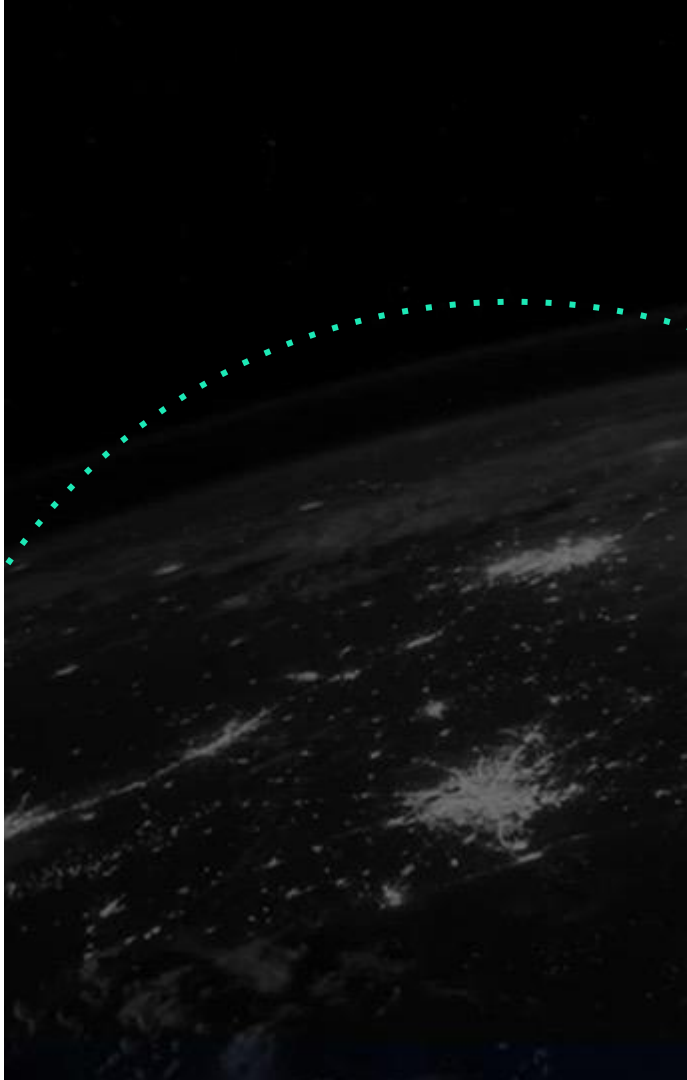
February 2023

Dynamic and injection tariffs benchmark



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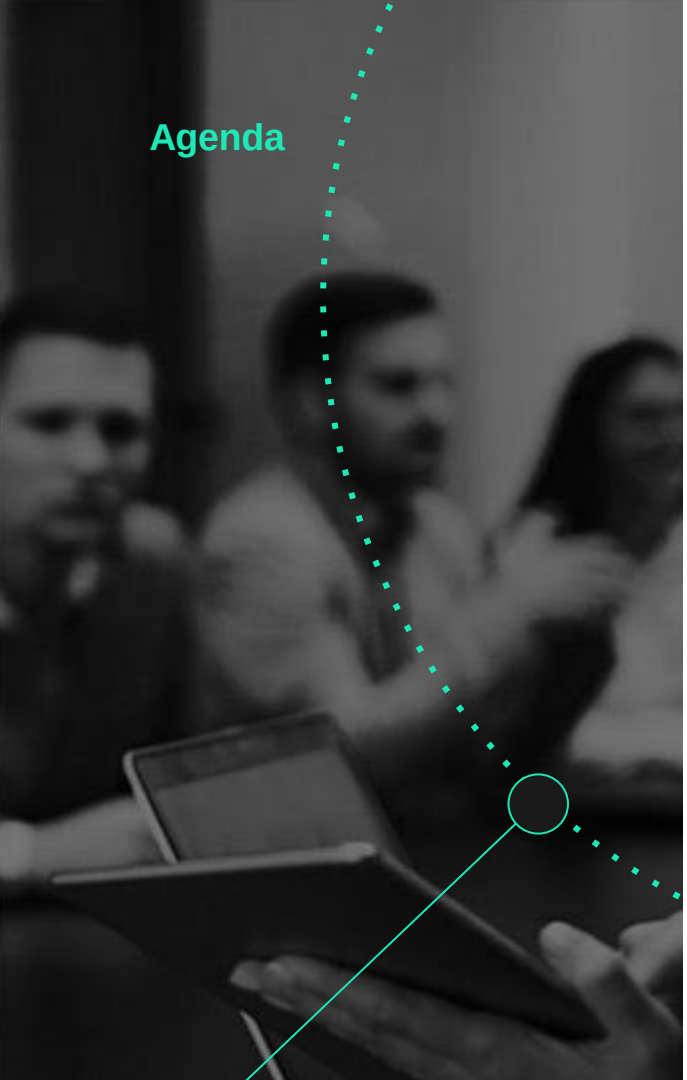


Agenda

1. Benchmark methodology
2. Injection tariffs
3. Dynamic tariffs
4. Country fiches
5. Conclusions and recommendations

Benchmark methodology

The benchmark was based on publicly available information issued mainly from regulators and TSOs websites

01. Understand the global context of the country

It is important to understand the **global energy context** of the countries to explain differences observed in the benchmark.

The following elements were collected:

- **Energy mix** based on installed capacity
- **Tariff structure**

Data collection: use of public databases, TSO & regulator websites

02. Collect and categorize injection costs

Three categories were considered to benchmark the injection costs:

- **Direct injection tariffs**, directly linked to the injected energy or labeled as injection tariffs
- **Indirect injection tariffs**, linked to other tariffs but that play a role in the tariffs paid by a generator to inject electricity on the grid
- **Other costs** generators incur but are not due to TSOs, such as cost of CO_2-emissions

Data collection: use of TSO website and interviews

03. Compare normalized injection costs and injection tariffs

The comparison of the injection costs and injection tariffs were realized based on assumptions of the load factors of the different generating technologies included. For each country the load factor used was as close to reality as possible.
This allowed to highlight differences between countries but also between the different types of power plants.
For the calculation of average injection costs and tariffs, Belgium was excluded to allow a side-by-side comparison.

Data collection: built assumptions based on publicly available data

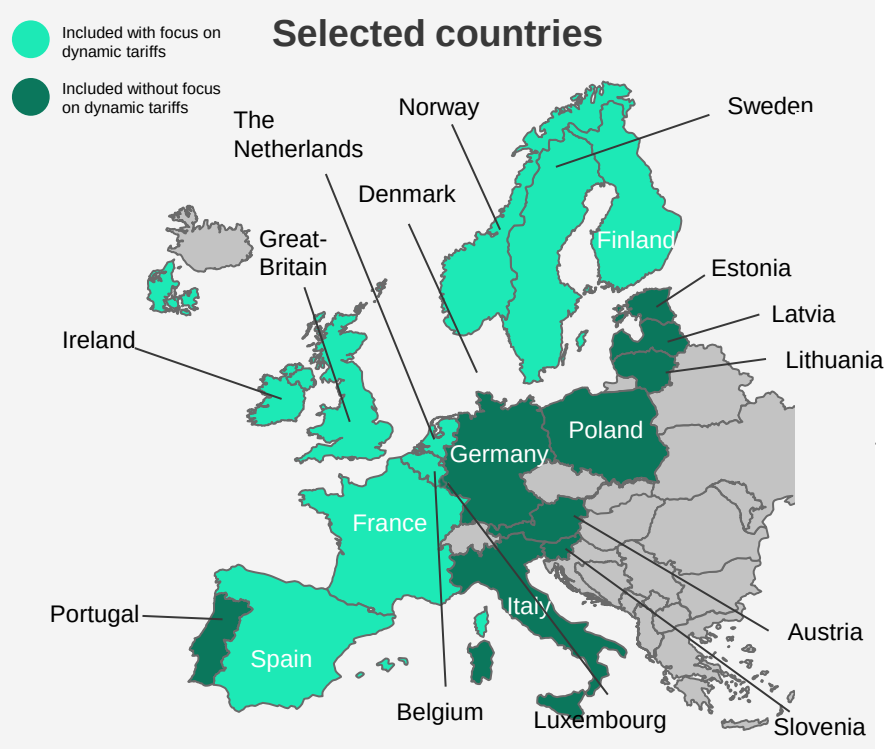
04. Highlight dynamic tariffs mechanisms*

This section aims to dig deeper on the **presence of dynamic transmission tariffs.** Do the benchmarked countries use a dynamic form of transmission tariff? **On what criteria** is it based (electricity price, time of use,...). Are there **trends** that can be spotted?

Data collection: use of TSO websites and interviews

*This step was only considered for 10 countries as shown in the next slide

20 countries, including Belgium, have been selected for the benchmark panel



Countries included in the benchmark have been selected based on the previous benchmark

The following criteria were used to select countries to be included in the benchmark:

- **19 of 20** countries participating countries from **previous benchmark** (2019). Ireland has been added due to the construction of the Celtic Link that should be ready by 2026.
- All countries are **European countries** and participate in the Single Day Ahead Coupling (SDAC) (with the exception of Great-Britain due to Brexit and Ireland as the Celtic interconnector is not yet built)
- Even if Great-Britain does not participate in the SDAC due to the Brexit, explicit day ahead energy trading remains effective, and **electricity is exchanged between Belgium and Great-Britain** via NemoLink.
- Due to electricity exchange between Great-Britain and Belgium, generators of both side of the cable have an influence on the situation on each side.

Injection costs are divided under 3 categories and consider different assumptions to ensure a relevant cost comparison

Direct injection tariffs

- Tariffs labeled as injection tariffs or specifically charged to generators
- Tariffs due per MWh injected, per MW connected or MW peak injected

Indirect injection tariffs

- Capacity tariffs that are not specifically charged to generators
- Annual fixed tariffs
- Ancillary services
- Cost for the coverage of losses (made use of the average Day-Ahead price)

Indirect costs

- Costs that have to be born by (certain) generators but that are not paid to the TSO
- Cost of CO_2-emissions
- Other exceptional costs (Voltage control obligations, Blackstart obligation,…)

Different assumptions have to be considered to ensure a relevant costs comparison

The following assumptions are considered:

The injection tariff usually varies between different voltage levels. Unless mentioned otherwise the data in this benchmark concerns the **380- 400 kV-networks**.

The benchmarked tariff methodologies **concern 2022** (unless mentioned differently) to ensure comparability.

In case the injection tariff varies between TSO's or different zones within a country the **average of the tariffs will be taken** to produce one cost parameter.

Taxes & levies that should be paid by electricity generators will, given their limited influence on total prices, **not be included.**

Costs for black-start and voltage control that are not being reimbursed by the TSO are calculated by using last available **value for Belgium, adapted to inflation.**

Active and reactive energy consumption by the generators for the use in their facility are **not included**.

For injection tariffs expressed in **foreign currencies** (non euro) the European Central bank **exchange rate of December 1st, 2022,** will be used.

The injection costs and tariffs were determined for idealized 400 MW power plants

All contributions to the injection costs were summed for a period of one year and normalized based on the amount of MWh injected to ensure the comparison. Different energy generation technologies were analyzed. Their injection can be based on injection profiles or on charge factors.

A standard capacity of 400 MW was considered for each power plant to ensure comparability

CCGT

- Load factor: 55%
- CO_2-emissions: 0,429 tCO_2/MWh*

Wind onshore

- Load factor: 20%
- CO_2-emissions : 0 tCO_2/MWh

Wind offshore

- Load factor: 42%
- CO_2-emissions : 0 tCO_2/MWh

Solar PV

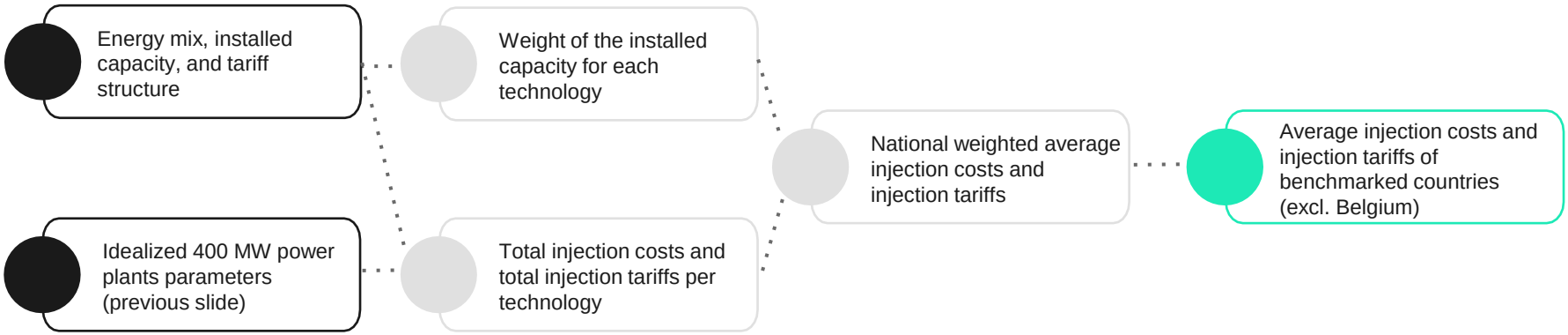
- Load factor: 12%(**)
- CO_2-emissions : 0 tCO_2/MWh

*Source: RTE, 2022

**The load factor for Solar PV will vary depending on the country's location. In this case the load factor will be different to come as close to reality as possible. Available in the Appendix A.

Weighted averages per country provide the final reference value for the injection tariff

The total injection costs and tariffs for each technology are displayed in a country fiche.
A national weighted average, based on the installed capacity of each technology will be calculated for each country.
The panel average is based on an arithmetic average of the injection costs defined in each country.



The calculation is made for injection tariffs & injection costs. Injection tariffs encompass direct and indirect injection tariffs due by generators to the TSOs. Injection costs also consider the other costs category.

Initial steps (1 and 2)
Intermediate steps (3)
Deliverable

Dynamic transmission grid tariffs: What, why and how?

Dynamic tariffs are defined as “charging **of different electricity rates at different times of the day and year** to reflect the **time-varying cost** of supplying electricity.” Source: Faruqui and Palmer (2011)

The tariff methodology 2024-2027 allows to include a dynamic component in the tariffs

- The tariffs methodology allow to include a dynamic component in the tariffs
- The dynamic component should be a function of the electricity price
- It can be applied for the injection and/or for the offtake

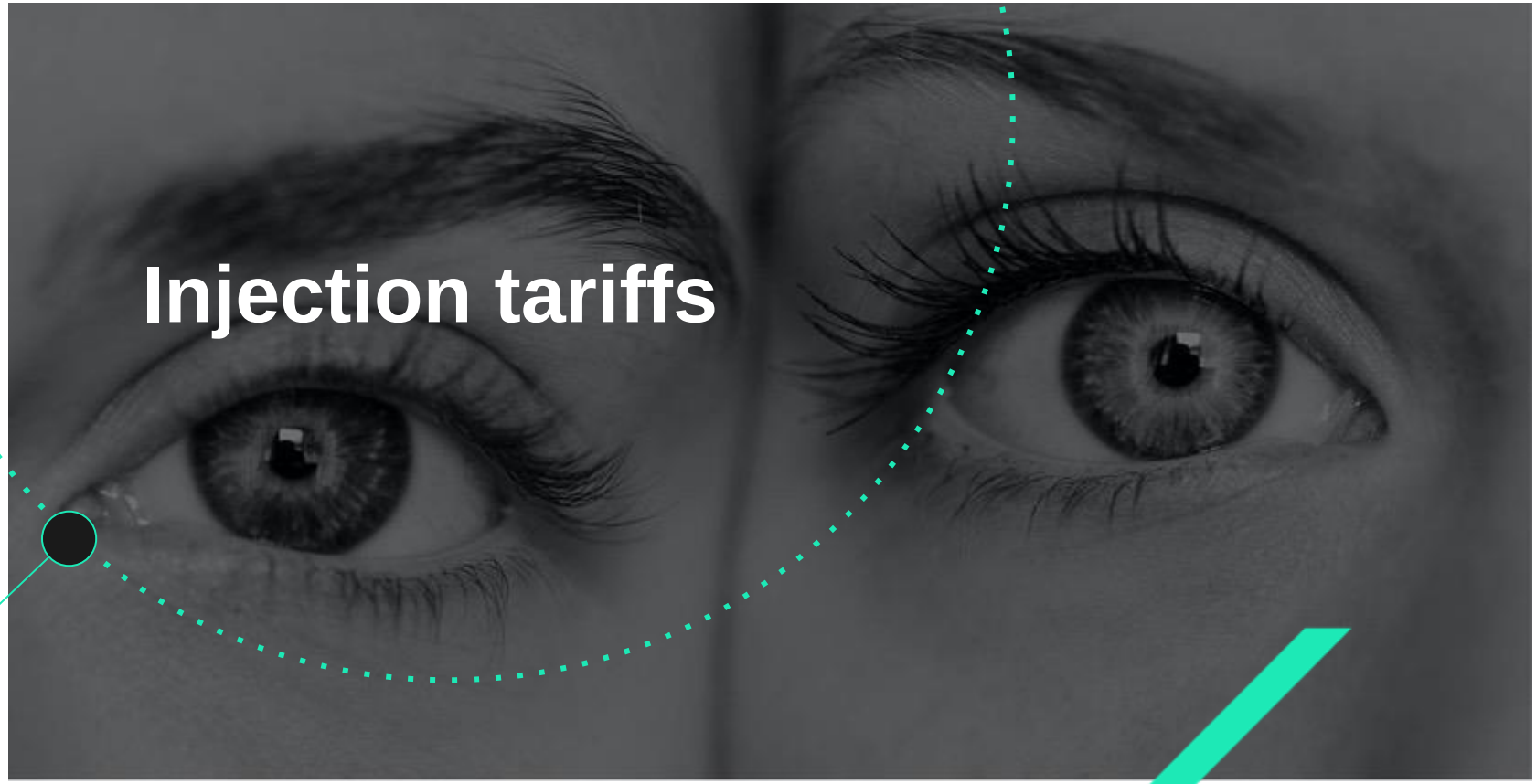
The benchmark considered all time varying changes in the tariffs as dynamic tariffs to better assess countries maturity

Dynamic grid tariffs based on electricity price is not common.

