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

Management Summary Report

26.03.2024

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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.

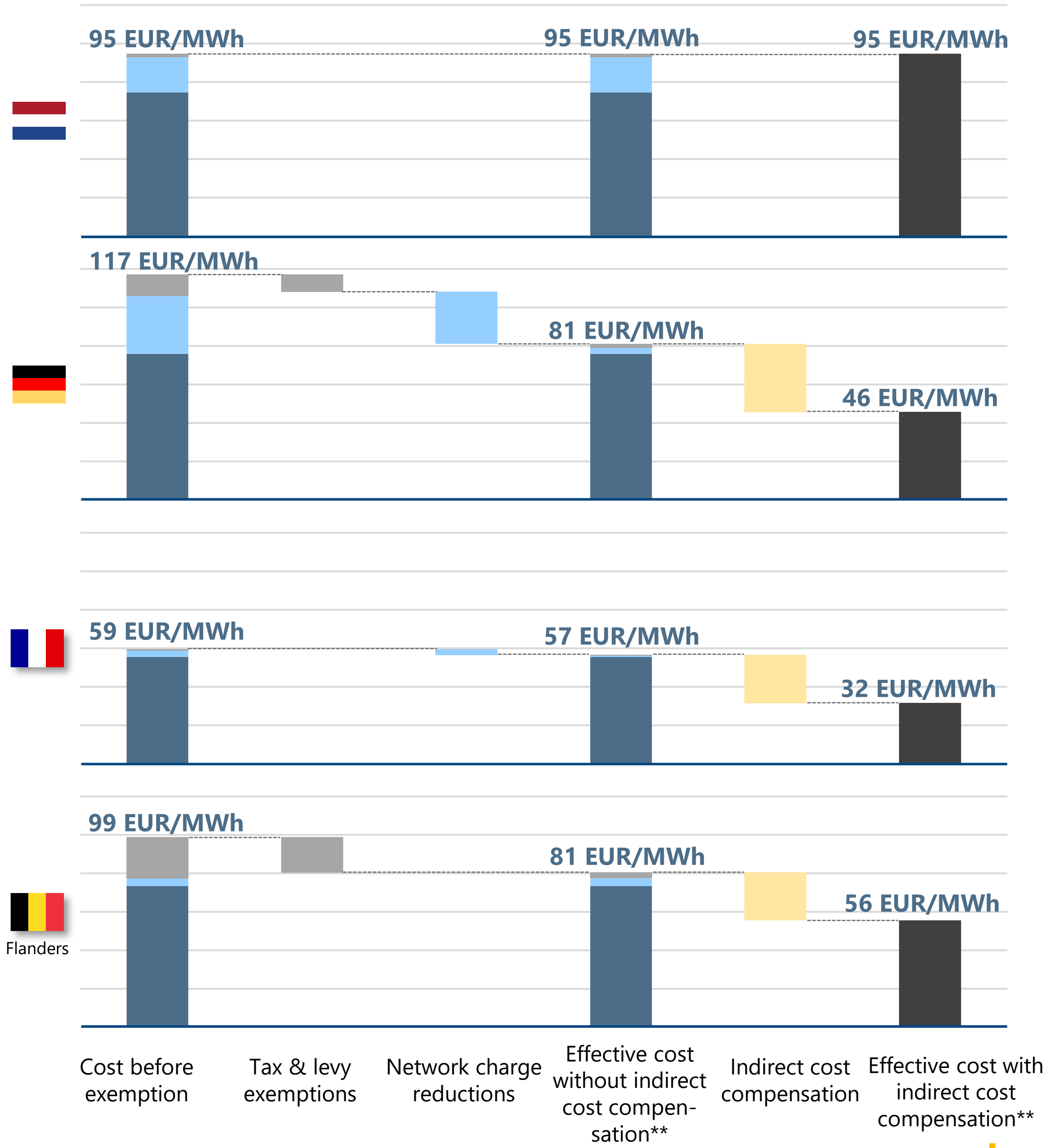
Management summary II/IV

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.

