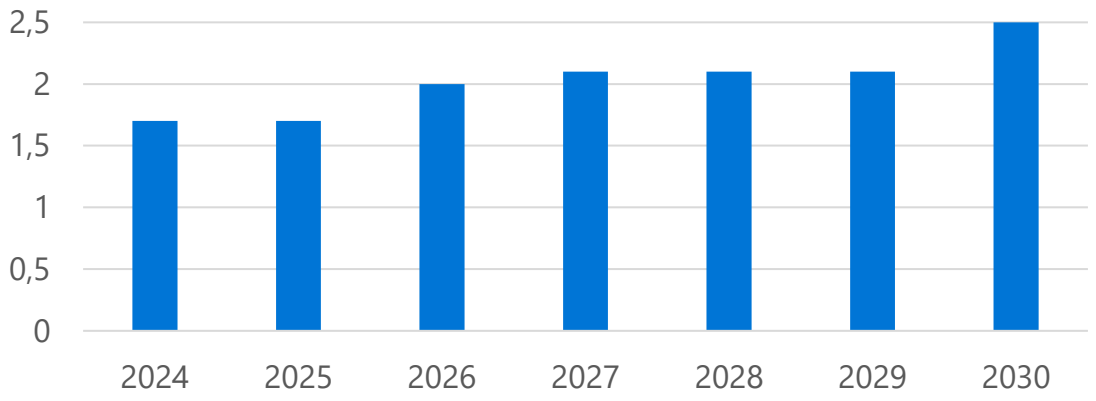


In contrast to the other countries analyzed, France will generate a major share of its energy from nuclear power plants. Energy production from hydro power plants is also more relevant in France than in the other countries, while offshore wind plays a minor role.

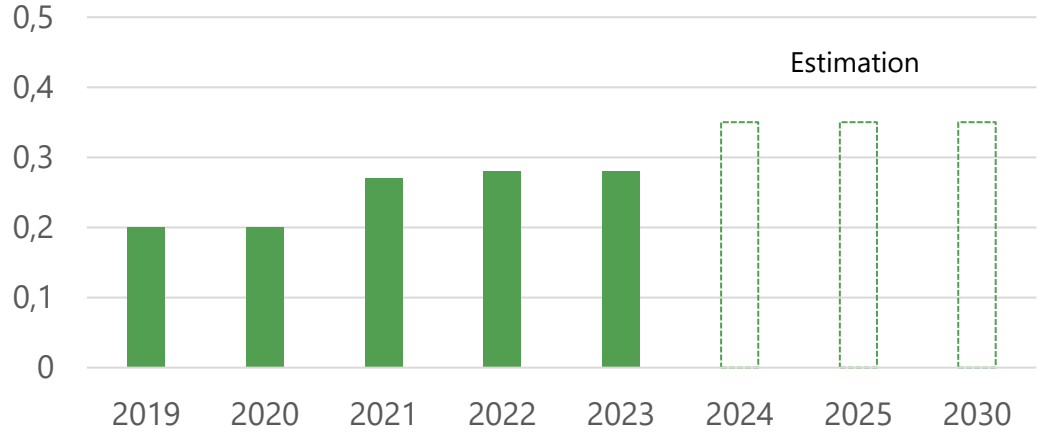
Sources:
2023: Energy-Charts,
2030: NECP 2021/2030

Network investments and expenditures high voltage level (TSO)

Total investment volume [bln EUR/a]*



Costs for system services, losses and congestion management [bln EUR/a]**



Investments:*

- Substantial investments of 1,7 – 2,5 bln EUR/a into high voltage network planned to facilitate network expansion and enforcement.
- According to the network development plan of the grid operators' offshore investments amount to ca. 7 bln EUR, onshore investments to ca. 7 bln EUR.
- Expected **total investment until 2030** amounts to ca. **14 bln EUR.**

Costs for system services, losses and congestion management**

- Operational cost of the high voltage network comprise the cost of grid losses; the cost of contracting balancing (reserve) capacity and the cost of redispatch (congestion management)
- Historical cost have been in the magnitude of 0,2 bln EUR/a.
- Since 2021 with the increase of commodity prices and grid congestion operational cost have increased substantially to 0,28 bln EUR/a in 2022.
- Operational cost are estimated to increase at an average of **0,3 – 0,4 bln EUR/a until 2030** driven by increase in congestion management cost.

* Source: RTE

** SDDR trajectories; future developments uncertain

Fact sheet – network charges in France

Network charges (Extra high voltage level)

General information

- On the highest grid level, there is only one variable charge
- On the lower grid level, seasonal variable charges apply
- Regulation is valid over a period of approximately 4 years (from 01. August 2021)
- Yearly changes to the tariffs are made and valid from 01. August of the respective year

Composition

- Management component: fixed basic fee in EUR/year
- Metering tariff in EUR/year
- Variable charge in EUR/MWh
- Source

Amount, annual change, development

- Management component: **10.032,24 EUR/a**
- Metering tariff:
  - **3.302,04 EUR/a** when meter is RTE owned
  - **592,80 EUR/a** when meter is self owned
- Variable charge: **3,50 EUR/MWh**

Network charge reductions

- **Stable profile**: > 7000h and > 10 GWh consumption → 81%
- **Anticyclical profile**: off-peak network utilisation rate greater than or equal to 0,44 and > 10 GWh consumption → 74%
- **Large consumer**: >500 GWh consumption; off-peak network utilisation rate ≥ 0,40 and < 0,44 → 76%

Companies of energy-intensive sectors are eligible to a compensation on the CO_2 component of electricity price

Companies of energy-intensive sectors, like i. a. production of various metals, hydrogen, chemicals, wood and paper (see Annex I for full list), are applicable to a compensation on the CO_2 component of the electricity price.

The method corresponds to the method specified by the EU in its guidelines:

- Calculation of the subsidy either as a function of production volume or as a function of electricity consumption
  - for some products product-specific electricity efficiency benchmarks exist
  - for the rest of the products a general fallback efficiency benchmark exists
- The basic aid intensity is 75% of the indirect emission costs incurred.
- Super cap: additional aid is paid for companies for which the remaining indirect costs (after compensation of 75%) exceed 1,5% of the company's gross value added. This additional aid may not exceed 25% of the costs of indirect emissions.
  → Overall aid intensity for these companies exceeds the basic aid intensity of 75%.
- The compensation is paid for the consumption in the previous year (in 2024 it is paid for 2023).

Requirements:

- Beneficiaries have to implement certain energy audit recommendations based on an energy performance plan of four years.

Sources: [1], [2], [3]

France has moderate offshore grid investment needs compared to Germany and the Netherlands

Capacity and investments until 2030:

- Target 4 GW** by 2030 installed capacity (8 GW by 2035)
- Investment volume ca. 7 bln EUR*

Allocation of cost:

- The developers are no longer liable for the costs of grid connection according to the Multi-year Energy Programming Law (PPE). RTE will be directly responsible for the connection of offshore wind farms.
- The cost of the connection is paid by consumers through the *tarif d'utilisation des réseaux publics d'électricité* (TURPE). It allows both the coverage of costs incurred by the TSO as well as their remuneration of investments.
- Since 2016, it has been possible for certain sites that consume large amounts of electricity to benefit from a reduction on TURPE and therefore to reduce the transmission part of their bill in return for the implementation of an energy performance policy. This reduction can reach up to 81% of the TURPE.

Sources: [1], [2], [3], [4]
*Estimation
** no specific target set for 2030

France enables its industrial customers to obtain a large share of nuclear power at a regulated low price through the ARENH scheme

The ARENH scheme (Accès Régulé à l'Electricité Nucléaire Historique, ARENH) enables electricity suppliers different from EDF to obtain part of the nuclear electricity production from EDF under specific conditions set by the French public authorities.

Method:

- The total amount of obtainable energy is capped at 100 TWh (25% of the historical yearly nuclear production) with a price of **42 EUR/MWh**.
- The amount of energy that a consumer can purchase at the ARENH price depends on consumption during the ARENH hours (see table). The share of consumption hours in the total ARENH hours multiplied by a reduction coefficient set by the regulatory authority (0.844 since 1 January 2024) results in the share of total consumption that can be covered with electricity at the ARENH price.
- If suppliers apply for more than 100 TWh in total, the amount the consumer receives gets reduced additionally. For 2024 suppliers applied for 130,41 TWh, this results in a reduction of 23,31%.
- Today the ARENH-scheme results in a 12% or 25% discount on commodity prices for electrolysers and baseload users respectively

		Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Weekdays	Hours between 1 and 7 AM												
	All hours												
Weekend + bank holidays	All hours												

Future of the ARENH scheme:

The scheme expires at the end of 2025 and will be replaced by a new scheme. The price of nuclear electricity will then be regulated at an average of 70 EUR/MWh. Additionally, a "rent capture mechanism" will be in place, which redistributes 50% of the extra revenue generated, if the price is above 78 EUR/MWh and 90% of the revenue if the price exceeds 110 EUR/MWh.
As 2030 prices are expected to be lower than 70 EUR/MWh, no price lowering effect is assumed in 2030.

Source: EDF, DFBEW

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Belgium: Nuclear phase out required introduction of Capacity Remuneration Mechanism to secure adequacy of supply – renewable energy target limited to offshore wind

- Belgium decarbonization and renewable electricity targets:

	CO_2 (GHG) target*	Renewable target*
2023	25%	30%
2030	55%	60%**
2050	CO_2 neutral	N.A.

Belgium wants to expand (intermittent) renewable capacity; capacity target for offshore wind -> 5.8 GW/2030, onshore wind -> 4.2GW/2030.

Hard coal has been phased out. Closure of 5 of the remaining 7 nuclear plants by 2025 (4 GW), 2 GW received 10-year lifetime extension to closed in 2035. Capacity Remuneration Mechanism was introduced in 2021. Belgium has awarded to 4.5 GW capacity guaranteed premiums from 2025/26.

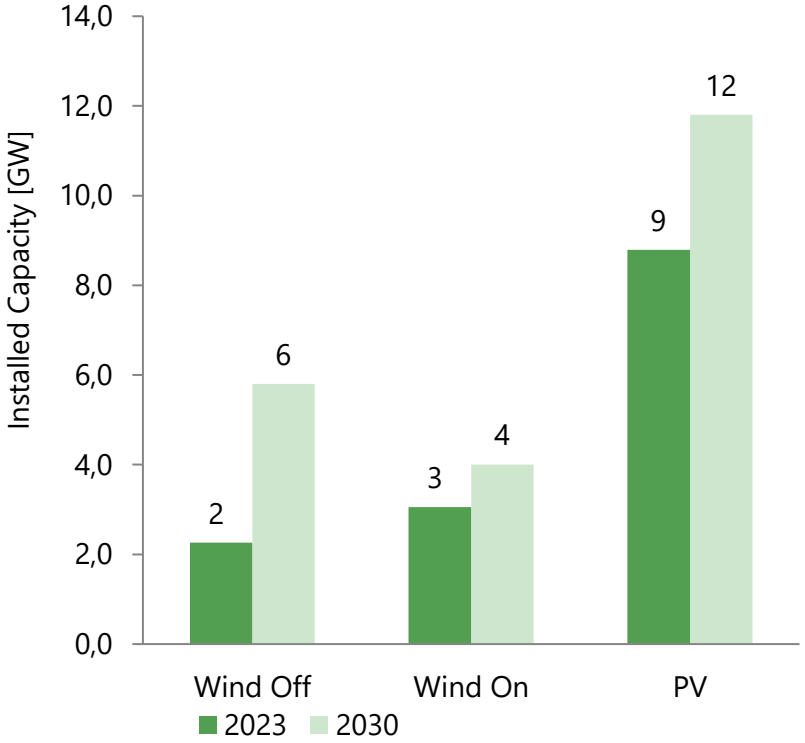
Need to replace phased-out nuclear capacity and reduce CO_2 emissions. CRM market incl. flexible supply (storages) introduced and to be continued. Plan to expand offshore wind by 2030 to 5.8 GW.

* compared to 2005; 2023 real; renewables: wind, solar

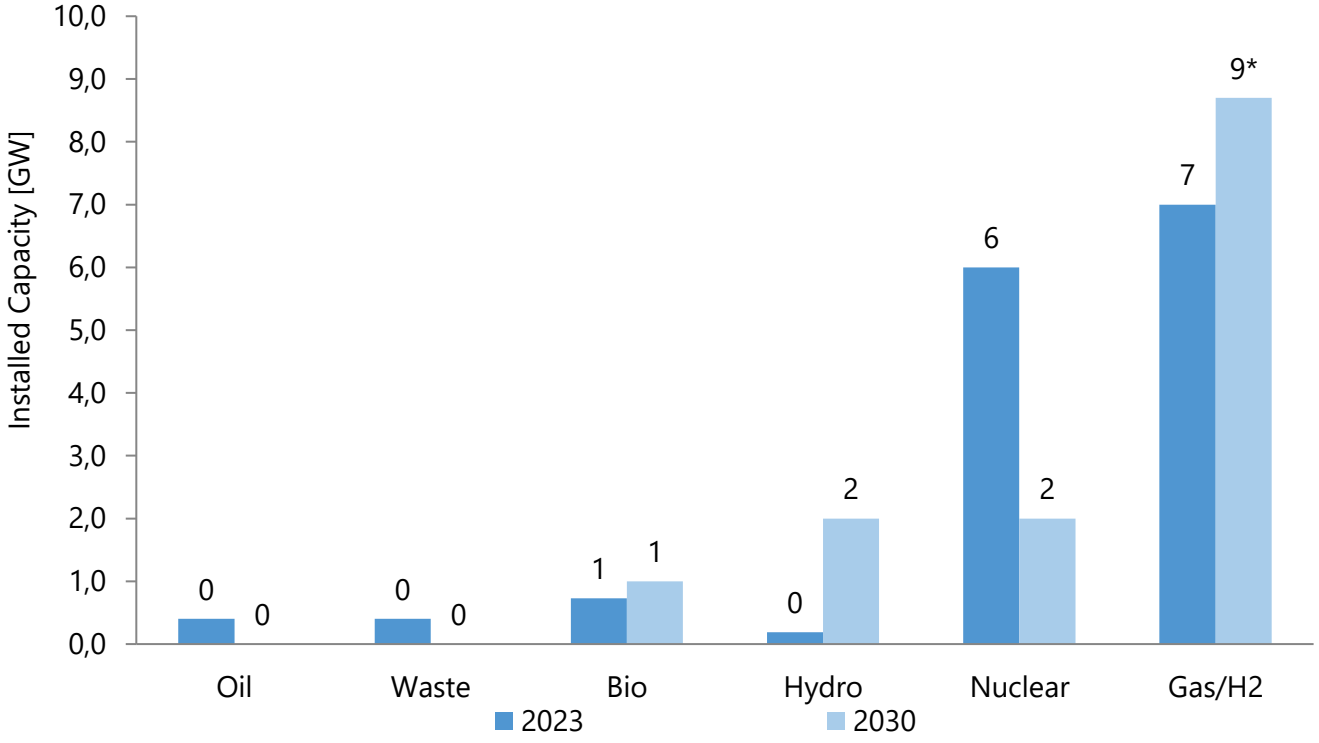
** expected; target N.A.

Belgium has ambitious targets for increasing renewable energy supply, while nuclear power plants are phased out

Development targets for RES



Development of conventional power supply [GW]

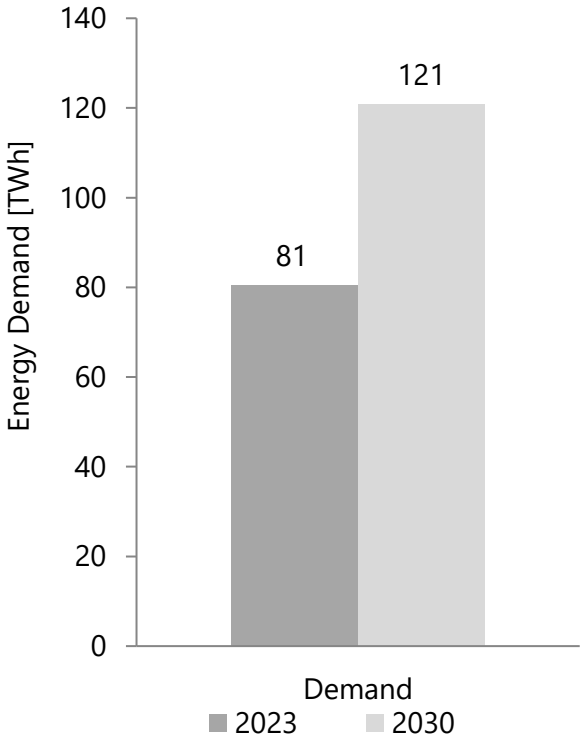


*new gas/H2 capacity part of CRM tenders

Sources:
2023: Energy-Charts, Elia Group
2030: NECP 2021/2030, Belgian Government

Belgium plans a sharp increase of energy from offshore wind

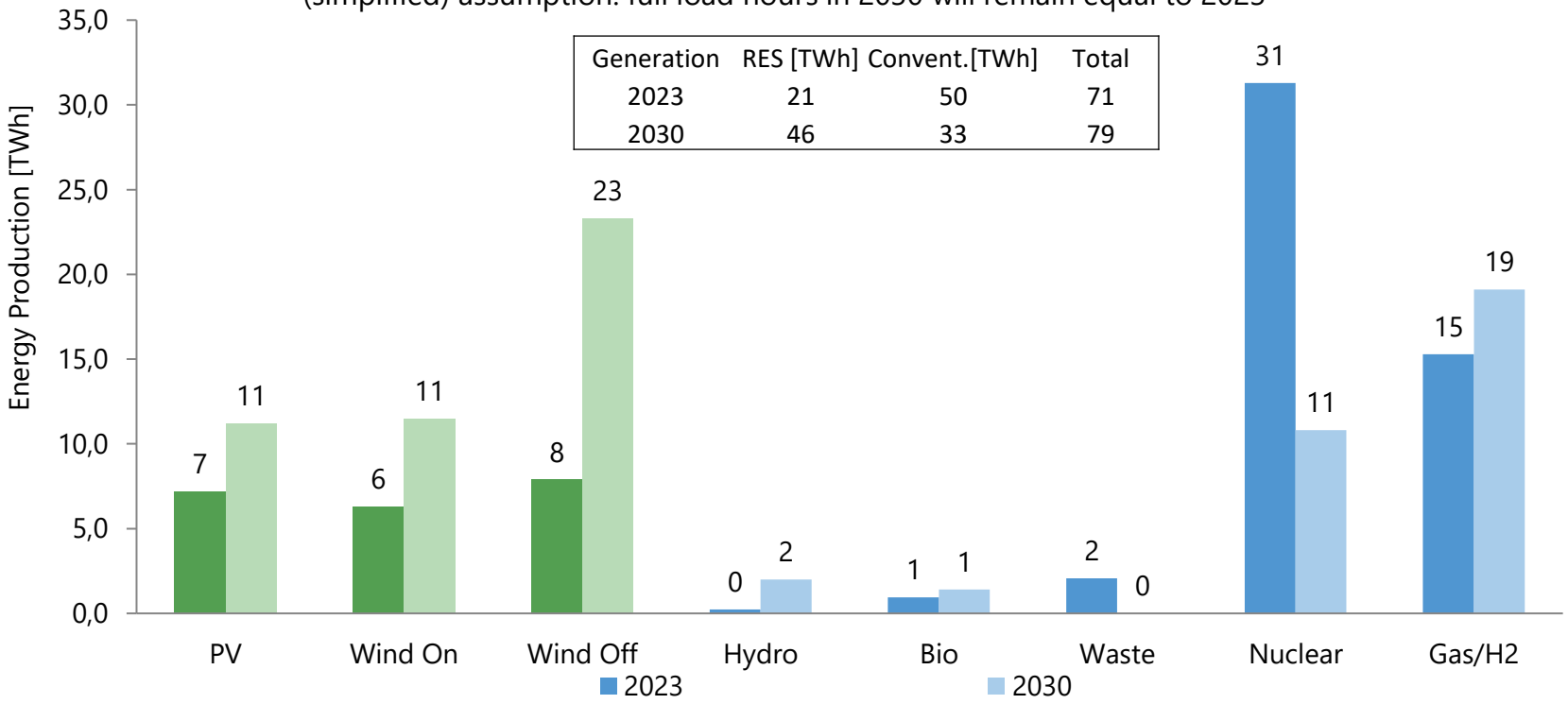
Development of demand



Development of energy production

(simplified) assumption: full load hours in 2030 will remain equal to 2023

Generation	RES [TWh]	Convent.[TWh]	Total
2023	21	50	71
2030	46	33	79

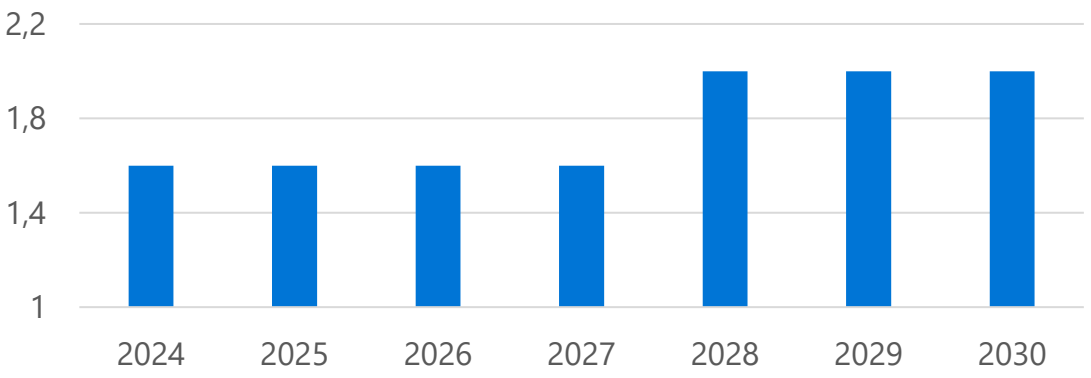


Belgium's strategy in 2030 is to rely on energy from RES accompanied by gas-fired power plants and the remaining nuclear capacity.

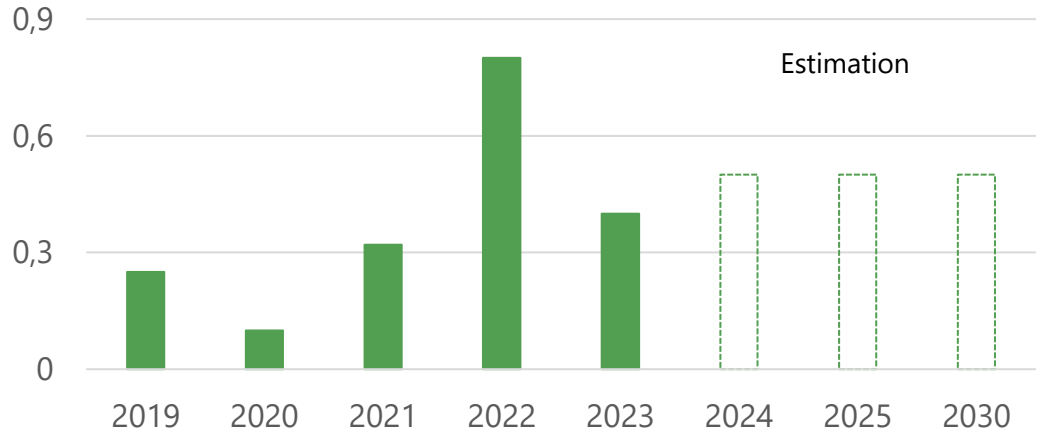
Sources:
2023: Energy-Charts, Elia Group
2030: NECP 2021/2030, Belgian Government

Network investments and operational cost at high voltage level

Total investment volume [bln EUR/a]*



Costs for system services, losses and congestion management [bln EUR/a]**



Investments:*

- Substantial investments of >1.5 – 2 bln EUR/a into high voltage network planned to facilitate network expansion and enforcement.
- According to ELIA offshore grid investments are estimated at ca. 8 bln EUR/a; onshore grid investments at ca. 4,4 bln EUR/a.
- Expected **total investment** until **2030** amounts to ca. **12,4 bln EUR**.

Costs for system services, losses and congestion management**

- Operational cost of the high voltage network comprise the cost of grid losses; the cost of contracting balancing (reserve) capacity and the cost of redispatch (congestion management)
- Historical cost have been in the magnitude of 0,25 bln EUR/a.
- Since 2021 with the increase of commodity prices and grid congestion operational cost have increased substantially to 0,8 bln EUR/a in 2022.
- Operational cost are estimated to stay elevated at an average of **0,5 bln EUR/a until 2030** driven by an increase in congestion management cost and a decrease in commodity prices.

E-Bridge competence in energy

* ELIA

** ELIA Opendata; future development uncertain

Fact sheet – network charges in Belgium

General information

- The tariffs are set for a period of 4 years (2024-2027) but differentiate for every year.

Composition

- Tariffs for the monthly offtake peak
- Tariffs for the annual offtake peak
- Tariff for power made available for offtake
- Tariffs for the management of the electricity system
- Tariffs for power reserves and black starts
- Market integration tariffs

- Source

Network charges (Extra high voltage level)

Amount, annual change, development

- Tariffs for the monthly offtake peak: **0,1986 EUR/kW*month**
- Tariffs for the annual offtake peak: **4,9552 EUR/kW**
- Tariff for power made available for offtake: **3,7292 EUR/kVA**
- Tariffs for the management of the electricity system: **0,2992 EUR/MWh**
- Tariffs for power reserves and black starts: **1,8002 EUR/MWh**
- Market integration tariffs: **0,3646 EUR/MWh**

Network charge reductions

- No reductions apply in Belgium

Energy-intensive companies are eligible to a compensation on the CO_2 component of the electricity price

Companies of energy-intensive sectors, like i. a. production of various metals, hydrogen, chemicals, wood and paper (see Annex I for full list), are applicable to a compensation on the CO_2 component of the electricity price.

The method corresponds to the method specified by the EU in its guidelines:

- Calculation of the subsidy either as a function of production volume or as a function of electricity consumption
  - for some products product-specific electricity efficiency benchmarks exist
  - for the rest of the products a general fallback efficiency benchmark exists
- The basic aid intensity is 75% of the indirect emission costs incurred
- Super cap in Flanders: additional aid is paid for companies in Flanders for which the remaining indirect costs (after compensation of 75%) exceed 1,5% of the company's gross value added.
  → Overall aid intensity for these companies can go up to 90%, which is the upper limit set by the Flemish government.
- The compensation is paid for the consumption in the previous year (in 2024 it is paid for 2023).

Requirements:

- Beneficiaries must have an electricity consumption of at least one GWh or their eligible activities (Flanders).
- Beneficiaries must have a certified energy plan or carry out an energy audit (Wallonia & Flanders) and implement the identified measures if economically feasible (Flanders).
- Beneficiaries have to submit a climate plan that draws the possible scenarios for the company to become carbon neutral by 2050 (Flanders).
- Beneficiaries have to invest at least 50% of the compensation in reduction of the company's emissions (Flanders).
- Beneficiaries have to implement the recommendations contained in the audit report if economically feasible **or** cover at least 30% of their electricity consumption from renewable sources **or** invest at least 50% of the compensation in reduction of the company's emissions (Wallonia).

E-Bridge
competence in energy

Sources: [1], [2], [3]

Offshore grid investments needs in Belgium are moderate compared to Germany and The Netherlands, but higher than France

Capacity and investments until 2030:

- Target 5.8 GW installed capacity
- Investment volume ca. 8 bln EUR*

Allocation of cost:

- Under the current market structure, the TSO Elia is responsible for the financing, construction, and operation of all offshore grid connections.
- The TSO is entitled to the reimbursement of these costs, which are ultimately included in an offshore grid levy to be paid by the end consumers.
- Since 01/01/2022 offshore grid development cost are paid by the consumers via special excise duty on electricity. This special excise duty is paid by every consumer, but the amount decreases with higher consumption.
- Large consumers (>100 GWh/a) paying a significantly lower amount of the excise duty (0,5 EUR/MWh).
- Electrolysers are exempted from the excise duty.

E-Bridge
competence in energy

Sources: [1], [2], [3], [4]

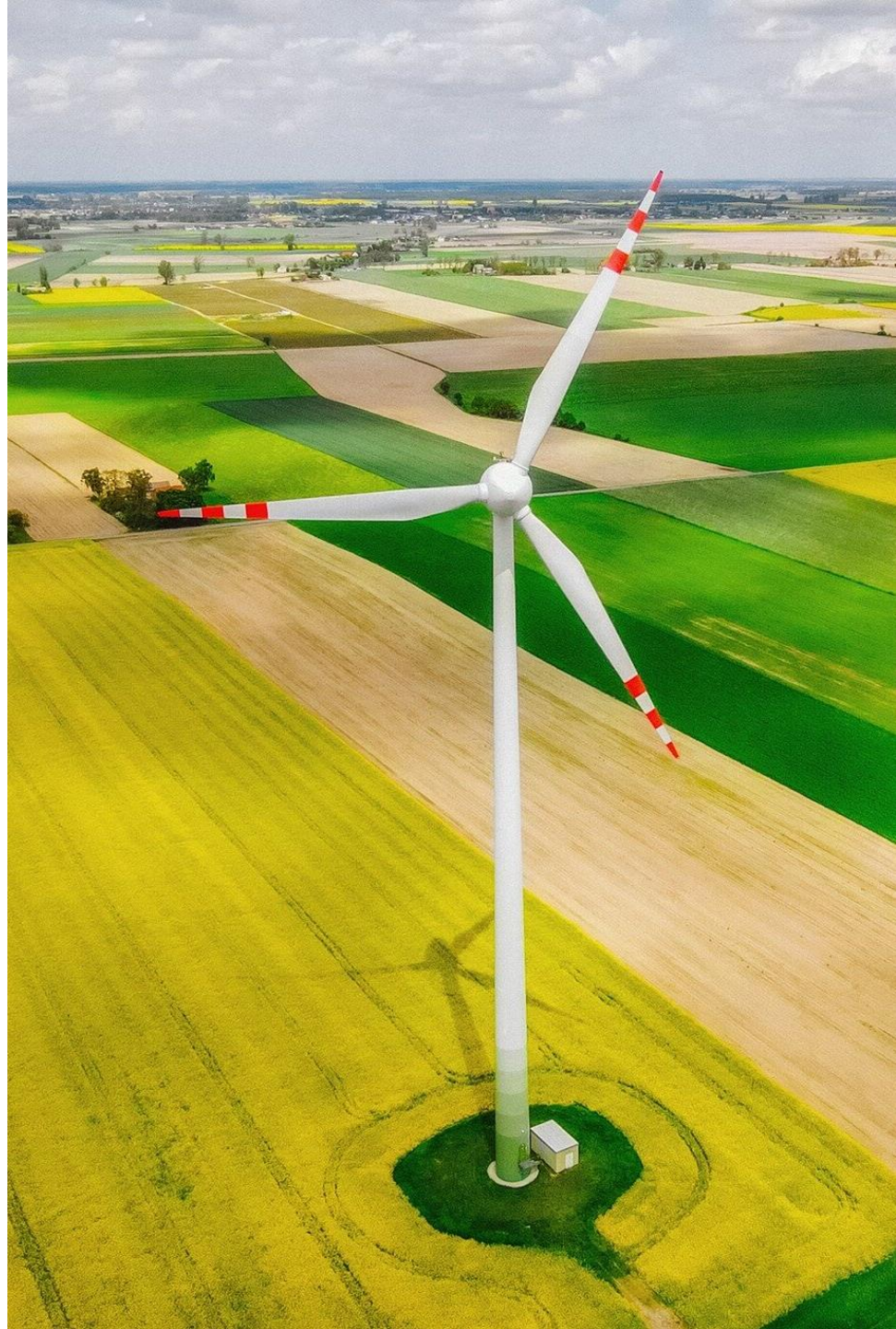
* Estimation

Belgium's three regions all have a certification scheme to promote renewable energy and CHP (1/2)

Background and regulation for energy producers

- The three regions in Belgium have implemented a Green Certificate scheme that promotes energy production from renewable source through a quota system based on the trade of certificates. Additionally, Flanders has implemented a Cogeneration Certificate scheme, which promotes primary energy savings through the use of qualitative CHP facilities.
- The number of Green Certificates producers of renewable energy receive is calculated by multiplying the amount of generated electricity with a technology dependent banding factor, in case of the Cogeneration scheme, one certificate is granted for every MWh of primary energy saved in a CHP facility.
- The trade of certificates is subject to federal legislation, while the quota obligations are defined in regional regulations. Producers can sell their certificates directly to suppliers on the market or to the federal grid operator ELIA at a minimum price set by law:
  - Flanders: 93 EUR per Green Certificate and 31 EUR per Cogeneration Certificate
  - Wallonia & Brussels: 65 EUR per Green Certificate

  ELIA sells these certificates in auctions that are held 2-3 times throughout the year.



E-Bridge
competence in energy

Sources: [1], [2], [3]

Belgium's three regions all have a certification scheme to promote renewable energy and CHP (2/2)

Regulation for energy consumers

- Electricity suppliers and access holders have to acquire a certain quota of Green and Cogeneration Certificates, if the quotas can't be fulfilled, the suppliers have to pay a fine.
  → These schemes represent **indirect costs for industrial companies**, as suppliers forward the costs to the consumer.
- The number of certificates needed for an energy supplier/access holder is calculated using C = Q x Ev, where Q is the applying quota and Ev is the electricity that was purchased. In Flanders and Wallonia a reduction for large energy consumer is possible.
- Super cap Flanders (7.1.11/1.): In Flanders the costs created by the financing subsidy for renewable energy and qualitative cogeneration are reduced to 0,5% of the gross added value when the company and/or site is part of a sector that has a considerable risk of delocalisation (see Annex IV/1 to Vlaamse Codex), and to 1% when it is part of a sector that has a risk of delocalisation (see Annex IV/1 to Vlaamse Codex).
- The certificate prices used for this study that are presented in the table equal the average price of certificates from the respective latest auction by ELIA (February 2024 for Flanders, June 2023 for Wallonia and Brussels).

Region	Price	Quota (Q)
Flanders (GC)	98,11 EUR/MWh	18%
Flanders (CHPC)	21,92 EUR/MWh	11,2%
Brussels	83,39 EUR/MWh	26,7%
Wallonia	65,51 EUR/MWh	40,28%

Cost for Certificates & Quotas

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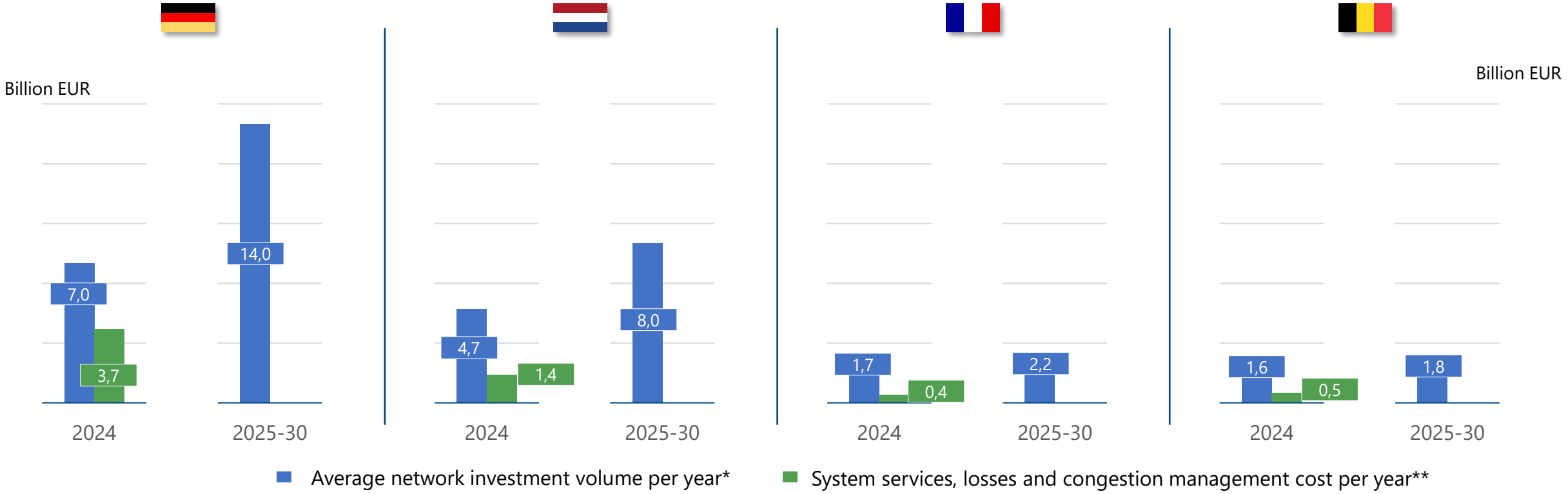
6 Annex

Comparison of network investments in transmission grid and costs for system services, losses and congestion management in 2024 and 2030



- Germany and the Netherlands have the highest investment needs in network extension and services with planed average annual investment volumes of approx. EUR 14 bln respectively EUR 8 bln. Relative to the expected total consumption in 2030 the Netherlands has by far the highest investments requirements.
- System service, losses and congestion management cost are significantly higher in Germany and the Netherlands compared to France and Belgium.