In order to better assess the countries maturity regarding the implementation of dynamic tariffs, other parameters than electricity prices were considered.

Data collection

- Due to the prospective character of dynamic tariffs, data was also collected from position papers
- If deemed necessary, interviews were also organized with TSOs



Injection tariffs

Costs considered in the benchmark for each country

Country	Austria	Belgium	Denmark	Estonia	Finland	France	Germany	Great-Britain	Ireland	Italy	Latvia	Lithuania	Luxembourg	Norway	Poland	Portugal	Slovenia	Spain	Sweden	The Netherlands
Energy injected	● ◐	◐	● ◐		●	●		●						● ◐					●	
Connected capacity					●			●	●		●								●	
Annual fixed tariffs						◐	●						◐							◐
Other	○		○				○	○	○	○		○		○	○	○	○	○	○	

Belgium is the only country of the benchmark that bills a tariffs based on the energy injected not labelled as an injection tariff

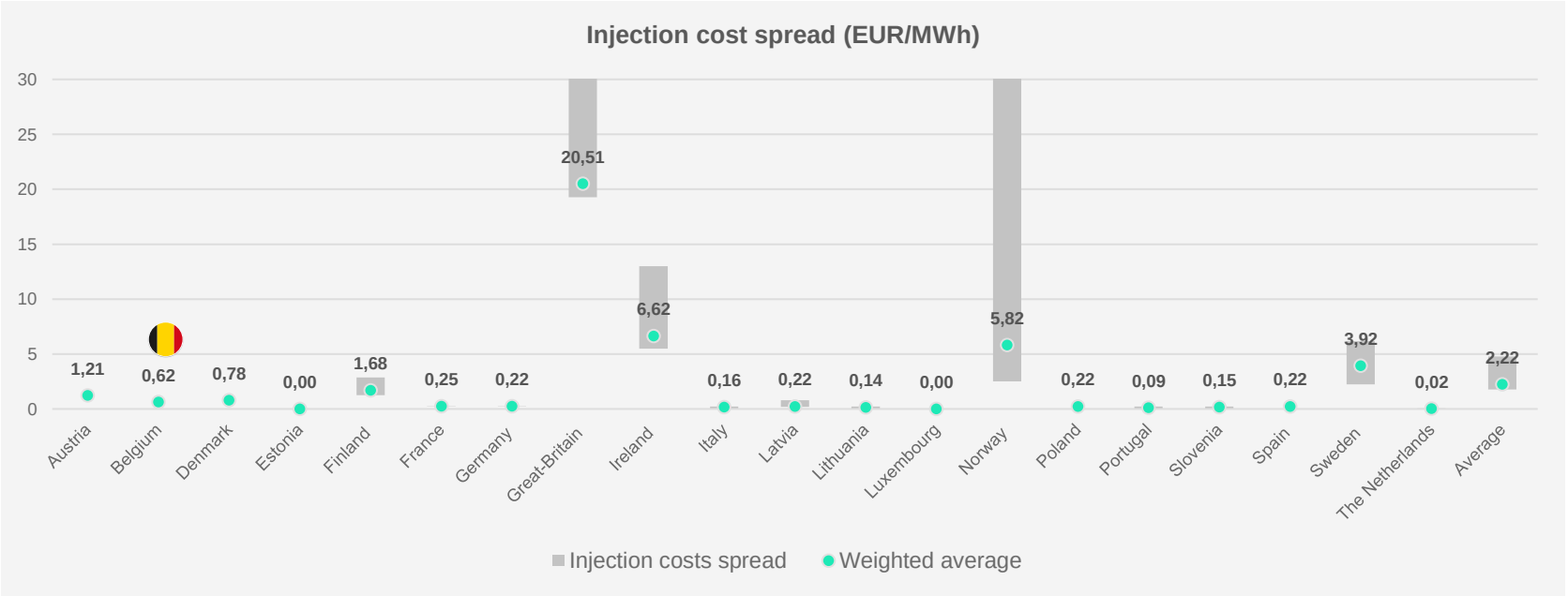
- **11 countries** (Belgium, Estonia, Germany, Italy, Lithuania, Luxemburg, Poland, Portugal, Slovenia, Spain and The Netherlands) **do not have a specific direct injection tariff** imposed on generators
- **Belgium applies a tariff based on the injected energy** as a contribution which is not labelled as an injection tariff as it covers costs related to blackstart and reserves
- **Tariffs are most often based on the injected energy, this is the case in 9 of the benchmarked countries**
- **5 countries** (Finland, Great-Britain, Ireland, Latvia and Sweden) **base at least part of the applicable tariffs on the connected capacity**
- **In 4 countries** the imposed tariff consist (partly) of **annual fixed tariff**, this is the case in France, Germany, Luxembourg and The Netherlands
- **Other cost categories,** which are not due to the TSO, consist mostly of **blackstart- and or Voltage control obligation**. In Great-Britain and Norway also a **CO_2-tariff is applied.** The black start and voltage control obligation is a mandatory services imposed by the regulation. This services induces additional costs that are not reimbursed by the TSOs, resulting in additional costs to be considered in the injection costs

Legend

- ● Direct Injection tariff
- ◐ Indirect injection tariff
- ○ Other costs

In Belgium, all generation technologies are subject to the same injection costs

In **Austria, Belgium, Denmark, Estonia and Spain** the injection costs are equal between all generating technologies as the tariff and costs are entirely based on the injected energy. **In all other countries a spread can be observed**. The tariffs are also **based on factors other than injected energy** (annual fixed tariff, capacity-based tariff, obligatory services for certain technologies or CO_2-tariffs). The **largest spread, 29,72 €/MWh** can be found **in Norway** and is almost entirely **due to the CO_2-tariff.** The **smallest spread, less than 0,00 €/MWh,** can be found **in Luxemburg** and is due to an **annual fixed tariff.**



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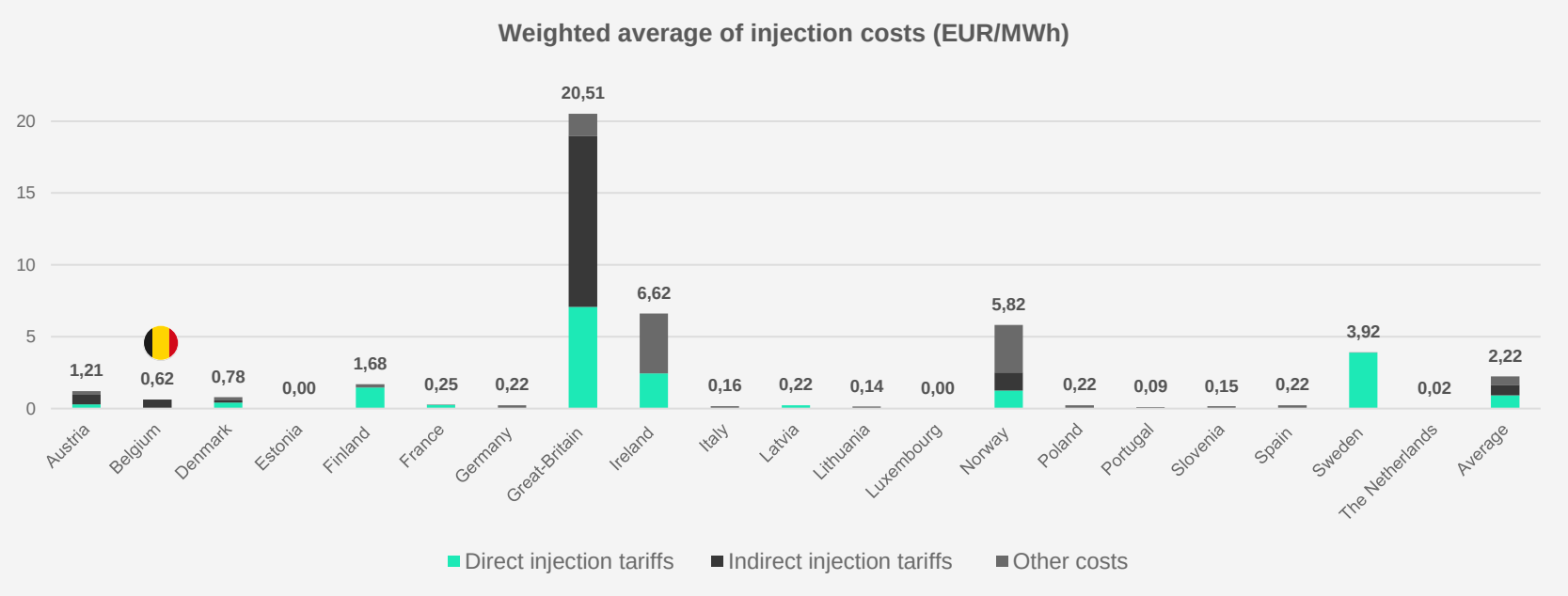
Generation technologies does not influence the injection costs of Belgian generators

- **In Austria, Belgium, Denmark, Estonia Poland and Spain**, the **injection costs are equal** as the tariffs and costs are equal for each technology and entirely based on the energy injected
- **Differences in injection tariffs between generating technologies occur in Finland, Great-Britain, Ireland, Latvia, Norway and Sweden. These are caused by:**
  - **Tariffs based on the installed capacity causing differences** in the injection costs expressed in **€/MWh** due to the load factor differences (Finland, Great-Britain, Ireland, Latvia and Sweden)
  - **Specific charges for offshore wind** (Great-Britain and Ireland)
  - **Important CO_2-tariffs are applied on CCGT's** (Great-Britain and Norway)
- **In France, Germany, Luxembourg and The Netherlands** the **spread is due** to an **annual fixed tariff**, that when expressed in **€/MWh** differs between the different generation technologies. The difference is negligible compared to other spreads
- **Voltage control- or Blackstart obligations can differ between technologies, resulting in a spread.** This is the case **in Italy, Lithuania, Norway, Slovenia and Sweden**

Belgium presents an injection cost of 0,62 €/MWh which is lower than the average injection costs applied by the panel (2,22 €/MWh)

The weighted average injection costs **range** between **0 €/MWh** (Estonia) **and 20,51 €/MWh** (Great-Britain) over the benchmarked countries. Weighted average **injection costs in Great-Britain** are **33 times higher compared to Belgium**. **Weighted average injection costs in Belgium** are **lower than the average** injection costs of countries in the benchmark **(2,22 €/MWh). Current Belgian injection costs are lower than 7 other countries**. Note that the average value remains influenced by the CO2 tariff in Norway and the costs of losses that Irish generators have to compensate.



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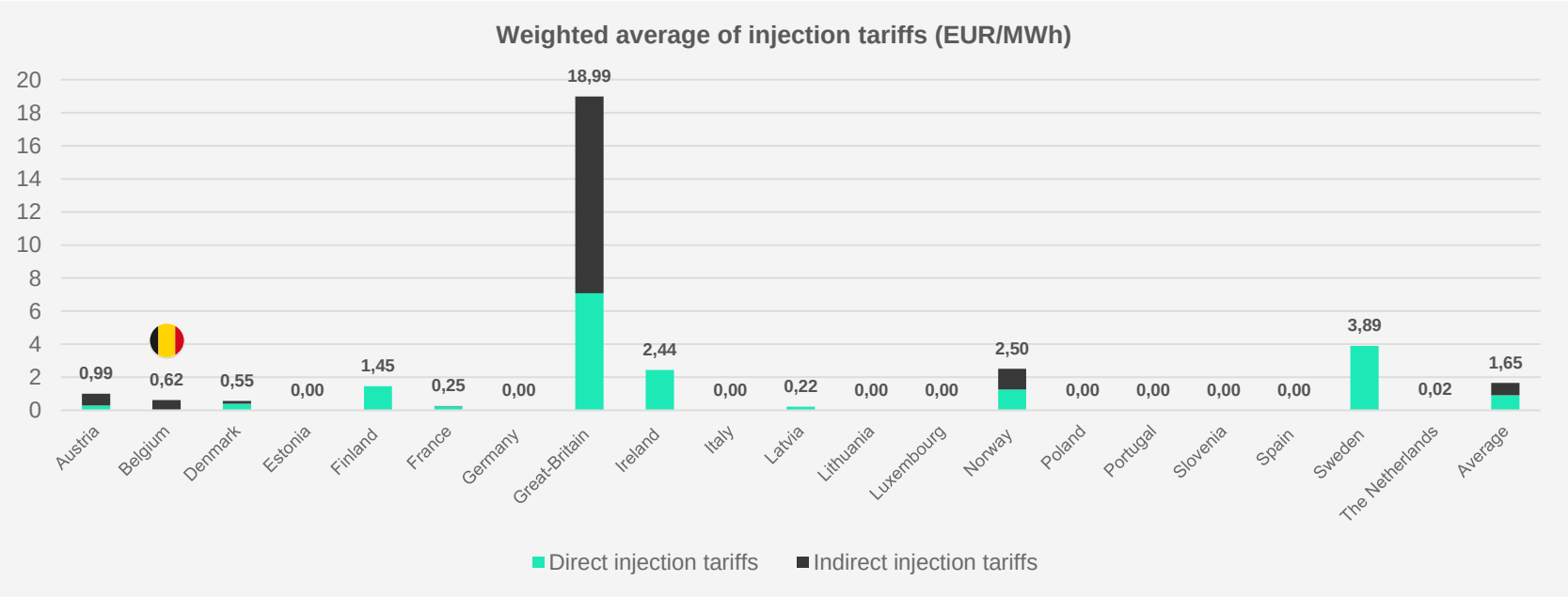
The injection cost of Belgium (0,62 €/MWh) is lower than the average injection costs over the benchmarked countries

- Belgium has injection **costs (0,62 €/MWh) that are lower than the average injection costs of benchmarked countries (2,22 €/MWh).** Belgium's average injection cost is lower than 7 countries of the panel.
- **Important CO_2-tariffs are applied on CCGTs in Norway** (29,51 €/MWh) **and Great-Britain** (7,88 €/MWh), resulting in high injection costs. The influence of this tariff on the average costs in Norway remains significant, representing over 50% of the total costs, although the installed capacity of CCGT is limited.
- **High grid tariffs applied in Great-Britain** also results in important injection costs. Charges related to the balancing services have quadrupled since 2017, mainly due to increased prices for gas and electricity.
- **High injection costs in Ireland** are due to the **high *Other costs* category, which contains the costs for covering losses.** Transmission loss adjustment factors, which determine for how much losses a generator is responsible, are determined at site level and work as a balance in kind mechanism. The increase is thus caused by the strong increase of gas and electricity price.
- **In Italy, Lithuania, Poland, Portugal, Slovenia and Spain,** the injection costs for generators **only consists of *Other costs***. In these countries **no tariffs are due to the TSO.**
- In **Portugal and Spain, the injection tariffs were removed in 2022 and 2020, respectively.** The removal of the injection tariff in Portugal is a consequence of the removal that occurred in Spain as there was a risk of cross-border competition distortion.