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

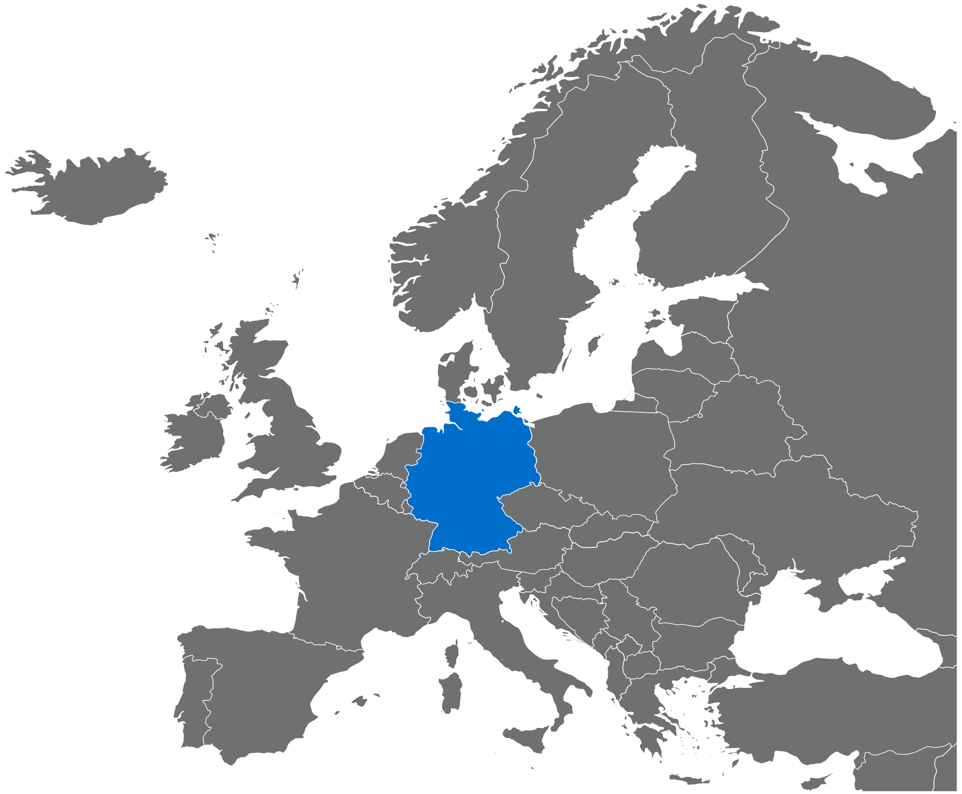
- Germany decarbonization and renewable electricity targets:

	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

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

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.

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.

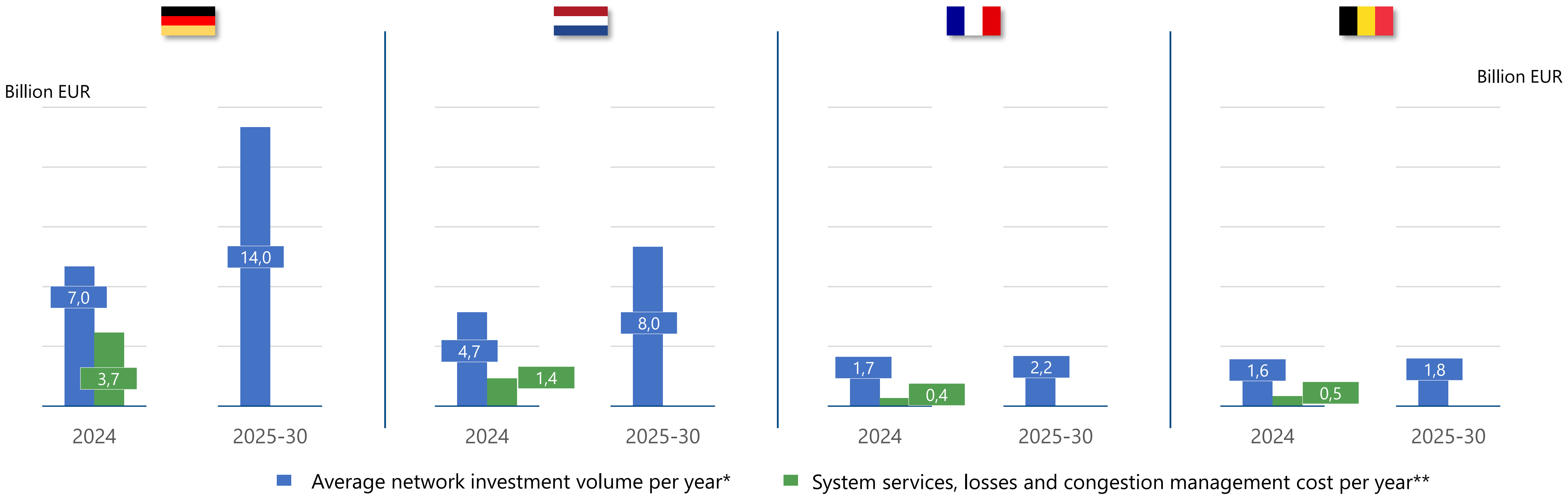
Hard coal has been phased out. Closure of 5 of the remaining 7 nuclear plants by 2025 (4 GW), 2 GW received 10-year lifetime extension to closed in 2035. Capacity Remuneration Mechanism was introduced in 2021. Belgium has awarded to 4.5 GW capacity guaranteed premiums from 2025/26.

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.

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.