*Investmentplans TSO's

**Derived from Market Monitoring reports

Financing of offshore investments: Mechanism differs between countries - NL and FR finance via the network charges, DE and BE via separate levies

- The investment costs are paid by the electricity consumers via a separate offshore-levy.
- Reliefs exist for large consumers from electro-intensive sectors, electrolysers are fully exempt.

- The investment cost are paid by all electricity consumers via the network tariffs.

- The French TSO RTE covers its investment costs through the network charges (TURPE), which are paid by all electricity consumers.
- Large electricity consumers benefit from a reduction on TURPE and can reduce the transmission part of their bill in return for the implementation of an energy performance policy. This reduction can reach up to 81% of the TURPE.

- The investment costs are paid via an offshore levy which, together with all other surcharges at federal level, has been combined into a special excise duty in 2022.
- The special excise duty has to be paid by all consumers, but the rate decreases with higher consumption. Large consumers are paying a significantly lower excise duty. Electrolysers are fully exempt.

Conclusions energy policy

- All countries share a **common goal to reduce CO_2 emissions** and increase the share of renewable energy. **France's energy policy** is still centered around **nuclear energy. Germany has the most ambitious renewable energy targets**, has phased out nuclear and will shut down coal plants towards 2030.

- Germany, the Netherlands and Belgium are facing substantial **challenges to integrate the growing share of renewable resources** and to replace the conventional fossil capacity which will be phased out (coal, lignite, old gas plants).

- Particularly **Germany and the Netherlands** have ambitious targets to expand offshore wind installations. This requires **substantially larger investments** in **grid expansion** and **grid connections** relative to Belgium and France. These investments will have to be paid back which most likely will structurally increase network charges/offshore levies in these two countries.

- The **offshore wind network investment and construction costs** are financed in **Germany via a separate levy and scheme**. This provides legal and regulatory exemption options on the applicability of this levy for industry consumers. In the **Netherlands offshore network cost** are **included** in the **network tariffs. For Belgium,** the initial surcharge has been replaced by a **special excise duty** which is always passed on to end users' invoices albeit industry consumers are paying a lower amount.

- While **Belgium and France have introduced a capacity mechanism** to address security of supply concerns, **Germany** is planning to establish a **capacity market by 2028**. The **Netherlands** is currently the only of the 4 countries **without a capacity mechanism**. The costs of a capacity mechanism are mainly born by the end consumer and increase their overall electricity cost.

- **Germany** and especially **Belgium** potentially face a **supply gap towards 2030**. Germany has recently announced a power plant strategy of 10 GW dispatchable capacity which will receive state aid.

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4.1 Overview and explanation of electricity cost elements

4.2 Baseload user

4.3 Electrolyser

4.4 Comparison baseload user and electrolyser

4.5 Main drivers and conclusions

5 Outlook and country comparison electricty cost components 2030

6 Annex

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6 Annex

Germany: Explanation table incl. assessment I/II

Category	Cost component/ exemption	Calculation method	Explanation	Assessment (qualitative)	Potential changes in the next years
Taxes	Energy Tax	0,50 EUR/MWh 0 EUR/MWh for Elektrolysers	Reduced tax for companies § 9b StromStG Elektrolysers are fully exempt	Equals minimum tax set by the EU	The reduction initially only applies to the years 2024 and 2025. An extension until 2028 is planned, but counter-financing is necessary
Levies/Fees	Concession Fee	1,10 EUR/MWh	Levy to the municipalities in return for the use of public roads and paths for the installation of power lines	Low impact on overall bill	no changes expected in the next years
Exemptions	Relief on concession fee § 2 KAV	1,10 EUR/MWh	Relief on concession fee if electricity costs > 210,40 EUR/MWh Source	Relief likely for big industrial users	no changes expected in the next years
Network Charges	Fixed charge Source	158,98 EUR/kW*a 0 EUR/MWh for Elektrolysers	Paid for the yearly peak Elektrolysers are fully exempt	Hinders flexibility	no changes expected in the next years
Network Charges	Variable charge Source	11,20 EUR/MWh 0 EUR/MWh for Elektrolysers	Paid for consumption Elektrolysers are fully exempt	No difference if flexible or not	no changes expected in the next years
Exemptions	Individual network charges § 19 Abs. 2 StromNEV	Offtake hours ≥ 7000h: 80% reduction Offtake hours ≥ 7500h: 85% reduction Offtake hours ≥ 8000h: 90% reduction	Network charge relief for energy intensive industries Percentage equals the maximum reduction possible, the actual reduction can be lower	Depends on the individual user Large impact on costs for baseload users	no changes expected in the next years

Germany: Explanation table incl. assessment II/II

Category	Cost component/ exemption	Calculation method	Explanation	Assessment (qualitative)	Potential changes in the next years
Levies/Fees	§19-StromNEV-levy Source	6,43 EUR/MWh for the first 1 GWh For exceeding consumption either a) 0,50 EUR/MWh or b) 0,25 EUR/MWh if electricity costs > 4% of revenue	Levy to compensate grid operators for the reduction in revenue resulting from the grid fee relief for electricity-intensive industry	Depends on electricity intensity of the individual user	no changes expected in the next years
Levies/Fees	Offshore-levy Source	6,56 EUR/MWh 0 EUR/MWh for Elektrolysers	Levy to promote the construction and operation of offshore connection lines		no changes expected in the next years
Levies/Fees	CHP-levy Source	2,75 EUR/MWh 0 EUR/MWh for Elektrolysers	Levy to promote the generation of electricity from CHP		no changes expected in the next years
Exemptions	Relief on CHP- and Offshore-levy § 31 EnFG	Sector list 1 (Annex II): ▪ Limitation to 15% of the levies ▪ Further limitation to 0,5% of gross added value ▪ Limitation only until levies reach 0,50 EUR/MWh Sector list 2 (Annex II): ▪ Limitation to 15% of the levies, when significant portion of energy use from RES, otherwise 25% ▪ Further limitation to 0,5% of gross added value when significant portion of energy use from RES, otherwise 1% ▪ Limitation only until levies reach 0,50 EUR/MWh	Relief for electricity cost-intensive industries to limit the levies in order to maintain their international competitiveness.	Complex calculation, depends on the individual user	no changes expected in the next years
Exemption	Exemption from CHP- and Offshore-levy for electrolysers	Relief of 100%	Electrolysers that produce green hydrogen are fully exempt from the levies § 25 EnFG		

Germany: Calculation of the compensation on CO_2 component of electricity price

Method:

- For this study the general fallback efficiency benchmark is used: Starting from 0,8 in 2021 the factor is reduced by 1,09% annually from 2022.
  → 0,783 for compensation of costs from 2023 (for 2024: 0,774)
- Compensation is paid for the previous year, so the calculated value on this slide refers to the compensation for 2023.

Calculation:

- Aid intensity: 75%;
- Country specific CO_2 emission factor for Germany: 0,72 tCO_2/MWh (see Annex V for calculation)
- Efficiency benchmark: 0,783
- EUA price for the previous year (2022): 83,59 EUR/tCO_2
- Super cap: When remaining indirect costs after compensation of 75% exceed 1,5% of the company's gross value added, the exceeding part is also compensated.
- Although a "base amount" of 5% of the relevant EUA price, but at least 5 EUR/tCO_2, is excluded from the super cap.

→ Basic compensation: 83,59 EUR/tCO_2 * 0,72 tCO_2/MWh * 0,75 * 0,783 = **35,34 EUR/MWh**

→ Maximum compensation with super cap: (83,59 – 5) EUR /MWh * 0,72 = **56,58 EUR/MWh**

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Sources: [1], [2], [3]

Netherlands: Explanation table incl. assessment I/I

Category	Cost component/ exemption	Calculation method	Explanation	Assessment (qualitative)	Potential changes in the next years
Taxes	Energy Tax Source	1,88 EUR/MWh	Reduced tax for companies with over 10 GWh consumption Is determined every year	Comparably high taxes on energy	Strong increase in the last years → further increase likely
Exemptions	Energy tax reduction Source	521,81 EUR	Per connection Is determined every year	Amount not really relevant for industry with +500 GWh	No changes expected in the next years
Network Charges	Vastrecht Source	12.478,96 EUR	Fixed basic fee per year	Amount not really relevant for industry with > 500 GWh consumption	No changes in last years → no changes expected in the next years
Network Charges	Contracted Capacity Source	60,65 EUR/kW	Paid on the contracted maximum capacity Tariff for the extra high voltage level	Hinders flexibility	7-fold increase in the last 5 years (Source)
Network Charges	Charge on monthly peak Source	6,91 EUR/kW/month	Paid on the actual monthly peak Tariff for the extra high voltage level	Helps flexibility as it rewards for months with lower power use	No changes expected in the next years
Network charges	Periodical connection charge	1200 EUR/MW*km*a	Derived from this study where they calculate with 480 kEUR for a 400 MW battery This charge is individually calculated by TenneT for customers on the extra high voltage level	Depends on the individual customer and it's connection to the grid	No changes expected in the next years

France: Explanation table incl. assessment I/II

Category	Cost component /exemption	Calculation method	Explanation	Assessment (qualitative)	Potential changes in the next years
Electricity production costs	The ARENH scheme	ARENH price: 42 EUR/MWh For detailed calculation see here	100 TWh of energy from nuclear power plants can be obtained at a fixed price of 42 EUR/MWh Amount of energy that can be obtained at ARENH price by the individual customer depends on share of consumption hours during ARENH hours	Effectively lowers commodity cost in France, especially for large baseload consumers	ARENH scheme will expire at end of 2025 Afterwards the price of nuclear energy gets regulated to 70 EUR/MWh
Taxes	CTA Source	10,11% for connection to the transmission grid	Tax applied to the fixed component of the transmission tariff: ▪ Management component ▪ Metering cost	Amount not relevant for industry with > 500 GWh consumption	No changes expected in the next years
Taxes	Energy Tax (TICFE/CSPE) L312-65	**Energy intensive companies** Electro-intensity ≥ 0,5% → 7,50 EUR/MWh Electro-intensity ≥ 3,375% → 5 EUR/MWh Electro-intensity ≥ 6,75% → 2 EUR/MWh **Sector exposed to international competition** Electro-intensity ≥ 0,5% → 5,5 EUR/MWh Electro-intensity ≥ 3,375% → 2,5 EUR/MWh Electro-intensity ≥ 6,75% → 1 EUR/MWh **Sector with risk of carbon-leakage** Electro-intensity ≥ 13,5% → 0,50 EUR/MWh Electrolysers: 0,00 EUR/MWh	▪ Standard tax rate: 22,50 EUR/MWh (L312-37) ▪ Reduced rates for energy-intensive industries described in article L312-65 (Annex III) ▪ Additional reduced rates for companies exposed to international competition (L312-72, Annex III) ▪ Additional reduced rates for companies with risk of carbon leakage (L312-73, Annex III) ▪ Electrolysers are exempt from energy tax (L312-65, L321-66)	Depends on energy-intensity of the individual user	▪ Until 1st February 2024, a special reduced rate of 0,50 EUR/MWh for companies was in place ▪ From 1st February 2024 the reduced rates for energy-intensive industries described in article L312-65 of the CIBS apply

France: Explanation table incl. assessment II/II

Category	Cost component/ exemption	Calculation method	Explanation	Assessment (qualitative)	Potential changes in the next years
Network costs	Management Component Source	10.032,24 EUR/year	Composante annuelle de gestion	Amount not relevant for industry with > 500 GWh consumption	No changes expected in the next years
Network costs	Component for taking off electricity Source	3,50 EUR/MWh	Composante annuelle de soutirage	No difference if flexible or not	No changes expected in the next years
Network costs	Metering tariff Source	3.302,04 EUR/year (when RTE owned) 592,80 EUR/year (when self owned)	Composante annuelle de comptage	Amount not relevant for industry with > 500 GWh consumption	No changes expected in the next years
Exemptions	Network charge reduction Source	Reduction rate: ▪ Stable profile: 81% ▪ Anticyclical profile: 74% ▪ Large consumer: 76%	Stable profile: > 7000h and > 10 GWh consumption Anticyclical profile: off-peak network utilisation rate greater than or equal to 0.44 and > 10 GWh consumption Large consumer: >500 GWh consumption; off-peak network utilisation rate ≥ 0.40 and < 0.44;	Depends on the individual user High impact on costs especially for large baseload users (stable profile)	No changes expected in the next years

France: Calculation of the compensation on CO_2 component of electricity price

Method:

- For this study the general fallback efficiency benchmark is used: Starting from 0,8 in 2021 the factor is reduced by 1,09% annually from 2022.
  → 0,783 for compensation of costs from 2023 (for 2024: 0,774)
- Compensation is paid for the previous year, so the calculated value on this slide refers to the compensation for 2023.

Calculation:

- Aid intensity: 75%;
- Country specific CO_2 emission factor for France: 0,51 tCO_2/MWh (valid until 2025, will be updated for the 2026-2030 period, see Annex V for calculation)
- Efficiency benchmark: 0,783
- EUA price for the previous year (2023): 83,59 EUR/tCO_2
- Super cap: When remaining indirect costs after compensation of 75% exceed 1,5% of the company's gross value added, the exceeding part is also compensated.
- Compensation from super cap may not exceed 25% of the indirect costs occurred

→ Savings of 83,59 EUR/tCO_2 * 0,51 tCO_2/MWh * 0,75 * 0,783 = **25,03 EUR/MWh**
→ Maximum super cap: 0,25 * 83,59 EUR/tCO_2 * 0,51 tCO_2/MWh = **10,66 EUR/MWh**
→ Maximum total compensation: **35,69 EUR/MWh**

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Sources: [1], [2], [3]

Belgium: Explanation table incl. assessment I/III

Category	Cost component/ exemption	Calculation method	Explanation	Assessment (qualitative)	Potential changes in the next years
Network Charges	Tariffs for the management of the electric system Source	0,2992 EUR/MWh	Management charge	No difference if flexible or not	sharp increase after 2024 (2025: 2,5949 EUR/MWh; 2027: 2,7264 EUR/MWh)
Network Charges	Tariff for the monthly peak offtake Source	0,1986 EUR/kW	Each month the ten highest peaks measured are excluded. Tariff is then applied to the highest peak measured during the month	Helps flexibility as it rewards for months with lower power use	Sharp increase after 2024 (2025: 0,3950 EUR/kW; 2027: 0,5292 EUR/kW)
Network Charges	Tariff for the yearly peak offtake Source	4,9552 EUR/kW	Each month the ten highest peaks measured are excluded. The tariff is then applied to the highest peak measured during the annual peak tariff period.	Hinders flexibility	sharp increase after 2024 (2025: 9,8260 EUR/kW; 2027: 12,9893 EUR/kW)
Network Charges	Tariff for the power put at disposal Source	3,7292 EUR/kVA	Tariff on the power that is made available (similar to Tariff on contracted capacity in NL)	Hinders flexibility	sharp increase after 2024 (2025: 7,5485 EUR/kVA; 2027: 10,0215 EUR/kVA)
Network Charges	Tariff for the control energy and black-start Source	1,8002 EUR/MWh	Tariff to compensate imbalances	No difference if flexible or not	Decrease after 2025 (2026: 1,7108 EUR/MWh; 2027: 1.6203EUR/MWh)
Network Charges	Tariffs for market integration Source	0,3646 EUR/MWh	Tariffs for electricity market integration	No difference if flexible or not	Sharp increase in 2025 followed by a decrease until 2027

Belgium: Explanation table incl. assessment II/III

Category	Cost component/ exemption	Calculation method	Explanation	Assessment (qualitative)	Potential changes in the next years
Taxes	Special excise duty (On federal level) Source	0-20 MWh: 14,21 EUR/MWh 20-50 MWh: 12,09 EUR/MWh 50-1000 MWh: 11,39 EUR/MWh 1.000-25000 MWh: 10,69 EUR/MWh 25.000-100.000 MWh: 2,73 EUR/MWh > 100.000 MWh: 0,50 EUR/MWh Electrolysers: 0,00 EUR/MWh	Special excise duty for commercial consumers For each segment the respective excise duty has to be paid and accumulated in the end Electrolysers are exempt from the special excise duty (Art. 429)		No major changes expected
Levies	Flanders Levy for the taxes pylons and trenches Source	0,5429 in EUR/MWh	Regional levy		No major changes expected
Levies	Wallonia Connection fee Source	0,075 EUR for the first 0,1 MWh 0,3 EUR/MWh above 0,1 MWh	Regional fee Rate applicable for high voltage customers with consumption of >10 GWh		No major changes expected
Levies	Brussels Levy for road rights Source	4,1778 EUR/MWh	Regional levy compensating for use of the public road network in the Brussels-Capital Region		No major changes expected
Certificate schemes	Flanders Green Certificates	98,11 EUR/MWh * 18,0%	Quota: 18,0% (Art. 7.1.10) Only 18,0% of the consumption must be covered by certificates Prices from Elia	Easy to calculate	Quota will decrease to 9% in 2030
Exemption	Flanders Reduction of Green Certificates	Consumption from 1 to 20 GWh: 47% Consumption from 20 to 250 GWh: 80% Consumption above 250 GWh: 98%	The consumption that has to be covered can be reduced additionally (Art. 7.1.10)		No major changes expected

Belgium: Explanation table incl. assessment III/III

Category	Cost component/ exemption	Calculation method	Explanation	Assessment (qualitative)	Potential changes in the next years
Certificate schemes	Flanders Cogeneration Certificates (CHP)	21,92 EUR/MWh * 11,2%	Quota: 11,2% (Art. 7.1.11) Only 11,2% of the consumption must be covered by certificates Prices from Elia	Easy to calculate	Quota will increase to 14% in 2025 and remain stable until 2031
Exemption	Flanders Reduction of Cogeneration Certificates	Consumption from 1 to 20 GWh: 47% Consumption from 20 to 100 GWh: 50% Consumption from 100 to 250 GWh: 80% Consumption above 250 GWh: 85%	The consumption that has to be covered can be reduced additionally (Art. 7.1.11)		No major changes expected
Certificate schemes	Wallonia Green Certificates	65,51 EUR/MWh * 40,28%	Quota: 40,28% (Source) Only 40,28% of the consumption must be covered by certificates Prices from Elia		Quota will increase to 44,51% in 2030
Exemption	Wallonia Reduction of Green Certificates	Consumption from 0 to 5 GWh: 25% Consumption from 5 to 25 GWh: 50% Consumption from 25 to 75 GWh: 85% Consumption above 75 GWh: 90%	The consumption that has to be covered can be reduced additionally (Source)		No major changes expected
Certificate schemes	Brussels Green Certificates	83,39 EUR/MWh * 26,7%	Quota: 26,7% (Source) Only 26,7% of the consumption must be covered by certificates Prices from Elia		Quota will decrease to 20,6% in 2030

Belgium: Calculation of the compensation on CO_2 component of electricity price

Method:

- For this study the general fallback efficiency benchmark is used: Starting from 0,8 in 2021 the factor is reduced by 1,09% annually from 2022.
  → 0,783 for compensation of costs from 2023 (for 2024: 0,774)
- Compensation is paid for the previous year, so the calculated value on this slide refers to the compensation for 2023.

Calculation:

- Aid intensity: 75%
- Country specific CO_2 emission factor for Belgium: 0,51 tCO_2/MWh; (valid until 2025, will be updated for the 2026-2030 period, see Annex V for calculation)
- Efficiency benchmark: 0,783 EUA price for the previous year (2023): 83,59 EUR/tCO_2
- Super cap: When remaining indirect costs after compensation of 75% exceed 1,5% of the company's gross value added, the exceeding part is also compensated.
- Compensation with super cap may not exceed aid intensity of 90%.

→ Savings of 83,59 EUR/tCO_2 * 0,51 tCO_2/MWh * 0,75 * 0,783 = **25,03 EUR/MWh**
→ Maximum compensation with super cap:
83,59 EUR/tCO_2 * 0,51 tCO_2/MWh * 0,90 * 0,783 = **30,04 EUR/MWh**

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Sources: [1], [2], [3]

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Assumptions for the “baseload” profile user case

General assumptions

- Consumption per year: 1.000.000 MWh (1 TWh)
- Full load hours: **8000 h**
- (monthly) peak load: 125 MW
- Connection to the highest voltage grid level of the transmission grid in each country (220/380KV)
- Gross added value high enough that no super caps are applicable

For some country specific taxes, levies, exemptions or network charges more detailed assumptions are necessary, these are presented in Annex VI.

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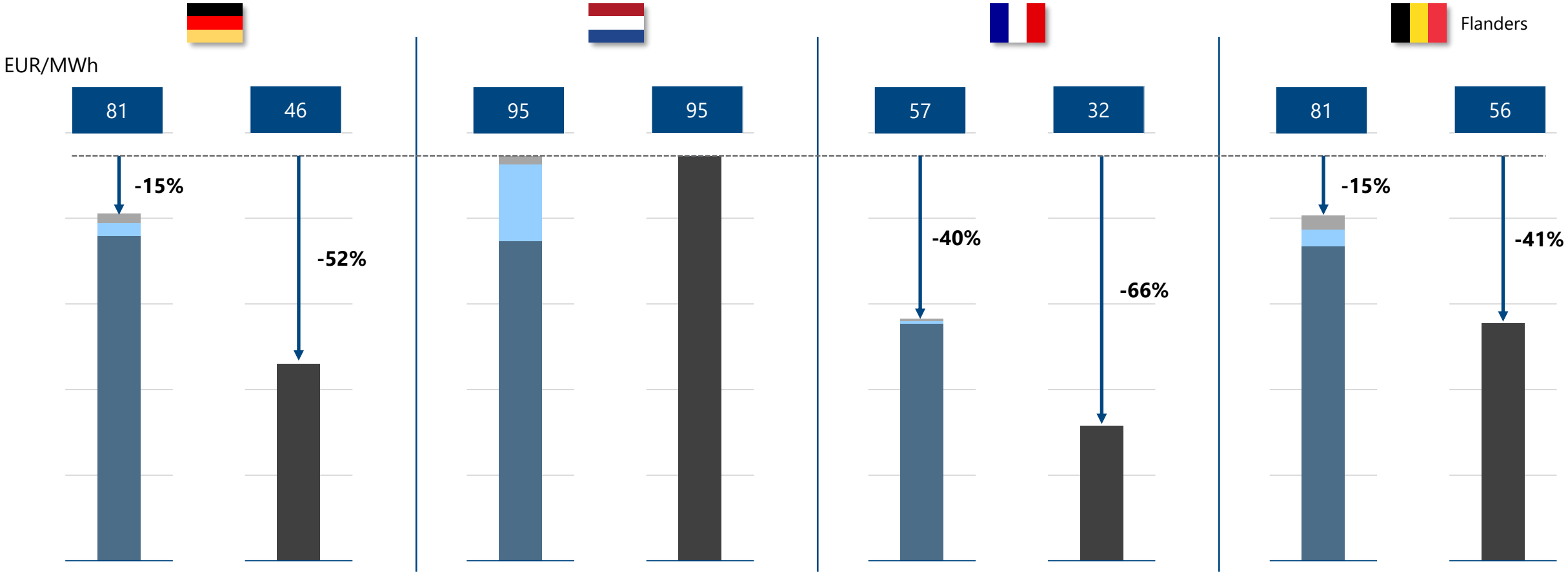
Baseload user: Effective electricity costs with and without indirect cost compensation in **2024**



Baseload user:
1 TWh/a, 8000 FLH
125 MW capacity

Price without indirect cost compensation

- Taxes, levies, subsidies and exemptions
- Network charges
- Electrical energy costs

Price with indirect cost compensation

- Price with indirect cost compensation

Applicable sectors:
production of various metals, hydrogen, chemicals, wood and paper

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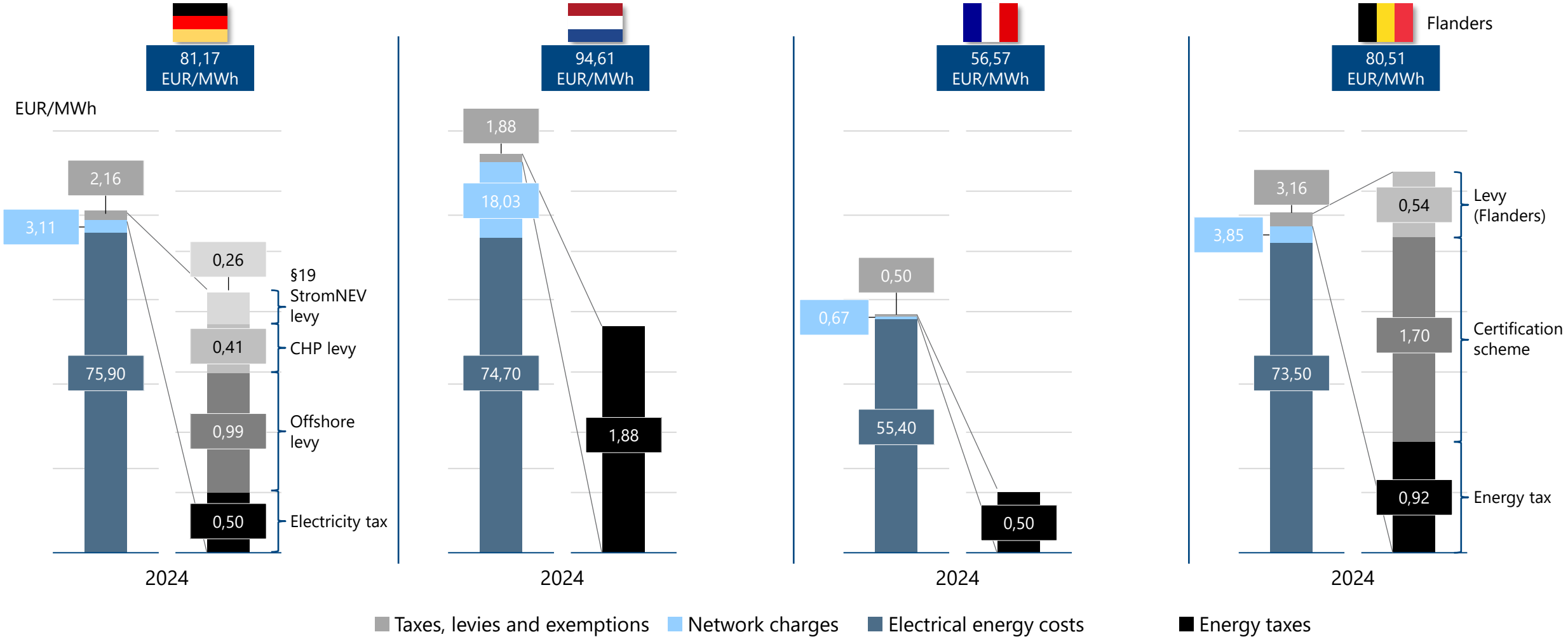
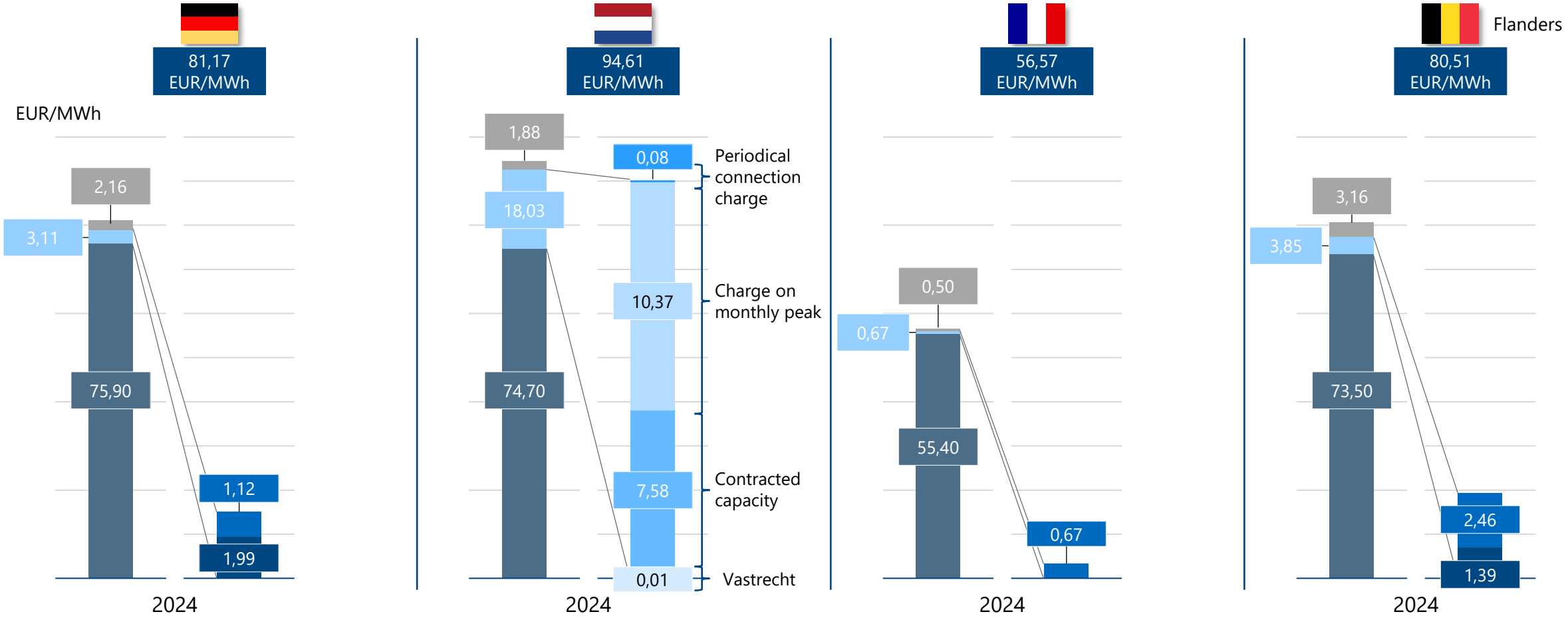
Baseload user: Taxes, levies, fees divided by component in **2024**



Baseload user: Network charges divided by component in **2024**



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Germany: Taxes, levies and exemptions for an industrial baseload user (1 TWh/a) in **2024**

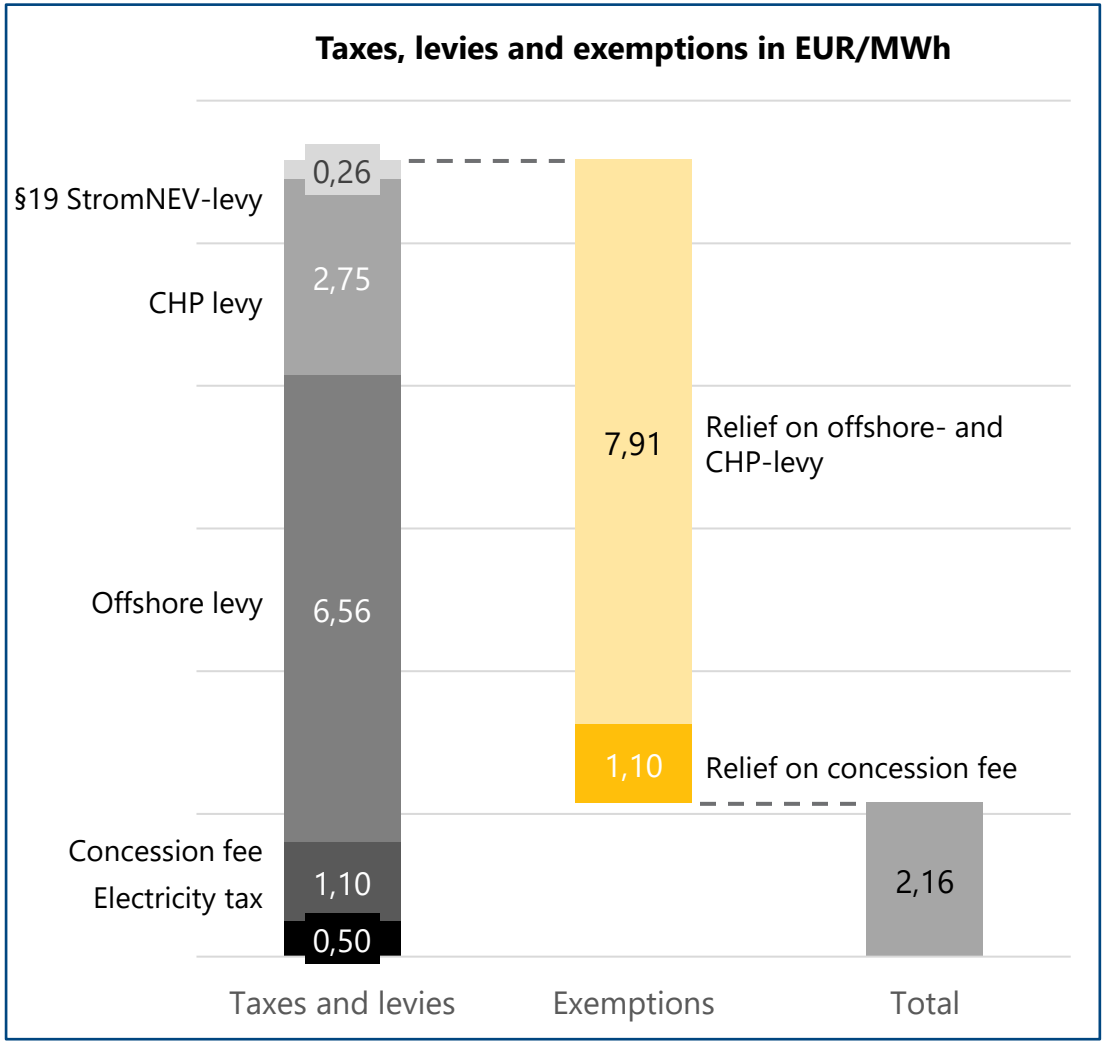
Taxes, levies and fees:

- Electricity tax: **0,50 EUR/MWh**
- Offshore-levy: **6,56 EUR/MWh**
- KWK-levy: **2,75 EUR/MWh**
- §19 StromNEV-levy:
  - **6,43 EUR/MWh** for the first 1000 MWh
  - For every MWh exceeding this: **0,25 EUR/MWh**
  - For 1 TWh → **0,26 EUR/MWh**
- Concession fee: **1,10 EUR/MWh**

Exemptions:

- Relief of **100%** of the concession fee → **1,10 EUR/MWh**
- Relief of **85%** of the offshore and CHP levy for energy consumption over 1000 MWh (not the first 1000 MWh)
  → **7,91 EUR/MWh**