Belgium presents an injection tariff of 0,62 €/MWh which is lower than the average injection tariffs applied by the panel (1,65 €/MWh)

The average total injection tariff **ranges** between **0 €/MWh** (Estonia, Italy, Lithuania, Portugal, Slovenia and Spain) **and 18,99 €/MWh** (Great-Britain) over the benchmarked countries. The average **injection tariff in Great-Britain** is **31 times higher compared to Belgium**. **Injection tariffs in Belgium** are **lower than the average** injection tariffs of countries in the benchmark **(1,65 €/MWh)** and **6 countries currently have higher average injection tariffs.**



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The injection tariff in Belgium (0,62 €/MWh) is lower than the average injection tariffs over the benchmarked countries

- Belgium has **injection tariffs (0,62 €/MWh) that are lower than the average injection tariff (1,65 €/MWh)** and **6 countries currently have higher injection tariffs.**
- **The high injection tariffs in Sweden** can be explained by two components**: the important capacity factor resulting in high injection tariffs for technologies with low load factors** (Solar PV and onshore wind) combined with **the weight of these technologies in the installed capacity**
- **Direct injection tariffs can be found in 9 of the benchmarked** countries, with values varying between **0,23 €/MWh (France)** and **7,07 €/MWh (Great-Britain):**
  - **In Austria**, **Denmark, France and Norway** the direct injection tariff is entirely **based on the energy injected**
  - **Finland, Great-Britain, Ireland, Latvia and Sweden** base the direct injection tariff (at least partly) on the **installed capacity**
- **Indirect injection tariffs can be found 9 countries:**
  - **In Austria, Belgium, Denmark, Great-Britain and Norway** indirect tariffs are calculated based on the energy injected
  - **In France, Germany, Luxemburg and the Netherlands** the indirect tariff consists of an annual fixed tariff
- **In Estonia, Italy, Lithuania, Poland, Portugal, Slovenia and Spain** generators are not subject to any tariffs from the TSO.

Average injection costs: intermediate summary

Average injection costs per country over all technologies vary **between 0 €/MWh** (e.g Estonia) and **20,51 €/MWh** (Great-Britain).

High injection costs in Great-Britain are due to **Balancing Services Use of System charges,** which covers the costs for balancing the grid, that have quadrupled since 2017.

Low injection costs in Luxemburg and The Netherlands are due to a **low annual fixed tariff** that is charged to generators and results in negligible €/MWh injection costs for all generating technologies.

€/MWh

9 out of the 20 countries in the benchmark apply a tariff that is **based on the injected energy. 7 countries have no tariffs for generators.**

Weighted average injection cost in Belgium (0,62 €/MWh) is lower than the average injection cost over all countries **(2,22 €/MWh).** Excluding the *other cost* category, and thus strictly looking at tariffs, the Belgian tariff **(0,62 €/MWh)** remains lower than the average tariff over all countries **(1,65 €/MWh).** The Belgian injection costs remain also below this value.

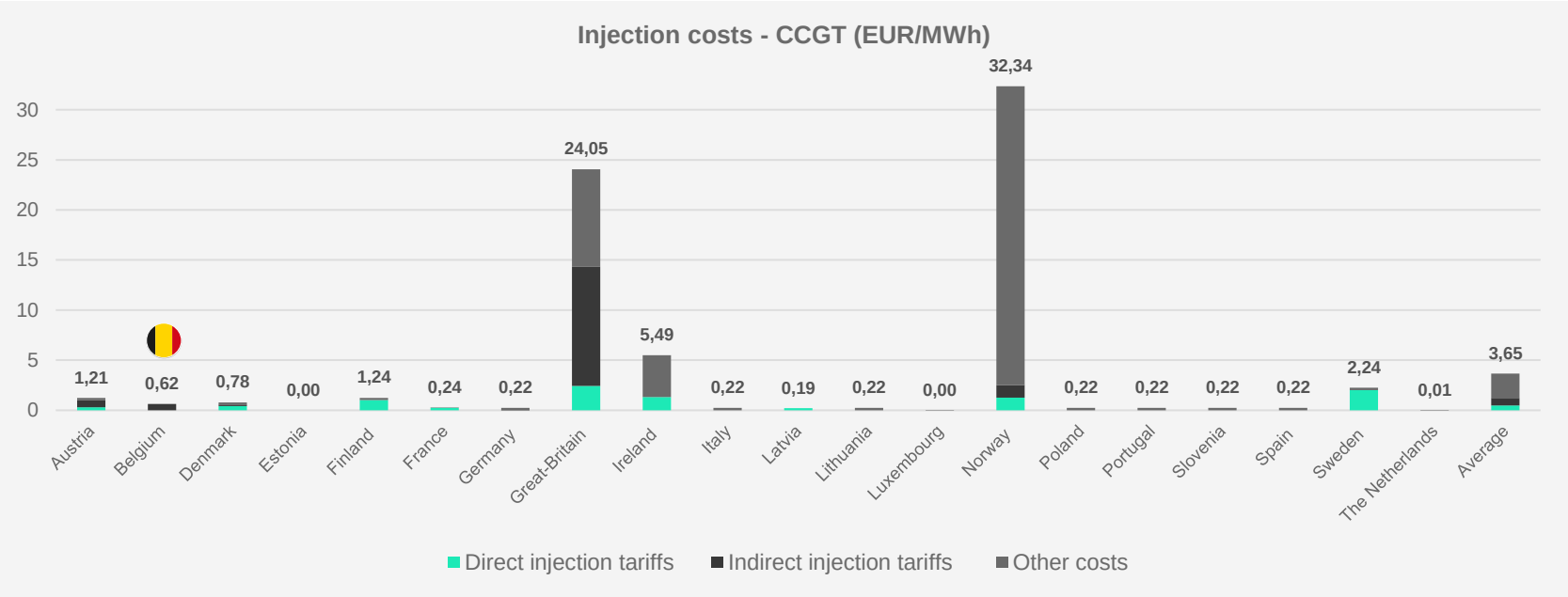
Capacity tariffs, annual fixed tariffs and tariffs that are specific to a generating technology cause a difference in injection costs between technologies.

Spain and Portugal used to impose an injection tariff on generators but no longer do**. The injection tariff is zero.** Only consumers must pay transmission grid tariffs to have access to the grid.

Injection costs related to a CCGT

Belgium presents a CCGT injection costs (0,62 €/MWh) lower than the average CCGT injection costs applied by the panel (3,65 €/MWh)

Total injection costs for a CCGT plant **vary between 0 €/MWh** (Estonia) **and 32,34 €/MWh** (Norway). **Norway and Great Britain** show **injection costs that are respectively 50 and 40 times higher** than the injection costs in Belgium. With **0,62 €/MWh** injection costs for a CCGT **in Belgium are lower than the average (3,65 €/MWh). Current Belgian injection cost for CCGT is lower than 7 countries in the benchmark.** Note that the average is heavily influenced by the important CO_2-tariffs in Great-Britain (7,88 €/MWh) and Norway (29,51 €/MWh).



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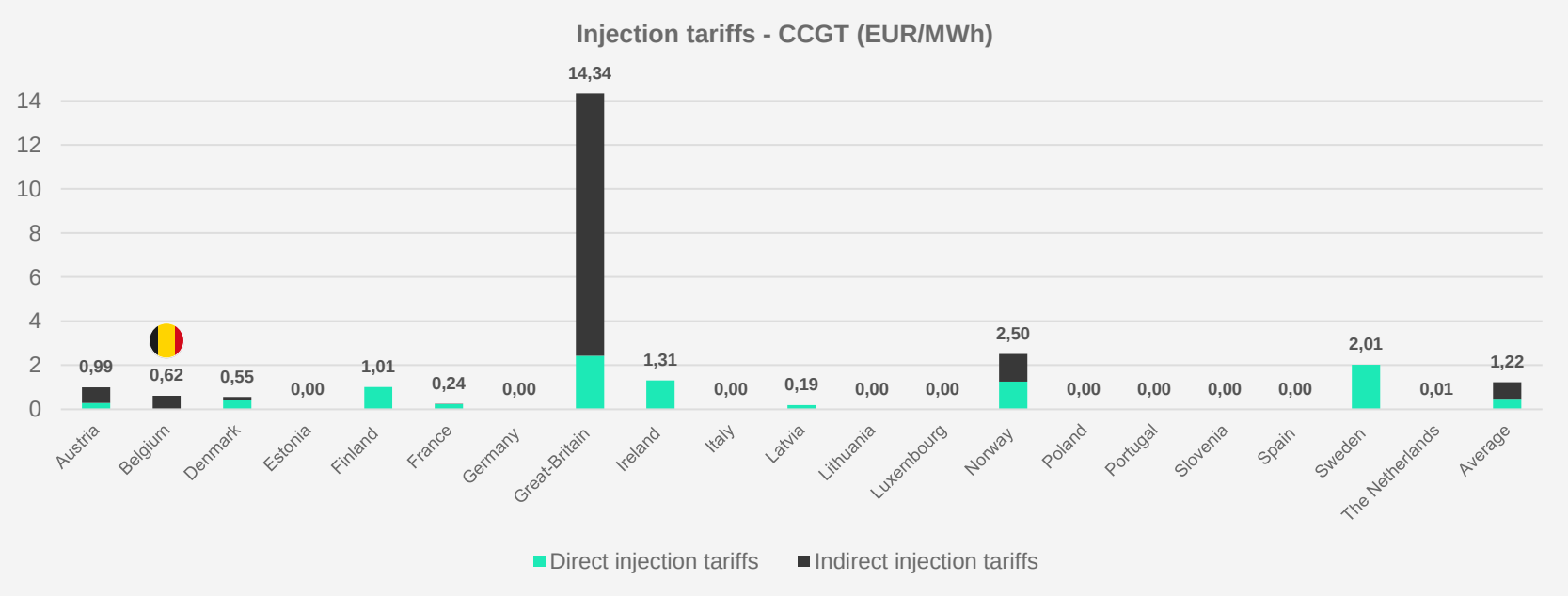
Belgian CCGT have an injection costs of 0,62 €/MWh, lower than the panel average.

- **With 0,62 €/MWh** the injection costs in Belgium for a CCGT are **lower than the average injection costs of countries in the benchmark (3,65 €/MWh)** and lower than 7 countries of the panel. The average value remains heavily influenced by the CO_2-tariff applied by Norway and Great Britain.
- **Norway** applies a CO_2-tariff on CCGTs that represents 90% (29,51 €/MWh) of the high total injection costs.
- **The high costs in Great-Britain** (24,05 €/MWh) are due to a CO_2-tariff and high Balancing services use of system (BSUoS) charges
- **The negligible injection cost in Luxembourg (~0 €/MWh) and The Netherlands (0,01 €/MWh)** is due to an annual fixed tariff.
- **In Italy, Lithuania, Poland, Portugal, Slovenia, and Spain** the estimated costs of the voltage control obligation (0,22 €/MWh) are the only contribution to the injection costs.

Belgium presents a CCGT injection tariffs (0,62 €/MWh) lower than the average CCGT injection costs applied by the panel (1,22 €/MWh)

Injection tariffs for a CCGT plant **vary between 0 €/MWh** (Estonia, Italy, Lithuania, Poland, Portugal, Slovenia, Spain) **and 14,34 €/MWh** (Great Britain). **Great Britain** shows **a high indirect injection tariff** with the charges of BSUoS **20 times higher** than the injection tariff in Belgium. With **0,62 €/MWh** injection tariffs for a CCGT **in Belgium are lower than the average (1,22 €/MWh)** and **6 countries currently have higher injection tariffs for CCGT.**



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Belgian CCGT have an injection tariff of 0,62 €/MWh, lower than the panel average.

- **Injection tariffs for a CCGT in Belgium (0,62 €/MWh) are below the average injection tariff (1,22 €/MWh)** of countries included in the benchmark and **6 countries currently have higher injection tariffs for CCGT.**
- **9 countries impose a direct injection tariff,** ranging between **0,19 €/MWh** (Latvia) **and 2,43 €/MWh** (Great-Britain).
  - **In Austria, Denmark, France and Norway** the direct injection tariff is based entirely on the injected energy and thus equal to the tariff of other generating technologies.
  - **Finland, Great-Britain, Ireland, Latvia and Sweden calculate** the direct injection tariff (at least partly) on the **installed capacity**
- **9 countries impose indirect injection tariffs on generators**
  - **Austria, Belgium, Denmark, Great-Britain and Norway** calculate indirect injection tariffs based on the energy injected
  - **In France, Germany and The Netherlands,** indirect injection tariffs are linked to **annual fixed tariffs.** Luxembourg applies a yearly fee that becomes negligible when distributed on the yearly injected energy.
- **No tariffs are applied to generators in Estonia, Italy, Lithuania, Poland, Portugal, Slovenia, and Spain.**

Injection costs for CCGT: intermediate summary

Average injection costs for a model CCGT are **3,65 €/MWh.** This value is heavily **influenced by CO_2-tariffs** in Norway and Great-Britain. **7 countries have no tariffs applicable for generators.**

High injection costs in Great-Britain are due to **Balancing Services Use of System charges,** which covers the costs for balancing the grid, that have quadrupled since 2017.

Low injection costs in The Netherlands are due to **low annual fixed tariff** that is charged to generators and results in negligible €/MWh injection costs for all generating technologies.

Injection costs for a CCGT in Belgium (0,62 €/MWh) are lower than the average injection cost for a CCGT **(3,65 €/MWh). When comparing the injection tariffs for a CCGT,** the Belgian tariff is lower than the benchmark average **(1,22 €/MWh).** The Belgian injection costs remain also below this value.

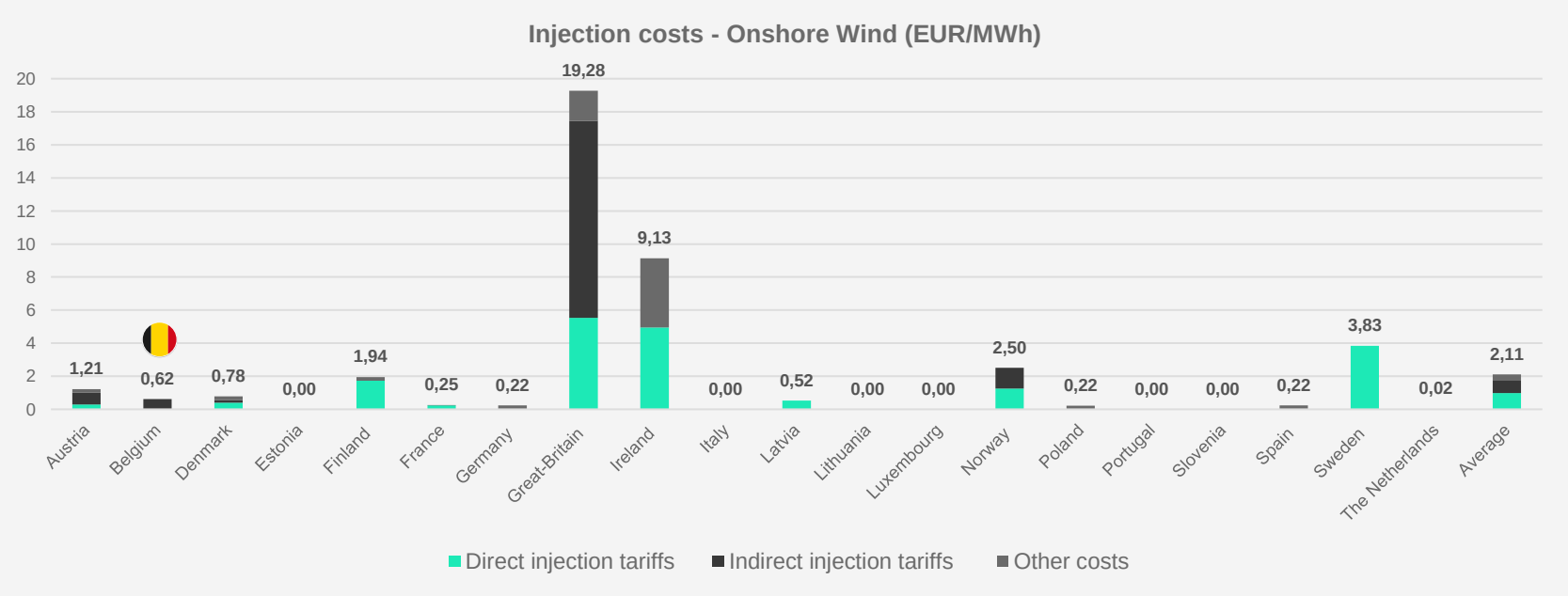
Tariffs related to CO_2-emissions increase the total injection costs for CCGT's in Norway and Great-Britain where these charges respectively are 29,51 €/MWh and 7,88 €/MWh. These tariffs are applied on top of the EU-ETS system.