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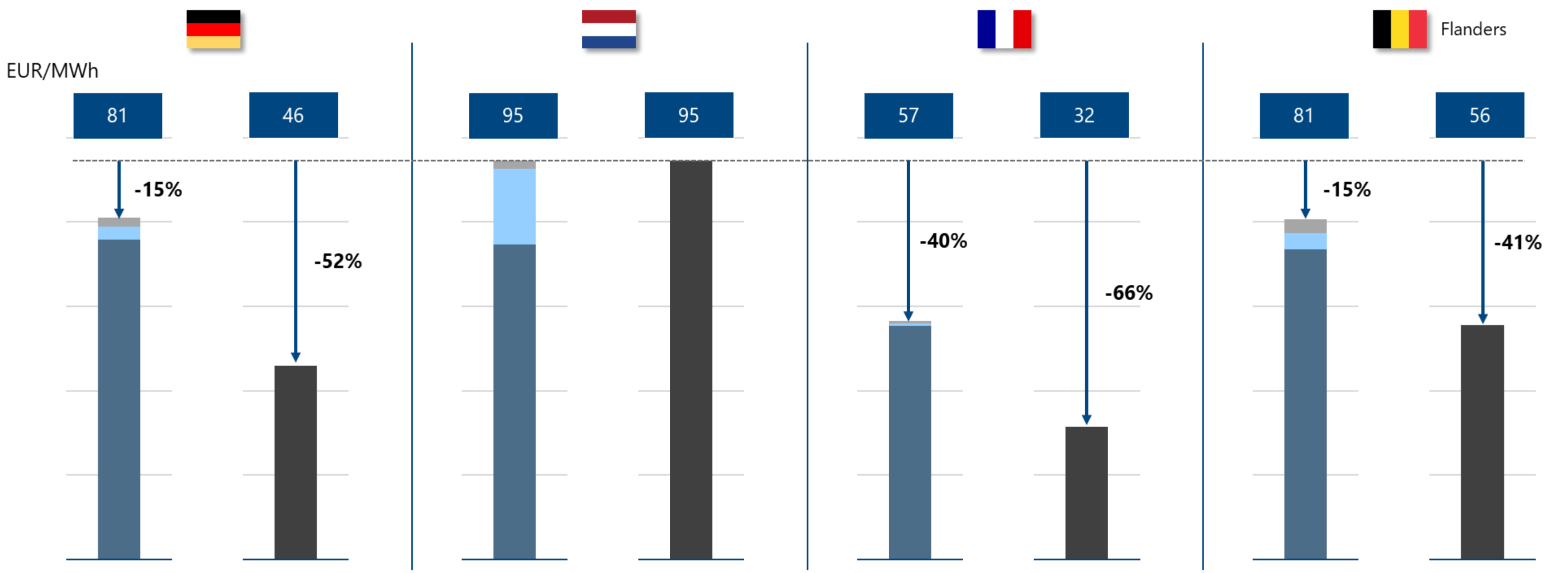
Baseload user: The highest total electricity costs in **2024** are in the Netherlands, the lowest in France –> Dutch industry with large disadvantage



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 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*

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

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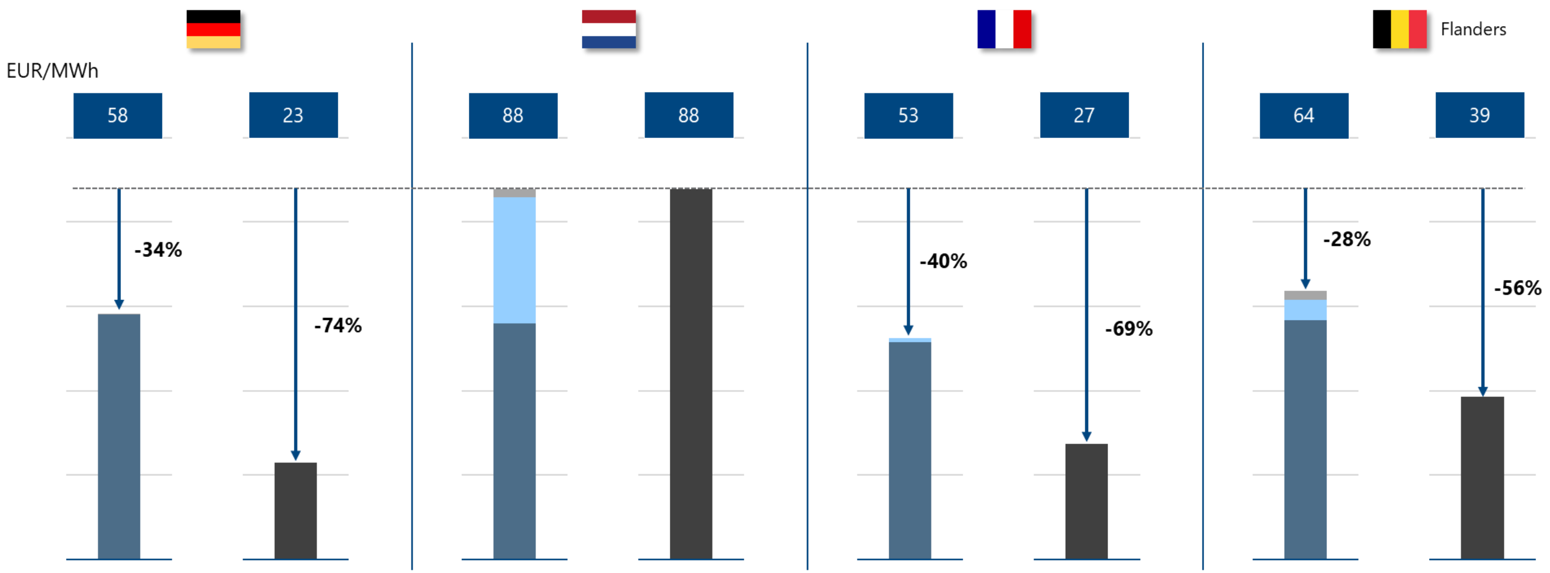
Electrolyser: The highest electricity costs in 2024 are in the Netherlands, the lowest in Germany –> Disadvantage for Dutch electrolysers even higher than for baseload users