→ Resulting taxes, levies and fees: **2,16 EUR/MWh**



Germany: Network charges and individual network charges for an industrial baseload user (1 TWh/a) in **2024**

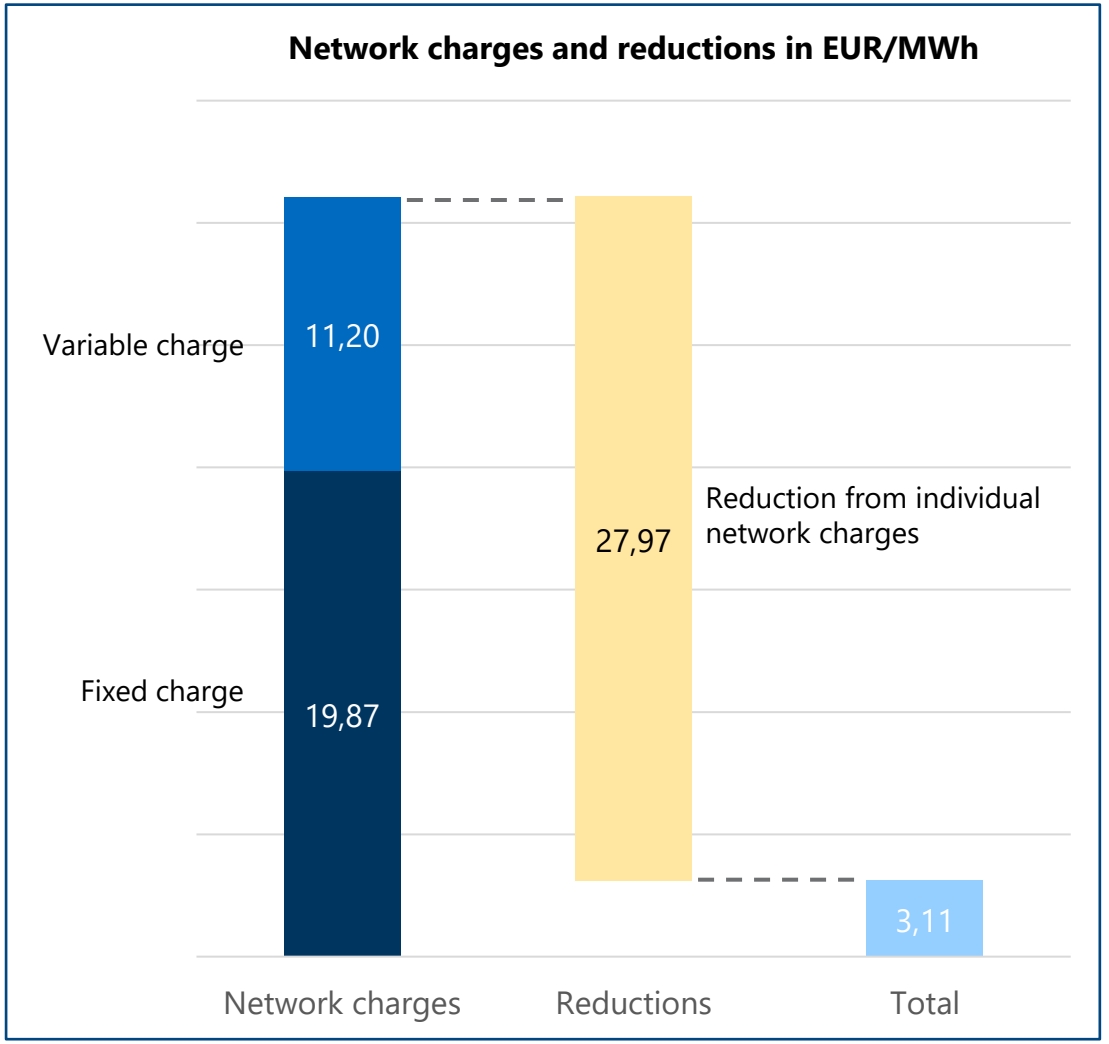
Network charges

- Fixed charge: **158,98 EUR/kW**
  - Peak Load: 125 MW → **19,87 EUR/MWh**
- Variable charge: **11,20 EUR/MWh**

Network charge reduction

- Individual network charges for >8000 FLH: 90% reduction possible → **27,97 EUR/MWh**

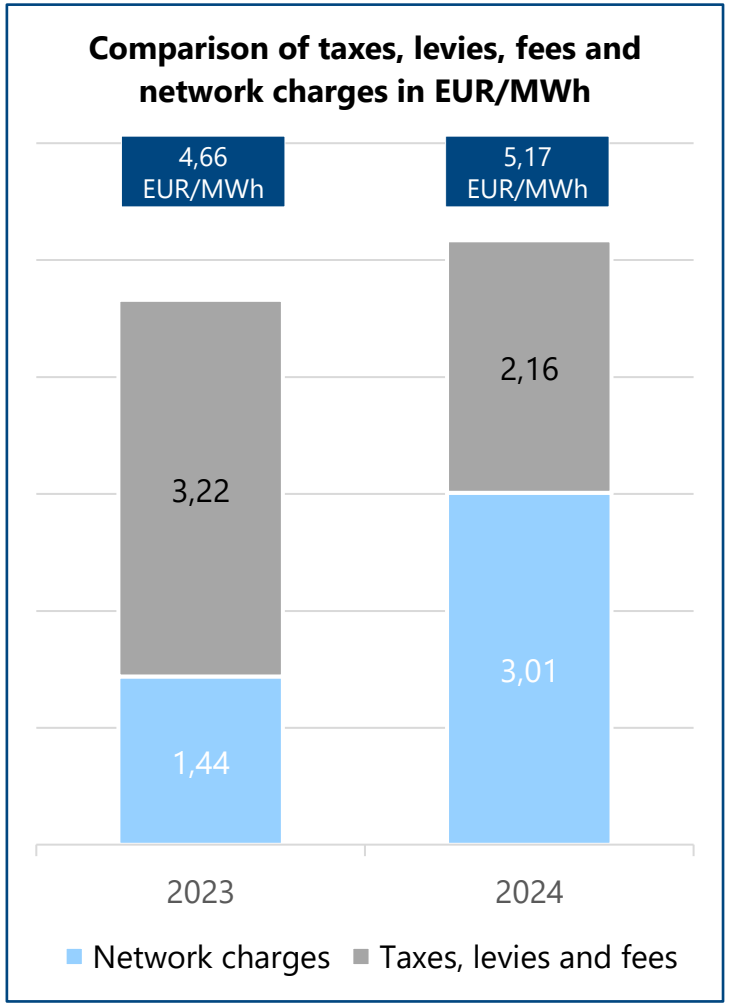
→ Resulting network charges: **3,11 EUR/MWh**



Germany: Comparison of taxes, levies, fees and network charges for a baseload user in 2023 and 2024 with exemptions or subsidies

- Taxes, levies and fees contains electricity tax, offshore, CHP and §19 StromNEV levy and a concession fee.
  - Difference between 2023 and 2024 mainly due to **tax reduction**
  - Also: increase in offshore levy (2023: 5,91 EUR/MWh → 2024: 6,56 EUR/MWh)
  - Also: decrease in CHP levy (2023: 3,57 EUR/MWh → 2024: 2,75 EUR/MWh)

- Network charges are made up of a capacity price and a working price
  → difference between 2023 and 2024 due to doubling of network charges due to **ending subsidies**



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Netherlands: Taxes, levies and exemptions for an industrial baseload user (1 TWh/a) in **2024**

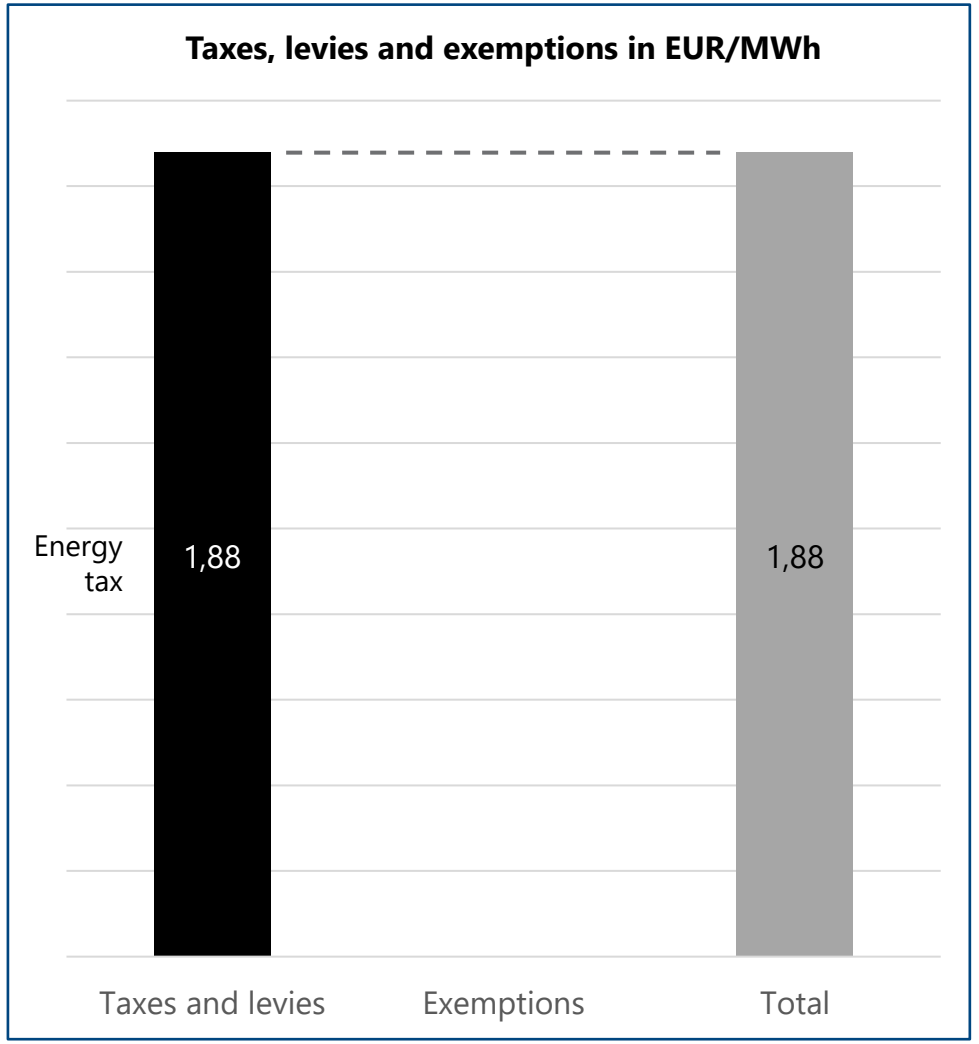
Taxes, levies and fees:

- Energy tax: **1,88 EUR/MWh**

Exemptions:

- Energy tax reduction: **521,81 EUR → 0,005 EUR/MWh**

→ Only taxes apply in the amount **1,88 EUR/MWh**

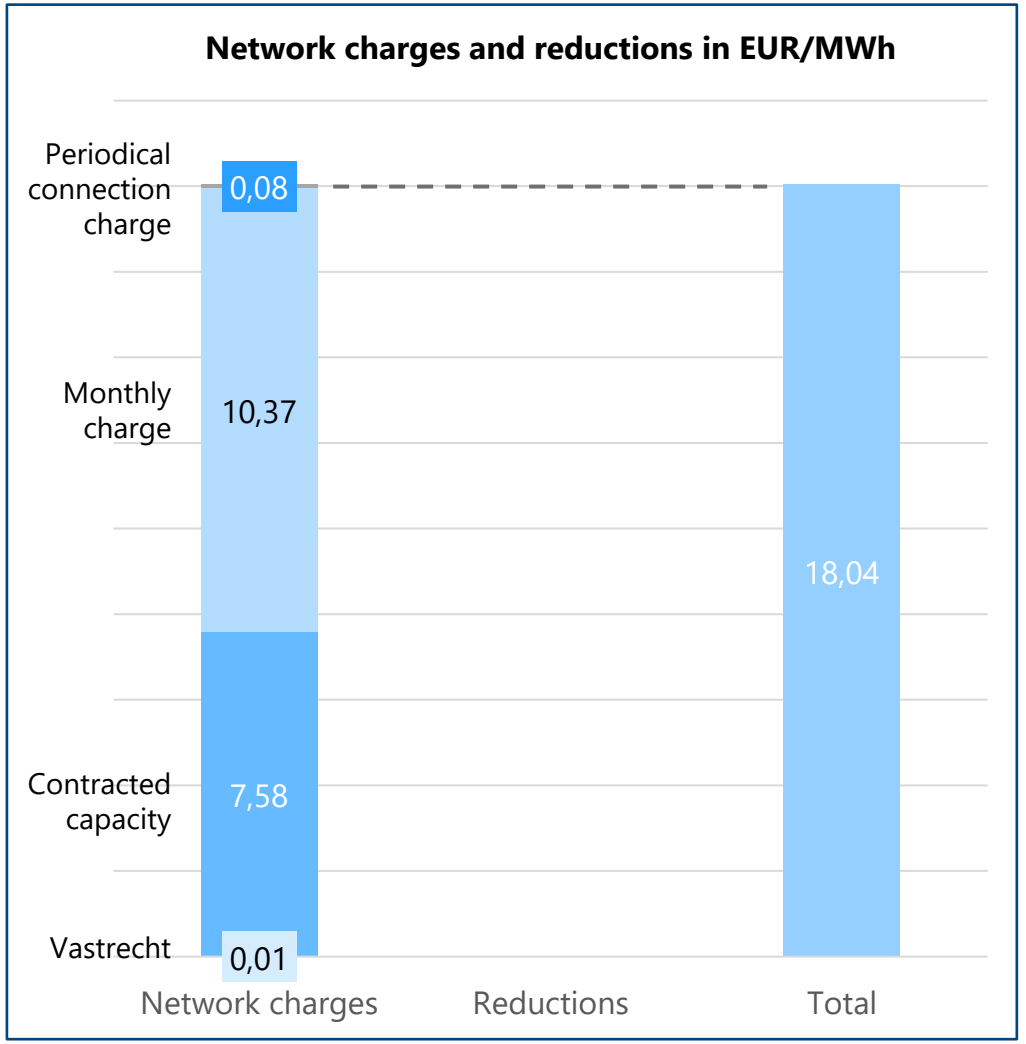


Netherlands: Network charges for an industrial baseload user (1 TWh/a) in **2024**

Network charges

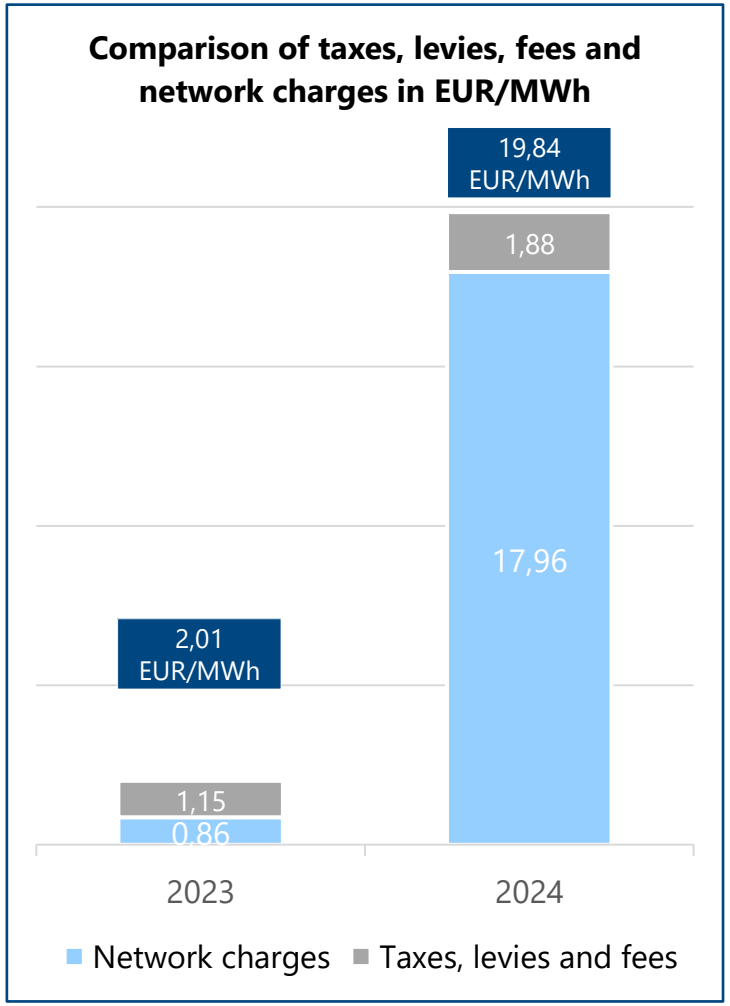
- Vastrecht: 12.478,96 EUR/a → **0,0125 EUR/MWh**
- Contracted capacity: 60,65 EUR/kW
  - Contracted Capacity/Peak load: 125 MW → **7,58 EUR/MWh**
- Charge on monthly peak: 6,91 EUR/kW/month
  - Average monthly peak load: 125 MW → **10,37 EUR/MWh**
- Periodical connection charge: 75.000 EUR/a → **0,075 EUR/MWh**

→ Network charges amount to **18,04 EUR/MWh**



Netherlands: Comparison of electricity costs for a baseload user in 2023 and 2024 without exemptions or subsidies

- Energy taxes increased from 1,15 EUR/MWh to 1,88 EUR/MWh.
- Network charges increased sharply as the reduction scheme (Volumecorrectie) was abolished as of 2024. With the reduction scheme a **reduction of up to 90%** was possible (in the graph on the right, a reduction of 90% is assumed).
- Furthermore, as the charge for contracted capacity and the charge on the monthly peak both doubled, the network charges itself increased as well.



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France – Influence of the ARENH scheme on commodity prices of the baseload user

Share of hours in operation during ARENH hours

- Constant load → 8000 h / 8760 h = **91,32%**

Capping of the overall amount of energy available under ARENH

- Requested amount of energy for 2024: 130,41 TWh (Source)
- Necessary reduction: (130,41 TWh – 100 TWh) / 130,41 TWh = **23.31%**

Percentage of consumption that can be obtain under ARENH scheme

- Necessary reduction of operation hours during ARENH hours: 91,32% * (1 - 23,31%) = **70,03%**
- Applying adjustment factor: 70,03% * 0,844 = **59,11%**

Resulting commodity price for baseload users

- Commodity price: 59,11% * ARENH price + 40,89% * market price → 59,11% * 42 EUR/MWh + 40,89% * 74,73 EUR/MWh = **55,38 EUR/MWh**

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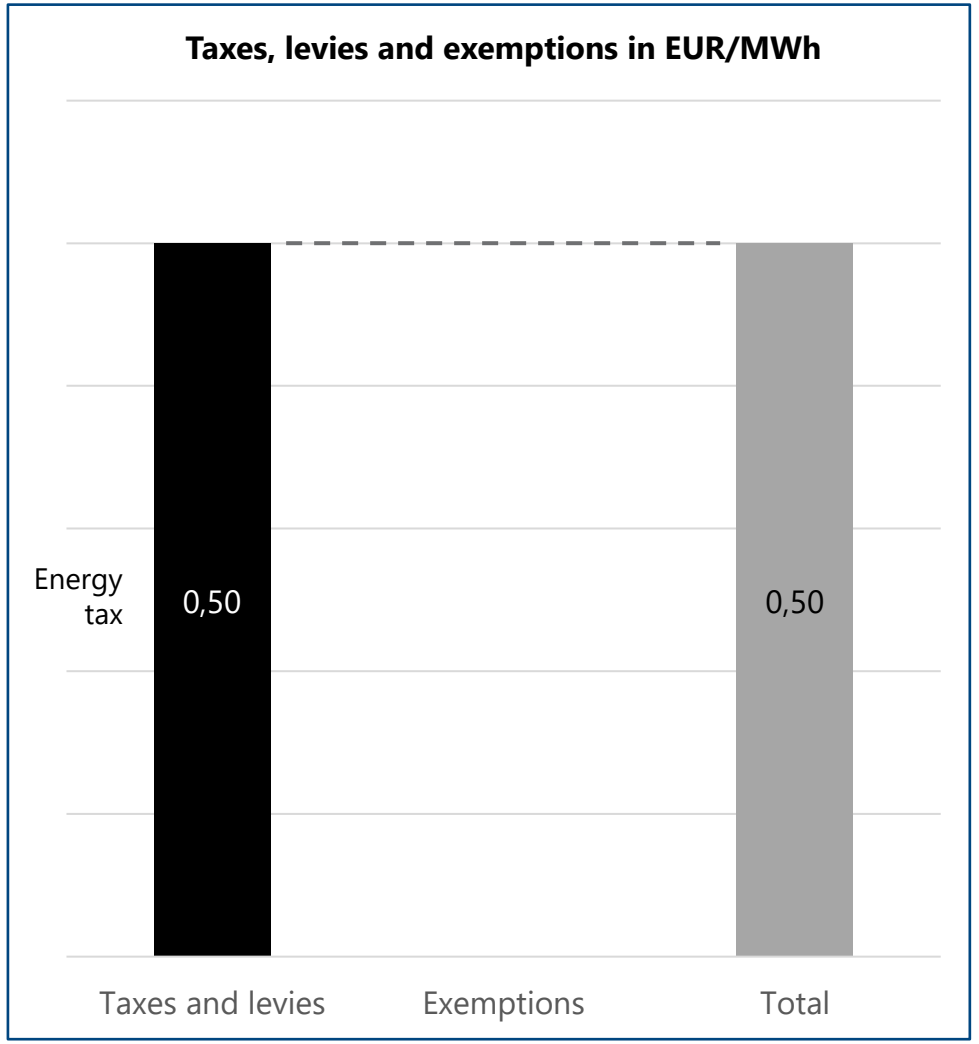
France: Taxes, levies and exemptions for an industrial baseload user (1 TWh/a) in **2024**

Taxes, levies and fees:

- Energy tax:
  - Sector with risk of carbon leakage & electro-intensity > 13,5%
    → **0,50 EUR/MWh**
- CTA: **10,11%** of the fixed part of the network charges
  - Management and Metering cost → **0,0013 EUR/MWh**

→ Only taxes apply in the amount **1,00 EUR/MWh**



France: Network charges and individual network charges for an industrial baseload user (1 TWh/a) in **2024**

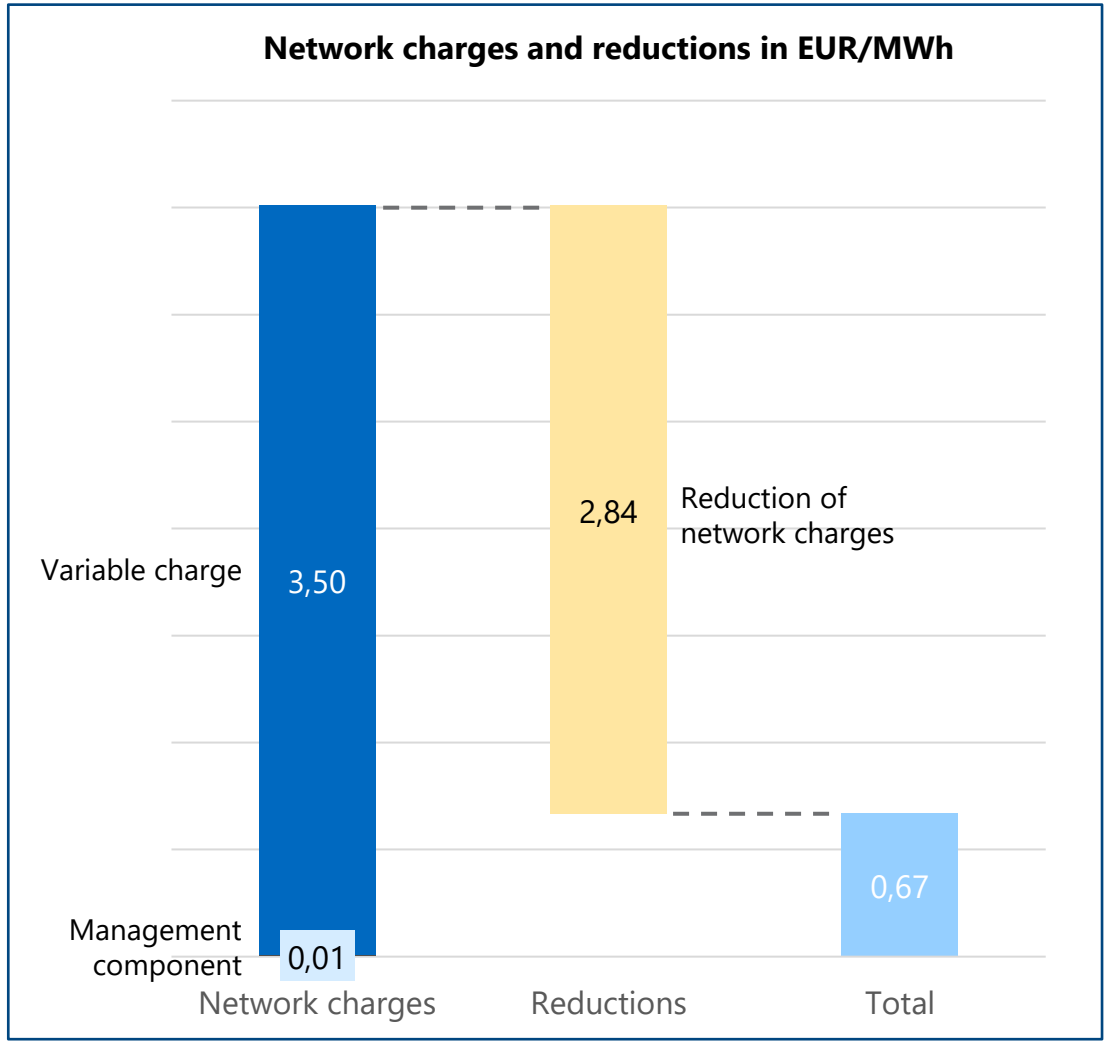
Network charges

- Management Component: **10.032,24 EUR/year**
  - Consumption: 1 TWh → **0,01 EUR/MWh**
- Metering charge: **3.302,04 EUR/year**
  - Consumption: 1 TWh → **0,003 EUR/MWh**
- Variable charge: **3,50 EUR/MWh**

Network charge reduction

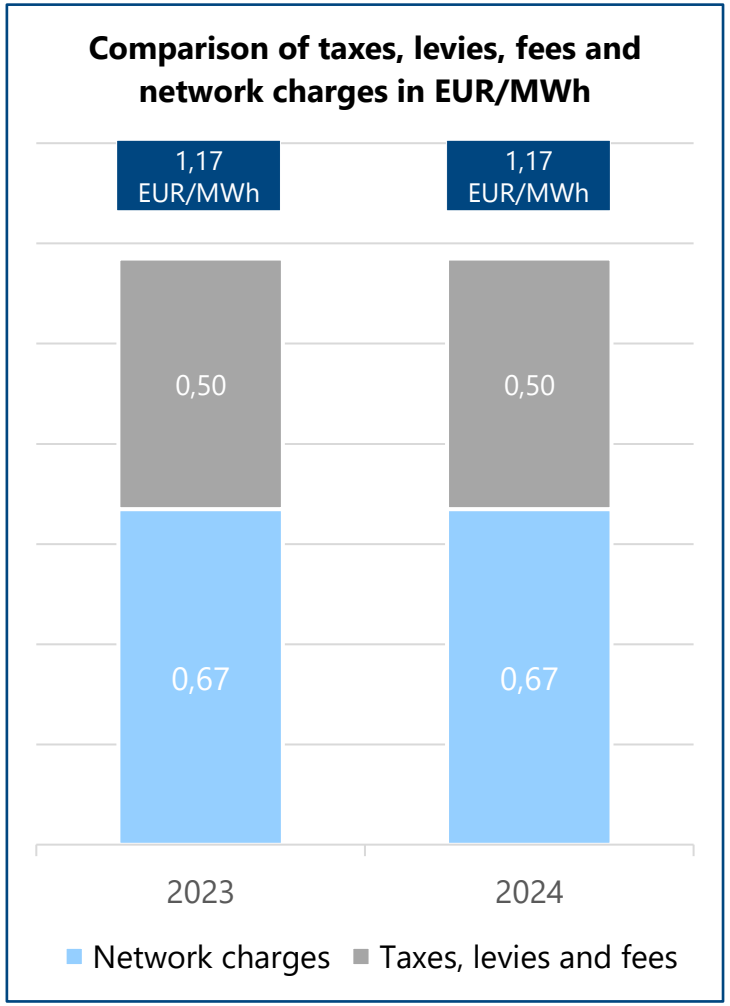
- For >7000 FLH: 81% reduction
  - Charges: 3,51 EUR/MWh → **2,85 EUR/MWh**

→ Resulting network charges: **0,66 EUR/MWh**



France: Comparison of electricity costs for a baseload user in 2023 and 2024 without exemptions or subsidies

- The reduction of the energy tax to 0,50 EUR/MWh, which was part of the tariff shield (“bouclier tarifaire”) that was introduced to lower energy cost during the energy crisis, ends on 31.01.2024.
- From 01.02.2024 the old taxation scheme is valid, which still results in a tax of 0,50 EUR/MWh for the analysed baseload user.



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Belgium - Flanders: Taxes, levies and exemptions for an industrial baseload user (1 TWh/a) in **2024**

Taxes, levies and other costs:

- Special Excise Duty: **0,92 EUR/MWh**
- Levy for the tax's pylons and trenches: **0,54 EUR/MWh**

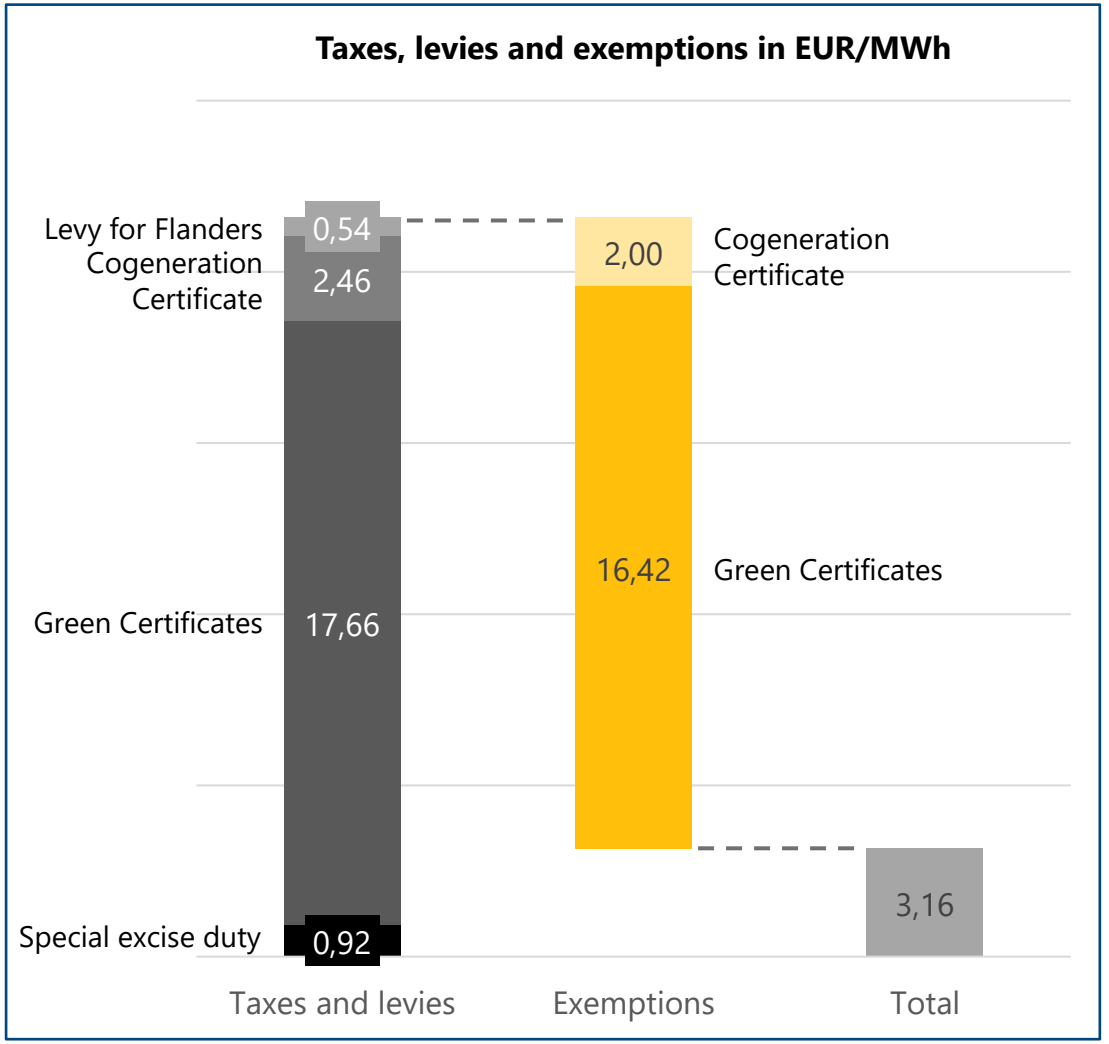
Certification scheme

- Green Certificates: 98,11 EUR/MWh * 18%
  → **17,66 EUR/MWh**
- Cogeneration: 21,92 EUR/MWh * 11,2%
  → **2,46 EUR/MWh**

Exemptions

- Green Certificates: reduction of 93% → **16,42 EUR/MWh**
- Cogeneration: reduction of 81% → **2,00 EUR/MWh**

→ Resulting taxes and levies: **3,16 EUR/MWh**



Belgium - Wallonia: Taxes, levies and exemptions for an industrial baseload user (1 TWh/a) in **2024**

Taxes, Levies and other costs:

- Special Excise Duty: **0,92 EUR/MWh**
- Connection fee: **0,30 EUR/MWh above 0,1 MWh**