Portugal and Spain used to impose an injection tariff on generators but no longer do**. The injection tariffs are zero.** Only consumers must pay transmission grid fees.

Injection costs related to onshore wind parks

Belgium onshore wind injection costs (0,62 €/MWh) are lower than the average applied by the panel (2,11 €/MWh)

Injection costs for onshore wind **vary between 0 €/MWh** (Estonia, Italy, Lithuania, Portugal, Slovenia, Spain) **and 19,28 €/MWh** (Great Britain). **Great Britain** shows **a high indirect injection cost** with the charges of BSUoS **almost 20 times higher** than the injection cost in Belgium. With **0,62 €/MWh** injection costs for onshore wind **in Belgium are lower than the average (2,11 €/MWh). Current Belgian injection cost is lower than 7 benchmarked countries.** The average value remains influenced by the high costs that generators have to pay to compensate the grid losses in Ireland (4,18 €/MWh).



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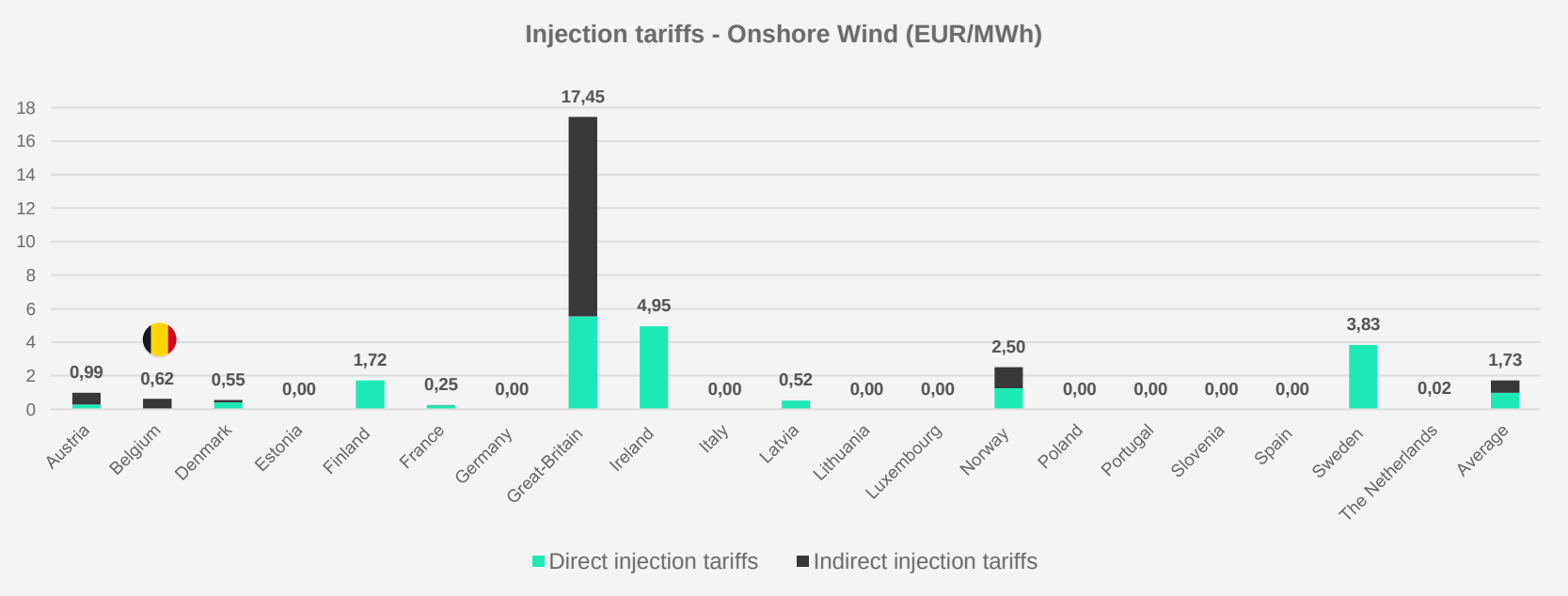
Injection costs for onshore wind **vary between 0 €/MWh** (Estonia, Italy, Lithuania, Portugal, Slovenia, Spain) **and 19,28 €/MWh** (Great Britain). **Great Britain** shows **a high indirect injection cost** with the charges of BSUoS **almost 20 times higher** than the injection cost in Belgium. With **0,62 €/MWh** injection costs for onshore wind **in Belgium are lower than the average (2,11 €/MWh). Current Belgian injection cost is lower than 7 benchmarked countries.** The average value remains influenced by the high costs that generators have to pay to compensate the grid losses in Ireland (4,18 €/MWh).

Belgian injection costs for onshore wind only include injection tariffs and are lower than the panel average

- With **0,62 €/MWh, injection costs for onshore wind parks in Belgium are lower than the average injection costs (2,11 €/MWh)** of countries in the benchmark. Also, the current Belgian injection cost for onshore wind is lower than 7 countries in the benchmark.
- **Injection costs** for onshore wind **vary between 0 €/MWh** (Estonia, Italy, Lithuania, Portugal and Slovenia)**, and 19,28 €/MWh for Great-Britain.**
- **For Ireland the high costs (9,13 €/MWh)** are explained by the high capacity-based charges (representing a share of 54%) and high loss coverage costs. This high share of other costs applicable to Irish onshore wind parks, increases the panel average.
- The high injection cost for **Great-Britain (19,28 €/MWh)** is due to high BSUoS charges, representing 60% of the total costs. The capacity-based tariffs result in higher **€/MWh** values due to the lower load factor of onshore wind (compared to CCGT).
- **The low costs for Luxembourg (~0 €/MWh) and the Netherlands (0,02 €/MWh)** are due **to an annual fixed tariff.**
- **In Poland, and Spain the voltage control obligation represents the only contribution to the injection costs**

Belgium onshore wind injection tariffs (0,62 €/MWh) are lower than the average applied by the panel (1,73 €/MWh)

Injection tariffs for onshore wind **vary between 0 €/MWh** (Estonia, Italy, Lithuania, Portugal, Slovenia, Spain) **and 17,45 €/MWh** (Great Britain). **Great Britain** shows **a high indirect injection tariff** with the charges of BSUoS **almost 20 times higher** than the injection tariff in Belgium. With **0,62 €/MWh** injection tariffs for onshore wind **in Belgium are lower than the average (1,73 €/MWh)** and **6 countries currently have higher injection tariffs for onshore wind.**



Belgium onshore wind injection tariffs (0,62 €/MWh) are lower than the average applied by the panel (1,73 €/MWh)

Injection tariffs for onshore wind **vary between 0 €/MWh** (Estonia, Italy, Lithuania, Portugal, Slovenia, Spain) **and 17,45 €/MWh** (Great Britain). **Great Britain** shows **a high indirect injection tariff** with the charges of BSUoS **almost 20 times higher** than the injection tariff in Belgium. With **0,62 €/MWh** injection tariffs for onshore wind **in Belgium are lower than the average (1,73 €/MWh)** and **6 countries currently have higher injection tariffs for onshore wind.**

Belgian injection tariffs for onshore wind are lower than the average

- With **0,62 €/MWh, injection tariffs for onshore wind parks in Belgium are lower than the average injection tariff (1,73 €/MWh)** and **6 countries currently have higher injection tariffs.**
- **In 9** countries direct injection tariffs are being imposed on generators:
  - **In Austria, Denmark, France and Norway** the direct injection tariff is entirely calculated based on the injected energy and thus equal to the tariff of other generating technologies. The tariff varies between **0,23 €/MWh (France) and 1,25 €/MWh (Norway)**
  - **Finland, Great-Britain, Ireland, Latvia and Sweden calculate** the direct injection tariff (at least partly) on the **installed capacity** resulting in higher direct injection costs due to the lower load factor (compared to CCGT) varying **between 0,52 €/MWh (Latvia) and 5,53 €/MWh (Great-Britain)**
- **9 countries impose indirect injection tariffs on generators**
  - **Austria, Belgium, Denmark, Great-Britain and Norway** calculate indirect injection tariffs based on the energy injected
  - **In France, Germany, Luxemburg and The Netherlands,** indirect injection tariffs are linked to **annual fixed tariffs**
- In **Estonia, Italy, Lithuania, Poland, Portugal, Slovenia and Spain** onshore wind generation is not subject to any tariffs related to transmission
- In **Portugal and Spain, the injection tariffs were removed in 2022 and 2020 respectively.** The injection tariff removal in Portugal is a consequence of the removal that occurred in Spain due to risks of cross-border competition distortions

Injection costs for onshore wind: intermediate summary

Average injection costs for a model onshore wind park are **2,11 €/MWh. 7 countries have no tariffs applicable for generators.**

High injection costs in Great-Britain are due to the high BSUoS charges which quadrupled since last injection benchmark and represents a share of 68% of total tariffs applicable.

Low injection costs in Luxemburg are due to **low annual fixed tariff** that is charged to generators and results in negligible €/MWh injection costs for all generating technologies.

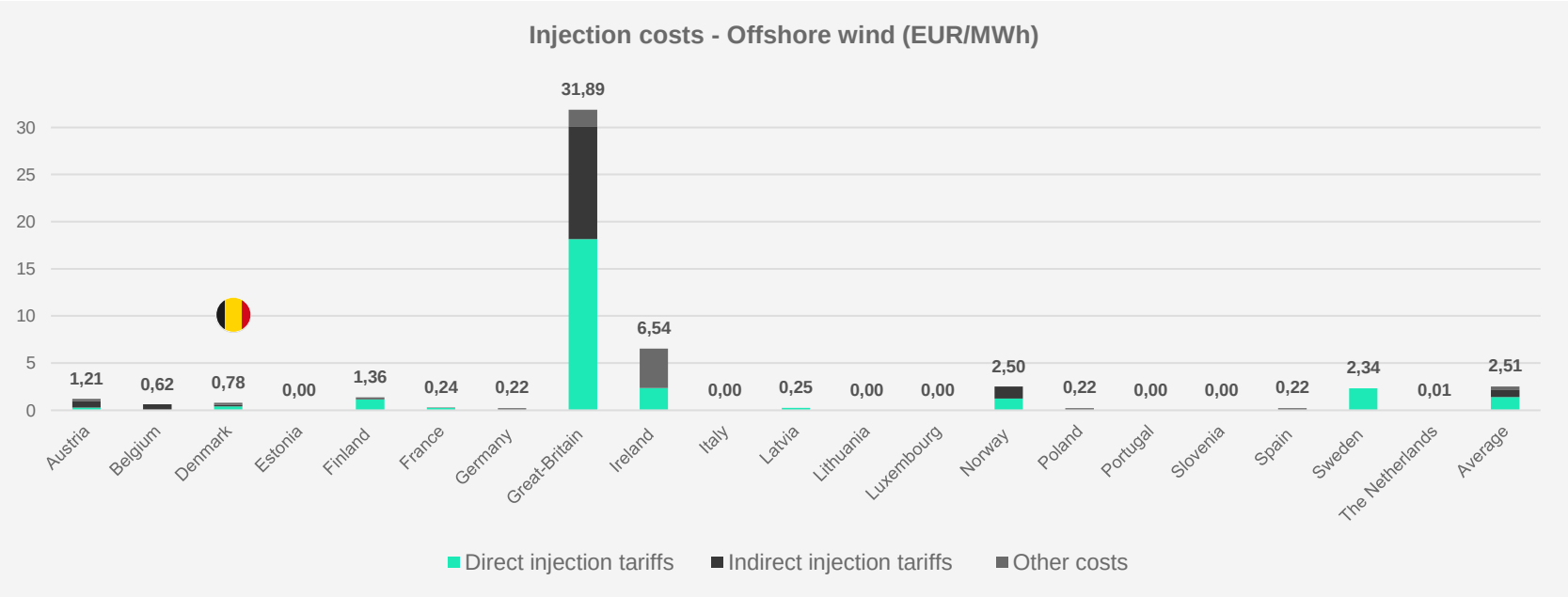
Injection costs of an onshore wind park in Belgium (0,62 €/MWh) are lower than the average injection cost in the benchmark (**2,11 €/MWh). Focusing on injection tariffs, Belgium onshore wind park tariffs (0,62 €/MWh)** are lower than the average tariff imposed **(1,73 €/MWh).** The Belgian injection costs remain also below this value.

Portugal and Spain used to impose an injection tariff on generators but no longer do**. The injection tariffs are zero.** Only consumers must pay transmission grid fees.

Injection costs related to offshore wind parks

In Belgium injection costs for offshore wind (0,62 €/MWh) are lower than the average of the benchmarked countries (2,51 €/MWh)

Total injection costs for a model offshore wind park **vary between 0 €/MWh** (Estonia, Italy Lithuania and Slovenia) **and 31,89 €/MWh** (Great-Britain), with **Great-Britain** having the **highest total injection costs**. **Belgium's injection costs** for offshore wind **(0,62 €/MWh)** are **below the average (2,51 €/MWh). The current injection costs for offshore wind in Belgium are lower than 7 benchmarked countries.**



In Belgium injection costs for offshore wind (0,62 €/MWh) are lower than the average of the benchmarked countries (2,51 €/MWh)

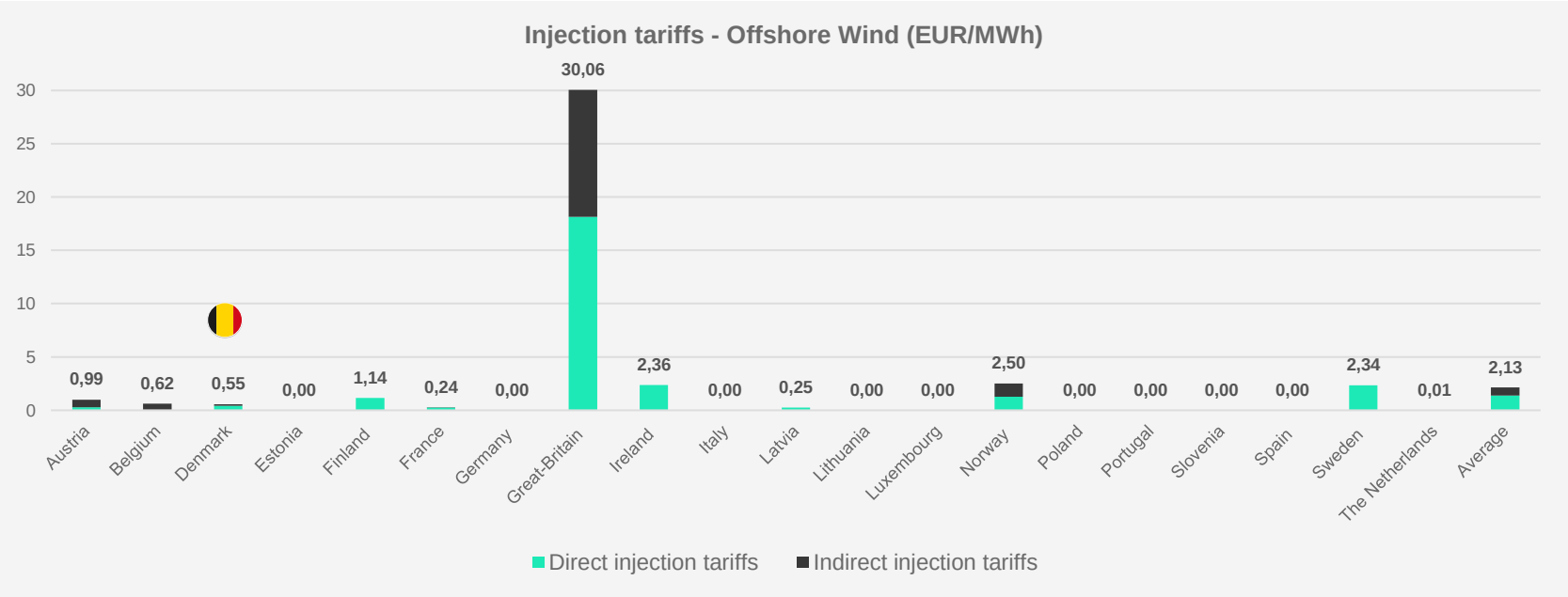
Total injection costs for a model offshore wind park **vary between 0 €/MWh** (Estonia, Italy Lithuania and Slovenia) **and 31,89 €/MWh** (Great-Britain), with **Great-Britain** having the **highest total injection costs**. **Belgium's injection costs** for offshore wind **(0,62 €/MWh)** are **below the average (2,51 €/MWh). The current injection costs for offshore wind in Belgium are lower than 7 benchmarked countries.**