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 indirect cost compensation
- **Electrolysers** with **significant disadvantage in the Netherlands** due to high network charges and no indirect 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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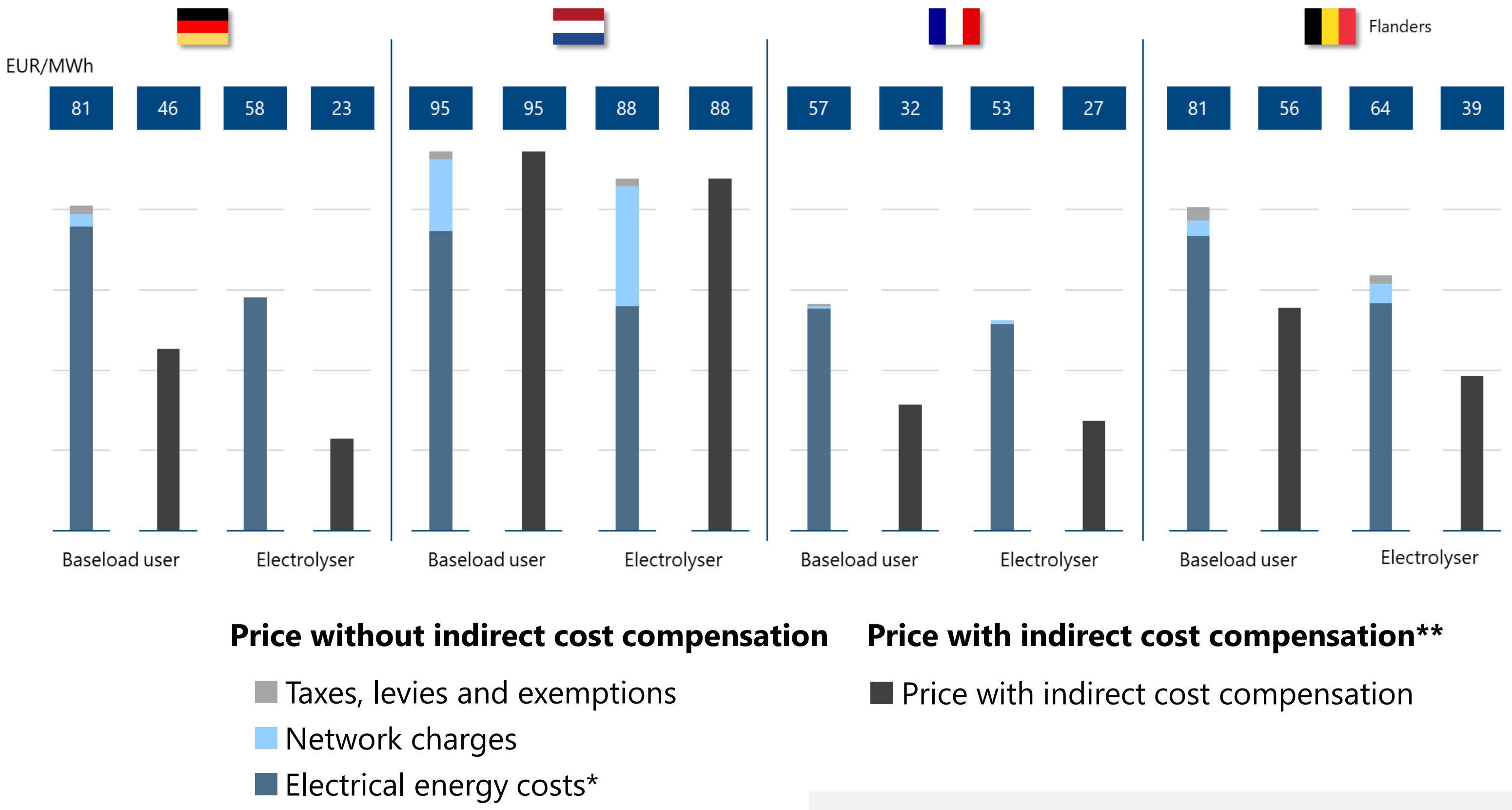
The electricity costs for **electrolysers** are lower than for **baseload users** in every country **2024**