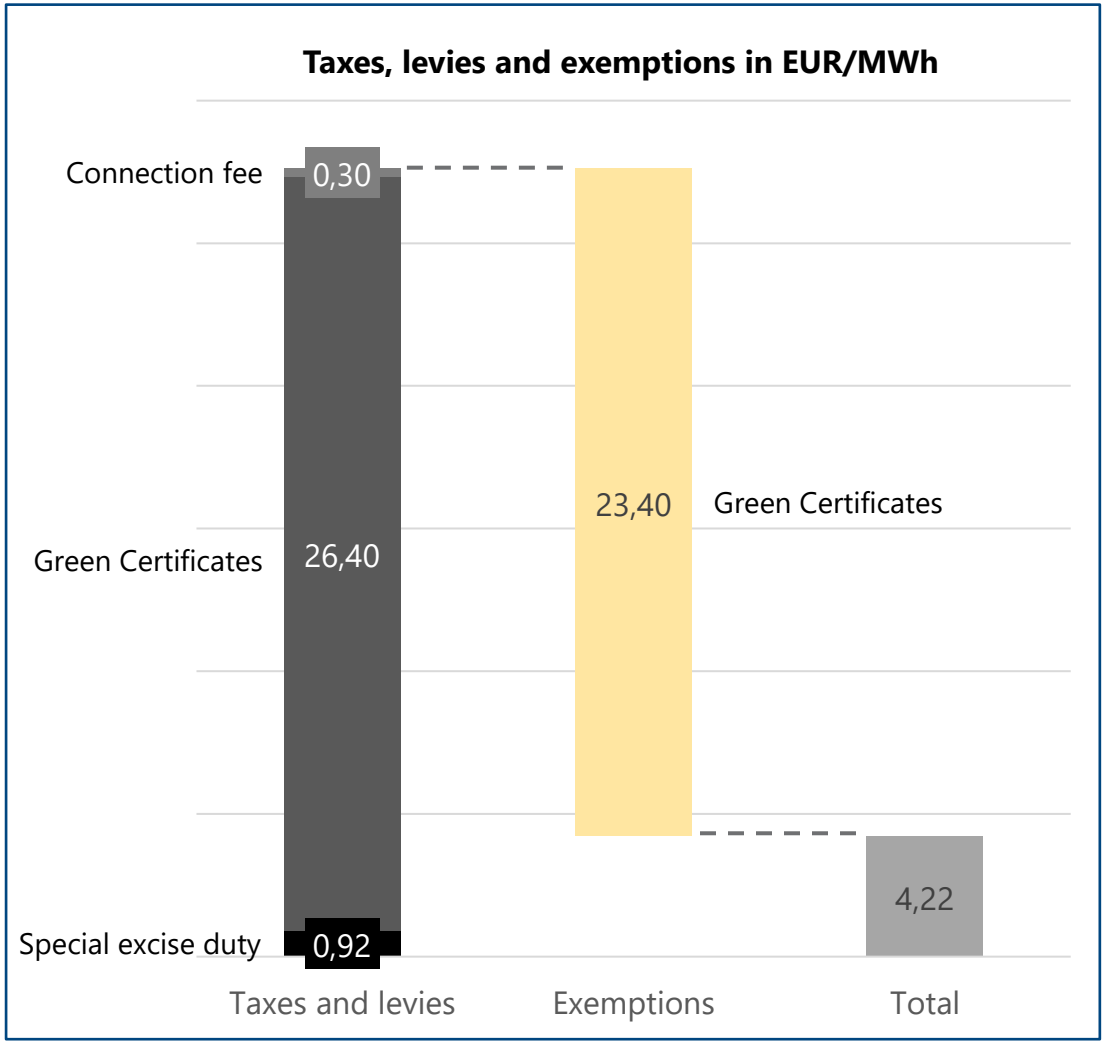
Certification scheme

- Green Certificates: 65,51 EUR/MWh * 40,28%
  → **26,40 EUR/MWh**

Exemptions

- Green Certificates: reduction of 89% → **23,40 EUR/MWh**

→ Resulting taxes and levies: **4,22 EUR/MWh**



Belgium - Brussels: Taxes, levies and exemptions for an industrial baseload user (1 TWh/a) in **2024**

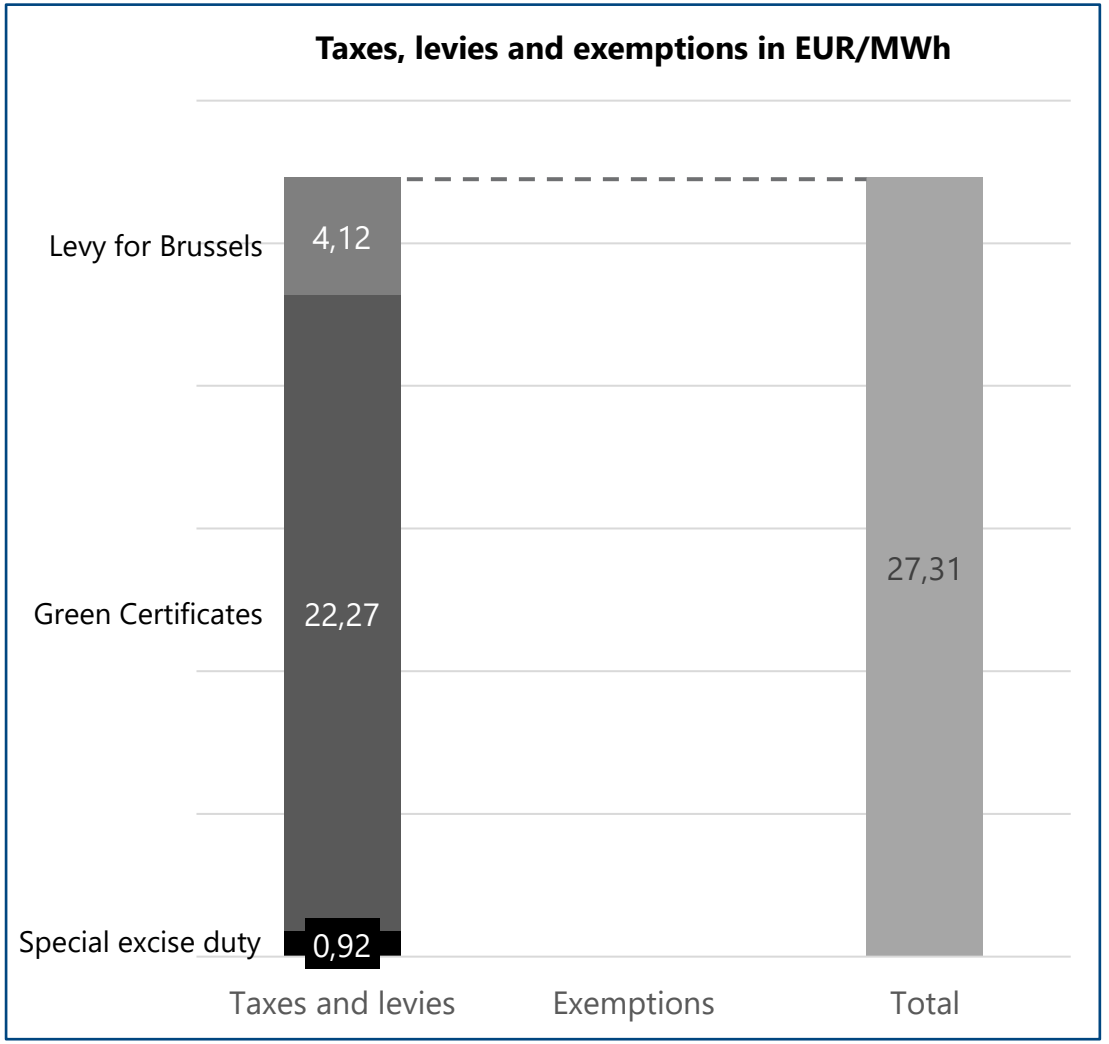
Taxes, Levies and other costs:

- Special Excise Duty: **0,92 EUR/MWh**
- Levy for road rights: **4,12 EUR/MWh**

Certification scheme

- Green Certificates: 83,39 EUR/MWh * 26,7%
  → **22,27 EUR/MWh**

→ Resulting taxes and levies: **27,31 EUR/MWh**



Belgium: Network charges and individual network charges for an industrial baseload user (1 TWh/a) in **2024**

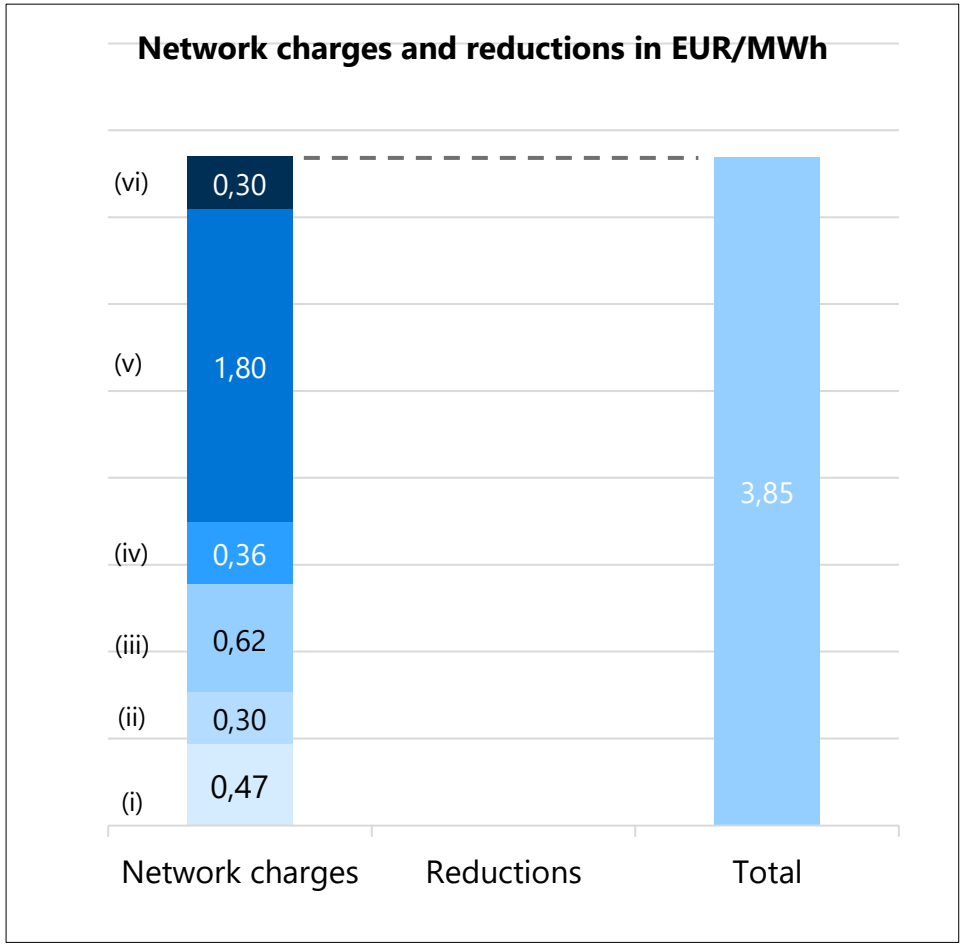
Fixed charges

- Tariff for the power put at disposal (i) -> **0,47 EUR/MWh**
- Tariff for the monthly peak for the offtake (ii)
  - Peak load: 125 MW -> **0,30 EUR/MWh**
- Tariff for the yearly peak for the offtake (iii) -> **0,62 EUR/MWh**

Variable charges

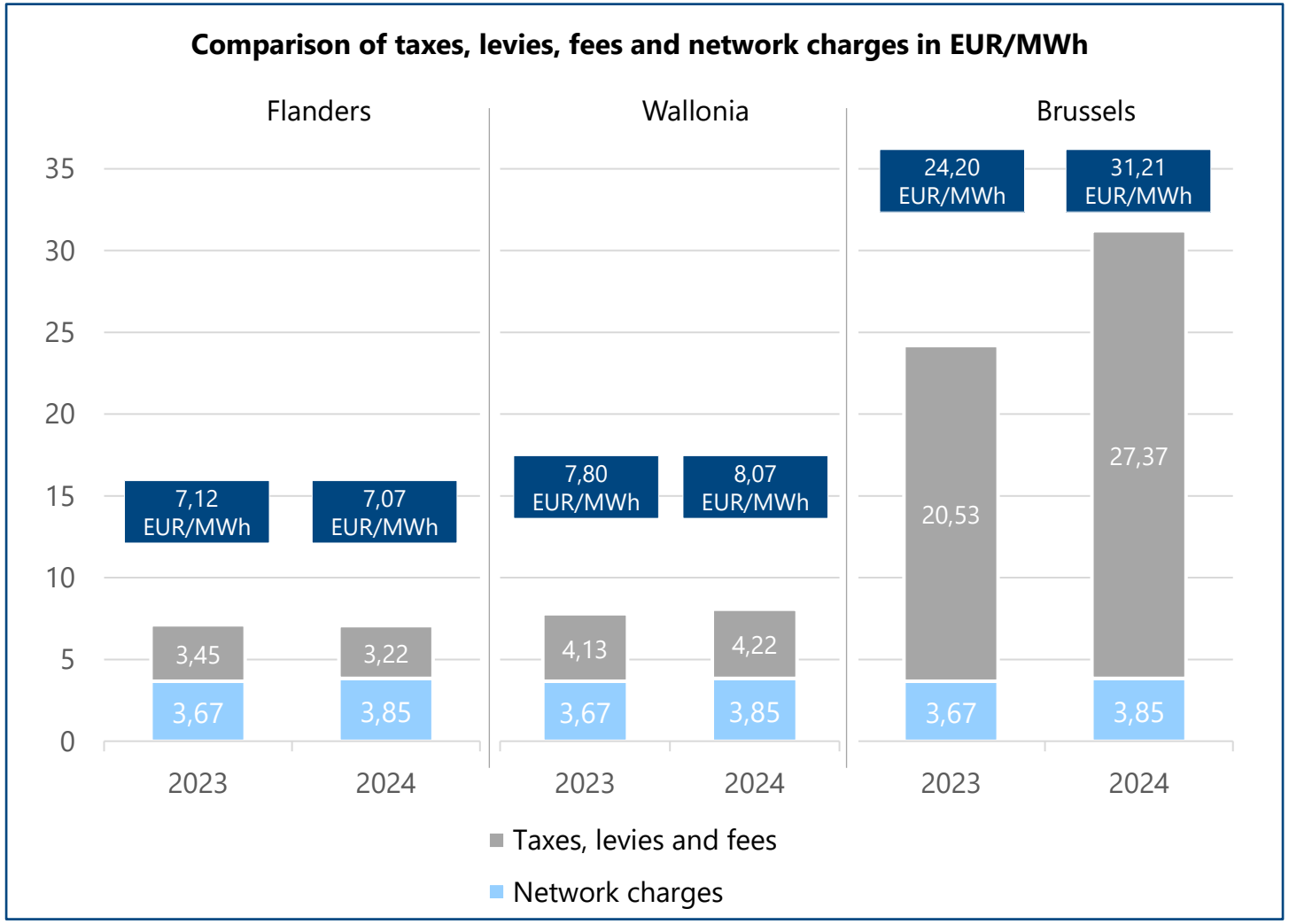
- Tariff for market integration (iv) -> **0,36 EUR/MWh**
- Tariff for the power reserves and black-start (v) -> **1,80 EUR/MWh**
- Tariff for the management of the electric system (vi) -> **0,30 EUR/MWh**

→ Network charges amount to **3,85 EUR/MWh**



Belgium: Comparison of electricity costs for a baseload user in 2023 and 2024 without exemptions or subsidies

- Network costs have increased in 2024 because of introduction of new tariff methodology for the period of 2024 – 2027.
- Taxes, levies, fees and subsidies increased in 2024 for Brussels and Wallonia on account of increase in quota for green certificates, while the quota decreased in Flanders.



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Assumptions for the electrolyser profile user case

General Assumptions

- Consumer is an **electrolyser**, as an example for a flexible user
- Consumption per year: 1.200.000 MWh (1,2 TWh), Peak load: 250 MW
- Full load hours: **100% load hours 0:00-06:00 and 11:00-17:00 h; 10% load all remaining hours**; Full load hours: **4818 h**
- Connection to the highest voltage grid level of the transmission grid in each country (220/380KV)
- Gross added value high enough that super caps are not applicable

For some country specific taxes, levies, exemptions or network charges more detailed assumptions are necessary, these are presented in Annex VII.

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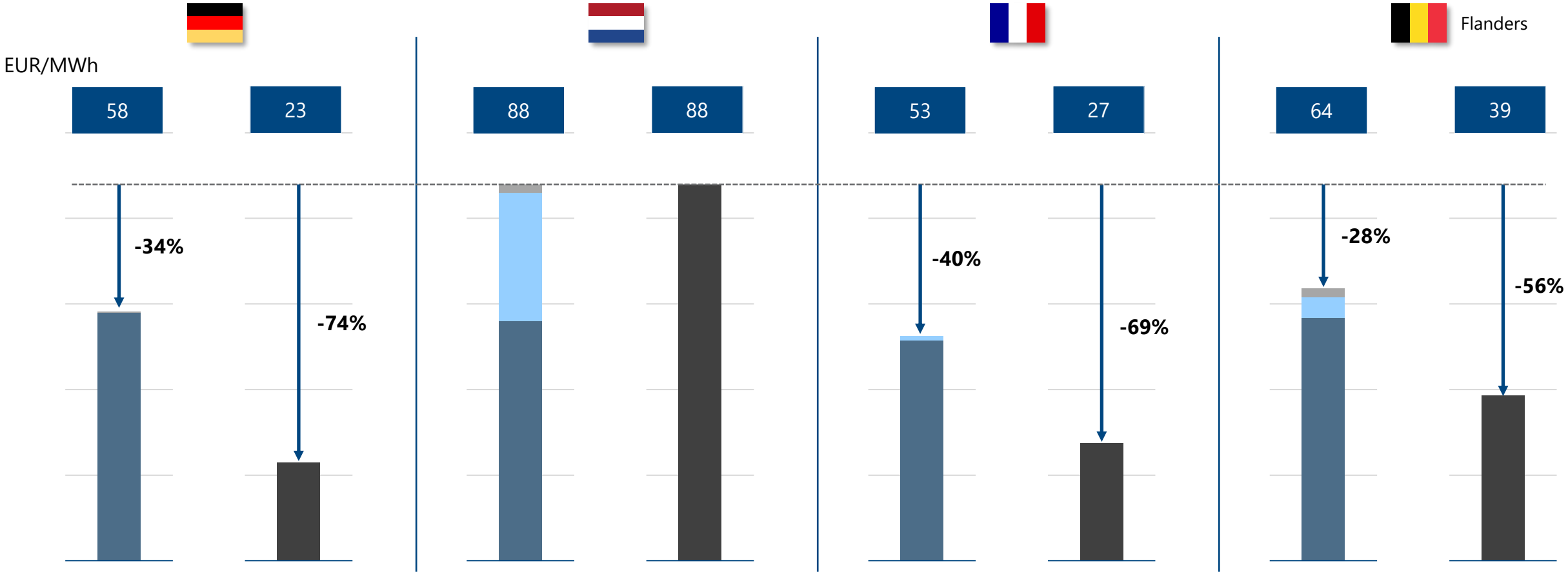
Electrolyser: Effective electricity costs with and without indirect cost compensation in **2024**



Electrolyser:
1,2 TWh/a, 4800 FLH
250 MW capacity

Price without indirect cost compensation

- Taxes, levies, subsidies and exemptions
- Network charges
- Electrical energy costs

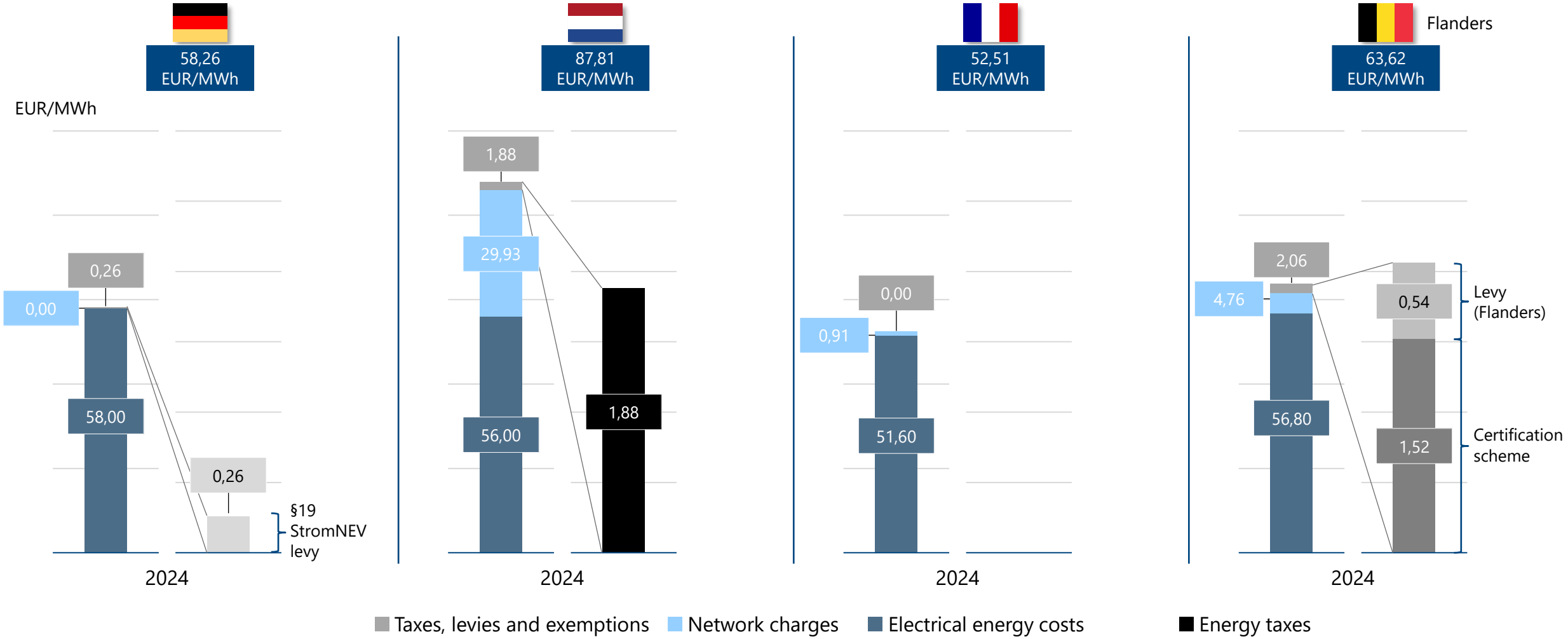
Price with indirect cost compensation

- Price with indirect cost compensation

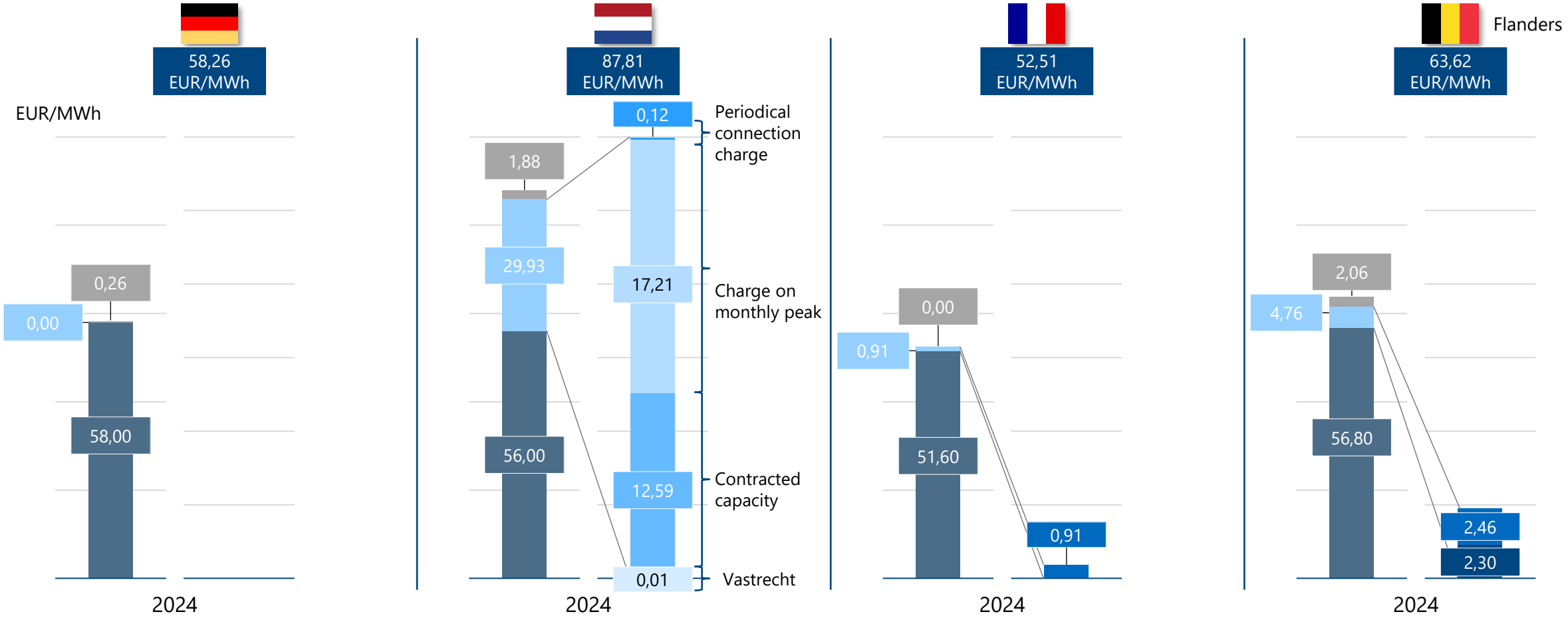
Applicable sectors:
production of various metals, hydrogen, chemicals, wood and paper

E-Bridge
competence in energy

Electrolyser: Taxes, levies, fees divided by component in **2024**



Electrolyser: Network charges divided by component in **2024**



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Germany: Taxes, levies and exemptions for the electrolyser in **2024**

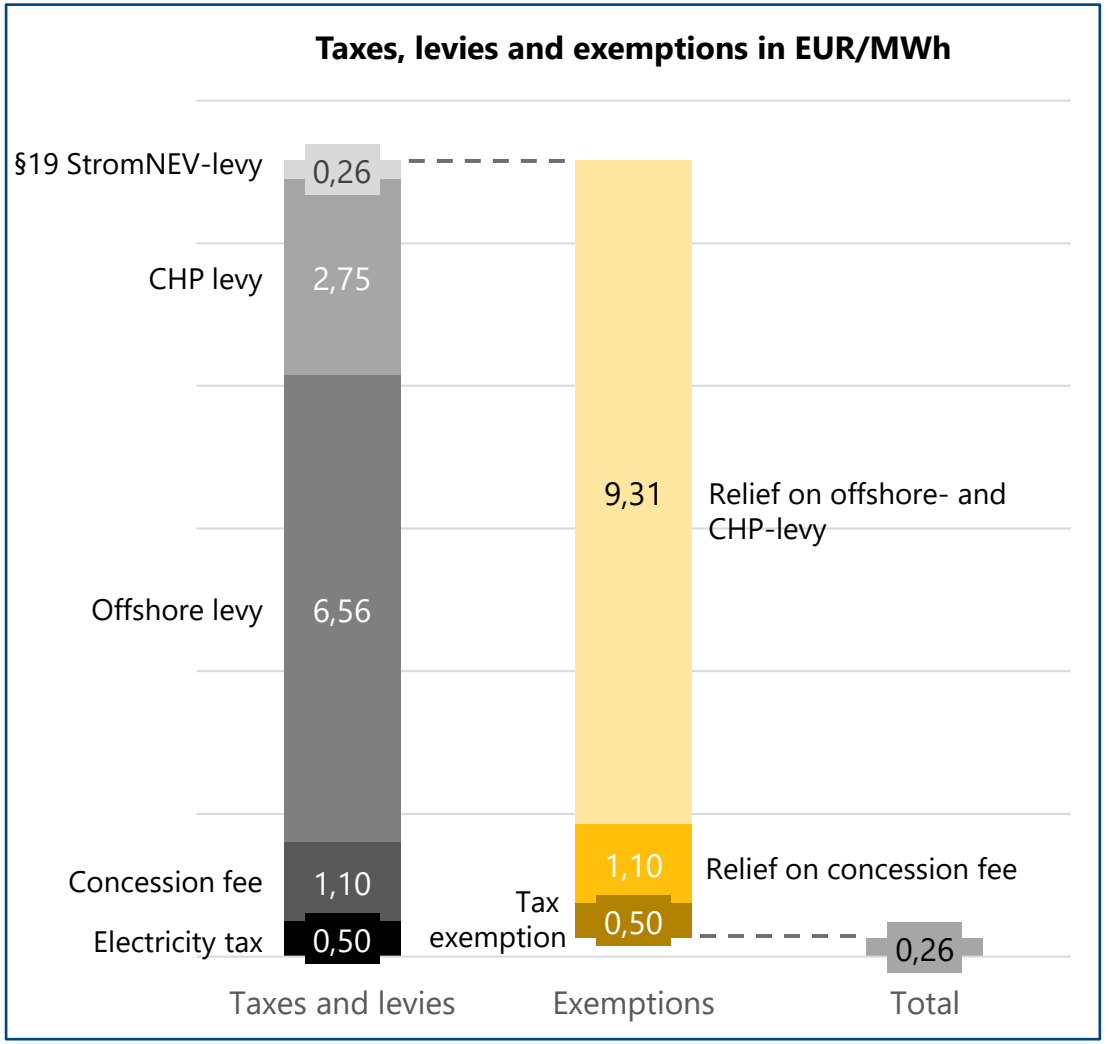
Taxes, Levies and fees:

- Electricity tax: **0,50 EUR/MWh**
- Offshore-levy: **6,56 EUR/MWh**
- KWK-levy: **2,75 EUR/MWh**
- §19 StromNEV-levy:
  - **6,43 EUR/MWh** for the first 1000 MWh
  - For every MWh exceeding this: **0,25 EUR/MWh**
  - For 1 TWh → **0,26 EUR/MWh**
- Concession fee: **1,10 EUR/MWh**

Exemptions:

- Relief of **100%** of the concession fee → **1,10 EUR/MWh**
- Exempt of the offshore- and CHP-levy → **9,31 EUR/MWh**
- Exempt of the electricity tax → **0,50 EUR/MWh**

→ Resulting taxes, levies and fees: **0,26 EUR/MWh**



Germany: Network charges and individual network charges for the electrolyser in **2024**

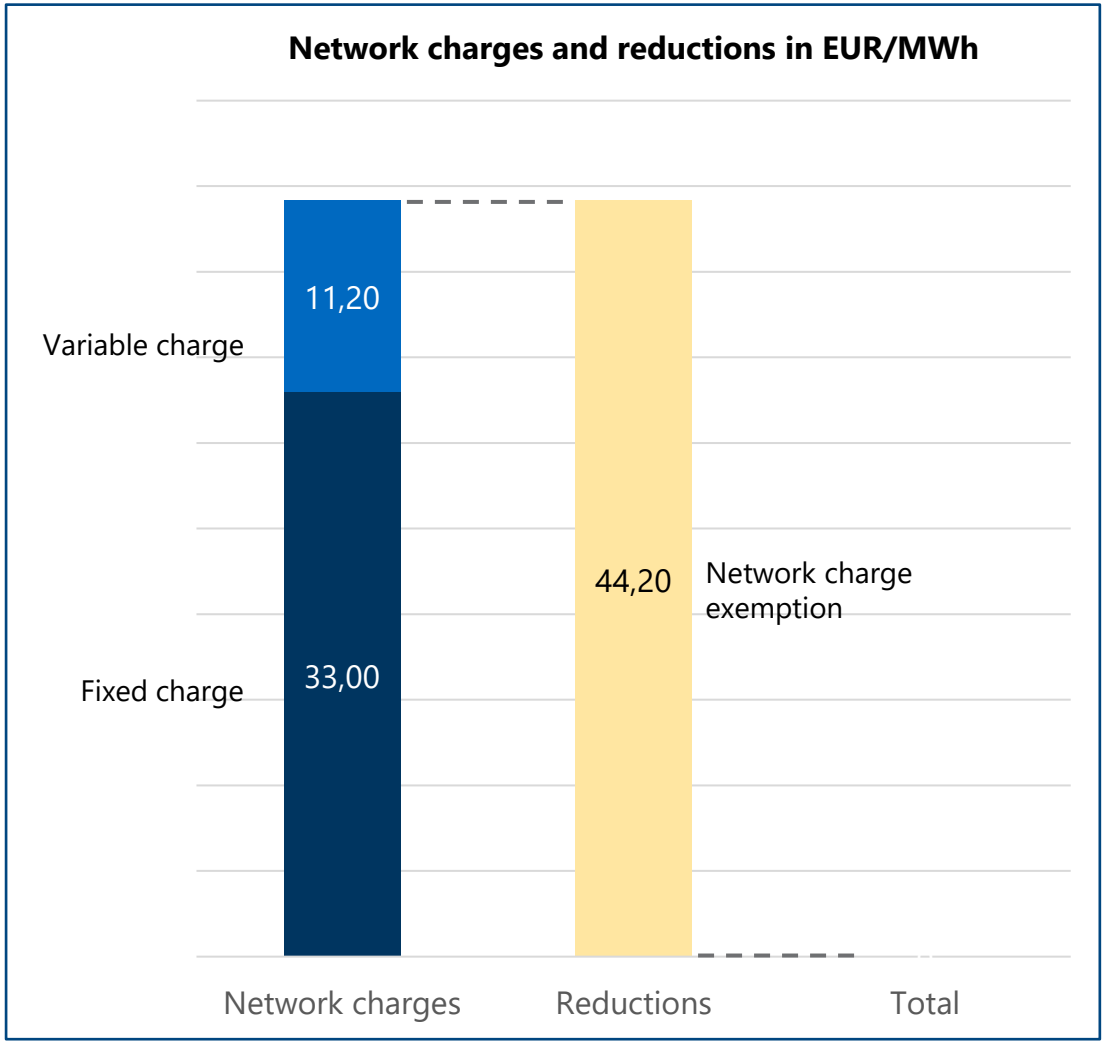
Network charges

- Fixed charge: **158,98 EUR/kW**
  - Peak Load: 250 MW → **33,00 EUR/MWh**
- Variable charge: **11,20 EUR/MWh**

Network charge reduction

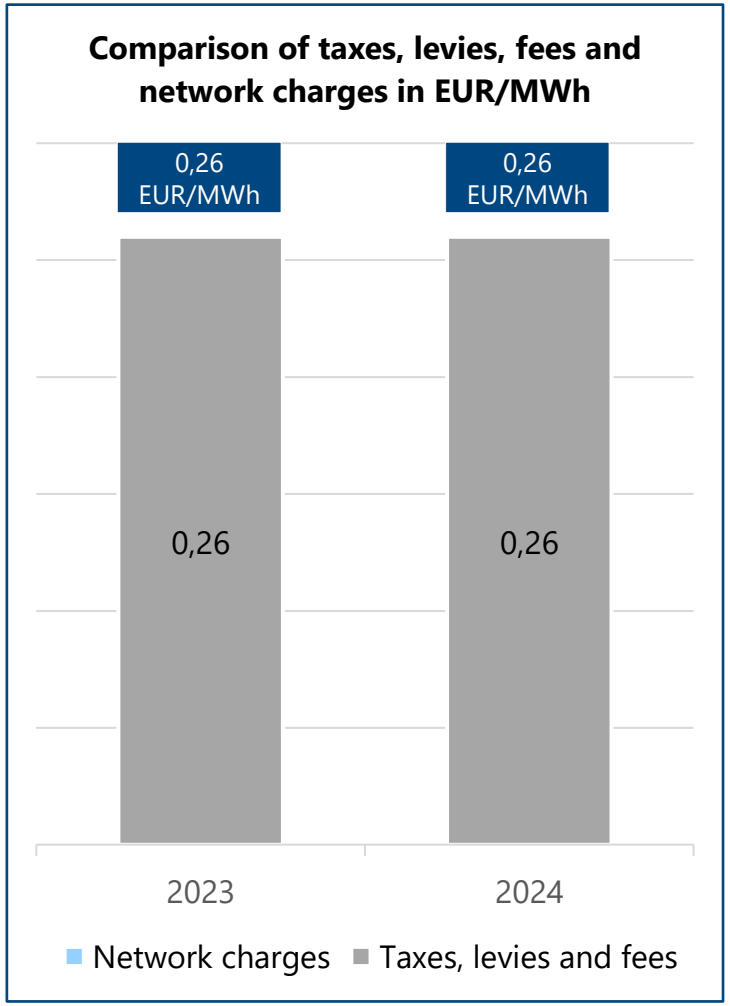
- Exempt of the network charges → **44,20 EUR/MWh**

→ Exemption of all network charges for electrolysers
→ Resulting network charges: **0,00 EUR/MWh**



Germany: Comparison of taxes, levies, fees and network charges for the electrolyser in 2023 and 2024 with exemptions or subsidies

- No difference for electrolyser between 2023 and 2024



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Netherlands: Taxes, levies and exemptions for the electrolyser in **2024**