Belgian injection costs for onshore wind include only tariffs and are lower than the average

- **Injection costs for offshore wind in Belgium (0,62 €/MWh) are lower than the average (2,51 €/MWh)** and lower than the injection costs in 7 countries.
- **Injection costs** for offshore wind **vary between 0,00 €/MWh (Estonia, Italy, Lithuania and Slovenia) and 31,89 €/MWh (Great-Britain)**
- **The high injection costs in Great-Britain** (**31,89 €/MWh)** are due to **specific tariffs that are due for offshore wind generation** (which cover the cost for the connection between the offshore power plant the Main Interconnected Transmission system) and **high costs for balancing the system, the BSUoS** (Balancing Services Use of System charges).
- **The high injection costs in Ireland** can be explained by the *Other costs* category which includes the costs that cover losses
- **The low costs for Luxembourg (~0 €/MWh) and the Netherlands (0,02 €/MWh)** are due **to an annual fixed tariff.**
- **In Estonia, Italy, Lithuania and Slovenia** offshore wind generation technology **does not incur any costs** related to the operation of the transmission grid

In Belgium injection tariffs for offshore wind (0,62 €/MWh) are lower than the average of the benchmarked countries (2,13 €/MWh)

The **injection tariffs** for offshore wind **vary between 0 €/MWh and 30,06 €/MWh (Great-Britain). Belgian injection tariffs (0,62 €/MWh)** are 50 times lower than the highest injection tariffs in the benchmark. **Injection tariffs in Belgium** are lower than th**e average** of the benchmarked countries **(2,13 €/MWh)** and **currently 6 countries have higher injection tariffs for offshore wind.**



In Belgium injection tariffs for offshore wind (0,62 €/MWh) are lower than the average of the benchmarked countries (2,13 €/MWh)

The **injection tariffs** for offshore wind **vary between 0 €/MWh and 30,06 €/MWh (Great-Britain). Belgian injection tariffs (0,62 €/MWh**) are 50 times lower than the highest injection tariffs in the benchmark. **Injection tariffs in Belgium** are lower than th**e average** of the benchmarked countries **(2,13 €/MWh)** and **currently 6 countries have higher injection tariffs for offshore wind.**

Belgium injection tariffs for offshore wind are lower than the average injection tariff imposed

- **Injection tariffs for offshore wind in Belgium (0,62 €/MWh) are lower than the average (2,13 €/MWh)** and **currently 6 countries have higher injection tariffs for offshore wind.**
- **In 9** countries direct injection tariffs are being imposed on generators
  - **In Austria, Denmark, France and Norway** the direct injection tariff is entirely calculated based on the injected energy and thus equal to the tariff of other generating technologies. The tariff varies between **0,23 €/MWh (France) and 1,25 €/MWh (Norway)**
  - **Finland, Great-Britain, Ireland, Latvia and Sweden calculate** the direct injection tariff (at least partly) on the **installed capacity** resulting in higher direct injection costs due to the lower load factor (compared to CCGT-technology) varying **between 0,25 €/MWh (Latvia) and 18,14 €/MWh (Great-Britain)**
- **9 countries impose indirect injection tariffs on generators**
  - **Austria, Belgium, Denmark, Great-Britain and Norway** calculate indirect injection tariffs based on the energy injected
  - **In France, Germany, Luxemburg and The Netherlands,** indirect injection tariffs are linked to **annual fixed tariffs**
- In **Estonia, Italy, Lithuania, Poland, Portugal, Slovenia and Spain** offshore wind generation is not subject to any tariffs related to transmission
- In **Portugal and Spain, the injection tariffs were removed in 2022 and 2020, respectively**. The injection tariff removal in Portugal is a consequence of the removal that occurred in Spain due to risks of cross-border competition distortions

Injection costs for offshore wind: intermediate summary

Average injection costs for a model offshore wind park are **2,51 €/MWh,** this value is **influenced by high values** in Great-Britain and Ireland. **7 countries have no tariffs applicable for generators.**

High injection costs in Great-Britain (31,89 €/MWh) are due to the high BSUoS charges and the charges that are specific to offshore wind.

Low injection costs in multiple countries are due to the lack of a tariff or a **low annual fixed tariff** that results in negligible €/MWh injection costs for all generating technologies.

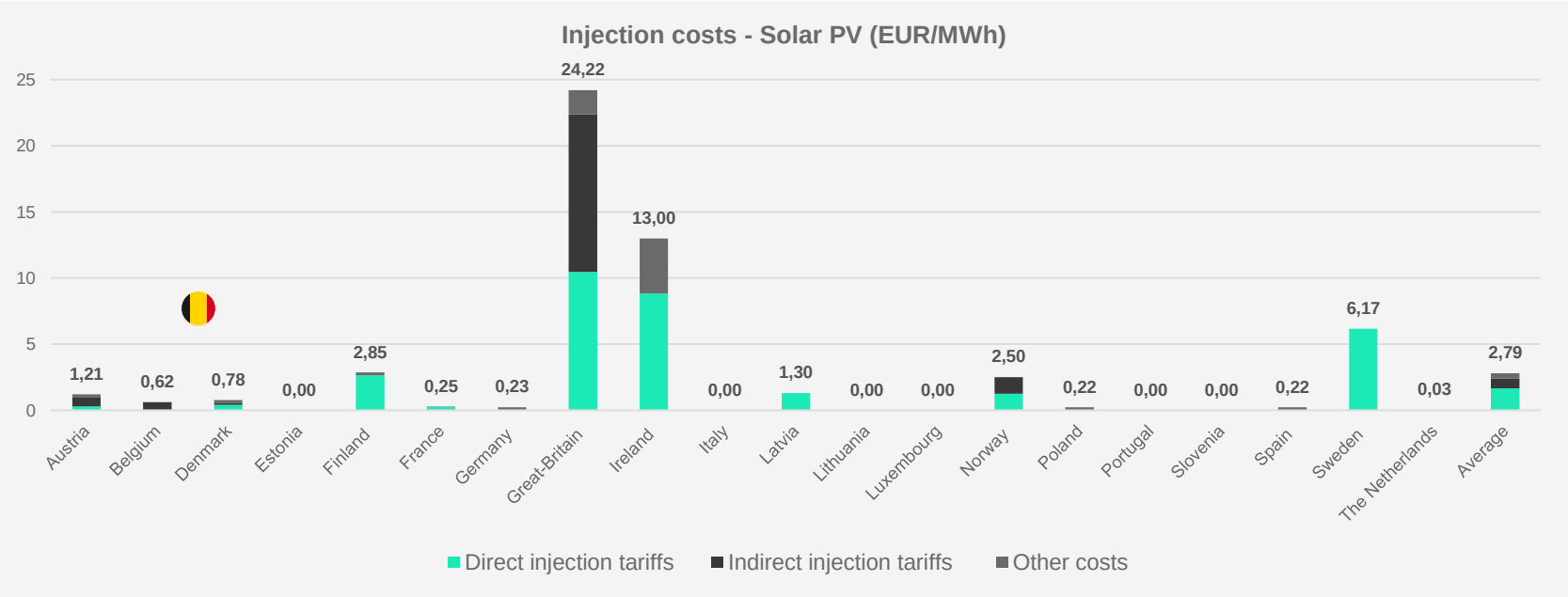
Injection costs for an offshore wind park in Belgium (0,62 €/MWh) are lower than the average costs applicable in the benchmarked countries (**2,51 €/MWh). Focusing on tariffs, Belgian onshore wind parks (0,62 €/MWh)** are subject to lower tariffs than the average tariff imposed **(2,13 €/MWh).** The Belgian injection costs remain also below this value.

Spain and Portugal used to impose an injection tariff on generators but no longer do**. The injection tariff is zero.** Only consumers must pay transmission grid fees.

Injection costs related to Solar PV parks

High injection costs for solar PV are observed in Finland, Sweden, Great-Britain and Ireland, where tariffs are based on capacity

Total injection costs for Solar PV **vary between 0 €/MWh and 24,22 €/MWh**, with **Great-Britain, Ireland and Sweden** having **the highest total injection costs, being at least 10 times higher than the costs in Belgium. At 0,62 €/MWh, injection costs in Belgium** are **below the average (2,79 €/MWh) and lower than the injection costs of 8 benchmarked countries.**



High injection costs for solar PV are observed in Finland, Sweden, Great-Britain and Ireland, where tariffs are based on capacity

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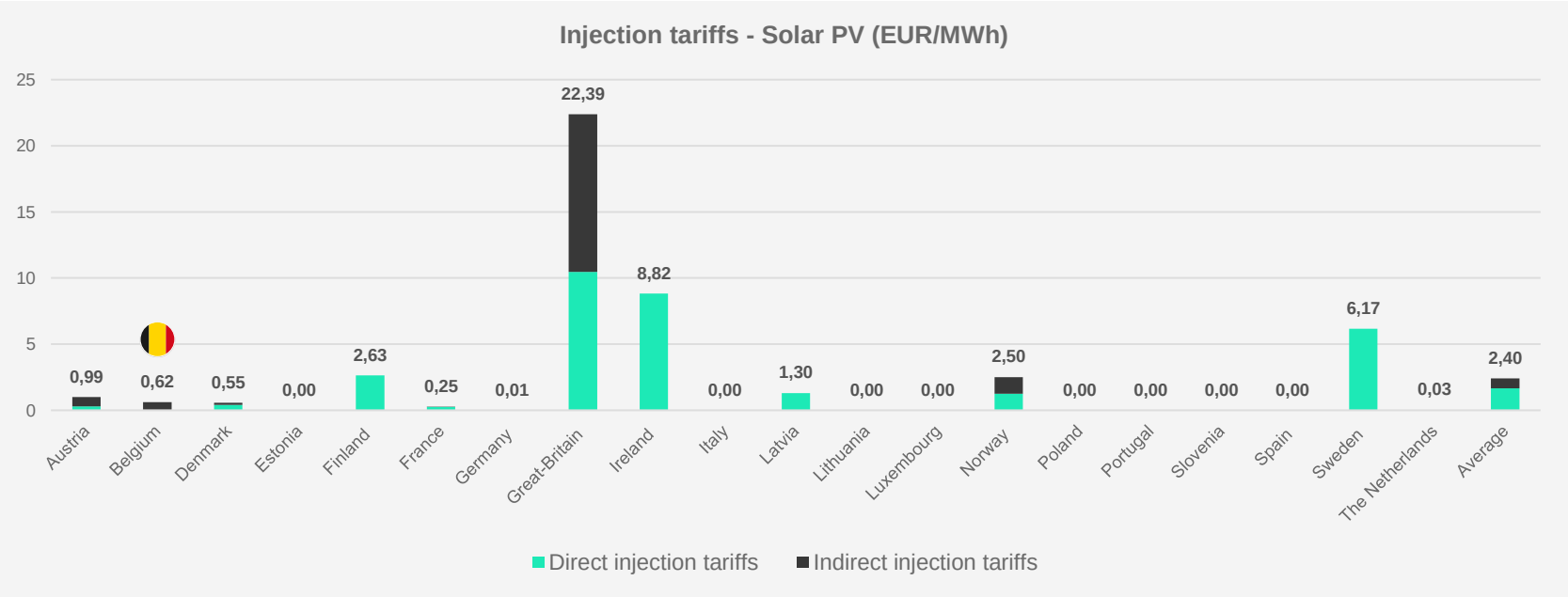
Belgian injection costs for Solar PV include only tariffs and are lower than the average

- **Injection costs for Solar PV in Belgium (0,62 €/MWh) are lower than the average cost (2,79 €/MWh).** Also, the current Belgian injection costs are lower than 8 other countries.
- **Injection costs** for Solar PV **vary between 0,00 €/MWh (Estonia, Italy, Lithuania and Slovenia) and 24,22 €/MWh (for Great-Britain).**
- **Great-Britain** (**24,22 €/MWh)** has **high injection costs**, this is due to **high costs for balancing the system, the BSUoS** (Balancing Services Use of System charges) and the capacity charges that are unfavorable for generating technologies with low load factors, such as Solar PV.
- The **high capacity-based tariffs applied in Sweden and Ireland** further **penalizes Solar PV** due to the **low PV load factors** considered for these countries.
- **The low costs for Luxembourg (~0 €/MWh) and the Netherlands (0,02 €/MWh)** are due **to an annual fixed tariff.**
- **In Estonia, Italy, Lithuania and Slovenia** Solar PV **does not incur any costs** related to the operation of the transmission grid.

In Belgium injection tariffs for Solar PV (0,62 €/MWh) are lower than the average of the panel (2,40 €/MWh)

Injection tariffs for Solar PV **vary between 0 €/MWh and 22,39 €/MWh**, with **Great-Britain, Ireland and Sweden** having **the highest total injection tariffs. Injection tariffs in Belgium (0,62 €/MWh)** are **below the average (2,40 €/MWh)** and **currently 7 countries have higher injection tariffs for Solar PV.**



In Belgium injection tariffs for Solar PV (0,62 €/MWh) are lower than the average of the panel (2,40 €/MWh)

Injection tariffs for Solar PV **vary between 0 €/MWh and 22,39 €/MWh**, with **Great-Britain, Ireland and Sweden** having **the highest total injection tariffs. Injection tariffs in Belgium (0,62 €/MWh)** are **below the average (2,40 €/MWh)** and **currently 7 countries have higher injection tariffs for Solar PV.**

Belgian injection costs for Solar PV include only tariffs and are lower than the average

- **Injection tariffs for Solar PV in Belgium (0,62 €/MW) are lower than the average tariff (2,40 €/MWh)** and **currently 7 countries have higher injection tariffs for Solar PV.**
- **Injection tariffs** for Solar PV **vary between 0 €/MWh (Spain, Estonia, Italy, Lithuania and Slovenia) and 22,39 €/MWh (for Great-Britain)**
- **In 9** countries direct injection tariffs are being imposed on generators
  - **In Austria, Denmark, France and Norway** direct injection tariffs are entirely calculated based on the injected energy. The tariff varies between **0,23 €/MWh (France) and 1,25 €/MWh (Norway).**
  - **Finland, Great-Britain, Ireland, Latvia and Sweden calculate** the direct injection tariff (at least partly) on the **installed capacity** resulting in higher direct injection costs due to the lower load factor (compared to CCGT-technology) varying **between 1,3 €/MWh (Latvia) and 10,47 €/MWh (Great-Britain)**
- **In 9** countries indirect injection tariffs are being imposed on generators
  - **In Austria, Belgium, Denmark, Great-Britain and Norway** indirect injection tariffs are calculated on the energy injected
  - **In France, Germany, Luxemburg and The Netherlands,** Indirect injection tariffs are linked to **annual fixed tariffs**
- In **Estonia, Italy, Lithuania, Poland, Portugal, Slovenia and Spain** offshore wind generation is not subject to any tariffs related to transmission
- **Portugal and Spain used to impose injection tariffs on generators but no longer do.** The removal in Portugal is a direct consequence of the removal that occurred in Spain due to risks of distortions in cross-border competition

Injection costs for Solar PV: intermediate summary

The average injection costs for a model solar PV power plant are **2,79 €/MWh.** This value is heavily **influenced by high values** in Great-Britain, Ireland and Sweden. **7 countries have no tariffs applicable for generators.**

High injection costs in Great-Britain a are due to the high-capacity tariffs that are being extra influenced by the low load factor for solar PV. The high BSUoS costs further increase the injection costs.

Low injection costs in multiple countries are due to the lack of a tariff or a **low annual fixed tariff** that results in negligible €/MWh injection costs for all generating technologies.

High capacity-based tariffs combined with **low load factors** for Solar PV in Ireland and Sweden **increases the injection costs** for this generating technology in these countries.