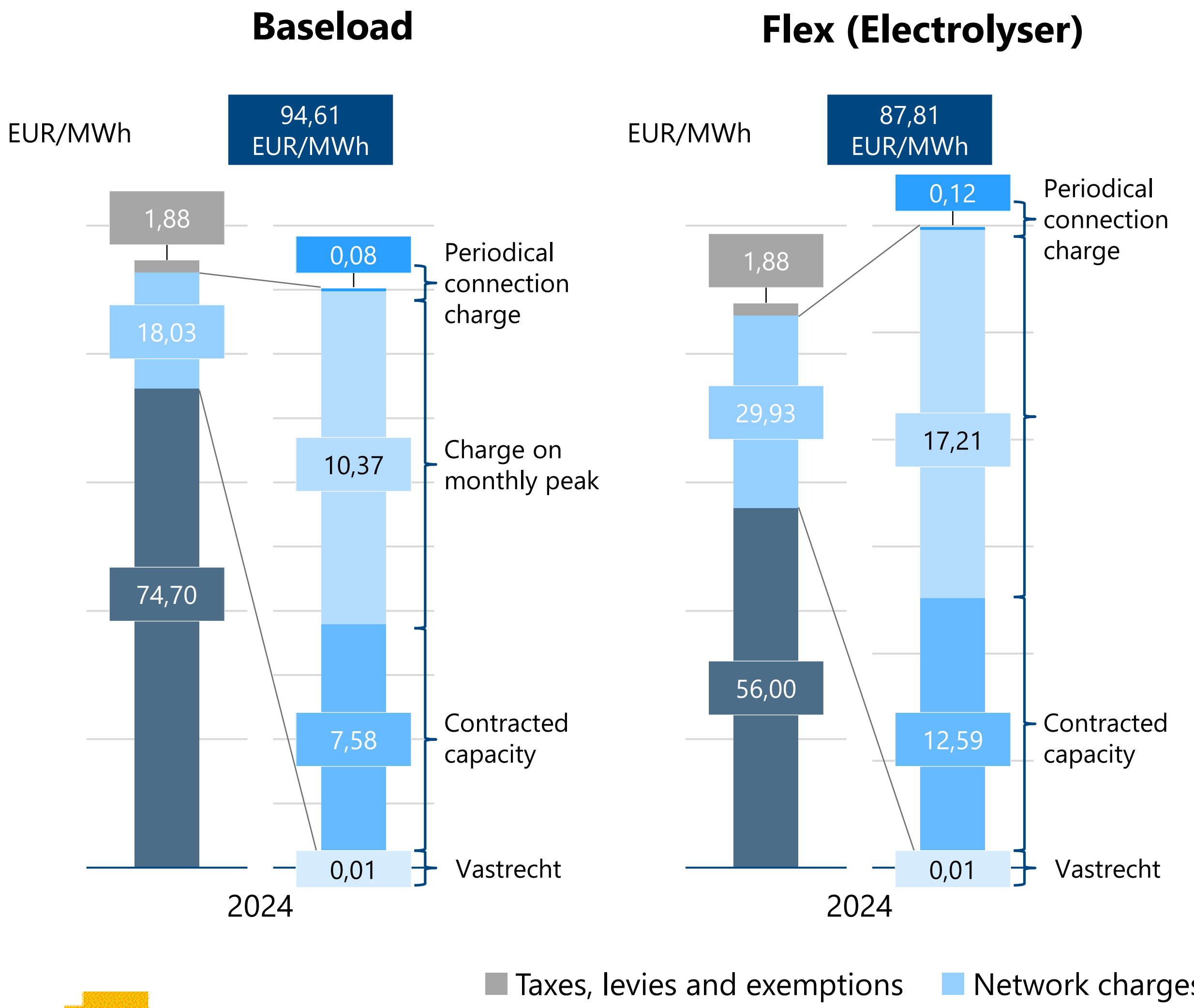


- **Dutch industry** baseload users and electrolysers have **significant cost disadvantage** compared to the other countries.
- While commodity cost components are at similar levels (except France, driven by ARENG scheme), the **largest cost differences** for the Netherlands emerge from **high network 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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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.

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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.