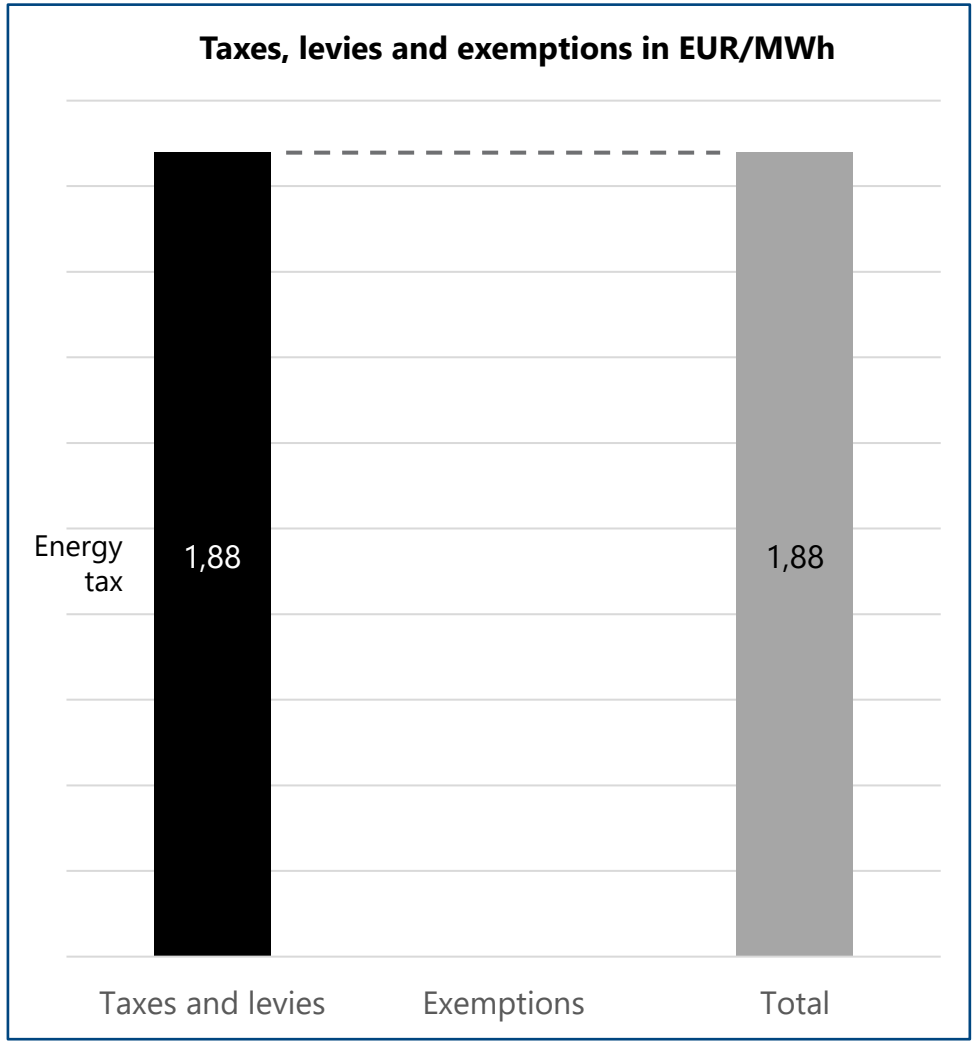
Taxes, Levies and fees:

- Energy tax: **1,88 EUR/MWh**

Exemptions:

- Energy tax reduction: **521,81 EUR → 0,005 EUR/MWh**

→ Only taxes apply in the amount **1,88 EUR/MWh**

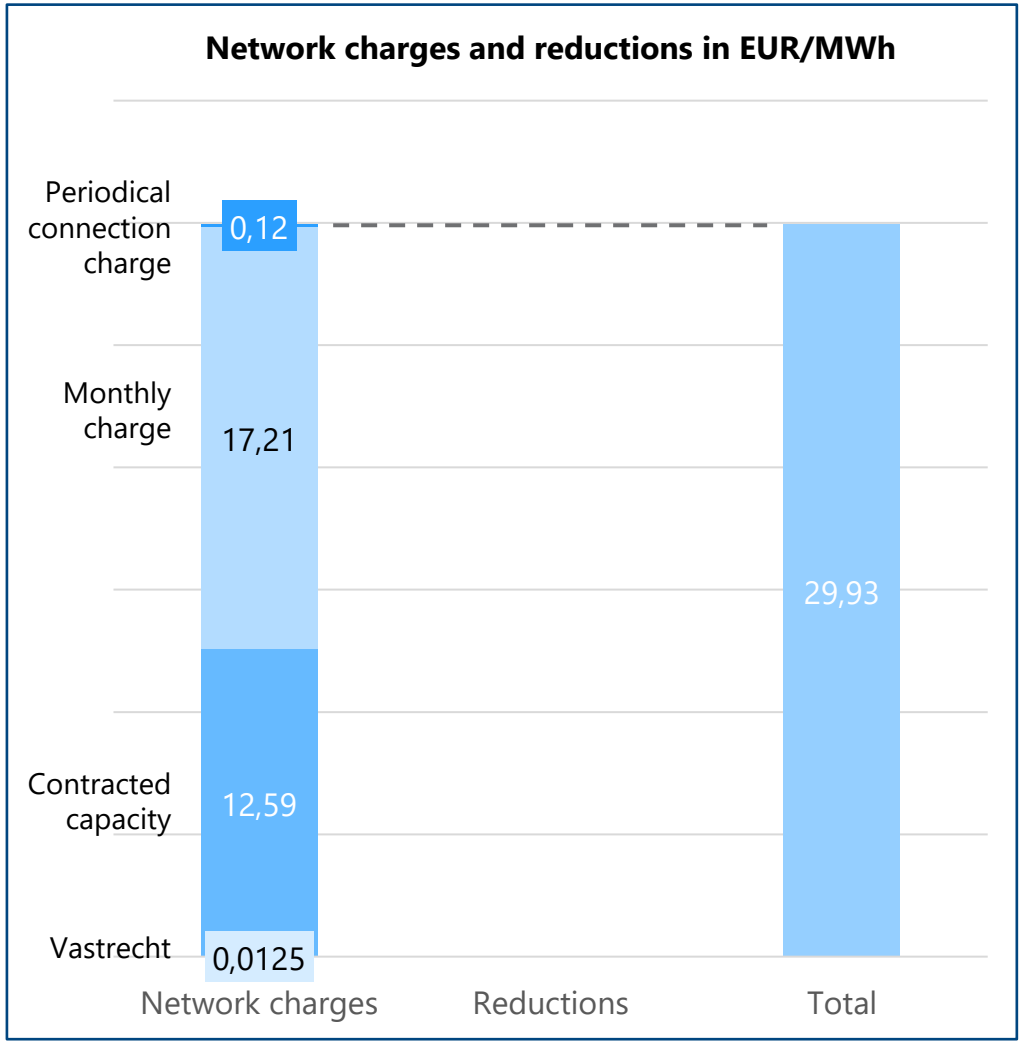


Netherlands: Network charges for the electrolyser in **2024**

Network charges

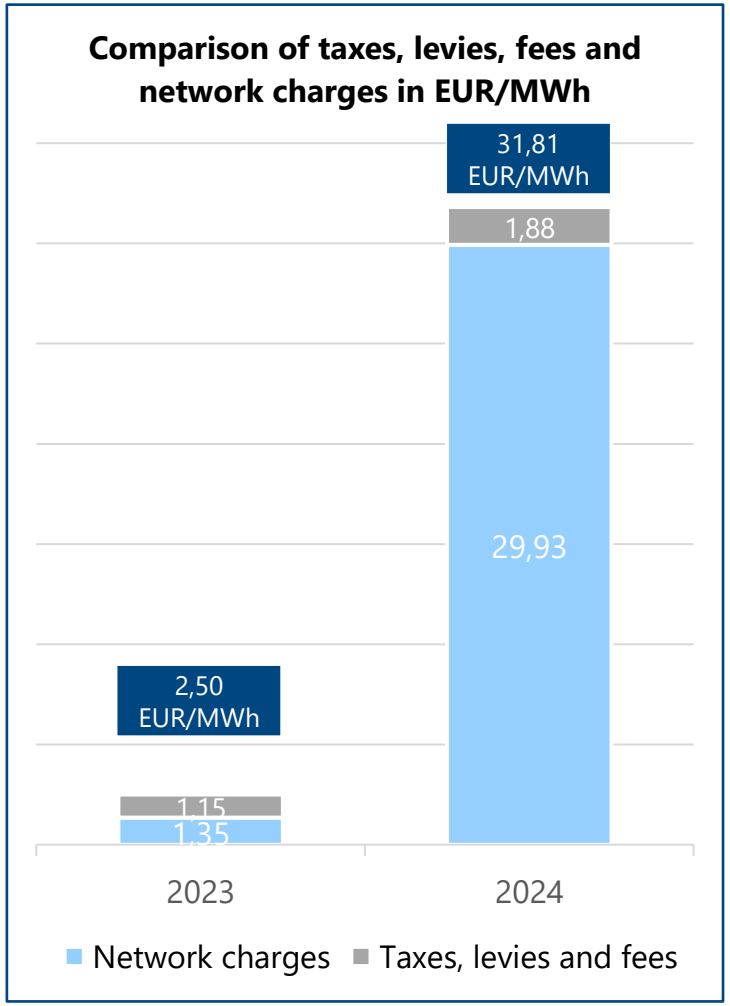
- Vastrecht: 12.478,96 EUR/a → **0,0125 EUR/MWh**
- Contracted capacity: 60,65 EUR/kW
  - Contracted capacity/Peak load: 250 MW → **12,59 EUR/MWh**
- Charge on monthly peak: 6,91 EUR/kW/month
  - Average monthly peak load: 250 MW → **17,21 EUR/MWh**
- Periodical connection charge: 75.000 EUR/a → **0,12 EUR/MWh**

→ Network charges amount to **29,93 EUR/MWh**



Netherlands: Comparison of electricity costs for the electrolyser in 2023 and 2024 without exemptions or subsidies

- Energy taxes increased from 1,15 EUR/MWh to 1,88 EUR/MWh.
- Network charges increased sharply as the reduction scheme (Volumecorrectie) was abolished as of 2024. With the reduction scheme a **reduction of up to 90%** was possible (in the graph on the right, a reduction of 90% is assumed).
- Furthermore, as the charge for contracted capacity and the charge on the monthly peak both doubled, the network charges itself increased as well.



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France – Influence of the ARENH-scheme on commodity prices of the electrolyser

Share of hours in operation during ARENH hours

- Hours of operation on weekdays in Apr, May, June, Sep and Oct between 1 and 7 AM: 624 h / 624 h (104 days)
- Hours of operation on weekends in Apr, May, June, Sep and Oct and in July and Aug: 1452 h / 2640 h (110 days)
- → 2076 h / 3264 h = **63,60%**

Capping of the overall amount of energy available under ARENH

- Requested amount of energy for 2024: 130,41 TWh (Source)
- Necessary reduction: (130,41 TWh – 100 TWh) / 130,41 TWh = **23.31%**

Percentage of consumption that can be obtain under ARENH scheme

- Necessary reduction of operation hours during ARENH hours: 63,60% * (1 - 23,31%) = **48,77%**
- Applying adjustment factor: 48,77% * 0,844 = **41,16%**

Resulting commodity price for electrolysers

- Commodity Price: 41,16% * ARENH Price + 58,84% * market price
  → 41,16% * 42 EUR/MWh + 58,84% * 58,30 EUR/MWh = **51,59 EUR/MWh**

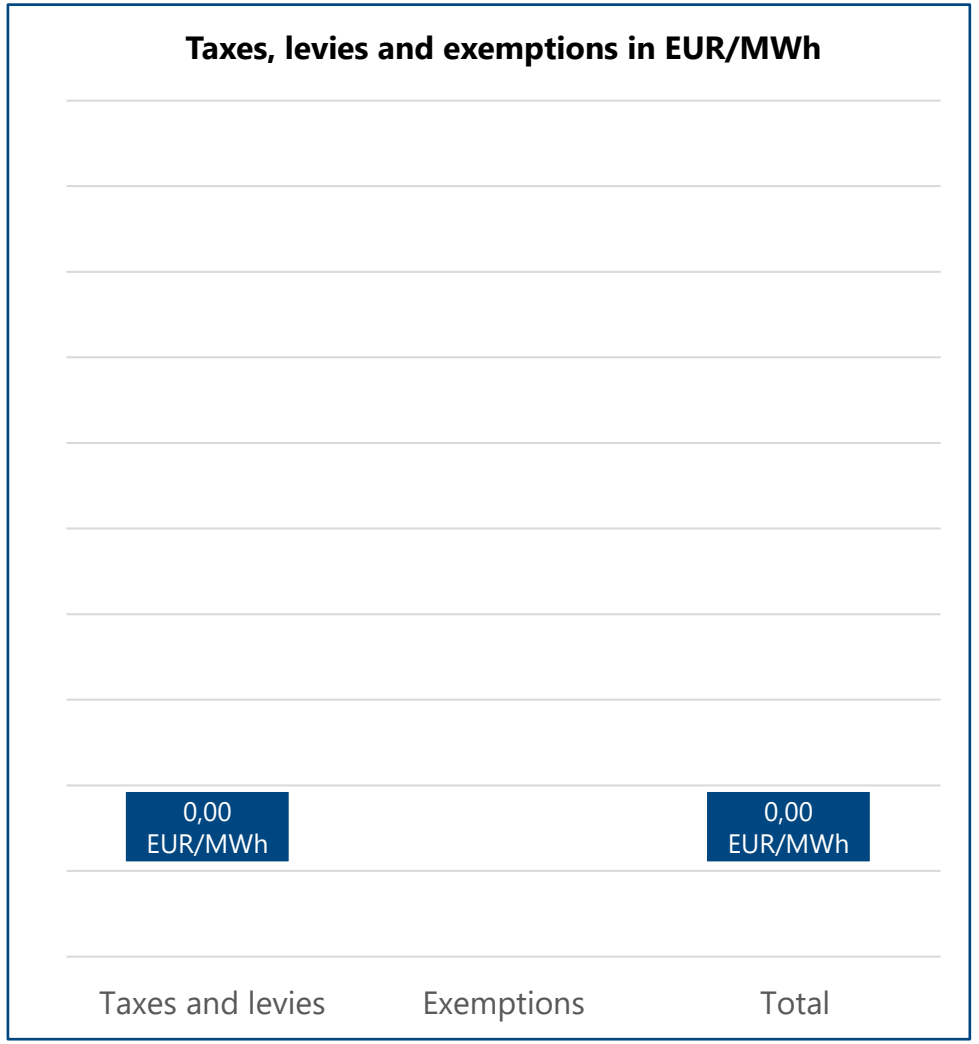
E-Bridge
competence in energy

France: Taxes, levies and exemptions for the electrolyser in **2024**

Taxes, Levies and fees:

- Energy tax: **0,00 EUR/MWh**
- CTA: **10,11%** of the fixed part of the network charges
  - Management and Metering cost → **0,0013 EUR/MWh**

→ Taxes in the amount **0,00 EUR/MWh** apply



France: Network charges and individual network charges for the electrolyser in **2024**

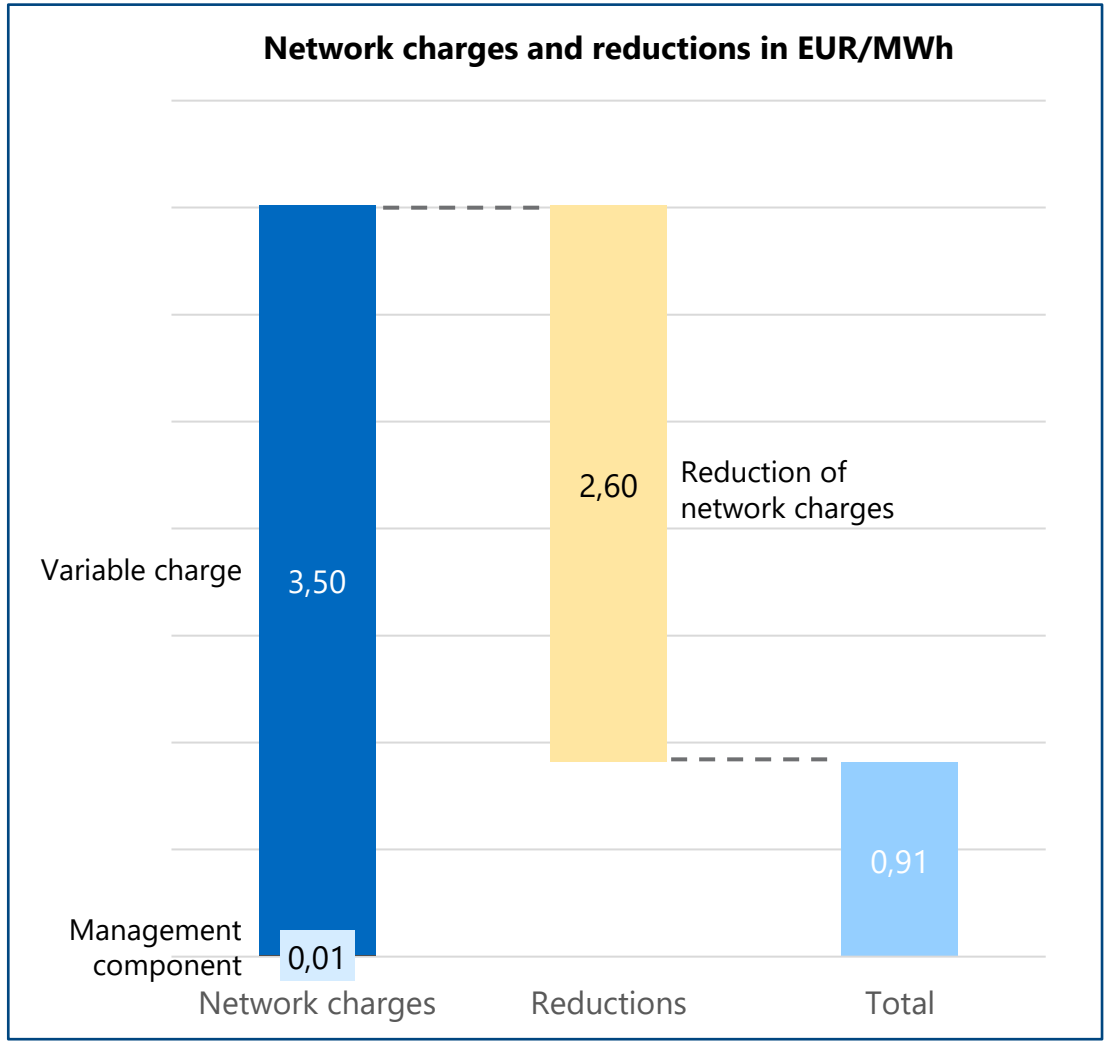
Network charges

- Management Component: **10.032,24 EUR/year**
  - Consumption: 1 TWh → **0,01 EUR/MWh**
- Metering charge: **3.302,04 EUR/year**
  - Consumption: 1 TWh → **0,003 EUR/MWh**
- Variable charge: **3,50 EUR/MWh**

Network charge reduction

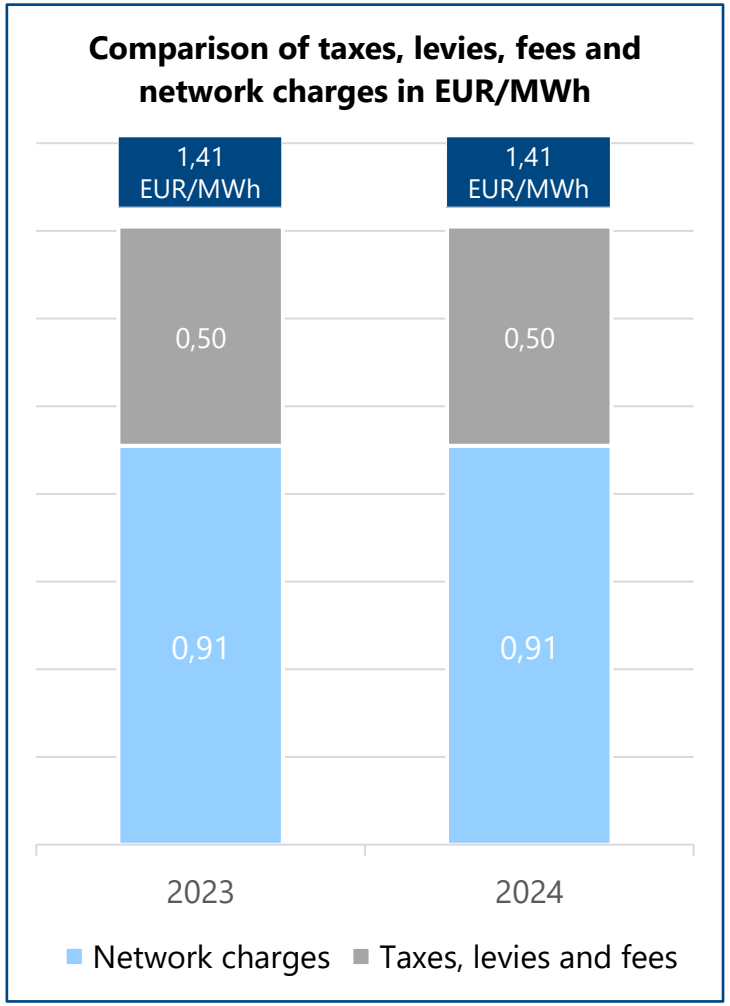
- Anticyclical profile: offpeak utilization > 44% → 74% reduction
  - Charges: 3,51 EUR/MWh → **2,60 EUR/MWh**

→ Relief of **2,60 EUR/MWh**
→ Resulting in network charges of **0,91 EUR/MWh**



France: Comparison of electricity costs for the electrolyser in 2023 and 2024 without exemptions or subsidies

- The reduction of the energy tax to 0,50 EUR/MWh, which was part of the tariff shield (“bouclier tarifaire”) that was introduced to lower energy cost during the energy crisis, ends on 31.01.2024.
- From 01.02.2024 the old taxation scheme is valid, which still results in a tax of 0,50 EUR/MWh for the analysed electrolyser.



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Belgium - Flanders:
Taxes, levies and exemptions for the electrolyser in **2024**

Taxes, Levies and other costs:

- Special Excise Duty: **0,00 EUR/MWh**
- Levy for the tax's pylons and trenches: **0,54 EUR/MWh**

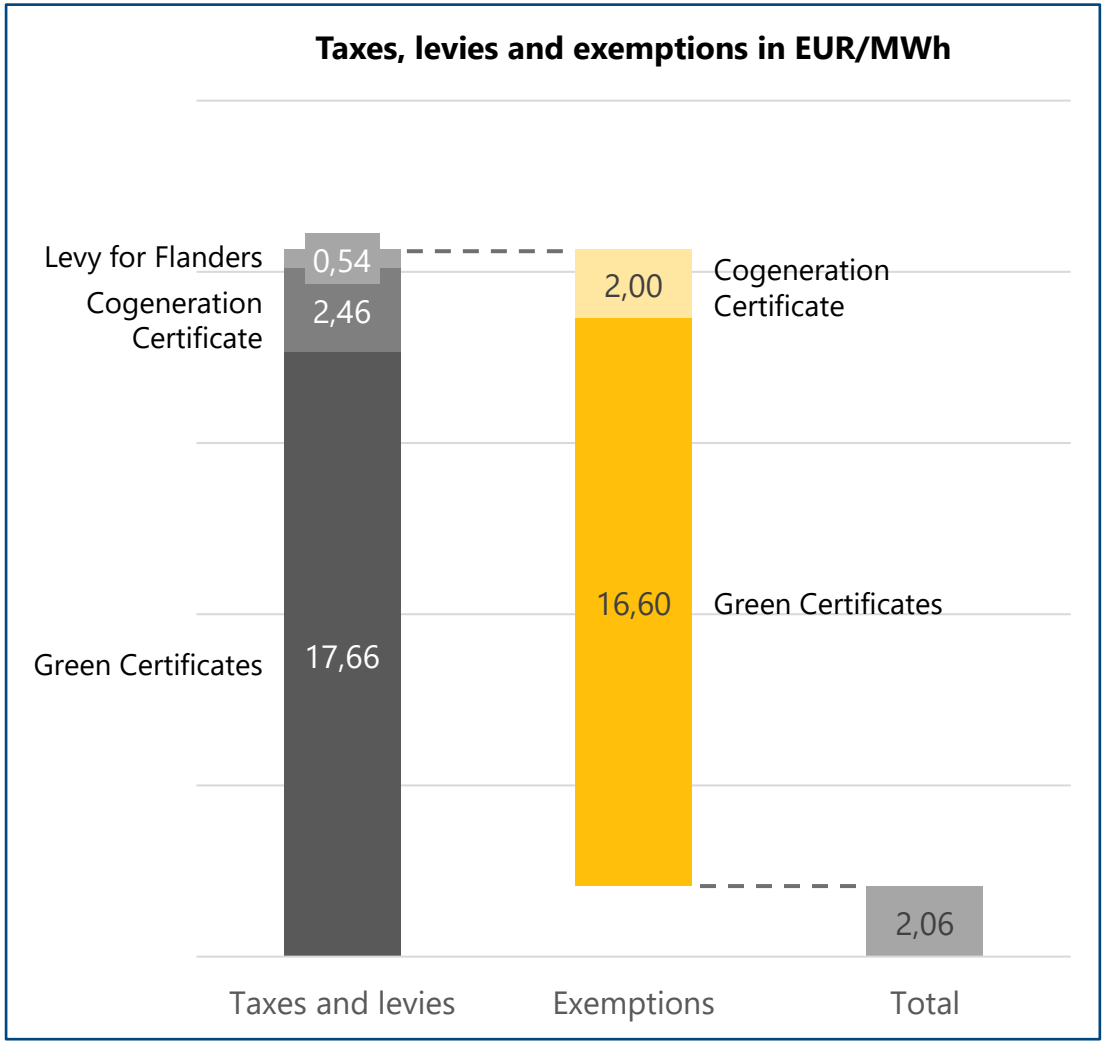
Certification scheme

- Green Certificates: 98,11 EUR/MWh * 18%
  → **17,66 EUR/MWh**
- Cogeneration: 21,92 EUR/MWh * 11,2%
  → **2,46 EUR/MWh**

Exemptions

- Green Certificates: reduction of 94% → **16,60 EUR/MWh**
- Cogeneration: reduction of 81% → **2,00 EUR/MWh**

→ Resulting taxes and levies: **2,12 EUR/MWh**



Belgium - Wallonia:
Taxes, levies and exemptions for the electrolyser in **2024**

Taxes, Levies and other costs:

- Special excise duty: **0,50 EUR/MWh**
- Connection fee: **0,30 EUR/MWh above 0,1 MWh**

Certification scheme

- Green Certificates: 65,51 EUR/MWh * 40,28%
  → **26,40 EUR/MWh**

Exemptions

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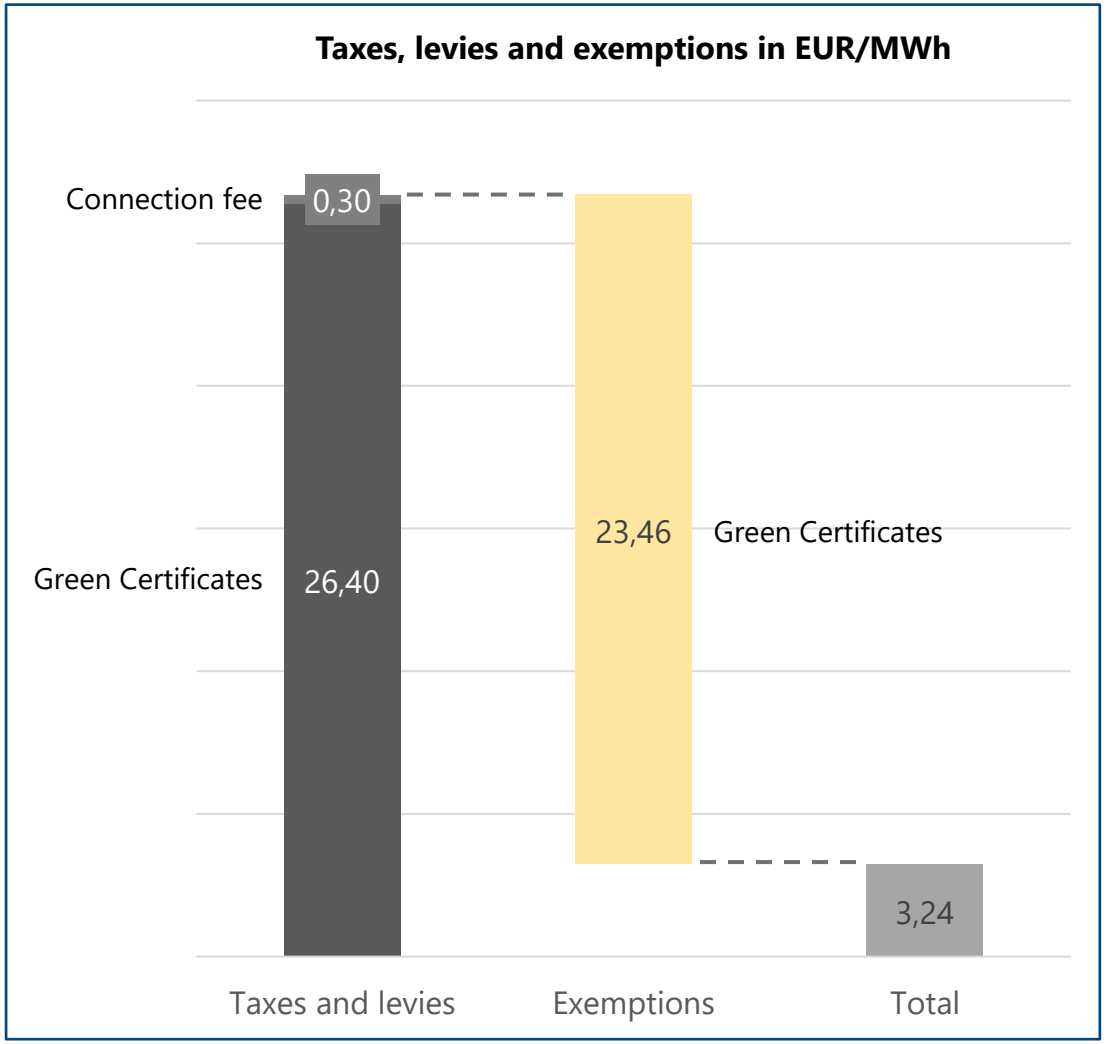
→ Resulting taxes and levies: **3,24 EUR/MWh**



Belgium - Brussels:
Taxes, levies and exemptions for the electrolyser in **2024**

Taxes, Levies and other costs:

- Special Excise Duty: **0,50 EUR/MWh**
- Levy for road rights: **4,12 EUR/MWh**

Certification scheme

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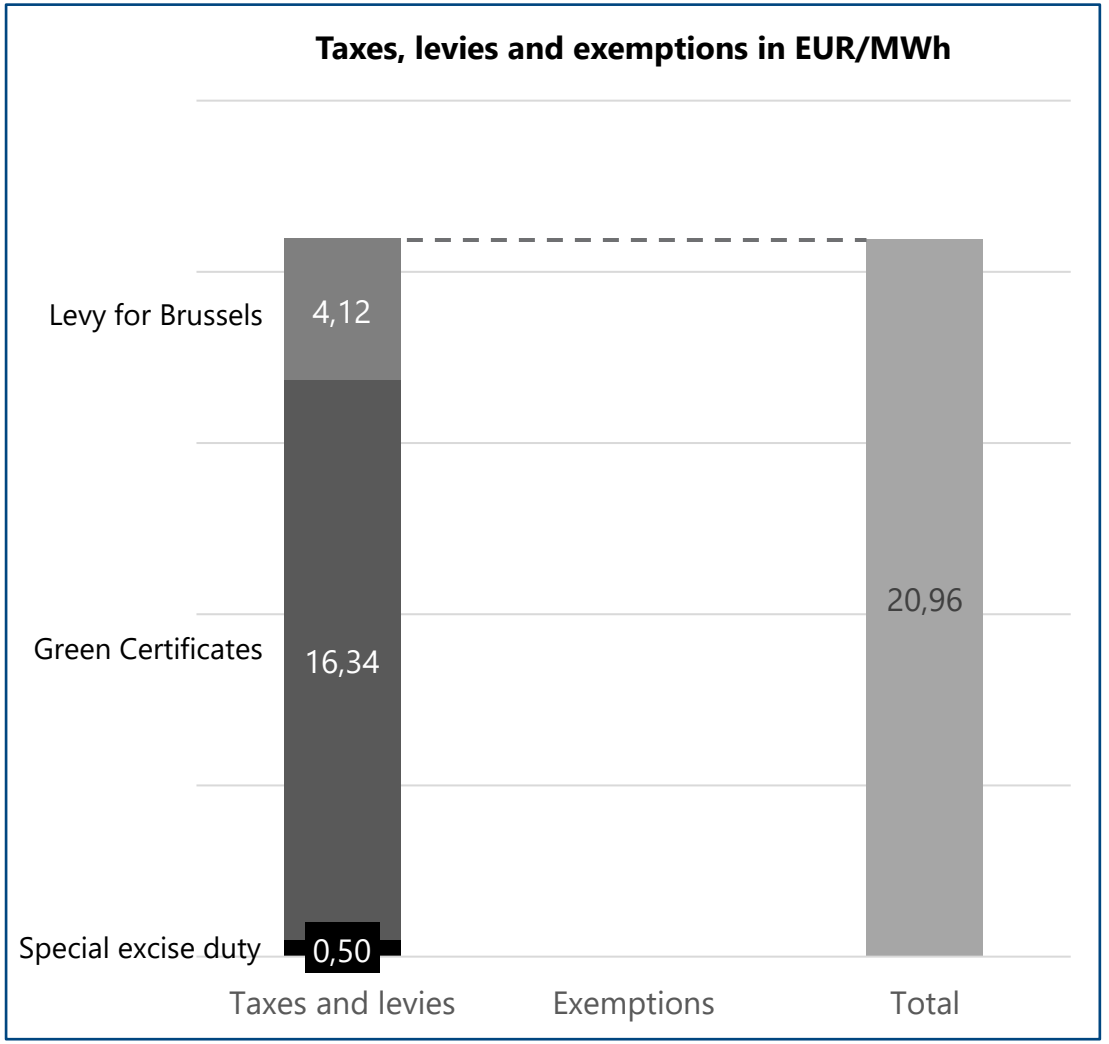
  → **16,34 EUR/MWh**

→ Resulting taxes and levies: **27,31 EUR/MWh**



Belgium:
Network charges and individual network charges for the electrolyser in **2024**