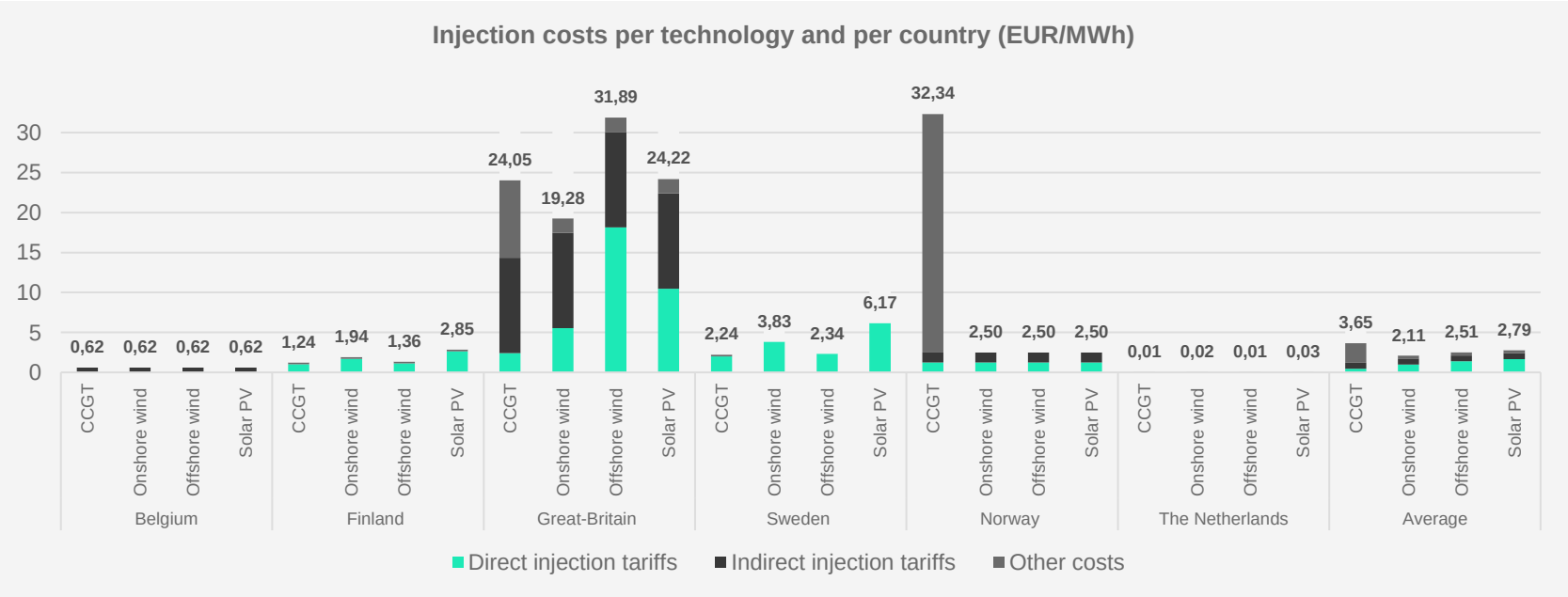
Injection costs for Solar PV in Belgium (0,62 €/MWh) are lower than the average injection cost in the benchmark (2,76 **Injection tariffs for a Solar PV power plant in Belgium (0,62 €/MWh)** are lower than the average tariff imposed **(2,40 €/MWh).** The Belgian injection costs remain also below this value.

Portugal and Spain used to impose an injection tariff on generators but no longer do**. The injection tariff is zero.** Only consumers must pay transmission grid fees.

Comparison of the different technologies

Injection costs in Belgium are equal over all generating technologies and lower than many countries that apply injection tariffs

Contrary to many other countries (Finland, Sweden, Norway, Great-Britain and Latvia) the **injection costs in Belgium are equal** between all generating technologies. In Belgium injection costs **only consist of an indirect injection tariff based on the injected energy**. **Belgian injection costs are lower than the benchmark average** for each generating technology.



Injection costs in Belgium are equal over all generating technologies and lower than the average for each technology

Contrary to many other countries (Finland, Sweden, Norway, Great-Britain and Latvia) the **injection costs in Belgium are equal** between all generating technologies. In Belgium injection costs **only consist of an indirect injection tariff based on the injected energy**. **Belgian injection costs are lower than the benchmark average** for each generating technology.

Generation technologies does not influence the injection costs of Belgian generators

- **With injection costs of 0,62 €/MWh cost in Belgium are lower than the arithmetic average for each technology** which ranges between 2,11 €/MWh and 3,65 €/MWh
- **The high costs for all technologies in Great-Britain** have multiple reasons: **high costs for balancing the system, the BSUoS** (Balancing Services Use of System charges), **capacity charges** that are unfavorable for generating technologies with lower load factors (RES), the **specific charges for offshore wind** and an **important CO_2-tariff** on CCGT
- An **important CO_2-tariff** is also the reason for the **high costs for CCGT in Norway**
- **When CO_2-tariffs are ignored, CCGT is consistently the cheapest technology, Solar PV** (or offshore wind in Great-Britain, due to the specific tariffs due) **is the most expensive one**
- **Tariffs that are calculated based on the installed capacity cause a difference** between the cheapest and most expensive technology of **1,61 €/MWh and 3,93 €/MWh in Finland and Sweden**
- **In Sweden and Norway, *other costs,*** which consist of a Voltage Control- or Blackstart obligation**, is only due by conventional technologies** lowering the difference between cheap and expensive technologies

Summary of analysis on injection tariffs

The benchmark shows varying costs and tariff structure in the evaluated countries with an impact on different generating technologies

Country findings

In Belgium **injection tariffs** are entirely based on the **amount of energy injected**. For each generating technology the **tariff is equal (0,62 €/MWh)** and **lower than the average.**

In Great-Britain injection tariffs are based on both **injected energy** and installed **capacity.** High BSUoS tariffs and high capacity tariffs make it the most expensive country over all technologies.

In The Netherlands the injection tariff only consists of an **annual fixed tariff** applicable for all users of the grid. When expressed as €/MWh for generators the values become negligible.

Portugal and Spain **removed the injection tariffs** in 2022 and 2020, respectively. Portugal's removal of injection tariffs is a direct consequence of Spain's removal due to the risk of cross-border competition distortions.

In Sweden, **capacity charges and load factor differences** impact the high range of total costs between technologies, **with Solar PV having the highest direct injection tariffs.**

Finland has **direct injection tariffs based on the injected energy and the installed capacity** of each generating technology. The different load factors make Solar PV have the highest values.

Ireland **has location-based capacity charges**, making a distinction between conventional, wind, and overall average. **Loss compensation accounts for 100% of the other costs category.**

Generating technology findings

Injection costs are **influenced by tariffs on CO_2-emissions**. These tariffs are applicable in Norway and Great-Britain and **only for CCGT** plants, representing a share of 91% and 33% of the total injection costs.

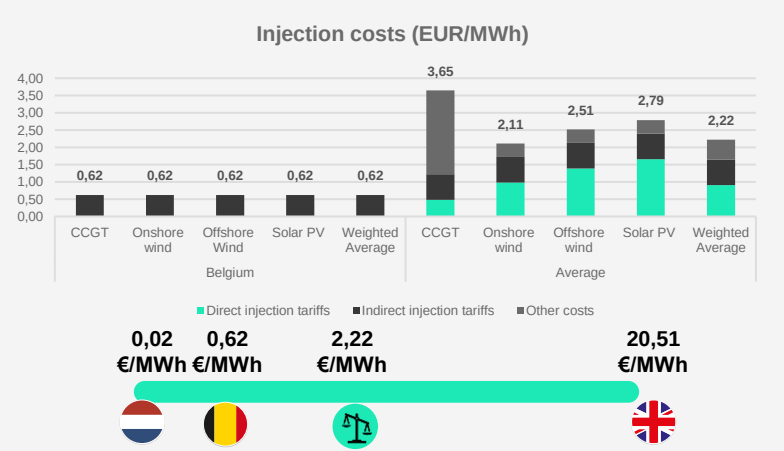
Injection tariffs for CCGT are consistently the lowest values compared to other technologies among all the benchmarked countries as RES technologies have lower load factors.

Estonia, Italy, Lithuania, Poland, and Slovenia **do not impose tariffs on generators**. Germany and Luxembourg have negligible tariffs consisting of an annual fixed tariff, with no impact on the injection costs (~ 0 EUR/MWh).

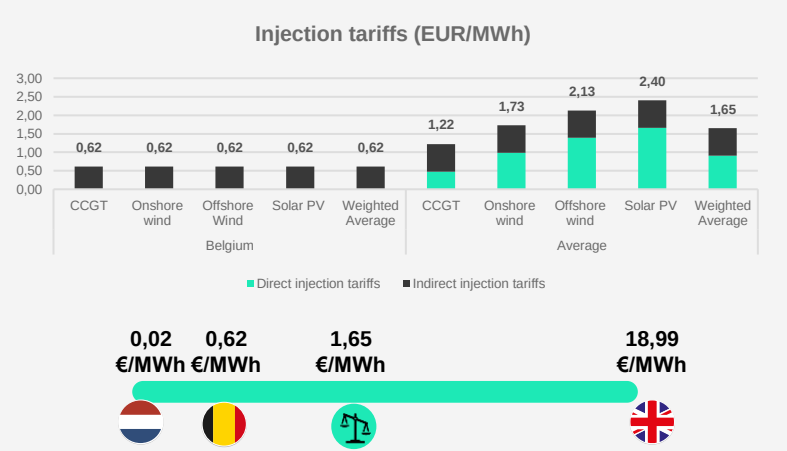
When there is an annual fee or a capacity tariff, **solar PV parks have the highest injection tariffs due to the influence of the low load factor**. Great-Britain is the only exception.

Great Britain has high specific tariffs for offshore wind, making it the most expensive technology to inject in the country. The high tariff has an influence on the average for offshore wind.

Injection costs (0,62 €/MWh) and injection tariffs (0,62 €/MWh) in Belgium are lower than the average cost and tariff for each generating technology



Belgian **injection costs are equal for all generating technologies** and so is the countries weighted average (0,62 €/MWh). The value is **lower than the average** cost for each technology and **lower than the weighted average cost** (2,22 €/MWh). The horizontal bar shows the range of the weighted average injection costs calculated.



Belgian **injection tariffs are equal for all generating technologies** and so is the countries weighted average (0,62 €/MWh). The value is **lower than the average tariff** for each technology and **lower than the weighted average cost** (1,65 €/MWh). The horizontal bar shows the range of the weighted average injection tariffs calculated.

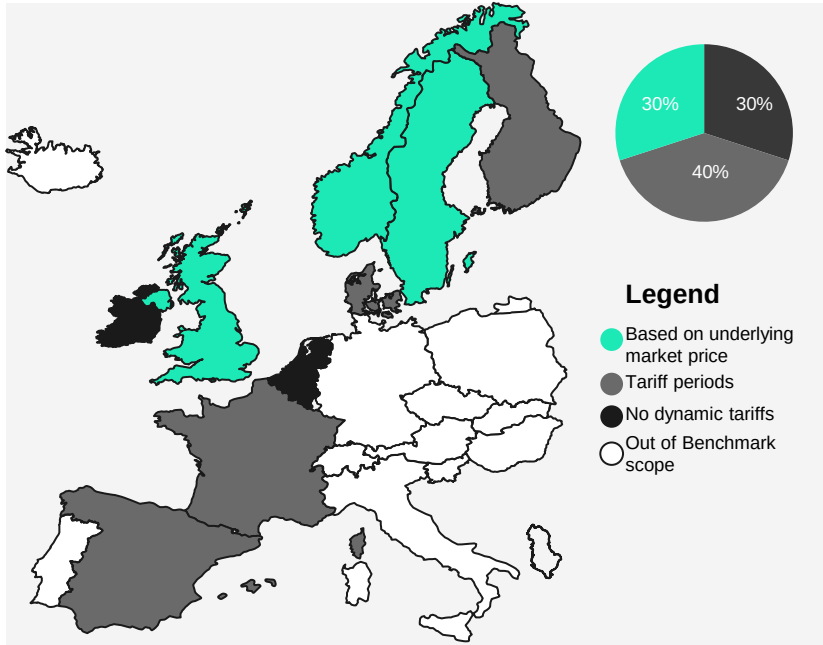
With an injection tariff increase up to 1,65 €/MWh, which is the average tariff in the benchmark, Belgian injection tariffs would remain in line with neighbouring European countries, with an injection cost remaining lower than the average.
The impacts on the overall generators' competitiveness should be deeply assessed.

Dynamic tariffs

Dynamic tariffs based on underlying market prices can be observed in Great-Britain, Norway and Sweden

Dynamic tariffs that are **based on underlying market prices** can be observed in 3 countries**: Sweden, Norway and Great-Britain. Four** countries **(Spain, France, Denmark & Finland)** use (or will be using) **multiple tariff periods. Belgium** is **investigating a potential dynamic tariff** for the tariff period 2024-2027. In **Ireland and the Netherlands** there are **no indications that a dynamic component will be implemented** in future tariff periods.

Dynamic tariffs implemented/to be implemented



Highlighted countries

In **Great-Britain**, the **Balancing Service Use of System (BSUoS)** charges are **dynamic** as the tariff is directly related to the actual costs the TSO incurs for balancing the system on a given day. The tariff is **determined on a half hourly basis**.

In **Norway** is the **energy component**, which covers the costs for grid losses, **dynamic**. The tariff component is directly **related to the hourly Day-Ahead electricity price**. The tariff is calculated based on the loss rate of the concerned tariff period and on the DA-price.

In Sweden is the **energy charge**, which covers the costs of losses on the grid, **dynamic**. The tariff component is directly **related to the Day-Ahead price on an hourly basis**. The tariff is calculated by multiplying the DA-price, increased with a risk premium, with the loss rates (variable between connection points).

The new tariff methodology allows the introduction of a dynamic component in the tariffs**.**. The tariff would **partly be linked to an underlying market price**. The share of the dynamic component is not specified in the tariff methodology.

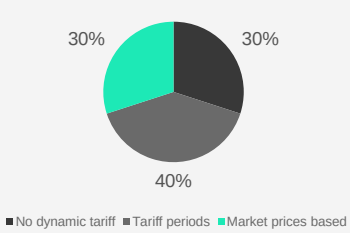
In **Denmark** there is a will to **include 2 tariff periods** (day- and nightime) in order to spread the consumption and grid use during the day. The changes should be implemented in the tariff period starting in 2024 (decisions are expected in quarter 3 of 2023).

Dynamic tariff components in Norway and Sweden are based on similar mechanisms

Dynamic tariffs that are **based on underlying market prices** can be observed in 3 countries**: Sweden, Norway and Great-Britain. Four** countries **(Spain, France, Denmark & Finland)** use (or will be using) **multiple tariff periods. Belgium and Denmark** are **investigating a potential dynamic tariff** for the following tariff period.

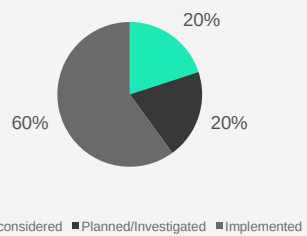
Dynamic tariff statistics

Dynamic schedules



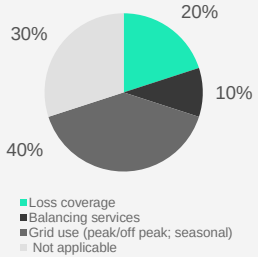
- **Market price based** dynamic tariffs are **variable in the time** with the tariff containing a **stochastic component.**
- **Tariff periods** and the height of the corresponding tariffs are **fixed beforehand** and **do not contain a stochastic component.**

Implemention Phase



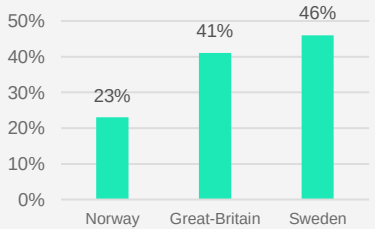
- **Ireland and The Netherlands** are **not considering the inclusion of a dynamic component.**
- **Belgium is** investigating the inclusion of a dynamic component **based on market prices and Denmark** wants to include **tariff periods** in the following tariff period.
- Other countries have implemented a dynamic/ToU tariff.