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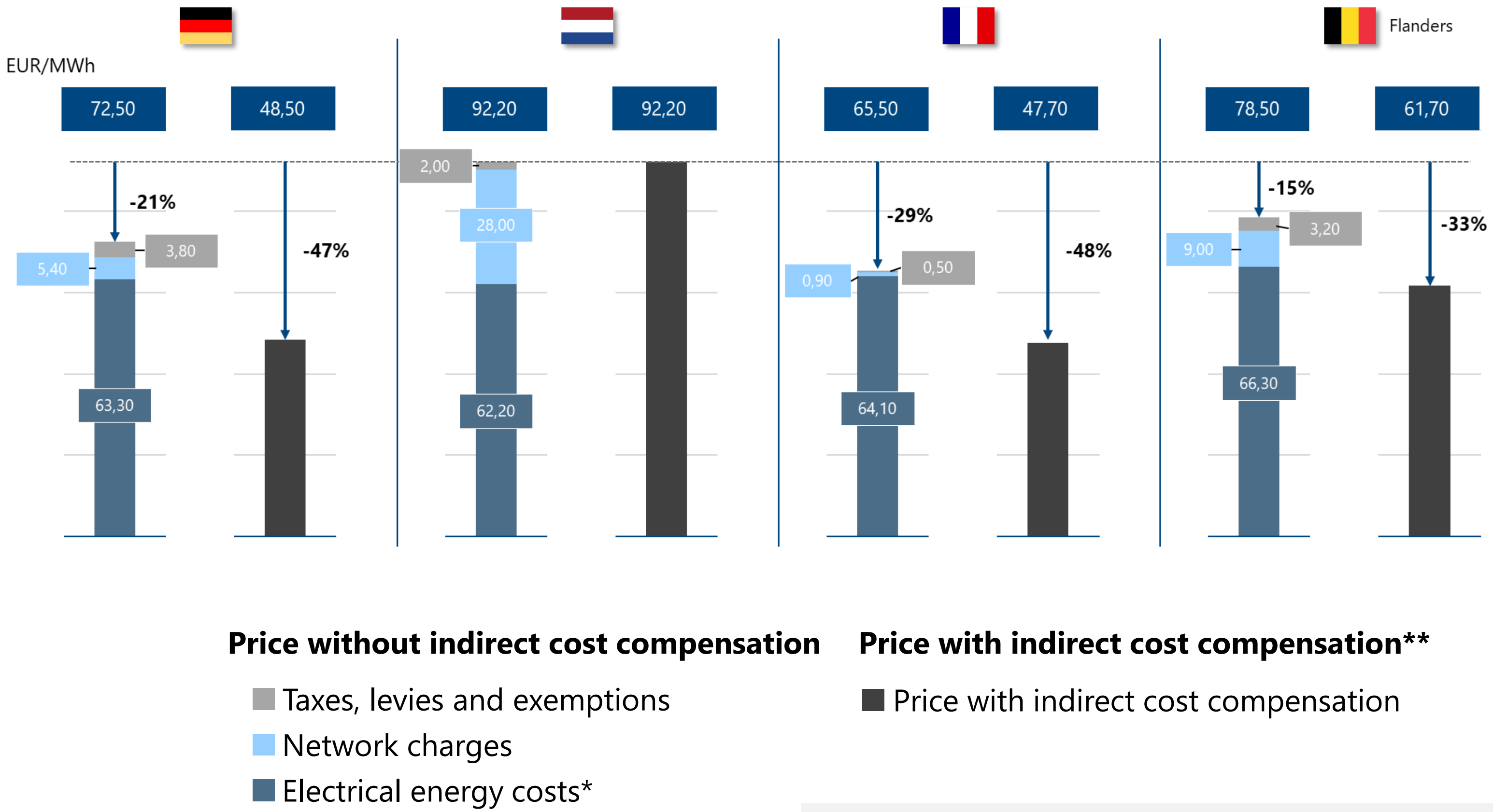
Baseload user: High disadvantage for Dutch baseload users due to the absence of reliefs/exemptions and the indirect cost compensation in 2030