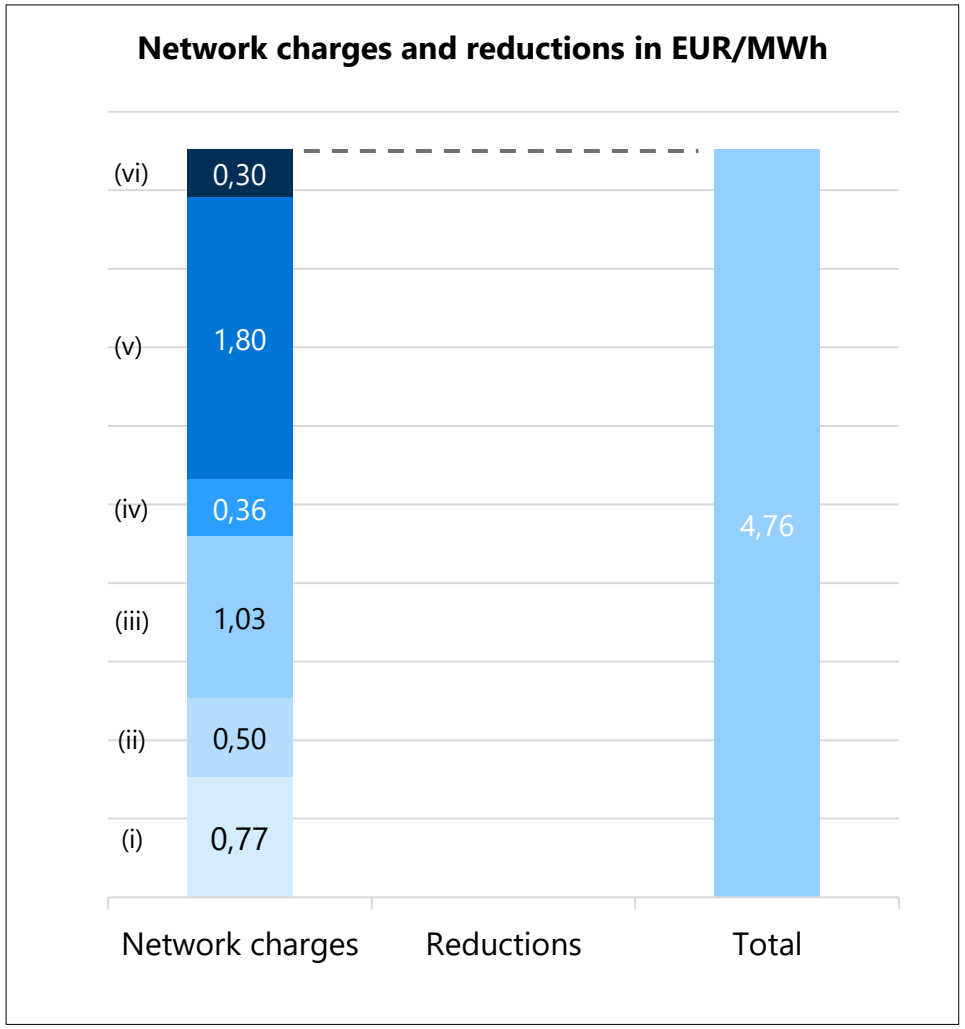
Fixed charges

- Tariff for the power put at disposal (i) → **0,77 EUR/MWh**
- Tariff for the monthly peak for the offtake (ii) → **0,49 EUR/MWh**
- Tariff for the yearly peak for the offtake (iii) → **1,03 EUR/MWh**

Variable charges

- Tariff for market integration (iv) → **0,36 EUR/MWh**
- Tariff for the power reserves and black-start (v) → **1,80 EUR/MWh**
- Tariff for the operation of the electric system (vi) → **0,30 EUR/MWh**

→ Network charges amount to **4,76 EUR/MWh**



Belgium: Comparison of electricity costs for the electrolyser in 2023 and 2024 without exemptions or subsidies

- Network costs have increased in 2024 because of introduction of new tariff methodology for the period of 2024 – 2027.
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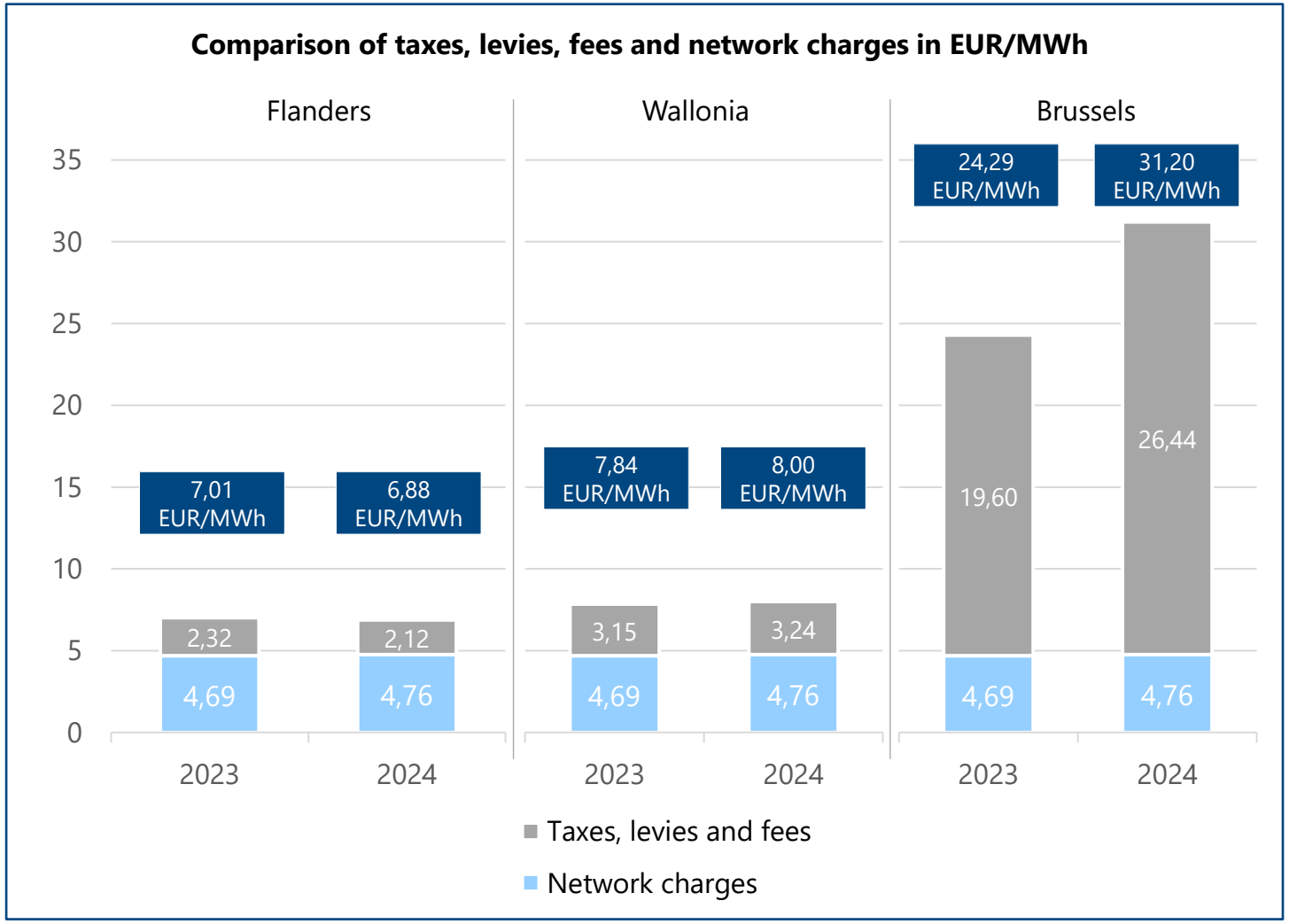

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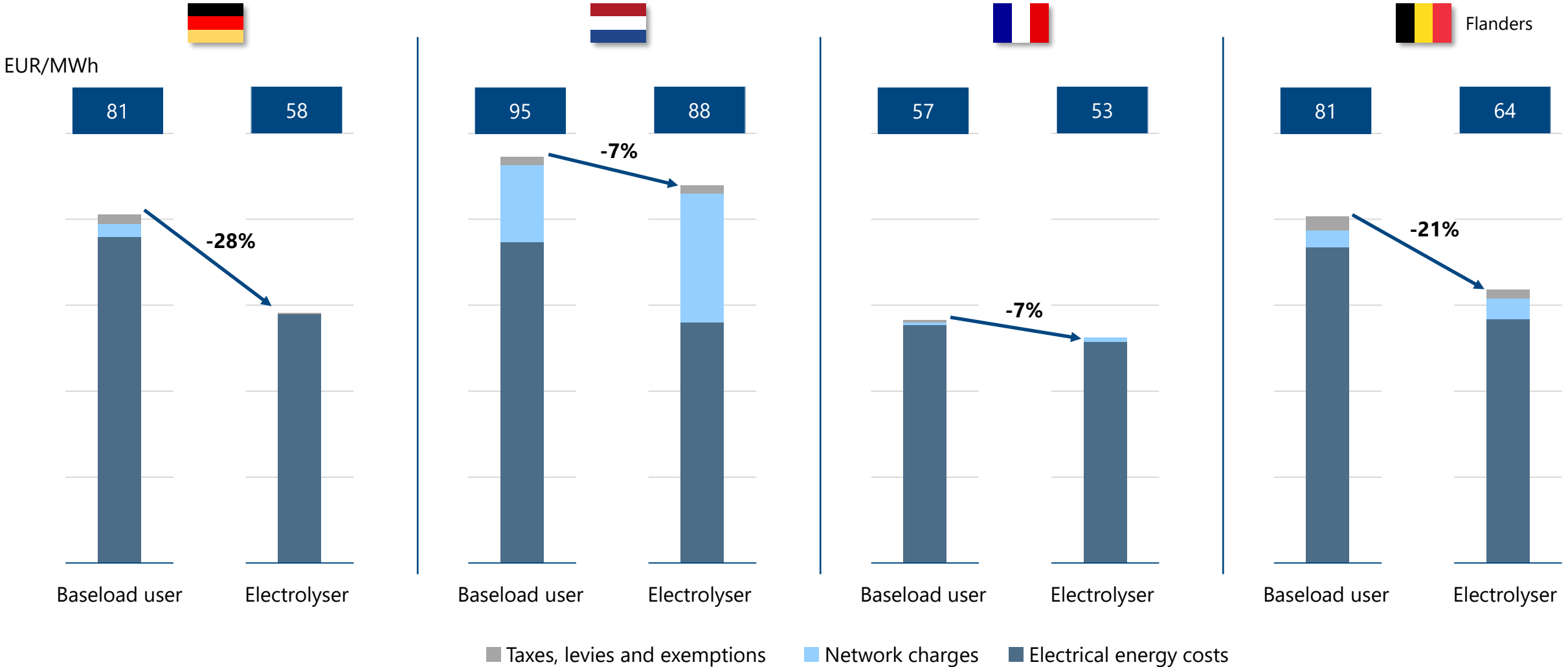
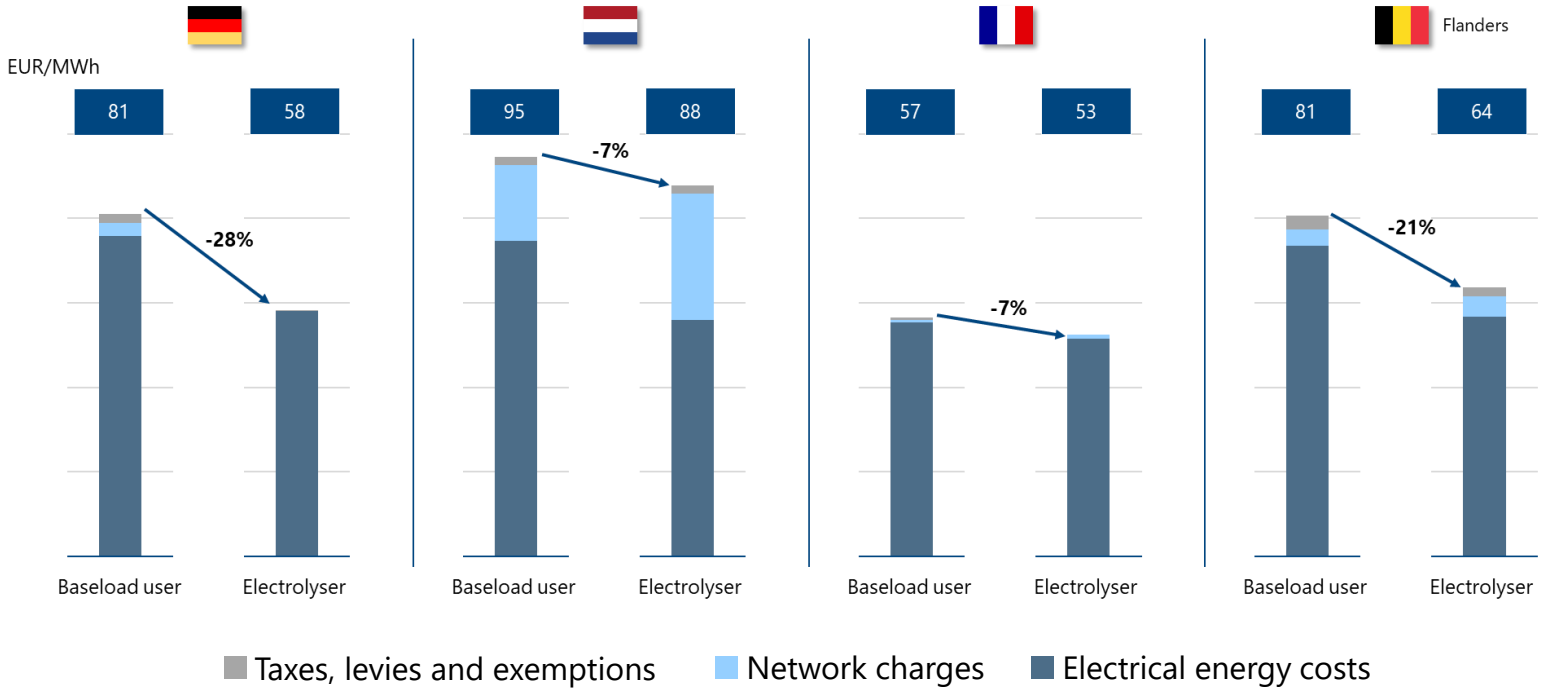
Comparison of effective electricity costs without indirect cost compensation in **2024** between **baseload** and **electrolysers**

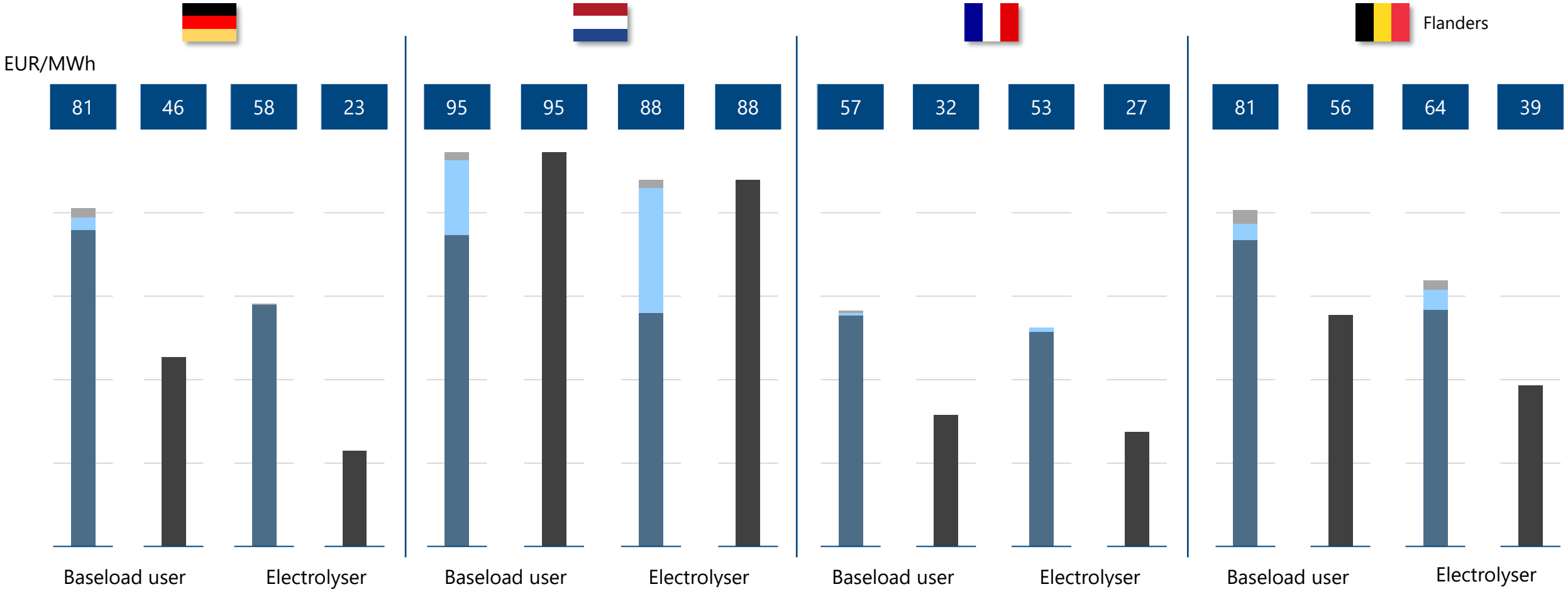


The electricity costs for **electrolysers** are lower than for **baseload users** in all countries in **2024** (w/o CO_2 price compensation)



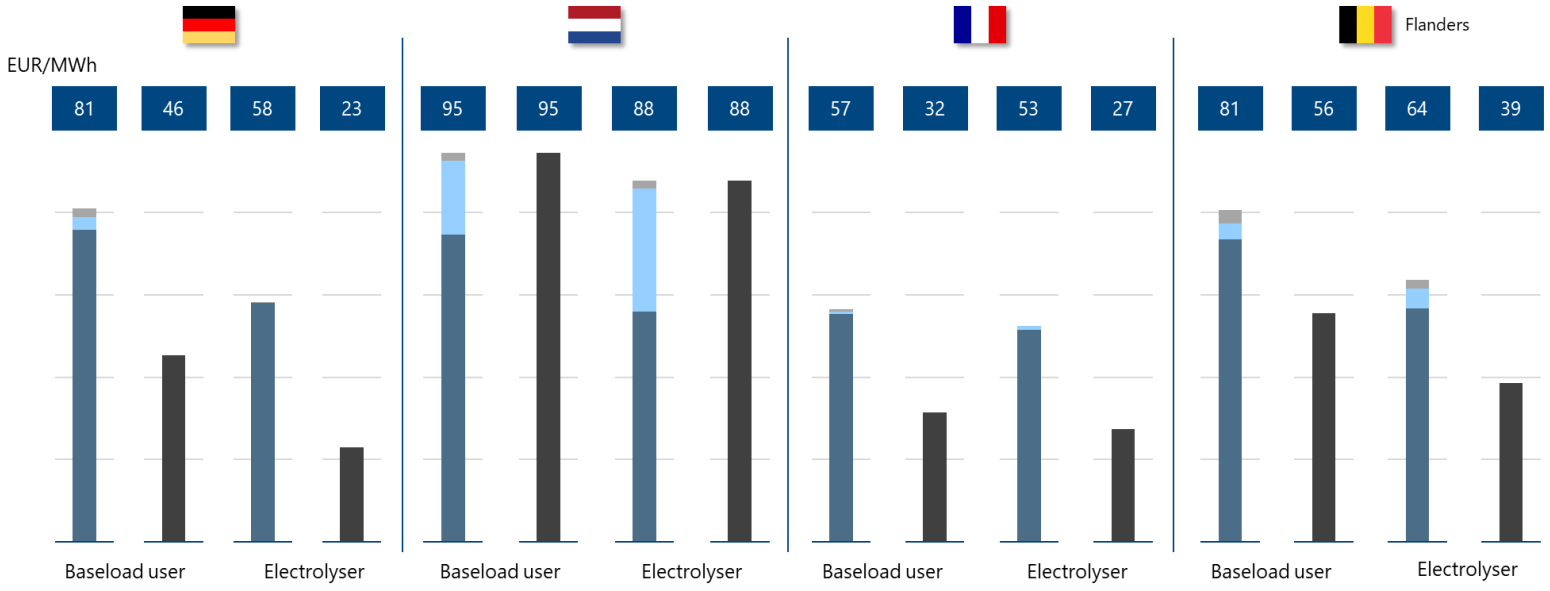
- **Electrolyser with cost advantage** against baseload user driven by commodity price reduction/optimization.
- **Largest advantage in Germany and Belgium** with 28% and 21% respectively.
- Flexusers/electrolysers in **Germany benefit from further network charge, tax and levy reductions**.
- Flexusers/electrolysers in **France and Belgium benefit from further tax exemptions**.
- **Dutch electrolysers with least advantage (7%)** due to higher network charges.

Comparison of effective electricity costs with and without indirect cost compensation in **2024** between **baseload** and **electrolysers**



Applicable sectors:
production of various metals, hydrogen, chemicals, wood and paper

The electricity costs for **electrolysers** are lower than for **baseload users** in every country **2024**



Price without indirect cost compensation

- Taxes, levies and exemptions
- Network charges
- Electrical energy costs*

Price with indirect cost compensation**

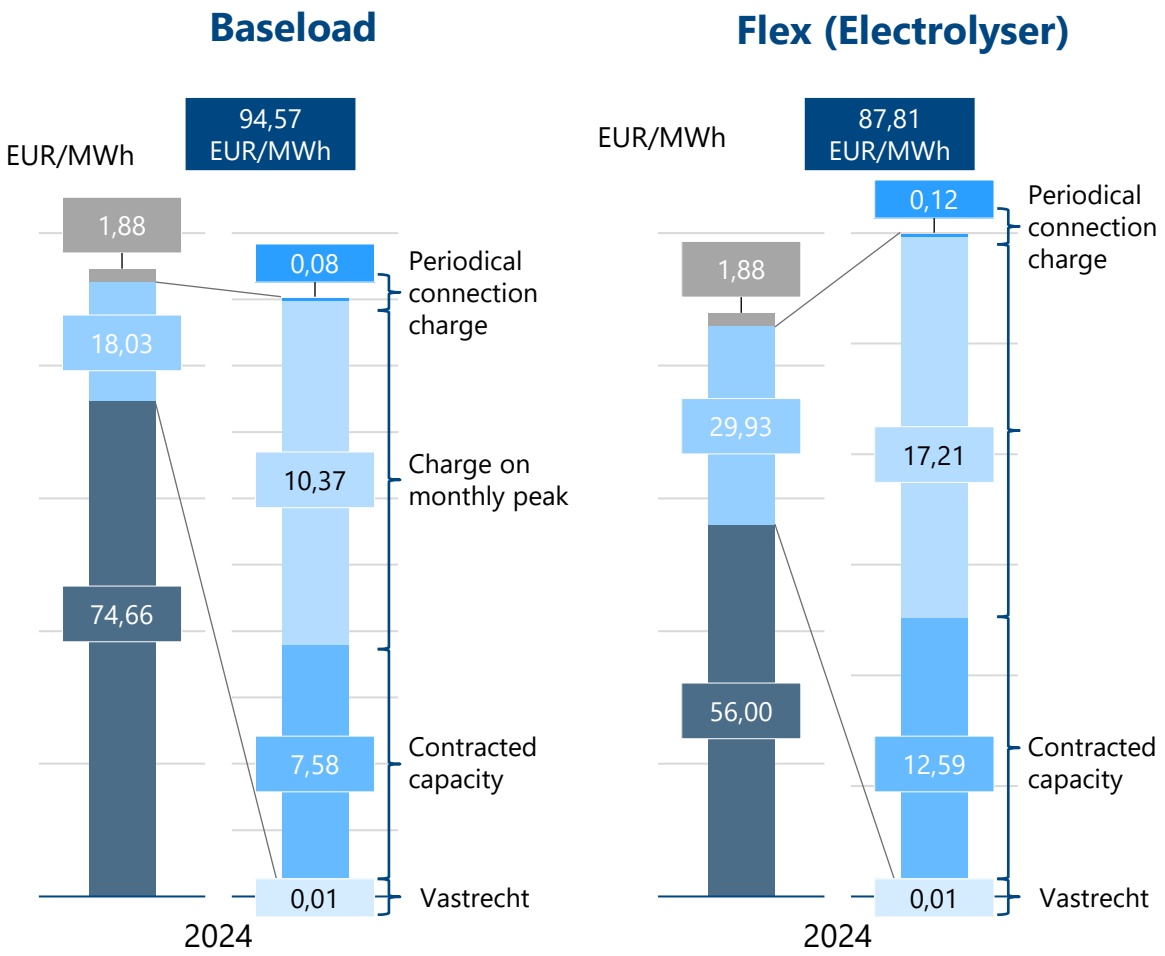
- Price with indirect cost compensation

- **Dutch industry** baseload users and electrolysers have **significant cost disadvantage** compared to the other countries.
- While commodity cost components are at similar levels (except France, driven by ARENG scheme), the **largest cost differences** for the Netherlands emerge from **high network charges, discontinued network charge reductions** and **discontinued indirect cost compensation**.
- **Electrolysers** can achieve a **substantial cost reduction** in **Germany and Belgium** due to electrolyser-specific policy such as tax and network charge exemptions.
- Due to the **higher network charges Dutch electrolysers** gain **almost no cost advantage** over baseload users. This means in general that **being flexible has almost no** advantage in the Netherlands; **i.e. incentives are low to become flexible.**

*** Applicable sectors: production of various metals, hydrogen, chemicals, wood and paper*

*Commodity costs: year to date settlement + future market indication Feb24

Zoom in: The network charge design of the Netherlands hinders flexibilities even though they are likely to be „network friendly“ by market-based orientation



- The contracted capacity is 66% higher since the baseload customer has a lower contracted capacity (125 MW to 250 MW from Flex user).
- **However, the flexible load pattern drives the monthly load peaks and thereby, network charges.**
- The concept of **„charges on monthly peaks“ was derived in a regime where network extension needs where mainly driven by load-based peaks (only)**.
- Typically, **electrolysers** will run in times with low electricity prices; i.e. times with high RES infeed and **can reduce network cost** at congested locations.
- The **current network charge design does not reward flexibility** and in this sense is **not aligned** with the **„cost-by-cause principle“**.

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4 Quantification of electricity cost components for large industries 2024

4.1 Overview and explanation of electricity cost elements

4.2 Baseload user

4.3 Electrolyser

4.4 Comparison baseload user and electrolyser

4.5 Main drivers and conclusions

5 Outlook and country comparison electricty cost components 2030

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Main drivers and conclusions of current electricity cost for baseload users and electrolysers in 2024

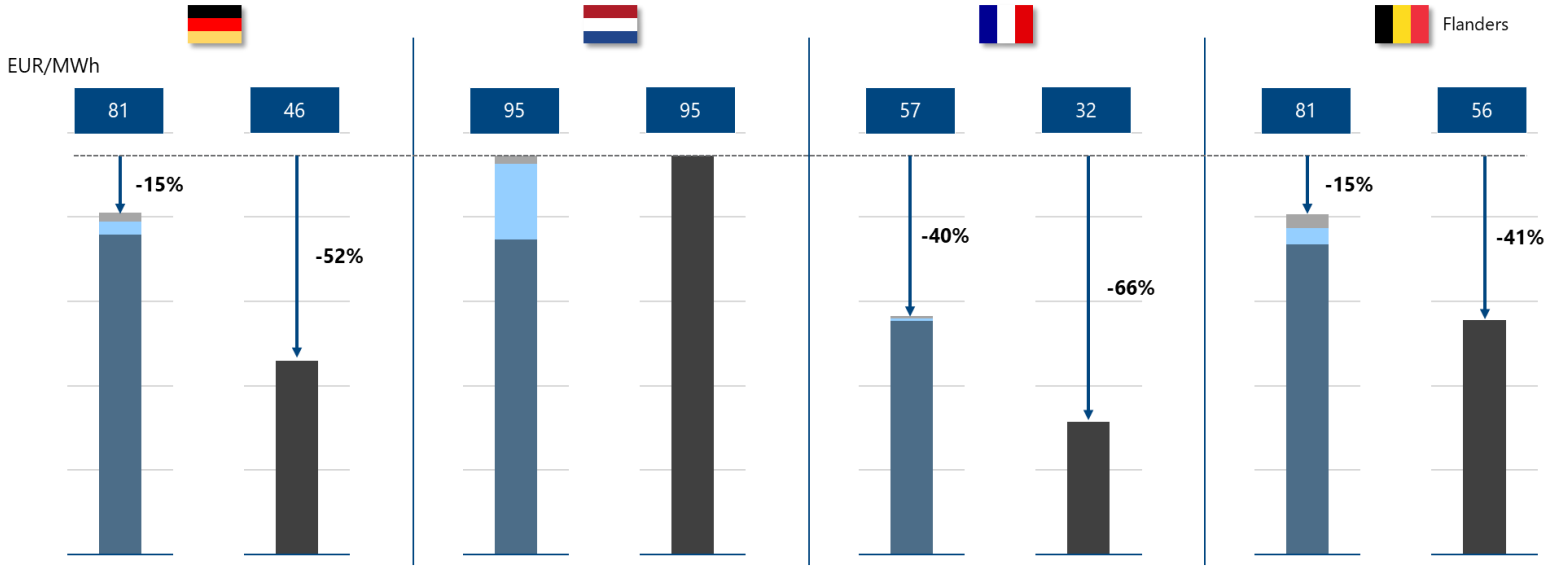
- Germany has three different **levies and high network charges**. All these cost elements are largely reduced by **substantial reliefs** for industry baseload consumers or **exemptions** for electrolysers.
- A termination of these reliefs/exemptions would result in Germany having the **highest electricity costs** for industry.

- The high electricity costs in the Netherlands are driven by the **high network charges** and the **absence of reliefs/ exemptions for the network charges** and the **absence of the indirect cost compensation**.

- France has no levies and **low network charges** for baseload users and electrolysers. Electrolysers benefit additionally from **exemptions from energy tax**.
- Companies (especially baseload users) also currently benefit from **low commodity costs due to the ARENH scheme**.

- Electricity costs in Belgium are driven up by the **certification scheme** which is unique to Belgium, even though large consumers benefit from reductions there. A termination of these reductions would result in a significant cost increase.
- The **network charges are similar to France,** but in Belgium **no reduction** exists which drives their network charges up in comparison to France and also Germany.

Baseload user: The highest total electricity costs in **2024** are in the Netherlands, the lowest in France –> Dutch industry with large disadvantage

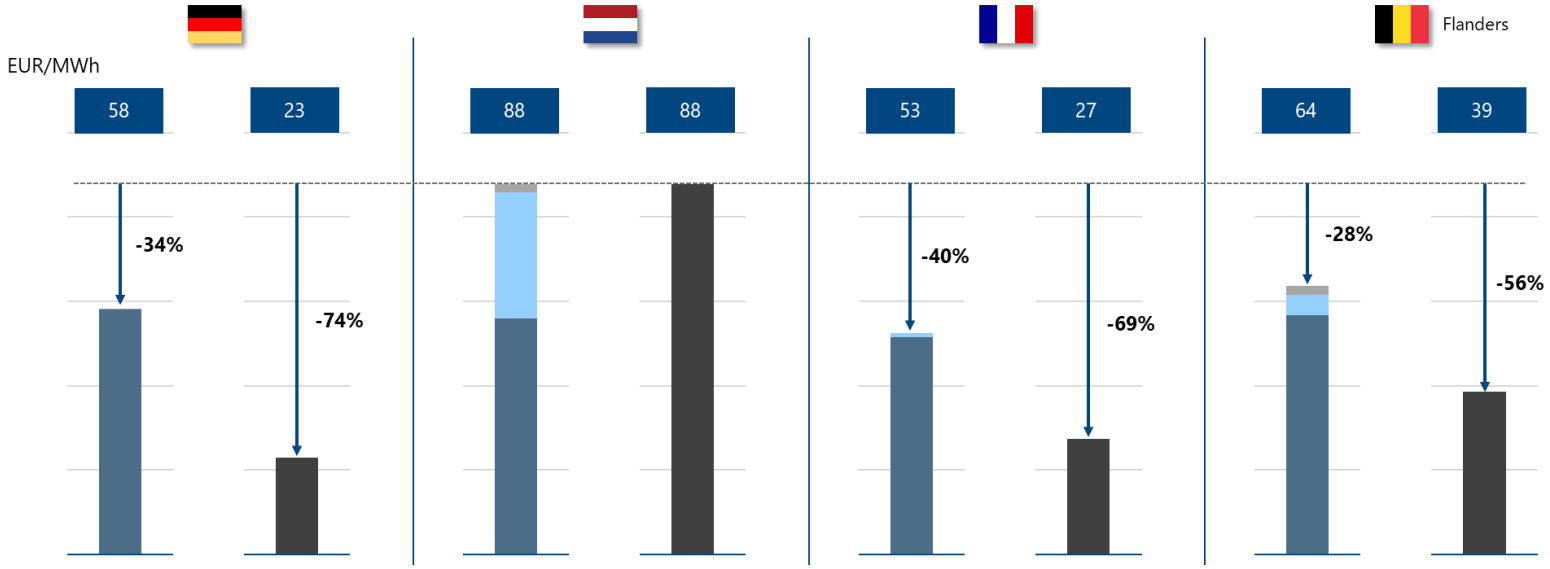


- **Dutch industry with** highest cost as CO_2 compensation and network charge reductions have been removed.
- France with the largest competitive advantage on total electricity cost due to ARENH and compensation schemes: 38 EUR/MWh (40%) in comparison to the Netherlands when excluding the indirect cost compensation (ICC).
- German and Belgian baseload users have an advantage of 14 EUR/MWh or 15% without ICC compared to Dutch baseload users.
- French industry that qualifies for ICC has a cost advantage of ca. 63 EUR/MWh (66%) against the Dutch industry (selected companies). With ICC, eligible German industry has a cost advantage of 49 EUR/MWh (52%), Belgian industry of 39 EUR/MWh (41%).

*** Applicable sectors: production of various metals, hydrogen, chemicals, wood and paper*

*Commodity costs: year to date settlement + future market indication Feb24

Electrolyser: The highest electricity costs in 2024 are in the Netherlands, the lowest in Germany –> disadvantage for Dutch electrolysers even higher than for baseload users



Price without indirect cost compensation

- Taxes, levies and exemptions
- Network charges
- Electrical energy costs*

Price with indirect cost compensation**

- Price with indirect cost compensation

- Some countries have specific exemptions for electrolysers.
- Germany with the largest competitive advantage for electrolysers due to almost complete reduction of network charges and fees/ taxes
- French and Belgian electrolysers also with cost advantage against the Netherlands due to lower network charges and cost compensation
- **Electrolysers** with **significant disadvantage in the Netherlands** due to high network charges and no cost compensation

*** Applicable sectors: production of various metals, hydrogen, chemicals, wood and paper*

*Commodity Costs: year to date settlement + future market indication Feb24

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5.1 Policy challenges, trends and assumptions until 2030

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Germany: Outlook 2030 - expected changes of taxes, levies, subsidies and exemptions and the indirect cost compensation

Taxes, levies, subsidies and exemptions

Electricity tax:
- The current reduction to 0,50 EUR/MWh only applies for 2024 and 2025. An extension until 2028 is planned, but counter-financing is necessary.
- The most electro-intensive industries could get a discount in the old regulation that led up to a minimum tax rate of **1,50 EUR/MWh (+ 200%)**
  → unlikely that future tax rates will exceed this

Levies & Fees:
- The CHP levy remained stable around **3 EUR/MWh** in the last years and is expected to stay stable around this value in the future **(+ 10%)**
- The offshore levy increased in the last years and is expected to increase further to around **12 EUR/MWh (+83%)** (further increase due to rising investment costs, see S. 16)
- The §19-StromNEV levy increased in the last years and is expected to follow the trend and increase further to around **8 EUR/MWh (+ 25%)**.
- No changes are expected, the value of **1,10 EUR/MWh (+ 0%)** is fixed.

Exemptions:
- No changes are expected regarding the relief on the CHP and offshore levy and the concession fee.

Indirect cost compensation

- Certificate Prices for 2030: **70 EUR/tCO_2** (Source, 13. February 2024)
- Fallback efficiency benchmark: **0,726** (yearly reduction by 1,09% starting from 0,8 in 2021)
- For the aid intensity it is assumed, that it will remain at 75%.
- CO_2 emission factor estimated to decrease with the revision in 2025
  - For Germany, the factor equals the weighted average of CO_2 emissions of fossil energy production.
  - The assumed value for 2030 is calculated by calculating the weighted average of CO_2 emissions from fossil energy generation (see s. 14) using the CO_2 emission values mentioned in this source. For gas and bio, it is assumed that the emission factor corresponds to the factor for CCGTs.