Reasoning/Affected grid bill components



- **In Sweden and Norway**, the dynamic component is linked to the component that **covers grid losses.**
- **In Great-Britain** the dynamic component covers the **costs for balancing the grid.**
- In countries that apply **tariff periods, the periods are mostly linked to peak and off peak periods** but can also depend on the **season** (Finland).

Dynamic component in percentage*



- Dynamic components represent between 23 and 46% of the grid bill.
- The dynamic component in **Norway and Sweden covers the same costs** (costs of grid losses) but the **difference in share is factor 2.** The difference is due to the higher fixed charges for offtake in Norway. This results in a lower percentage of the dynamic component.

*The percentage was calculated by looking at the total costs for consumer, making abstraction of special reductions and/or charges for reactive energy. Specifics can be found in the country fiche.

Dynamic injection tariffs: summary

Time of use/tariff periods are found in Finland, France, Spain.
Dynamic tariffs that are **linked to the electricity price** can be observed in Great-Britain, Norway and Sweden.

No dynamic tariff can be observed in **Ireland or The Netherlands**. In neither of the countries there is an indication to change this is the close future.

Time of Use/tariff periods are **fixed and linked to specific times**. The reasoning for different tariff rates is often **linked to peak- and off-peak hours**. In Finland the tariff period is based on **seasons** (winter day time/other time).

Dynamic injection tariffs **based on the electricity price** are **linked to the losses** incurred on the grid (Norway and Sweden) or **the costs related to the grid balance (Great-Britain).** The dynamic component represents between 23% (Norway) and 46% (Sweden) of the grid bill for a theoretical consumer.

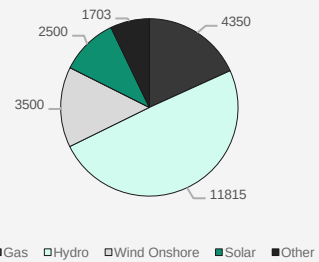
Belgium is investigating the inclusion of a dynamic component that is **linked to the electricity price.**

Denmark is investigating the inclusion of a tariff periods to encourage grid use on off-peak hours and discourage grid use during peak hours**. The tariff periods would be based on day- and nighttime.**

Summary of the country fiche

Austria – country fiche

Installed Capacity (MW)



Source: ENTSOE, data for 2022

Installed Capacity take-aways

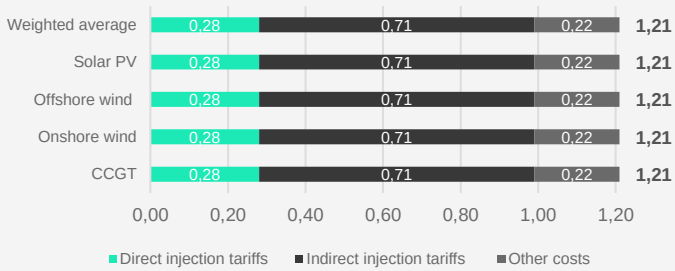
- The installed capacity is balanced between multiple power sources.
- RES (Hydro, Onshore wind and Solar PV) make up 60% of the total installed capacity.
- Gas represent a share of 18%.
- *Other* category consists primarily of biomass and waste

Tariff structure

Categories	Tariff name	Explanation
Offtake	Grid usage fee	• Calculated based on the installed capacity and the energy offtake • Tariff vary between different regions: Austria, Tyrol and Vorarlberg • Capacity component: 12300 EUR/MW (Austria), 21460 EUR/MW (Tyrol) and 2700 EUR/MW (Vorarlberg) • Energy component: 2,8 EUR/MWh (Austria), 0,79 EUR/MWh (Tyrol) and 0,27 EUR/MWh (Vorarlberg)
	Grid loss charge	• Based on energy offtake • Tariff varies between different zones: Austria, Tyrol and Vorarlberg • **Austria**: 0,88 EUR/MWh ;**Tyrol**: 0,88 EUR/MWh; **Vorarlberg**: 0,37 EUR/MWh
	Grid Provision fee	• Only charged in Vorarlberg region: 8700 EUR/MW
Injection	System service fee	• 0,28 EUR/MWh (Austria, Tyrol and Vorarlberg) • Paid by generators with an installed capacity larger than 5 MW
	Grid loss charge	• Tariff varies between different zones: Austria, Tyrol and Vorarlberg • **Austria**: 0,88 EUR/MWh ;**Tyrol**: 0,88 EUR/MWh; **Vorarlberg**: 0,37 EUR/MWh • An average of 0,71 €/MWh has been considered
Other	Voltage control	• 0,22 EUR/MWh (*) • Obligated costs incurred by generators

(*) Estimated value

Injection costs (EUR/MWh)

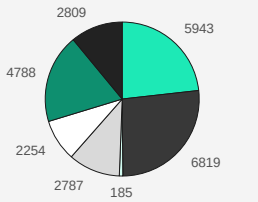


Explanation & analysis

- **Direct injection tariffs**, which consist entirely of the system service fee, **make up less than 25%** of the total costs incurred by generators.
- **Indirect injection tariffs**, which consist of charges to cover grid losses, **make up 57% of the total costs.**
- **All tariffs** are calculated based on the energy injected and thus equal between generating technologies, **no technology has an advantage/disadvantage** over another.
- **Other costs** include the **voltage control obligation** which is obligatory for all generators and makes up for about 20% of the total incurred costs.
- Dynamic tariffs have not been analyzed for Austria.

Belgium – country fiche (1/2)

Installed Capacity (MW)



Source: ENTSOE, data for 2022

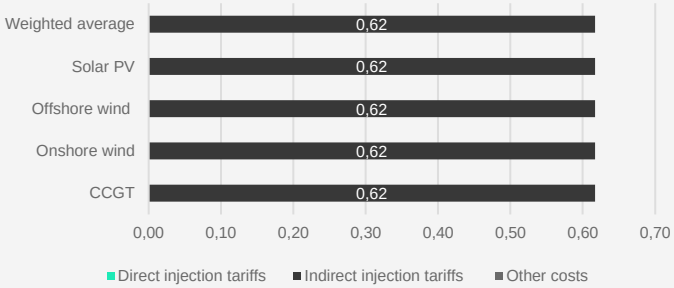
Installed Capacity take-aways

- Gas- and nuclear power plants make up half the installed capacity.
- The nuclear capacity will decrease to 2 GW due to the nuclear phase-out starting from 2022. Doel 4 and Tihange 3 will remain active until 2036 representing the active nuclear capacity.
- High share (39%) of RES (primarily Wind & Solar PV) in total installed capacity.

Tariff structure

Categories	Tariff name	Explanation
Offtake	Monthly peak	• 0,22 EUR/kW • Maximum offtake power on all quarters (15 minute basis), determined on a monthly basis
	Annual peak	• 5,55 EUR/kW • Maximum offtake power during quarters in annual peak period, defined as the period from November to March between 17:00 – 20:00 • Determined ex post for the 12 months prior to invoice
	Power put at disposal	• 4,70 EUR/kVA
	Operation of the electric system	• 0,92 EUR/MWh
	Reactive energy	• The applicable tariff rate depends on the exceedance of the thresholds for the offtake or injection of reactive energy • Tariff rate ranges between 3,84 EUR/MVAr and 4,99 EUR/MVAr depending on how much the thresholds for the reactive energy delivery or offtake is exceeded
	Power reserves and blackstart	• 0,73 EUR/MWh
	Market integration	• 0,37 EUR/MWh
	Public service obligations (PSO) and levies	• Levy for use of the public domain in Wallonia 0,31 EUR/MWh net offtaken (Exception for highest voltage levels) • Levy for road rights in Brussels-region: 3,60EUR/MWh net offtaken (only applicable for HV-levels) • Levy for taxes on pylons and trenches in Flandres: 0,37 EUR/MWh net offtaken (universally applicable)
Injection	Reactive energy	• Idem as for offtake
	Power reserves & blackstart	• 0,62 EUR/MWh

Injection costs (EUR/MWh)



Explanation & analysis

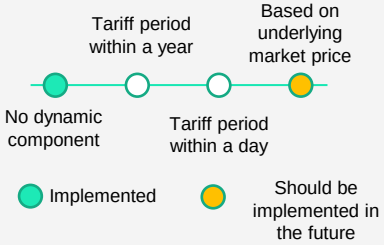
- Belgium's injection costs only consists of **indirect injection tariffs.**
- The indirect injection tariff consists of a tariff aiming to **finance part of the costs for blackstart and reserves.** The remaining part is covered by the offtake.
- Injection costs are **only based on an energy component,** thus **no generating technology** has an **advantage/disadvantage** over another.
- The **balanced installed capacity reflects the absence of an advantage/disadvantage** for a specific technology.

Belgium – country fiche (2/2)

Dynamic component

- **Currently,** there is **no dynamic component** in the tariff structure (neither for injection, nor offtake).
- Transmission tariffs should promote a more **rational energy consumption**. The tariff methodology 2024-2027 allows tariff components **to include a dynamic component** in **function of electricity market prices** in future tariff periods.

Maturity of Dynamic component



- **Tariff methodology of 2024-2027 allows** the inclusion of a **dynamic component** for both offtake and injection.
- Dynamic component is allowed for components covering the following costs: **management of electrical system** (with the exclusion for reactive energy tariffs), tariffs for **imbalances** and **tariffs for market integration.**

Percentage distribution

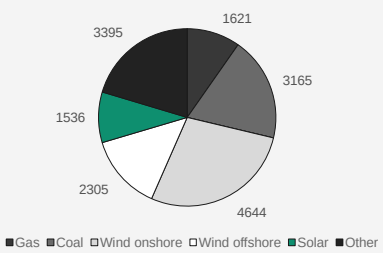
- There is no dynamic tariff applied in Belgium.

Transmission grid tariffs in Belgium do not differ between generating technologies

1. As the injection costs are only determined by the injected electricity there are **no advantages nor disadvantages** to invest in one generating technology over another.
2. The **equality of injection** costs seems to be **reflected in the mix of installed capacity**.
3. Due to the absence of “other costs”, the injection tariffs and injection costs are similar.
4. The injection tariffs aims to cover black start and reserves costs.
5. The new tariff methodology for the period 2024-2027 allows the introduction of dynamic tariffs.

Denmark – country fiche (1/2)

Installed Capacity (MW)



Source: ENTSOE, data for 2022

Installed Capacity take-aways

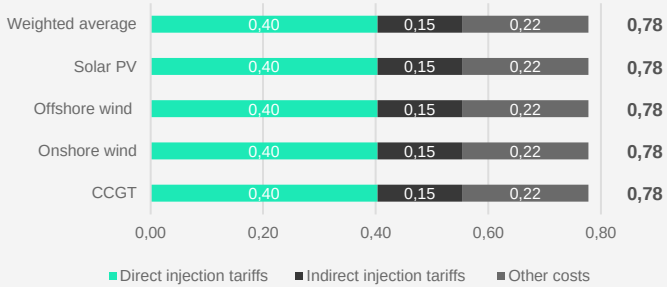
- Denmark has a high share of renewables (50%) with a focus on wind.
- Fossil fuelled power plants (gas and coal) make up a third of installed capacity.
- *Other* category consists primarily of oil and biomass powered electricity plants. A minor part (7 MW) is hydro power.

Tariff structure

Categories	Tariff name	Explanation
Offtake	Tranmission network tariff	• 6,6 EUR/MWh • Calculated based on energy offtake
	System tariff	• 8,20 EUR/MWh • Calculated based on energy offtake
	Balance tariff	• 0,31 EUR/MWh • Calculated based on energy offtake
Injection	Feed-in	• 0,40 EUR/MWh • Calculated based on energy injected
	Balance tariff	• 0,15 EUR/MWh • Calculated based on energy injected • Solar cells, wind turbines and decentralized plants that are still covered by the take-off obligation, which is a system where the TSO is obliged to sell the excess electricity of the production unit in accordance with Renewable Energy Act. These units do not pay a balance tariff
Other	Voltage control	• 0,22 EUR/MWh (*) • Obligatory to contribute to voltage regulation, represents a cost for generators that is not being reimbursed by the TSO

(*) Estimated value

Injection costs (EUR/MWh)

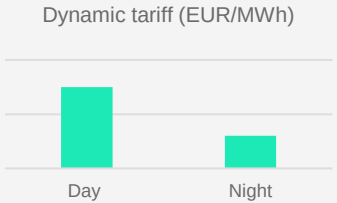


Explanation & analysis

- **Direct injection tariffs make up half** of the total injection costs for generators in Denmark.
- **Indirect injection tariffs** consists of **a charge for balancing services** that represents about a quarter of the total injection costs. The costs is established for units that are not covered by the take-off obligation.
- Both the **direct injection** tariff and the **indirect injection** tariff are calculated **based on injected energy.**
- **Other costs** consists of a **voltage control obligation** making up about 25% of total injection costs.
- The injection costs **are equal for all** generation technologies, thus **no technology has an advantage/disadvantage** over another.

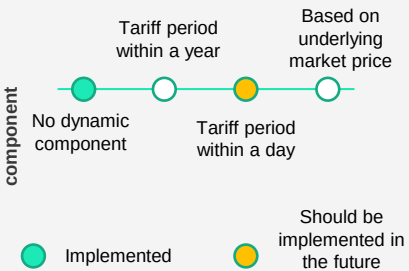
Denmark – country fiche (2/2)

Multiple tariff periods for offtake



- A **low-price zone at night** to incentivize the network use when the load is low, stimulating **more effective grid** use.
- The dynamic tariff **should be implemented** in the next tariff methodology period, but the details are **subject to public consultation** and **approval** by Danish Supply authority.

Maturity of Dynamic component



- Tariff **changes upcoming** to establish a tariff model that better **reflects** costs **for grid availability** and better rewards **consumers flexibility.**
- Introduction of a dynamic component (day- & night-time distinction) and capacity based charges linked to peak-load. Changes are planned to be implemented starting from 2024.

Percentage distribution

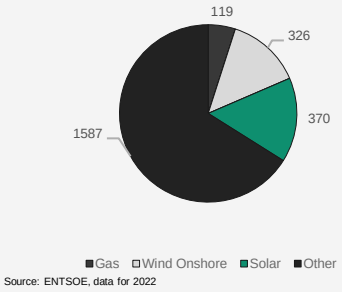
- Tariff methodology outline contains **no information on distribution and height** of future dynamic components.
- Literature on dynamic grid pricing (not specific for Denmark suggests that for Time of Use (TOU) systems **peak time prices should be 2 to 4 times higher** than off-peak prices.

Denmark applies a direct injection tariff and total injection costs do not differ between generating technologies

1. Injection costs consists of **tariffs** directly paid to the TSO. Generators are also supporting additional costs considering the voltage control obligation.
2. **Direct injection** tariffs **make up half** of the total injection grid bill (per MWh) for generators.
3. Injection costs are entirely **based** on the amount of **electricity injected** and thus **no cost differences between technologies** is observed**.**
4. Transmission **grid tariffs might change** in the following tariff period with the **inclusion of a dynamic component,** capacity-based charges and differentiation in the tariffs based on location.

Estonia – country fiche

Installed Capacity (MW)



Source: ENTSOE, data for 2022

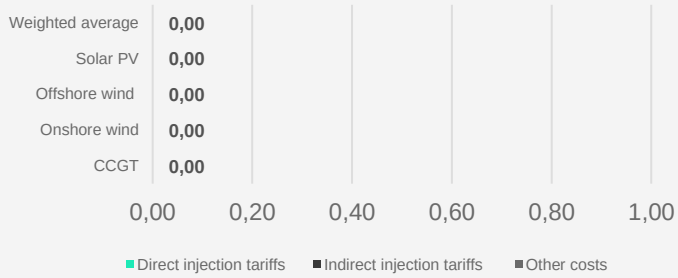
Installed Capacity take-aways

- *Other* category, consisting primarily of oil, represents 66% of the total installed capacity.
- RES (Onshore wind and Solar PV) represent a share of 29%
- Gas only represent a share of 5%.

Tariff structure

Categories	Tariff name	Explanation
Offtake	Transmission fee	• 6,53 EUR/MWh
Injection	/	• No tariffs charged to generators
Other	/	• Generators are not subject to other costs

Injection costs (EUR/MWh)

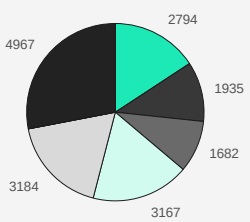


Explanation & analysis

- The tariffs applied in Estonia only consist of a transmission fee applied to consumers based on the energy offtake.
- Estonia does **not impose any tariffs on generators.**
- Generators are **not subject to Other costs**, the total injection costs are zero for all generating technologies.
- Dynamic tariffs have not been analyzed for Estonia.