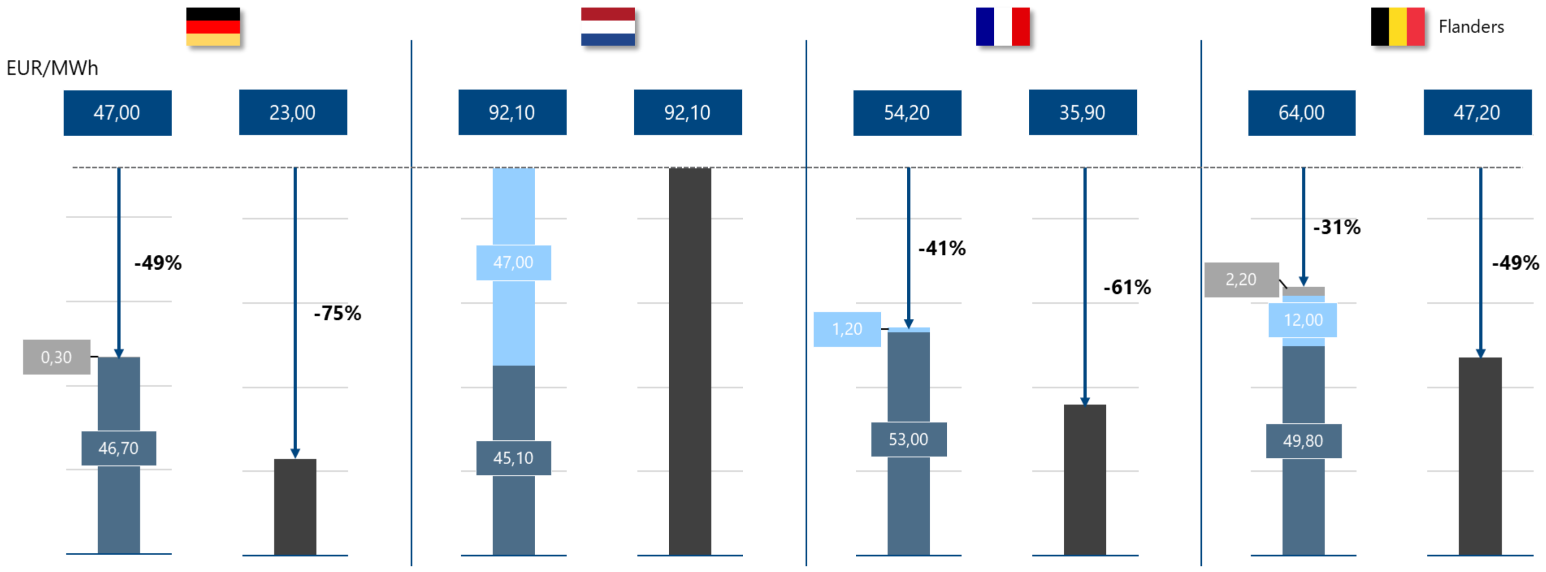


- Despite the reduction of the compensation schemes **French and German baseload industry** is still expected to have a **significant cost advantage compared to the Netherlands in 2030**.
- Electricity cost in **Germany, France and Belgium** are expected to be ca. **21%, 29% and 15% below the cost in 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 ca. **50% below** and in **Belgium** to be ca. **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: 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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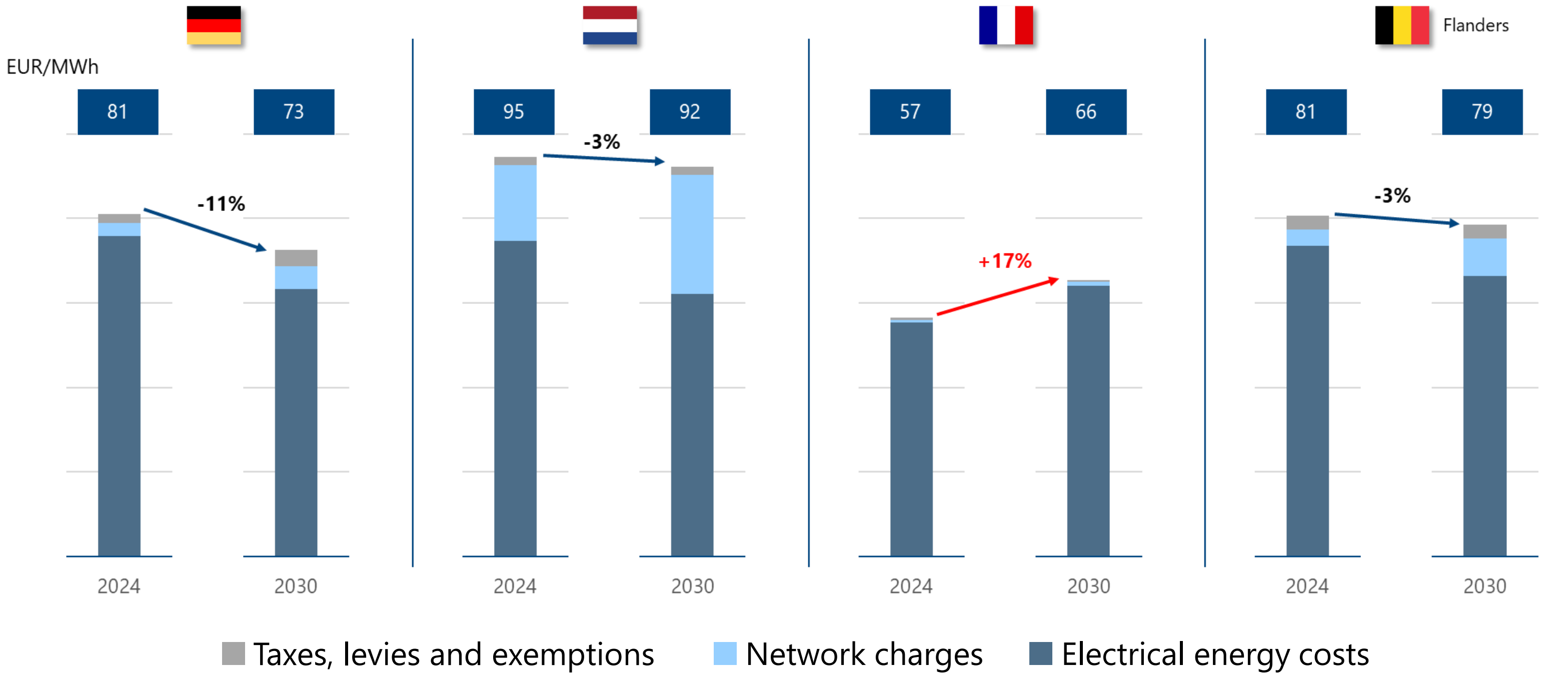
Baseload user: Until 2030 electricity costs* in Germany are expected to decrease, remain fairly stable in the Netherlands and Belgium while they increase in France