  → Assumption for CO_2 emission factor: **0,63 tCO2/MWh**

→ Resulting in compensation of:
70 EUR/tCO_2 * 0,63 tCO_2/MWh * 0,75 * 0,726 = **24 EUR/MWh (- 61%)**

Germany: Outlook 2030 - expected changes of network charges

Network charges

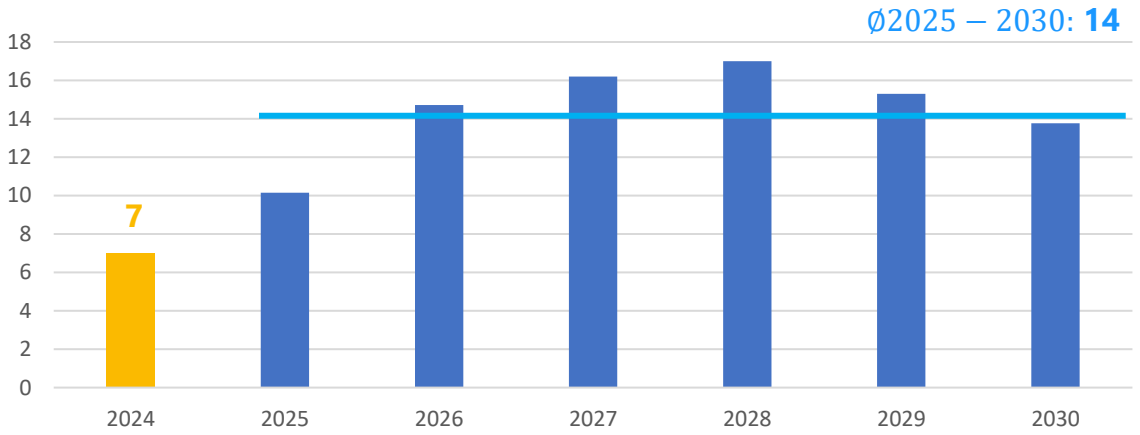
Network charges*

- Based on the sharp increase of network investment cost after 2024 (average ca. 100%) by 2030 and relatively stable cost for system services, losses and congestion management (see slide 18), network charges are expected to rise substantially by 2030. As investment cost account for80% of the yearly cost, an increase of network charges of about 80% is therefore assumed.
  - We assume that cost for system services, losses and congestion management will strongly rise after 2030 since until 2030 HVDC extensions mitigate cost increasements.
- Resulting in network charges (before relief/exemption)*:
  - Baseload user: **54 EUR/MWh** (2024: 30 EUR/MWh, + 80%)
  - Electrolyser: **75 EUR/MWh** (2024: 42,5 EUR/MWh, + 80%)

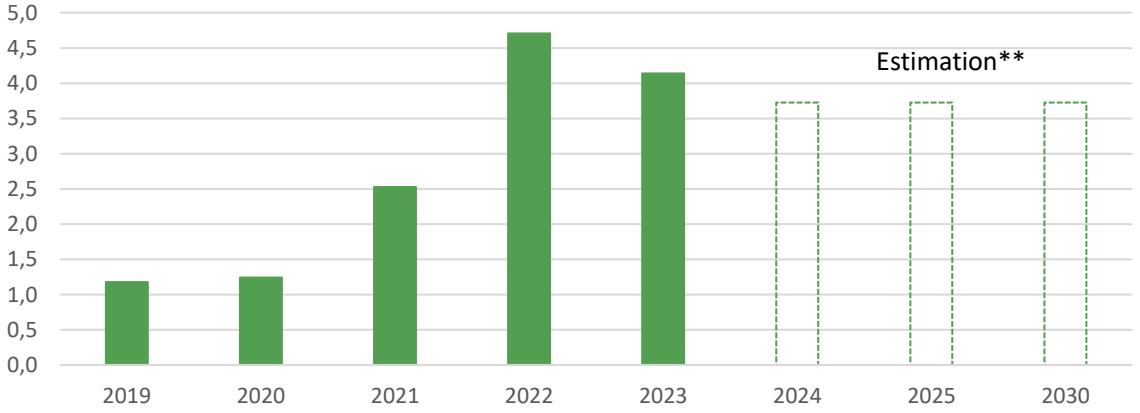
Exemptions:

- No changes are expected regarding the individual network tariffs for large consumers, the values are fixed in the regulation.

Total investment costs [bln EUR/a]



Costs for system services, losses and congestion management [bln EUR/a]



* Disclaimer: Network charge projections based on rough estimation (see s. 11)

Netherlands: Outlook 2030 - expected changes of taxes, levies, subsidies and exemptions

Taxes, levies, subsidies and exemptions

Energy tax:

- The energy tax is determined every year with a sharp increase in the last two years. Before 2023 the tax was stable at around 0,55 EUR/MWh. As commodity costs are decreasing the tax is not expected to increase much.
  → Expected to increase slightly to around **2 EUR/MWh (+ 6%)**

Levies:

- As the Netherlands abolished levies in the past years, it is not expected that they will introduce new levies.

Exemptions:

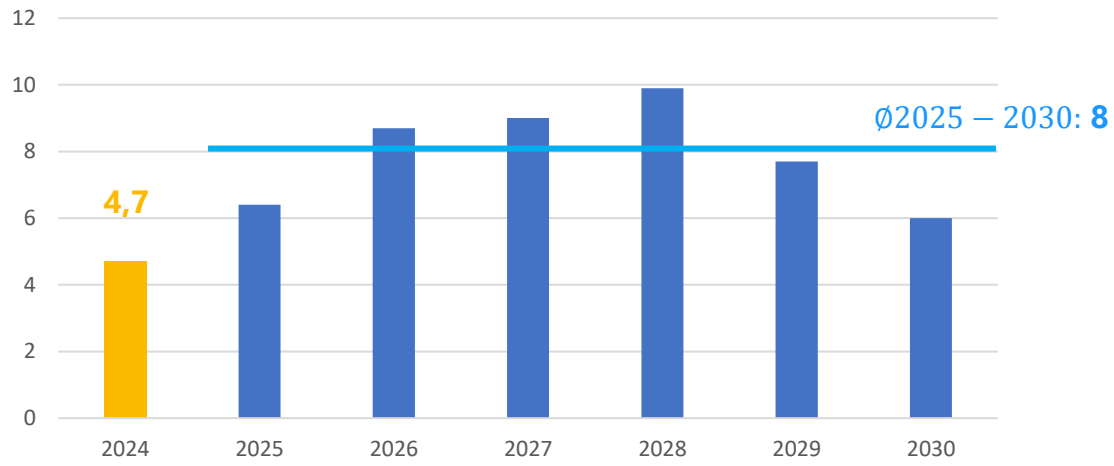
- A tax exemption for electrolysers will be introduced as of 1. January 2025.
  → Energy tax for electrolysers in 2030 will be **0,00 EUR/MWh**
- The energy tax reduction is determined newly every year; as the government sees a certain use of energy as basic need an abolishment of this relief is not expected.
  → With decreasing commodity cost, the tax reduction is expected to decrease as well to estimated **500 EUR/a (- 4%)**

Netherlands: Outlook 2030 - expected changes of network charges

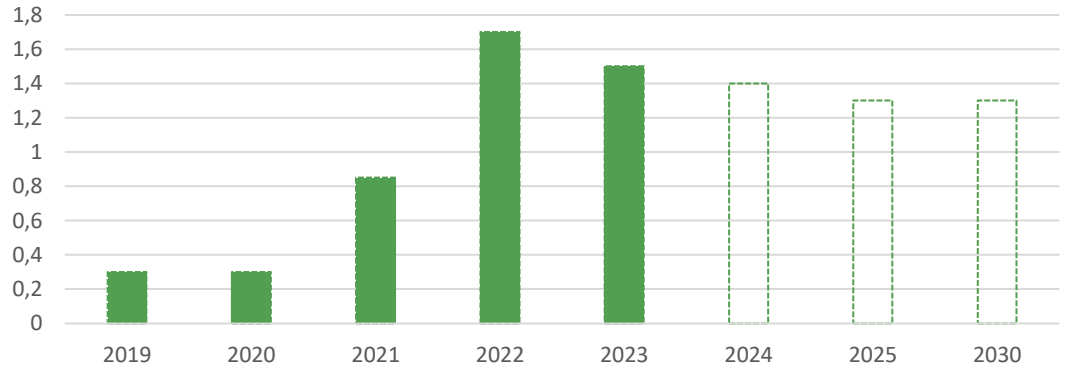
Network charges

- Based on the sharp increase of network investment cost (average ca. 70%) by 2030 and relatively stable cost for system services, losses and congestion management, network charges are expected to rise substantially by 2030.
- As investment costs account for 80% of the yearly costs, an increase of network charges of about 55% is therefore assumed.
- Resulting in network charges*:
  - Baseload user: **28 EUR/MWh** (2024: 18 EUR/MWh, + 55%)
  - Electrolyser: **47 EUR/MWh** (2024: 30 EUR/MWh, + 55%)

Total investments costs (on- & offshore) [bln EUR/a]*



Costs for system services, losses and congestion management [bln EUR/a]



* Disclaimer: Network charge projections based on rough estimation (see s. 11)

France: Outlook 2030 - expected changes of taxes, levies, subsidies and exemptions and the indirect cost compensation

Taxes, levies, subsidies and exemptions

Energy tax:

- Reduction to 0,50 EUR/MWh ends on 31.01.2024, from then the old scheme for energy-intensive industries applies again.
- No further changes on the energy tax regulation are expected as of now.

Indirect cost compensation

Indirect cost compensation:

- Certificate prices for 2030: 70 EUR/tCO_2 (Source, 13. February 2024)
- Fallback efficiency benchmark: 0,726 (yearly reduction by 1,09% starting from 0,8 in 2021)
- CO_2 emission factor estimated to decrease with the revision in 2025
  - For France the factor equals the weighted average of CO_2 emissions of the price setting (marginal) power plants
  - Estimation of future marginal power plants and their share not possible
  - Price was set by energy imports in 28% of the time in 2021*, no significant changes are assumed until 2024/25 when the new factor is calculated
  - Due to the decrease of the factor in Germany from 0,72 to 0,63 an equivalent decrease in France is assumed: 0,28 * 0,09 = 0,03
  - → Assumption: (0,51 – 0,03) tCO_2/MWh = **0,48 tCO_2/MWh**

→ 70 EUR/tCO_2 * 0,48 tCO_2/MWh * 0,75 * 0,726 = **18,30 EUR/MWh (- 27%)**

* Source: Approval France

France: Outlook 2030 - expected changes of network charges

Network charges

Network charges:

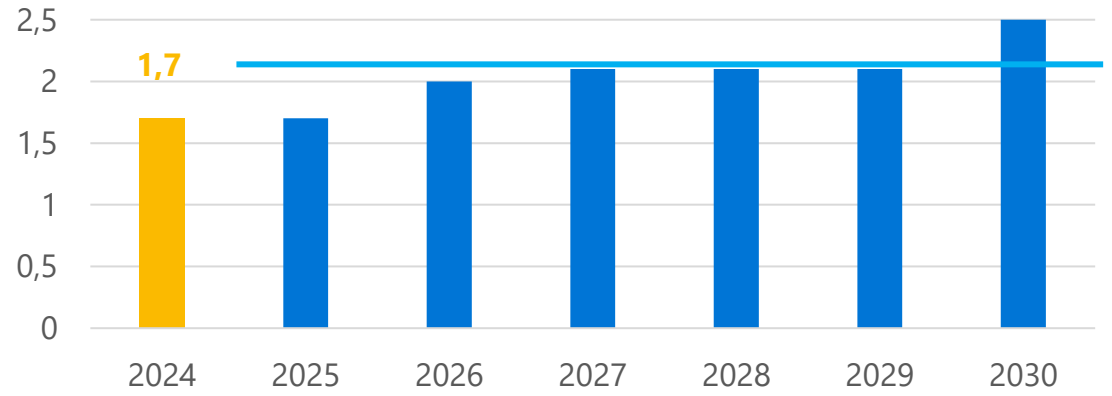
- An increase of 30% until 2030 is assumed based on the development of investment cost and costs for system services, losses and congestion management.
- Resulting in network charges (before relief/exemption)*:
  - Baseload user: **4,55 EUR/MWh** (2024: 3,5 EUR/MWh, + 30%)
  - Electrolyser: **4,55 EUR/MWh** (2024: 3,5 EUR/MWh, + 30%)

Exemptions:

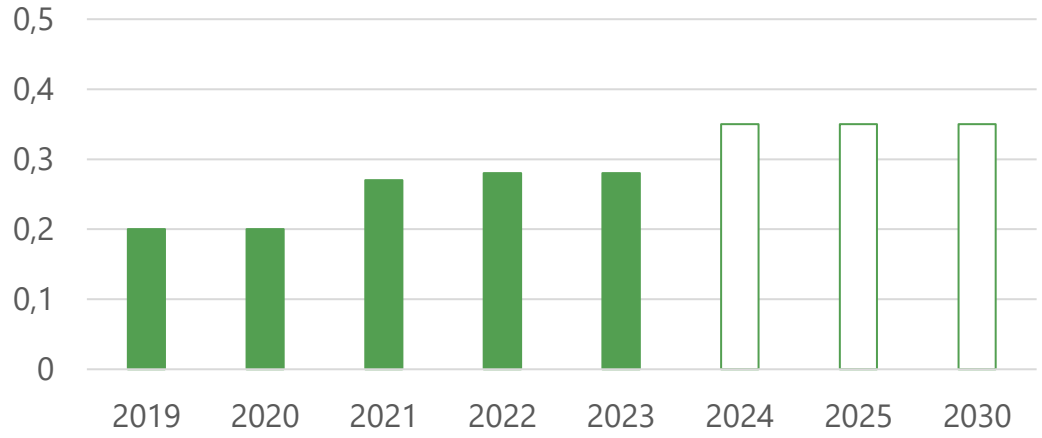
- No changes of the regulation of network charge reductions are expected.

Total investments costs [bln EUR/a]

Ø2025 – 2030: **2,2**



Costs for system services, losses and congestion management [bln EUR/a]



* Disclaimer: Network charge projections based on rough estimation (see s. 132)

Belgium: Outlook 2030 - expected changes of taxes, levies, subsidies and exemptions and the indirect cost compensation

Taxes, levies, subsidies and exemptions

Energy tax:

- The special excise duty was introduced on 01/01/2022 to replace federal contribution and surcharges stated under transmission costs, no new changes are expected.

Levies:

- Besides the updates done during regulatory period in line with the underlying regulations and tariff methodology, no major changes are expected.
- Levy Flanders: increase to **1 EUR/MWh (+ 84%)** expected (following trend)
- Levy Brussels: increase to **5 EUR/MWh (+ 20%)** expected (following trend)
- Connection fee in Wallonia is determined by regulation, therefore no changes expected.

Indirect cost compensation

- Certificate prices for 2030: 70 EUR/tCO_2 (Source, 13. February 2024)
- Fallback efficiency benchmark: 0,726 (yearly reduction by 1,09% starting from 0,8 in 2021)
- CO_2 emission factor estimated to decrease with the revision in 2025
  - For Belgium the factor equals the weighted average of CO_2 emissions of the price setting (marginal) power plants
  - Estimation of future marginal power plants and their share not possible
  - Price was set by energy imports in 80% of the time in 2019*, no significant changes are assumed until 2024/25 when the new factor is calculated
  - Due to the decrease of the factor in Germany from 0,72 to 0,63 an equivalent decrease in Belgium is assumed: 0,8 * 0,09 = 0,07

  → Assumption: (0,51 – 0,07) tCO_2/MWh = 0,44 tCO_2/MWh

→ 70 EUR/tCO_2 * 0,44 tCO_2/MWh * 0,75 * 0,726 = **16,80 EUR/MWh (- 33%)**

* Source: Approval Belgium

Belgium: Outlook 2030 - expected changes of network charges

Network charges

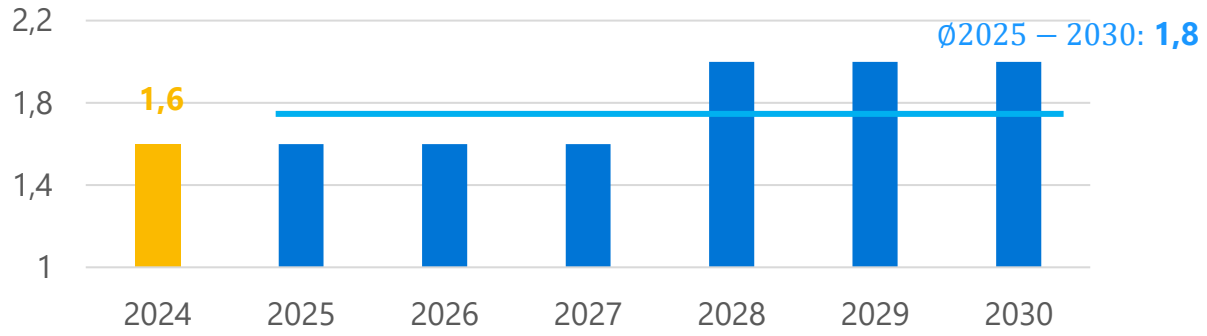
Network charges:

- After having stable to slightly decreasing tariffs from 2020 to 2024, the tariffs will increase sharply from 2025 to 2027.
- This is in order to finance the ambitious investment program.
- No further increase after 2027 is assumed, as the increase happening until then exceeds the expected increase of cost of approx. 25%.

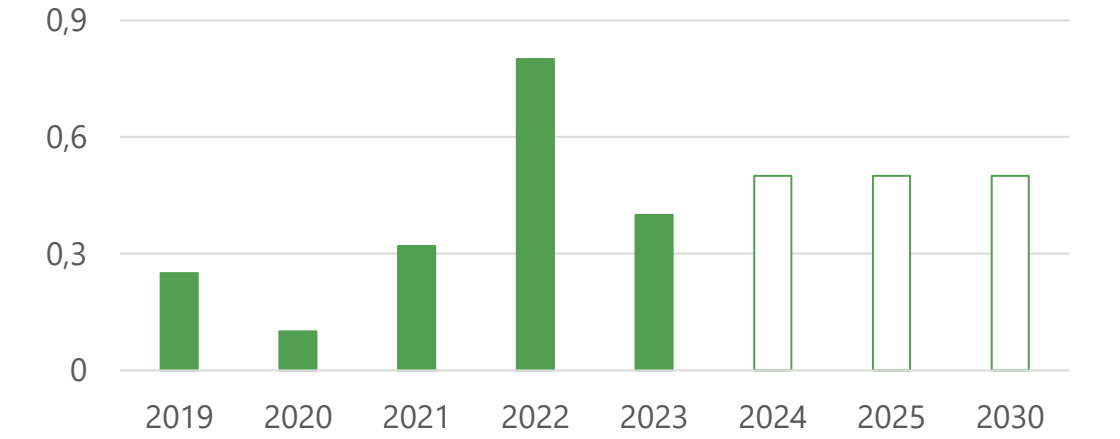
Resulting in network charges (before relief/exemption)*:

- Baseload user: **9 EUR/MWh** (2024: 3,85 EUR/MWh, + 134%)
- Electrolyser: **12 EUR/MWh** (2024: 4,76 EUR/MWh, + 152%)

Total investments cost [bln EUR/a]



Costs for system services, losses and congestion management [bln EUR/a]



* Network charge projections based on ELIA

Belgium: Outlook 2030 - expected changes of the certificate scheme

Certificate scheme

Certificate schemes:

- Brussels: The quota will decrease from 26,7% in 2024 to 20,6% in 2030.
- Flanders:
  - Starting from 18% in 2024, the quota for Green Certificates will decrease yearly until it reaches 9% in 2030.
  - The CHCPs quota is set to increase from 11,2% in 2024 to 14% in 2025 and then remains stable until 2031.
- Wallonia: Starting from 40,28% in 2024, the quota for Green Certificates will increase yearly until it reaches 44,51% in 2030.
- As certificate prices in Elia´s auction don't follow any trend in the past years, but stay remain quite stable, it is assumed that these prices will also remain stable in the future at around the current prices:
  - Brussels: **84 EUR/MWh**
  - Flanders: Green Certificate: **98 EUR/MWh**; Cogeneration: **22 EUR/MWh**
  - Wallonia: **66 EUR/MWh**

Summary projection of development of taxes, levies, network charges* and indirect cost compensation until 2030 for all countries**

Component	2024	2030
Electricity tax	0,50	1,50
§ 19 StromNEV levy	6,43	8,00
CHP levy	2,75	3,00
Offshore levy	6,56	12,00
Concession fee	1,10	1,10
Network charges baseload	31,00	54,00
Network charges electrolyser	44,20	75,00
Relief baseload (tax, levies & network)	-43,07	-70,40
Relief electrolyser (tax, levies & network)	-61,28	-100,30
Total baseload	**5,27**	**9,20**
Total electrolyser	**0,26**	**0,30**
Indirect cost compensation	-35,34	-24,00

Component	2024	2030
Electricity Tax	1,88	2,00
Network charges baseload	18,00	28,00
Network charges electrolyser	30,00	47,00
Relief electrolyser (tax)	0,00	-2,00
Total baseload	**19,88**	**30,00**
Total electrolyser	**31,88**	**47,00**

Component	2024	2030
Electricity Tax	0,50	0,50
Network charges baseload	3,50	4,50
Network charges electrolyser	3,50	4,50
Relief baseload (network)	-2,84	-3,60
Relief electrolyser (network)	-3,09	-3,80
Total baseload	**1,16**	**1,40**
Total electrolyser	**0,91**	**1,20**
Indirect cost compensation	-25,03	-18,30

Component	2024	2030
Electricity Tax	0,92	1,00
Levy Flanders	0,54	1,00
Network charges baseload	3,85	9,00
Network charges electrolyser	4,76	12,00
Certificate scheme baseload	20,12	11,90
Certificate scheme electrolyser	20,12	11,90
Relief baseload (tax & certificate)	-18,37	-10,70
Relief electrolyser (tax & certificate)	-19,52	-11,70
Total baseload	**7,06**	**12,20**
Total electrolyser	**6,82**	**14,40**
Indirect cost compensation	-25,03	-16,80

* Disclaimer: Network charge projections based on rough estimation (see s. 11)

** All values are in EUR/MWh

Changes are expected for commodity costs, network charges and indirect cost compensation in 2030

- Largest changes expected at **network charges (increase)** and **indirect cost compensation (decrease)** towards 2030.
- Germany and the Netherlands with the highest network charge increase expected in 2030; ca. 80% resp. 55%
- The indirect CO_2 cost compensation is expected to decrease by ca. 30% in Germany, France and Belgium.
- Commodity costs are expected to continue to converge between neighboring countries. While commodity costs are expected to decrease in Germany, the Netherlands, and Belgium by 10-20%, they are expected to slightly increase in France due to adjustment of the ARENH scheme.

E-Bridge
competence in energy

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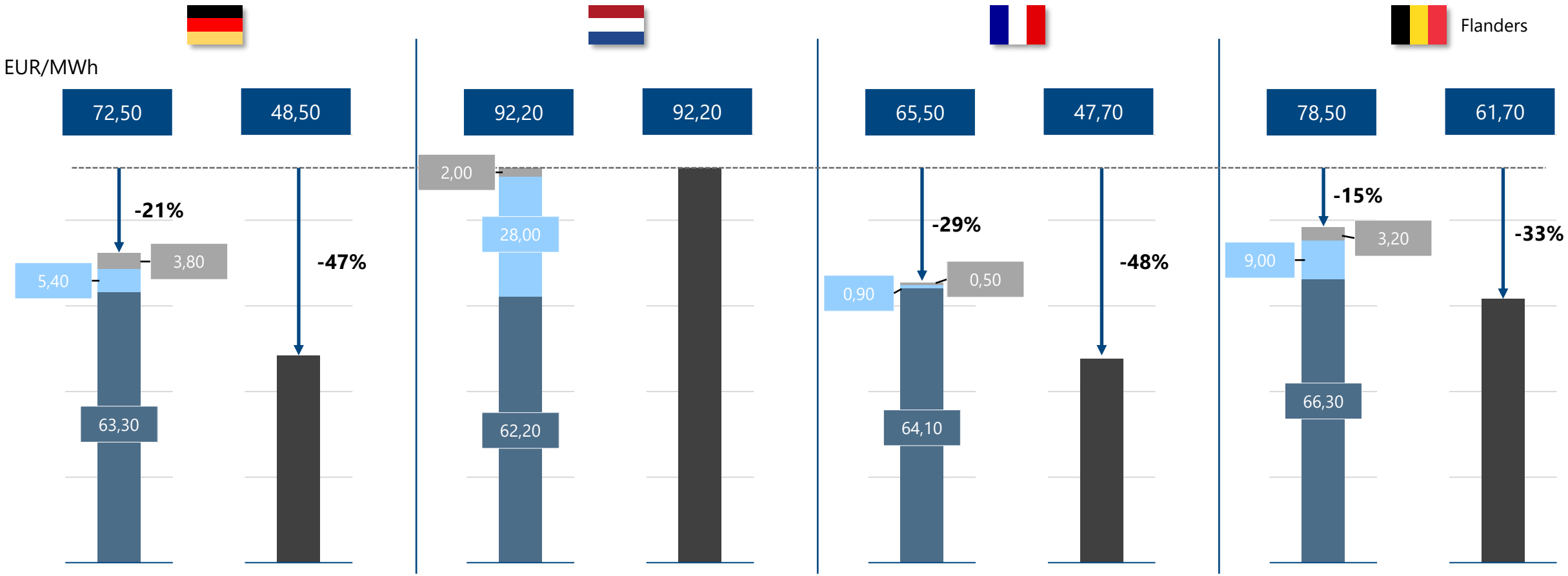
Baseload user: Effective electricity costs with and without indirect cost compensation in **2030**, EUR/MWh



Price without indirect cost compensation

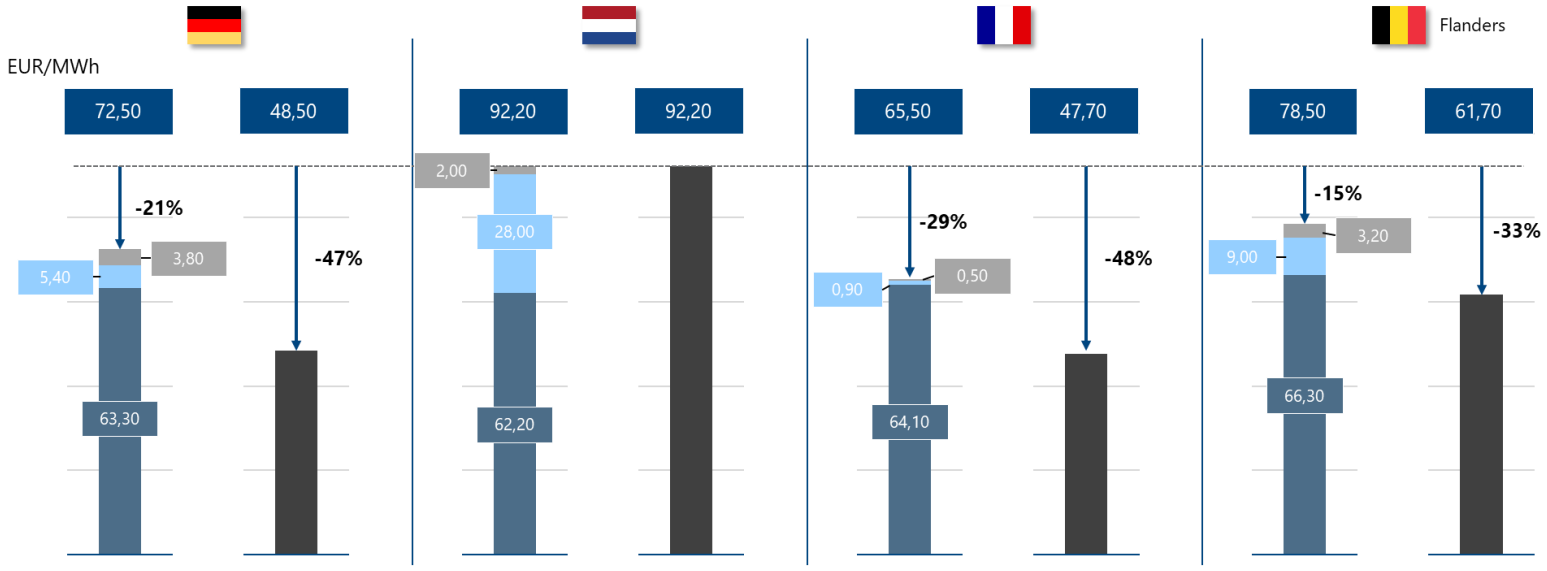
- Taxes, levies and exemptions
- Network charges
- Electrical energy costs

Price with indirect cost compensation

- Price with indirect cost compensation

*** Applicable sectors: production of various metals, hydrogen, chemicals, wood and paper*

Baseload user: High disadvantage for Dutch baseload users due to the absence of reliefs/exemptions and the indirect cost compensation in 2030

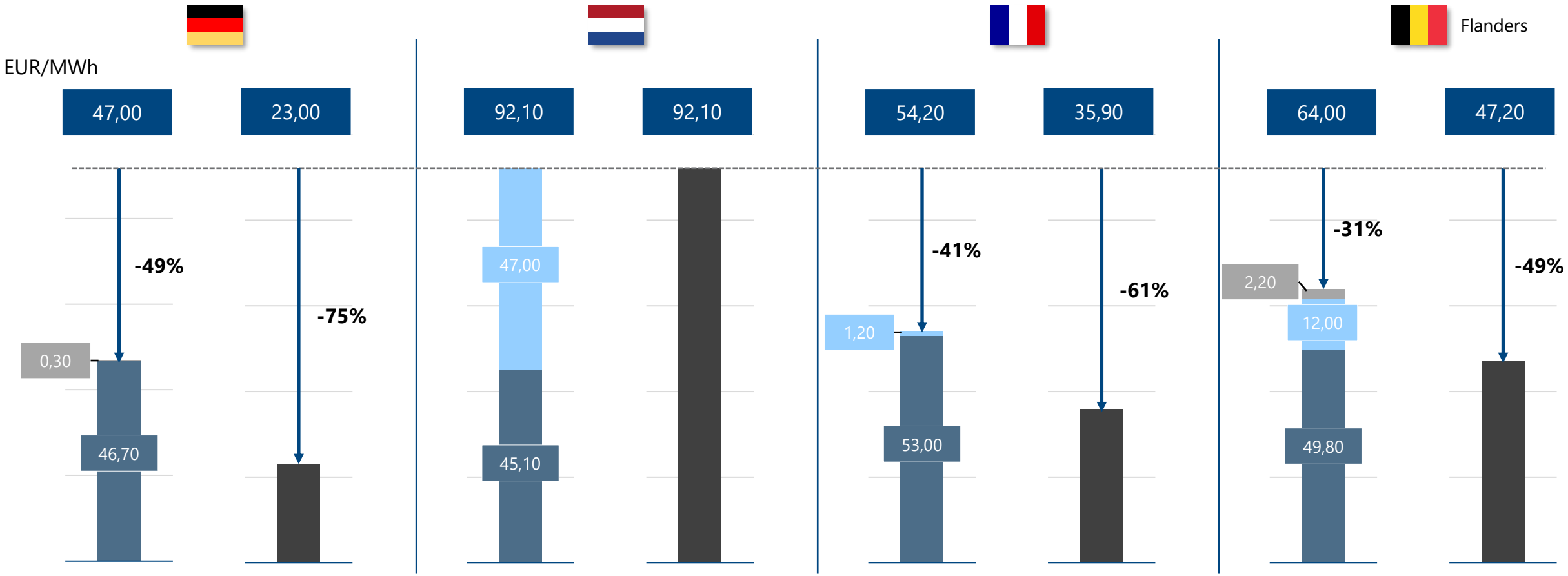


- Despite the reduction of the compensation schemes **French and German baseload industry** is still expected to have a **significant cost advantage compared to the Netherlands in 2030**.
- Electricity cost in **Germany, France and Belgium** are expected to be **21%, 29% and 15% below the cost in the Netherlands** respectively for industries, that are not eligible for the indirect cost compensation (ICC).
- With the ICC, electricity cost in **France and Germany** are expected to be **50% below and in Belgium to be 30% below the cost in the Netherlands.**
- The **3 countries benefit** from **lower network charges and reliefs** as well as from the **CO_2 compensation scheme, while Dutch baseload users face** the **highest network charges in 2030**, as there are no reliefs in the Netherlands

*** Applicable sectors: production of various metals, hydrogen, chemicals, wood and paper*

*Commodity cost: Future market indication Feb24

Electrolyser: Effective electricity costs with and without indirect cost compensation in **2030**, EUR/MWh



Price without indirect cost compensation

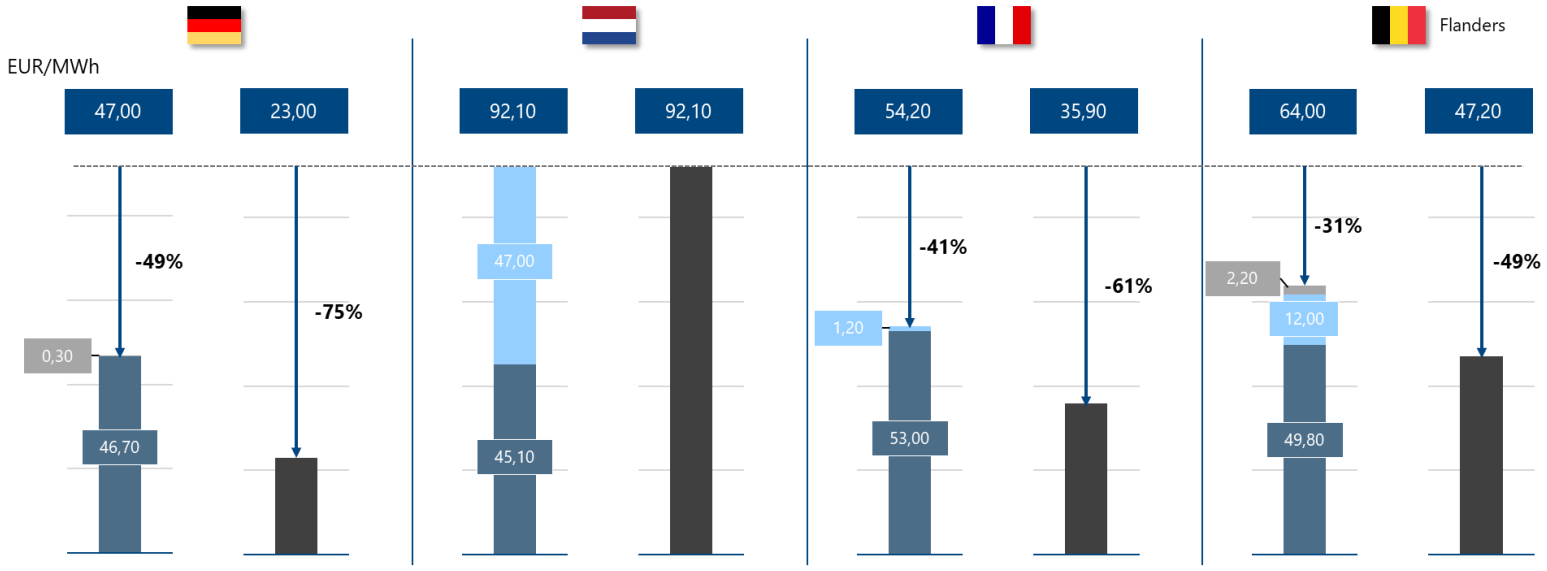
- Taxes, levies and exemptions
- Network charges
- Electrical energy costs

Price with indirect cost compensation

- Price with indirect cost compensation

*** Applicable sectors: production of various metals, hydrogen, chemicals, wood and paper*

Electrolyser: Dutch electrolysers have an even higher disadvantage than baseload users due to the very high expected network charges in 2030