- 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.

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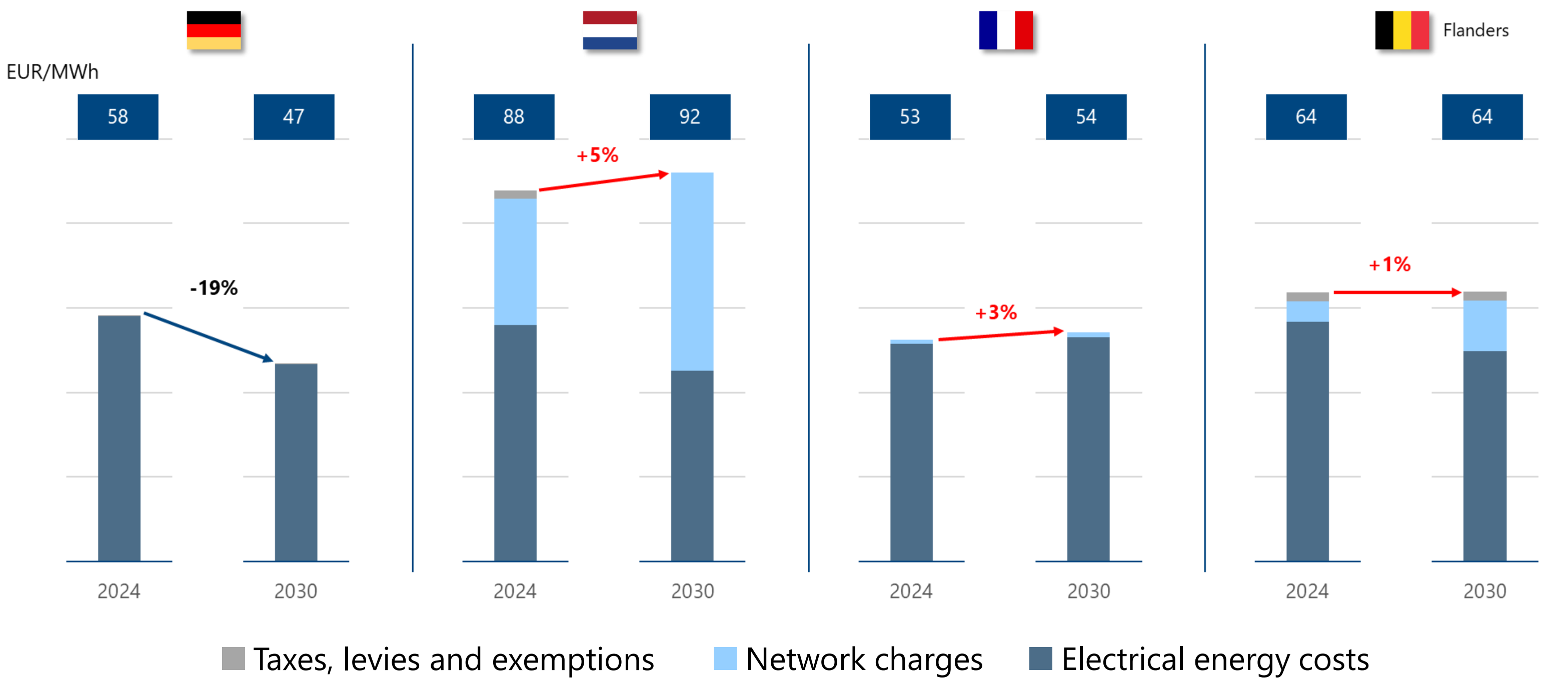
* Indirect cost compensation is not taken into account, as otherwise the commodity costs would not be comparable

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.

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

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Annex I: 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

Annex II: 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