Price without indirect cost compensation

- Taxes, levies and exemptions
- Network charges
- Electrical energy costs*

Price with indirect cost compensation**

- Price with indirect cost compensation

** *Applicable sectors: production of various metals, hydrogen, chemicals, wood and paper*

*Commodity cost: Future market indication Feb24

- For **electrolysers** the **electricity cost advantage** in Germany, France and Belgium is **larger than for baseload users**.
- Even without the indirect cost compensation (ICC) Belgian, French and German electrolysers have **30% - 50% lower electricity costs** than Dutch electrolysers, which is driven in Belgium and France by **partial reliefs on taxes** and in Germany by **complete reliefs on taxes, levies and network charges**.
- When including the ICC**, German electrolysers** are expected to be **only paying ca. 25% of the electricity** cost **compared** to their **Dutch peers. French and Belgian electrolysers** are expected to **pay 39% and 51%** of Dutch users respectively.
- **Network charges** for **electrolysers** in the **Netherlands** are expected to amount **approximately half of the total cost.**

NOTE: This analysis does not include proposals for tariff structure changes in the Netherlands that could benefit flexible users (e.g., non-firm ATOs, ATR85), as their potential impact could not yet be sufficiently assessed

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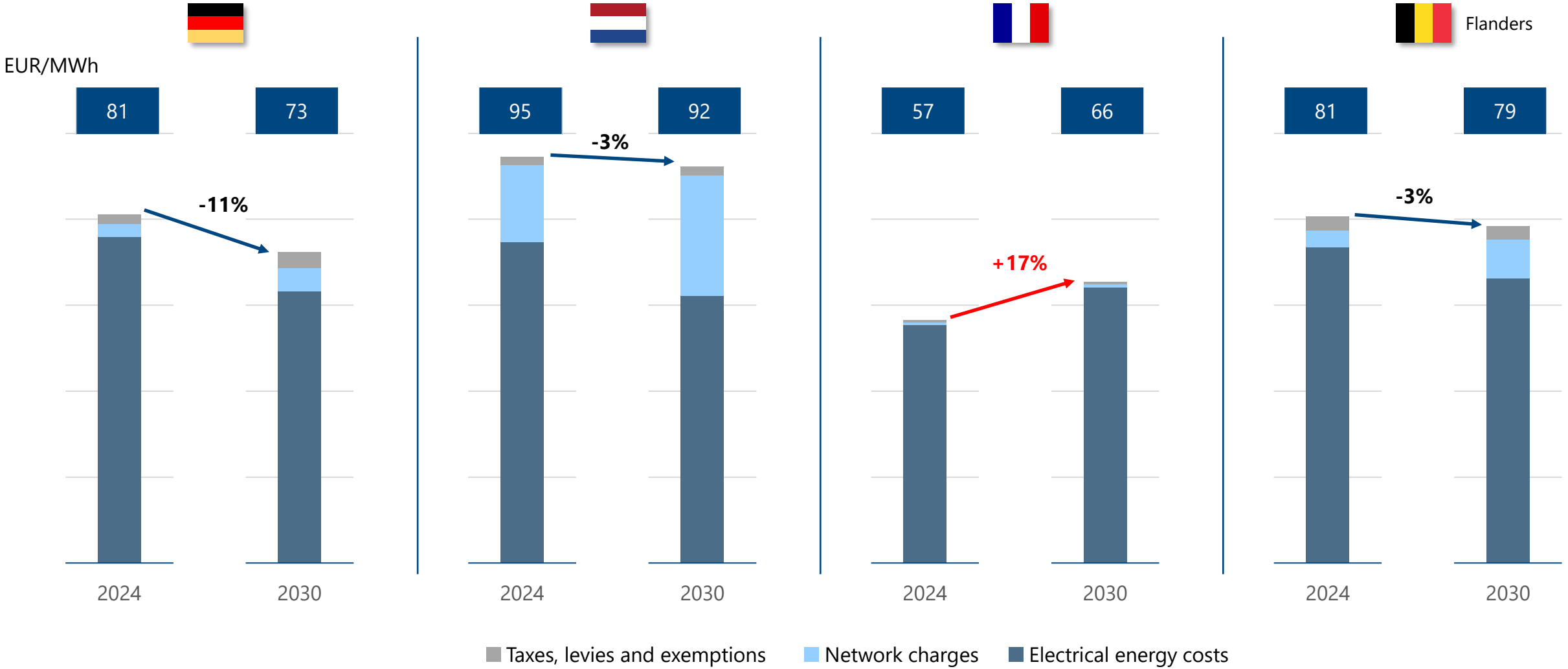
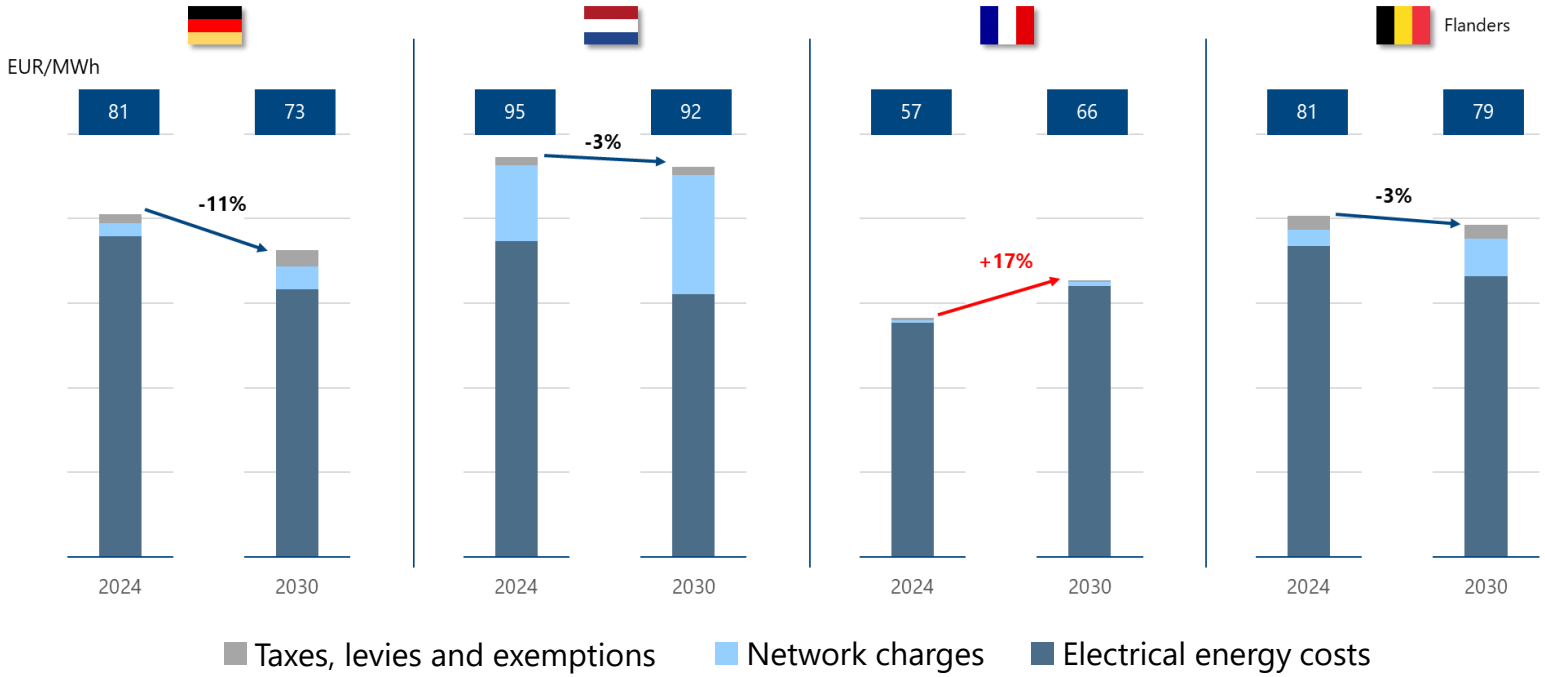
Baseload user: Comparison of effective electricity costs without indirect cost compensation* between 2024 and 2030



* Indirect cost compensation is not taken into account, as otherwise the commodity costs would not be comparable

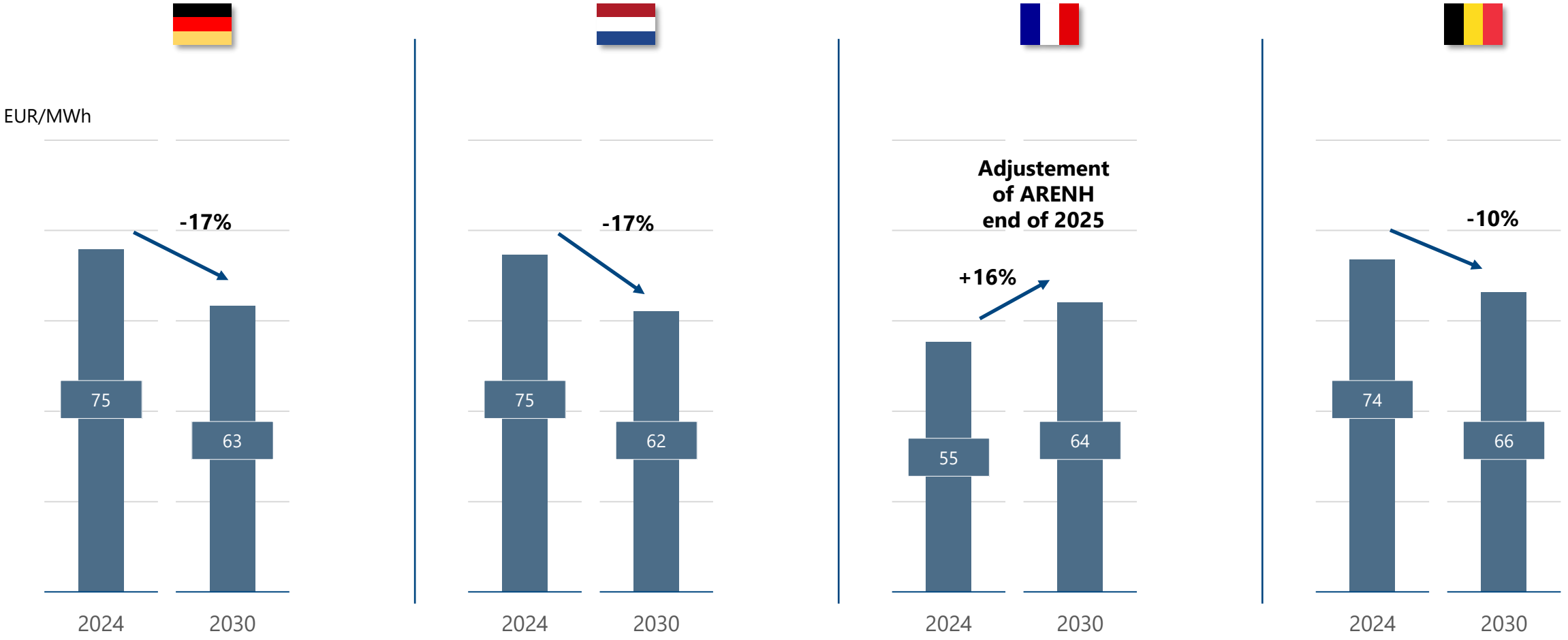
Baseload user: Until 2030 electricity costs* in Germany are expected to decrease, remain fairly stable in the Netherlands and Belgium while they increase in France



- The expected decrease of commodity costs lead to lower electricity costs for German companies despite a rise in network tariffs in 2030.
- In the **Netherlands and Belgium lower commodity costs** are **offset** to a large extend by **higher network charges**.
- France is expected to have the lowest electricity costs for baseload costumers also in 2030, although the costs will increase compared to 2024. This is due to higher commodity costs in consequence of the adjustment of the ARENH scheme.

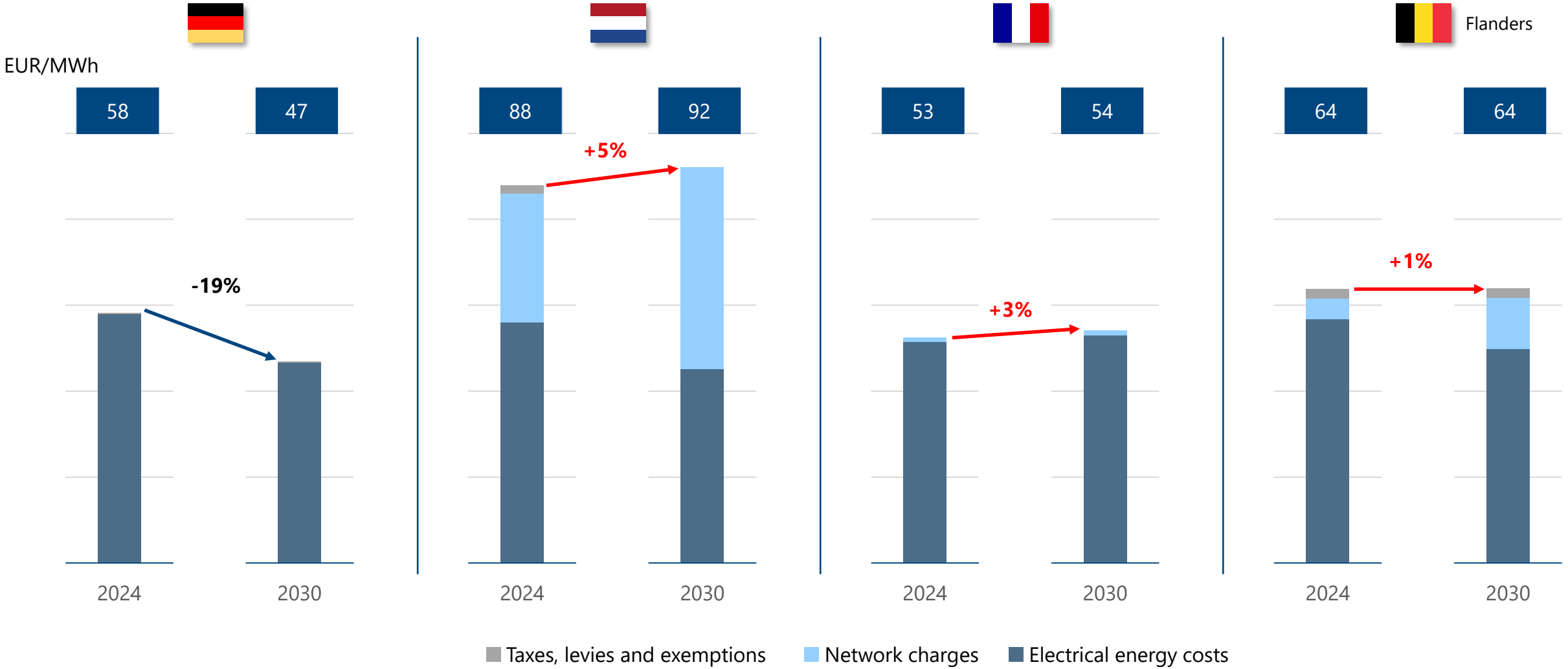
* Indirect cost compensation is not taken into account, as otherwise the commodity costs would not be comparable

Baseload user: Comparison of commodity costs in **2024** and **2030**



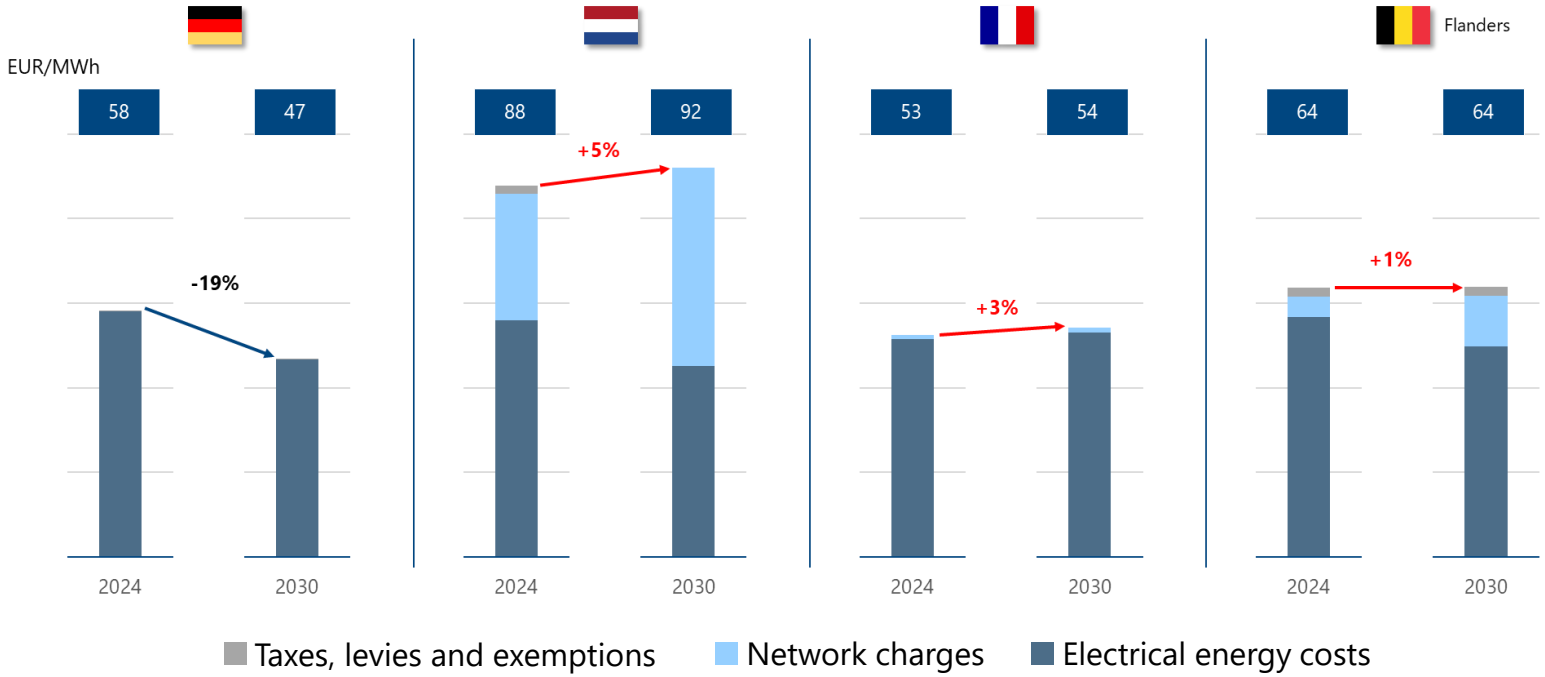
*Commodity Costs: year to date settlement + future market indication Feb24

Electrolyser: Comparison of effective electricity costs without indirect cost compensation* for a between 2024 and 2030



* Indirect cost compensation is not taken into account, as otherwise the commodity costs would not be comparable

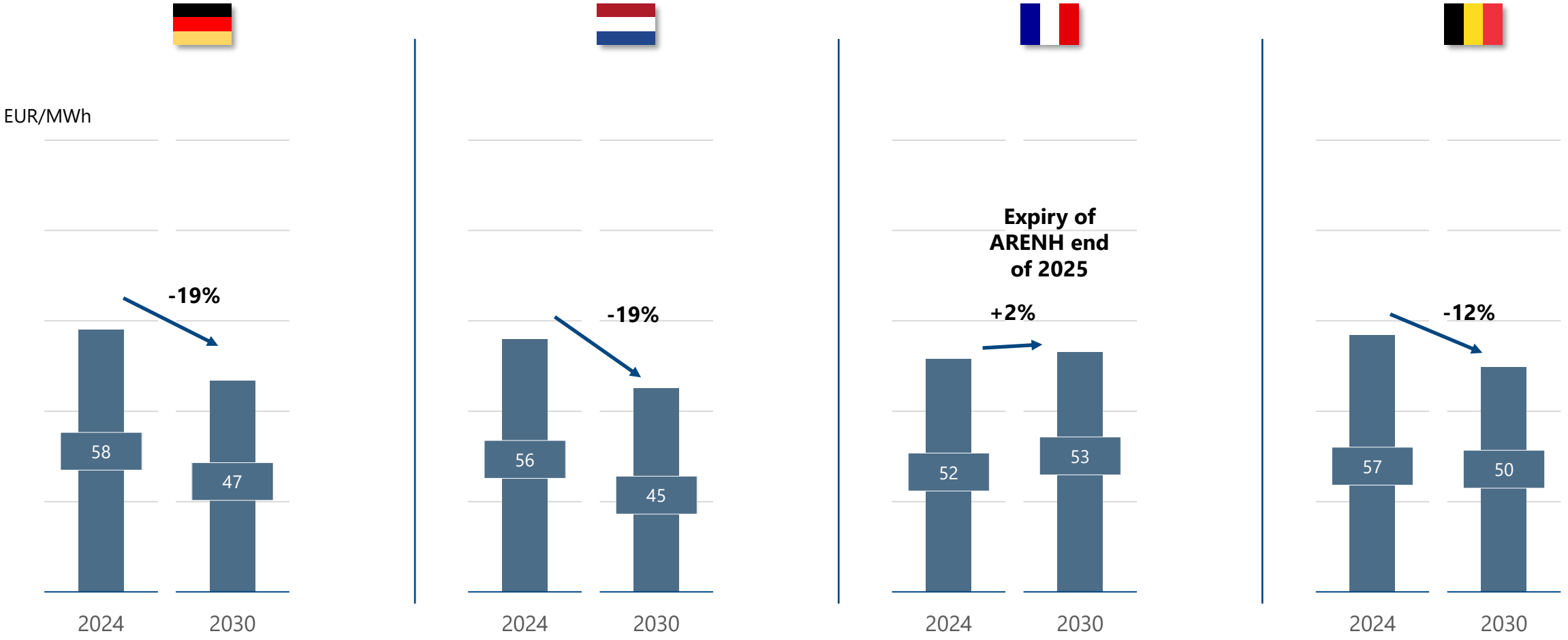
Electrolyser: Until 2030 the electricity costs* for electrolysers are expected to decrease in Germany, to remain fairly stable in France and Belgium and increase somewhat in the Netherlands



- Some countries have specific exemptions for electrolysers.
- Electrolysers in Germany are benefiting from an expected decrease in commodity prices in 2030 compared to today as they are largely exempted from network charges, levies and taxes.
- In the **Netherlands,** the lower commodity costs are more than offset by the **sharp increase in network charges.**
- The **disadvantage for electrolysers** in the **Netherlands** compared to the other countries is growing larger in 2030 due to the increase in network charges.
- French and Belgian electrolysers are expected to pay about the same electricity cost in 2030 compared to today.

* Indirect cost compensation is not taken into account, as otherwise the commodity costs would not be comparable

Electrolyser: Comparison of commodity costs in **2024** and **2030**



*Commodity Costs: year to date settlement + future market indication Feb24

Agenda

1 Background and objective of the study

2 Management Summary

3 Energy policy, fundamental and regulatory framework per country

4 Quantification of electricity cost components for large industries 2024

5 Outlook and country comparison electricty cost components 2030

6 Annex

Abbreviations

ARENH	Accès Régulé à l'Electricité Nucléaire Historique, scheme in France that makes parts of the nuclear production available at a fixed price set by the government
CHP	Combined heat and power
CHPC	CHP-certificates (only existent in the Flanders region of Belgium)
CRE	French Energy Regulatory Commision
CREG	Belgian Federal Commission for Electricity and Gas Regulation
DSO	Distribution system operator
FLH	Full load hours
GC	Green certificates (existent in all three regions of Belgium)
RES	Renewable energy sources (Wind, PV, etc.)
RTE	France's Transmission System Operator
TSO	Transmission system operator

Annex I: Applicable industry sectors for indirect cost compensation according to EU regulation

Industry sector applicable
Manufacture of leather clothing
Production and initial processing of aluminium
Production of other inorganic raw materials and chemicals
Production and first processing of lead, zinc and tin
Production of wood and cellulose
Production of paper, cardboard and paperboard
Production of raw iron, steel and ferroalloys
Mineral oil processing
Production and initial processing of copper
Production and initial processing of other non-ferrous metals
Polyethylene in primary moulds
All product categories in the iron foundry sector
Mats and nonwovens made of glass fibre
Hydrogen and inorganic oxygen compounds of non-metals

Source: EU

Annex II: Electricity cost-intensive or trade-intensive sectors in Germany - List 1: Economic sectors with a significant risk of relocation

List 1: Economic sectors with a significant risk of relocation
Hard coal mining sector
Natural gas extraction
Iron ore mining
Other non-ferrous metal mining
Quarrying of natural stone and natural stone, limestone and gypsum, chalk and slate
Mining of chemical and fertilizer minerals
Salt extraction
Quarrying of stone and earth n.e.c.
Fish processing
Potato processing
Production of fruit and vegetable juices
Other fruit and vegetable processing
Production of oils and fats (excluding margarine and similar dietary fats)
Production of starch and starch products
Sugar production
Production of homogenized and dietetic foods
Production of vermouth and other flavored wines
Malt production
Textile preparation and spinning
Weaving mill
Finishing of textiles and clothing

List 1: Economic sectors with a significant risk of relocation
Production of knitted and crocheted fabric
Carpet manufacturing
Manufacture of rope goods
Manufacture of nonwovens and articles thereof (excluding apparel)
Manufacture of technical textiles
Manufacture of leather clothing
Manufacture of hosiery products
Production of leather and leather fiber fabric; finishing and dyeing of hides
Sawmills, planing and wood impregnation plants
Production of veneer, plywood, wood fiber and chipboard panels
Production of parquet panels
Manufacture of wood products n.e.c., cork, straw and plaiting materials (except furniture)
Production of wood and cellulose
Production of paper, cardboard and paperboard
Production of household, hygiene and toilet articles made of cellulose, paper and cardboard
Manufacture of wallpapers
Mineral oil processing
Production of industrial gases
Production of dyes and pigments
Production of other inorganic raw materials and chemicals

List 1: Economic sectors with a significant risk of relocation
Production of other organic raw materials and chemicals
Production of fertilizers and nitrogen compounds
Production of plastics in primary molds
Production of synthetic rubber in primary forms
Manufacture of other chemical products n.e.c.
Production of man-made fibers
Production of pharmaceutical raw materials
Production and retreading of tires
Manufacture of other rubber goods
Production of plastic sheets, films, tubes and profiles
Production of plastic packaging materials
Manufacture of other plastic goods
Manufacture of flat glass
Refinement and processing of flat glass
Manufacture of hollow glass
Manufacture of glass fibers and articles thereof
Manufacture, finishing and processing of other glass, including technical glassware
Manufacture of refractory ceramic materials and goods
Production of ceramic wall and floor tiles and slabs
Manufacture of ceramic sanitary ware
Production of ceramic insulators and insulating parts
Manufacture of ceramic products for other technical purposes

E-Bridge competence in energy

Source: Annex II EnFG

Annex II: Electricity cost-intensive or trade-intensive sectors in Germany - List 1: Economic sectors with a significant risk of relocation

List 1: Economic sectors with a significant risk of relocation
Manufacture of other ceramic products
Production of cement
Production of coated abrasives and abrasives
Manufacture of other non-metallic mineral products n.e.c.
Production of pig iron, steel and ferroalloys
Production of steel pipes, pipe fittings, pipe closures and pipe connections made of steel
Production of bright steel
Production of cold-rolled strip with a width of less than 600 mm
Production of cold-drawn wire
Production and initial processing of aluminium
Production and first processing of lead, zinc and tin
Production and initial processing of copper
Production and initial processing of other non-ferrous metals
Processing of nuclear fuels
Iron foundries
Production of forged, pressed, drawn and stamped parts, rolled rings and powder metallurgical products
Surface finishing and heat treatment
Manufacture of cutlery and flatware made from base metals
Production of wire goods, chains and springs
Production of screws and rivets

List 1: Economic sectors with a significant risk of relocation
Manufacture of electronic components
Manufacture of batteries and accumulators
Production of fibre optic cables
Manufacture of other electronic and electrical wires and cables
Manufacture of other electrical equipment and appliances n.e.c.
Production of bearings, gears, gear wheels and drive elements
Manufacture of motorbikes
Manufacture of other transport equipment n.e.c.

Source: Annex II EnFG

Annex II: Electricity cost-intensive or trade-intensive sectors in Germany - List 2: Economic sectors with a risk of relocation

List 2: Economic sectors with a risk of relocation
Butchering (excluding butchering of poultry)
Butchering of poultry
Production of margarine and similar products food fats
Milk processing (without production of ice cream)
Grinding and peeling mills
Production of long-life baked goods
Production of dough products
Manufacture of confectionery (excluding long-life bakery products)
Production of convenience food
Manufacture of other food products n.e.c.
Production of animal feed for livestock
Production of feed for other animals
Production of soft drinks; extraction of natural mineral waters
Production of stationery and office supplies made of paper, cardboard and paperboard
Manufacture of other articles of paper and paperboard
Manufacture of pyrotechnic products
Production of adhesives
Production of bricks and other building ceramics
Production of chalk and burnt plaster

List 2: Economic sectors with a risk of relocation
Production of fibre cement products
Steel foundries
Light metal foundries
Manufacture of barrels, drums, cans, buckets, etc. Metal containers
Production of packaging and closures made of iron, steel and non-ferrous metal
Manufacture of other parts and accessories for motor vehicles

Source: Annex II EnFG

Annex III: List of electro-intensive sectors qualified for tax reduction in France

Consumption by businesses with an industrial activity (Article L312-71)	Minimal level of electro-intensity	Taxes in EUR/MWh
Mining and quarrying	0,5%	7,5
Manufacturing industry	3,375%	5
Production and distribution of electricity, gas, steam or air conditioning	6,75%	2
Production and distribution of water, sewerage, waste management and pollution control.		

Source: L312-71

Annex III: List of electro-intensive sectors qualified for tax reduction in France

Consumption by industrial installations in certain sectors of activity exposed to international competition (Article L312-72)
Extraction of iron ore, minerals for the chemical industry and natural fertilisers, as well as support activities for these activities;
Metallurgy of iron, aluminium, copper, lead, zinc or tin, as well as the manufacture of tubes, pipes and tube or pipe fittings of these metals, lead bars, rods, profiles and wire and zinc plates, sheets and strip;
Manufacture of basic organic and inorganic chemicals, other than industrial gases, dyes and pigments and denatured ethyl alcohol, except uranium enrichment and the production of ethyl alcohol from fermented materials;
Manufacture of nitrogen products and fertilisers and production of compost by treatment and disposal of organic waste;
Manufacture of the following basic plastics: low-density, linear low-density and high-density polyethylene, polypropylene, polyvinyl chloride and polycarbonate;
spinning of cotton, manufacture of man-made fibres and manufacture of leather garments, including fire-resistant and protective garments of this material;
Manufacture of paper, paperboard and mechanical pulp.

Minimal level of electro-intensity	Taxes in EUR/MWh
0,5%	5,5
3,375%	2,5
6,75%	1

Source: L312-72

Annex III: List of electro-intensive sectors qualified for tax reduction in France

- Consumption by industrial installations in certain sectors of activity exposed to international competition and a significant risk of carbon leakage
- Sectors listed in Annex of to Commission Decision 2014/746/EU
- If level of electro-intensity above 13,5% tax rate is reduced to 0,5 EUR/MWh

Source: L312-73

Annex IV: Definition of gross value added

Definition from European Commission:

The gross value added of the undertaking must be calculated as turnover, plus capitalized production, plus other operating income, plus or minus changes in stocks, minus purchases of goods and services (which shall not include personnel costs), minus other taxes on products that are linked to turnover but not deductible, minus duties and taxes linked to production. Alternatively, it can be calculated from gross operating surplus by adding personnel costs. Income and expenditure classified as financial or extraordinary in company accounts is excluded from value added. Value added at factor costs is calculated at gross level, as value adjustments (such as depreciation) are not subtracted

Source: L312-73

Annex V: **CO_2 emission factor** for the indirect cost compensation can be calculated in **two different ways** according to **EU regulation**

There are two different emission factors that can be used:

- The **CO_2 emission factor** calculated by the EU in the Appendix of the ETS Guidelines
  → chosen by Germany **(0,72 tCO2/MWh)**
- The **market-based CO_2 emission factor** calculated by each member states for themself
  → chosen by France and Belgium, these two countries calculated an **own market-based factor of 0,51 tCO_2/MWh**

There is **no limitation** for which year the emission factors are valid

- In France and Belgium the factor is valid from 2021-2025 and will then be revised/updated for the 2026-2030 period
- The ETS Guidelines will be updated in 2025 as well → an update of the emission factor for Germany is possible

Calculation Methods are described in the ETS Guidelines

- The "CO_2 emission factor" (in tCO_2/MWh) is the **weighted average of the CO_2 intensity of electricity from fossil fuels in different geographical areas.** The weighting takes into account the production mix of fossil fuels in the respective geographical area. The CO_2 factor is the result of dividing the emissions of CO_2 equivalents (based on energy industry data) by the gross electricity generation from fossil fuels in TWh.
- The "market-based CO_2 emission factor", in tCO_2/MWh is determined **on the basis of a study on the CO_2 content of the actual margin setting technology on the electricity market**. It has to be based on a model of the electricity system simulating price formation and observed data on the marginal cost adjustment technology during the entire year t-1 (including the hours when imports were marginal cost adjusted). The study must be approved by the national regulatory authority and the EU Commission.
- According to the studies of Belgium and France, the market-based CO_2 emission factor in both countries is equal to the weighted average of the CO_2 content of the technologies identified as determining the electricity price for each hour in over the reference year.

Sources: ETS Guidelines, Approval France, Approval Belgium (Flanders)

Annex VI: Complete overview of assumptions for the “baseload” profile case

General Assumptions

- Consumption per year: 1.000.000 MWh (1 TWh)
- Full load hours: **8000 h**
- (monthly) peak load: 125 MW
- Connection to the highest voltage grid level of the transmission grid in each country (220/380KV)
- Gross added value high enough that no super caps are applicable

Further Assumptions* (necessary for country specific taxes, levies, exemptions or network charges)

- Electricity Cost > 4% of revenue
- For individual grid tariffs the highest possible reduction of the applying step is assumed
- Sector of List 1 or List 2 + significant use of energy from RES, i. e. qualification for a reduction of the CHP and offshore levy

- Length of connection is 0,5 km (relevant for periodical connection charge)

- Metering device is owned by RTE
- Electricity cost > 13,5% of revenue (electro-intensity)
- Energy-intensive company with exposition to international competition and carbon leakage (relevant for energy tax)
- For the reduction of the network charges the “stable profile” applies

- No specific assumptions

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* These assumptions are valid for all countries but only relevant in the country they are assigned to

Annex VII: Complete overview of assumptions for the electrolyser case

General Assumptions

- Consumer is an **electrolyser**
- Consumption per year: 1.200.000 MWh (1,2 TWh), Peak load: 250 MW
- Full load hours: **100% load hours 0:00-06:00 and 11:00-17:00 h; 10% load all remaining hours**; Full load hours: **4818 h**
- Connection to the highest voltage grid level of the transmission grid in each country (220/380KV)
- Gross added value high enough that super caps aren't applicable

Further Assumptions* (necessary for country specific taxes, levies, exemptions or network charges)

- Electricity Cost > 4% of revenue, resulting in a § 19 StromNEV-levy of 0,25 EUR/MWh for the consumption above 1 GWh
- Sector of List 1 or List 2 + significant use of energy from RES, i. e. qualification for a reduction of the CHP and offshore levy

- Length of connection is 0,5 km (relevant for periodical connection charge)

- Metering device is owned by RTE
- Electricity cost > 13,5% of revenue (electro-intensity)
- Energy-intensive company with exposition to international competition and carbon leakage (relevant for energy tax)
- For the reduction of the network charges the "anticyclical profile" applies

- No specific assumptions

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* These assumptions are valid for all countries but only relevant in the country they are assigned to