Finland – country fiche (1/2)

Installed Capacity (MW)



Source: ENTSOE, data for 2022

Installed Capacity take-aways

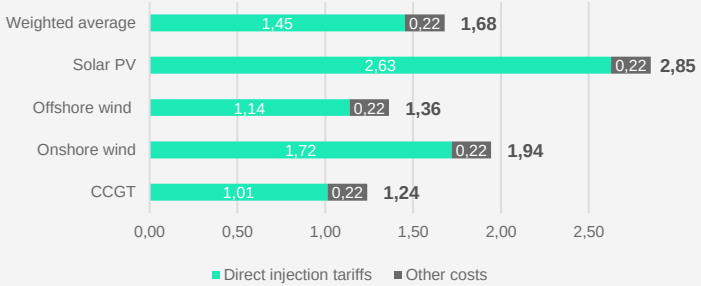
- Renewables make up a third of installed capacity, with 50-50 split between hydro and wind.
- Fossil and nuclear fuelled generators represent a third of installed capacity (major importance for nuclear).
- High share of *other* technologies (25%), primarily consisting of fossil peat, biomass and other renewable sources (7 MW of Solar)

Tariff structure

Categories	Tariff name	Explanation
Offtake	Consumption fee	• 8,96 €/MWh (winter daytime) or 2,55 €/MWh (other) • Differentiated between winter and summer time
	Grid output fee	• 0,92 EUR/MWh
	Reactive power	• 1000 €/MVAr, month • Charged on the highest monthly hour of reactive power that exceeds the allowed quantity • Highest 50 monthly values are omitted
	Reactive energy	• 5,00 €/MVArh • Charged on the highest monthly hour of reactive energy exceeding allowed quantity • Highest 50 monthly values are omitted
Injection	Feed-in	• 0,61 EUR/MWh • Charged based on energy sent through the grid
	Generation Capacity Fee	• 1944 EUR/MW • Tariff applicable for generators with a generation capacity larger than 1 MW, for smaller generators a different tariff applies. • Determined based on the connected capacity.
Other	Voltage control	• 0,22 EUR/MWh (*) • Obligatory to contribute to voltage regulation, represents a cost for generators that is not being reimbursed by the TSO.

(*) Estimated value

Injection costs (EUR/MWh)

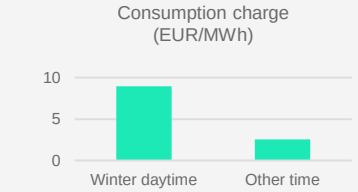


Explanation & analysis

- **Direct injection tariff that varies between** generating technologies as it is **based** both on **the injected energy** and on **the installed capacity.**
- **The Generation Capacity Fee** combined with load factor differences causes differences in total injection costs between generating technologies.
- **Load factor differences create a spread** of more than 100% between the cheapest (CCGT) and most expensive (Solar PV) technology.
- **Other costs** consists only of a **voltage control obligation** that is equal for each technology.
- **Little installed Solar PV capacity**, which is in line with low load factor and high injection costs, note that **other factors influence an investment decision.**

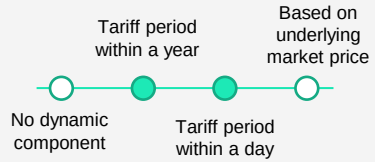
Finland – country fiche (2/2)

Tariff periods for offtake



- Price difference **based on the season: peak time pricing** during daytime in winter season (lasting from December to February between 7.00 am and 9.00 pm).
- The purpose is to **shift load away from peak hours** during winter to ensure adequacy, as the consumption is highly temperature dependent.

Maturity of Dynamic component



- 2 tariff periods are implemented: Winter daytime and Other times.
- The granularity is based on the **season** (winter period) and **hour of the day** (daytime).

Percentage distribution

- There is no dynamic tariff applied in Finland.

The Generation Capacity fee creates a difference between different generating technologies

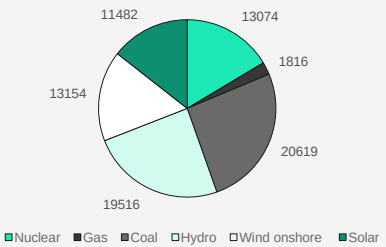
1. **The Generation Capacity fee and load factor differences create a difference in injection costs** between generating units. The most expensive generating technology (Solar PV) being twice as expensive as the cheapest generating technology (CCGT).

2. Injection costs seem to **influence the installed capacity**: in Finland there is little installed Solar PV capacity, which is the technology with the highest total injection costs. However other criteria influence the investment decision.

3. **A Seasonal dynamic component** for offtake is being used. The purpose of the seasonal tariff rate is to ensure adequacy during peak hours in the winter period.

France – country fiche (1/2)

Installed Capacity (MW)



Source: ENTSOE, data for 2022

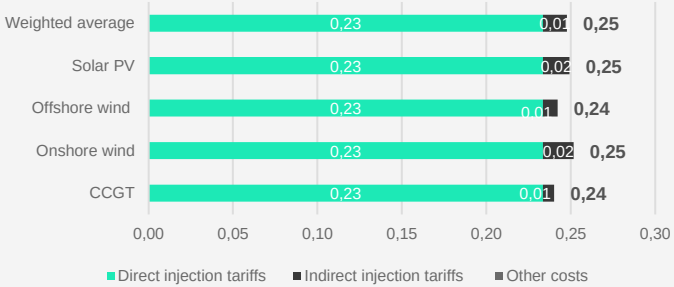
Installed Capacity take-aways

- Nuclear power represents a high share of the total installed capacity.
- Renewables make up a third of installed capacity with similar installed capacities for wind and hydro.
- Remaining installed capacity is a mix of fossil fueled and *other*, where this category consists of Oil and biomass powered electricity plants and a minor part of offshore wind (20 MW)

Tariff structure

Categories	Tariff name	Explanation
Mutual (Offtake and Injection)	Annual Management component	• 9404,04 EUR/year • For each main power connection • Lower charges for lower voltage levels
	Annual metering component	• 3095,28 EUR/Device/Year • Tariff differs based on ownership status of device (here device is owned by TSO)
	Annual reactive energy component	• Season dependent • For consumption and generation of reactive energy • Different threshold values
Offtake	Annual consumption component	• 3,3 EUR/MWh • Function of energy offtake in each connection point • Extra costs for subscribed power overruns for lower voltage levels
Injection	Injection component	• 0,23 EUR/MWh • Based on active energy injected

Injection costs (EUR/MWh)

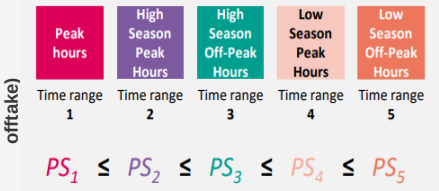


Explanation & analysis

- **The direct injection tariff** is **equal for all technologies** and **makes up 90 %** of the injection costs for generators.
- **The direct injection tariff** is calculated based on the amount of energy injected on the grid.
- **Indirect tariffs** consist only of **annual fixed tariffs** that differ between technologies (on a MWh-basis, due to load factor differences) but it **the impact is negligible** both on a relative (representing less than 10%) and an absolute basis (varying between 1 and 2 cents per MWh).
- **Installed capacity of technologies** for which the injection costs are calculated **show minor differences** (CCGT, Wind and Solar PV), which is **in line** with equal injection costs.

France – country fiche (2/2)

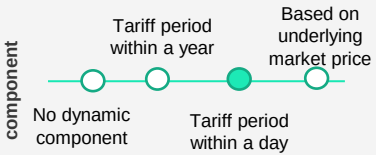
Different tariff periods (for offtake)



Source: TURPE6

- **5 time ranges** based on **season** and **Peak- or Off-Peak hours**, for which an offtake Power Subscription (PS) needs to be taken.[1]
- The tariff differentiation is only valid for offtake on **voltage** levels **lower than 380-400 kV.**
- Total offtake charge depends on **fixed component-subscription**, **actual electricity offtakes** and **subscription overruns**, which are penalties when the users consume mor power than what they have subscribed for

Maturity of Dynamic component



- Dynamic component **through multiple tariff periods, different time ranges.**
- Periods **vary between months, between type of day and between hours** within a day but the tariffs are determined upfront.

Percentage distribution

- There is no dynamic tariff applied in Belgium.

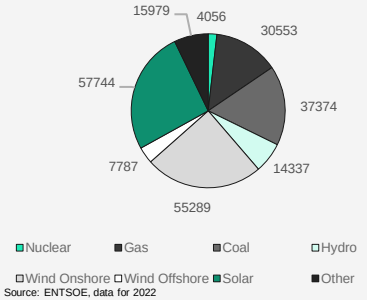
Injection costs in France are almost entirely made up of a direct injection tariff

1. Injection costs consist **for more than 90%** of **direct injection tariffs** that are energy based and equal for all technologies. No other costs are supported by generators.
2. **Annual fixed tariffs** induce **negligible differences** in total access costs **between technologies.**
3. **The installed capacity** of each technology does not seem to be influenced by the injection costs. However other factors influence the investment decision.
4. **For offtake multiple tariff periods** are applicable. The periods are **linked to the season and peak- or off-peak hours** and incentivize consumers to reduce the consumption during hours with the highest tariffs.

1. Appendix B contains details on when the time periods apply

Germany – country fiche

Installed Capacity (MW)



Source: ENTSOE, data for 2022

Installed Capacity take-aways

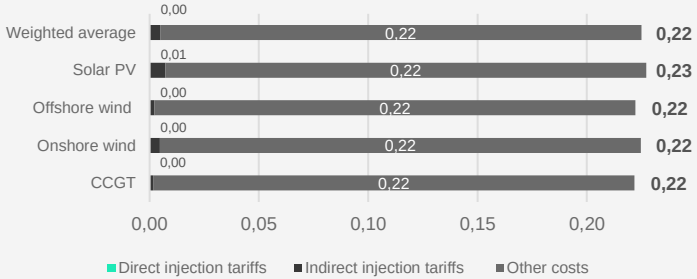
- RES (hydro, onshore- & offshore wind and solar PV) make up 56% of the total installed capacity.
- Fossil fueled capacity represents a share of 31%.
- Installed nuclear capacity represents only 2%. The Nuclear phase out was foreseen to be finished end 2022, but due to recent changes on energy markets (Ukraine war,…) the lifetime of some nuclear reactors has been extended
- *Other* category consists primarily of biomass and oil.

Tariff structure

Category	Tariff name	Explanation
Offtake	Annual charge for Network use (applicable for all TSO's)	• Based on peak power offtake and energy offtake • Use time dependent: • **>2500h**: **power component** ranging between 70370 Eur/MW and 78360 Eur/MW ; **energy component** ranging between 4,3 EUR/MWh and 5,3 EUR/MWh • **<2500h**: **power component** ranging between 11100 EUR/MW and 12230 EUR/MW; **energy component** ranging between 27,6 EUR/MWh and 31,4 EUR/MWh
	Monthly charge for network use (applicable for Amprion, Tennet and Transnet)	• For consumers with temporary high power consumption • **Power component** ranging between 11260 EUR/MW and 13060 EUR/MW • **Energy component** ranging between 4,3 EUR/MWh and 5 EUR/MWh
	Reactive power consumption charges (only applicable at Tennet and 50 Hertz)	• Depends on the capacitive load • Varies between 6 EUR/MVArh and 29 EUR/MVArh
	Metering point charges	• Varies between 1892 EUR/year and 5470,48 EUR/year
	Reserve capacity charges (only for Transnet and 50 Hertz	• **<200h**: 27310 EUR/MW (50Hertz) – 27740 (Transnet) EUR/MW • **<400h**: 32770 EUR/MW (50 Hertz) - 33290 EUR/MW (Transnet); • **<600h:**38230 EUR/MW (50Hertz) - 38840 EUR/MW (Transnet)
Injection	Metering point charges	• Depending on the TSO this varies between 1892 EUR/year and 5470,48 EUR/year. • An average value of 3259 EUR/year has been considered for the study
Other	Voltage control	• 0,22 EUR/MWh (*) • Obligated costs incurred by generators

(*) Estimated value

Injection costs (EUR/MWh)

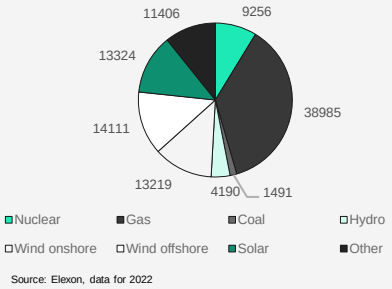


Explanation & analysis

- Germany **only imposes an annual fixed tariff** for the metering on generators, when transformed to a costs per MWh injected, the **tariff is negligible.**
- The **Other cost category,** consists of a **voltage control obligation, which** is a mandatory service for both conventional and renewable power plants. These costs makes almost 100% of the injection costs that German generators incur.
- Dynamic tariffs have not been analyzed for Germany.

Great-Britain – country fiche (1/2)

Installed Capacity (MW)



Source: Elexon, data for 2022

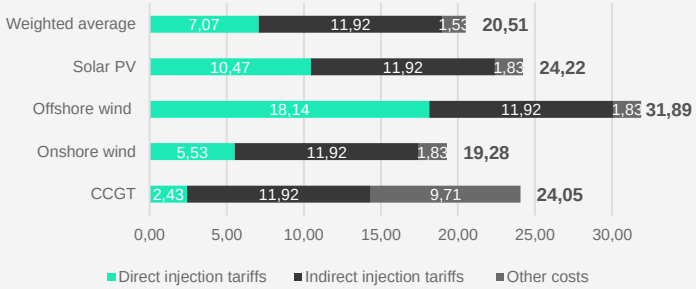
Installed capacity take-aways

- Gas-powered electricity plants represent a third of the total installed capacity.
- All renewables combined represent over 40% of the total installed capacity (mostly consisting of Wind and Solar PV).
- Currently, nuclear represents only 9 % of the total installed capacity.

Tariff structure

Categories	Tariff name	Explanation
Offtake	Transmission network Use of System (TNUoS)	• Fixed tariff • Capacity based, influenced by geographic location • Consists of 3 components: Half-hourly tariff, Embedded Export Tariff & Non-half-hourly tariff
	Balancing Services Use of System (BSUoS)	• Variable tariff based on the actual cost of system operation • Mark-up to cover grid losses (split between offtake and injection)
Injection	Transmission network Use of System (TNUoS)	• Fixed tariff • Capacity based, influenced by geographic location, fuel type & voltage levels • Consists of multiple components: Generation Wider tariffs, local circuits tariff, local substation tariff (onshore & offshore) • The generation wider tariffs are calculated based on the actual load factors of each power plant, in case the actual load factors are not available, generic load factors are used (40% for conventional carbon – CCGT, 75% for conventional low carbon, 45% for intermittent – RES)
	Balancing Services Use of System (BSUoS)	• 11,92 EUR/MWh (to calculate the total injection costs, the average over a year period is used) • Tariff is based on the actual cost of system operation
Other	Carbon price support	• 3,86 EUR /MWh (gas) • Considering a 50 percent thermal efficiency, average of CCGT's in UK*, this represents 6,44 EUR/MWh (electric)
	Loss compensation	• Compensation in kind mechanism where 45% of the losses are allocated to generators • Loss compensation = Loss percentage * Average DA-price, where loss percentage is 1,7% and the average DA-prices is 239,5 EUR/MWh

Injection costs (EUR/MWh)



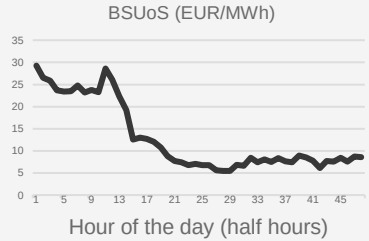
Explanation & analysis

- **Direct injection tariffs** consist of generation wider tariffs, local charges (both based on capacity).
- **Generation wider tariffs** are calculated based on the actual annual load factor of a generator. For comparability, the load factors from our methodology have been used for the calculation.
- Local tariffs **differ between generating technologies** and are especially **high for offshore wind.**
- **Indirect injection tariffs** consists of **BSUoS charges**
- **BSUoS charges** quadrupled since 2017, due to increased electricity costs and higher costs to balance the grid.
- **Other costs** consists of **carbon price support** (only for CCGT) and **loss compensation.**

* source: Statista.com

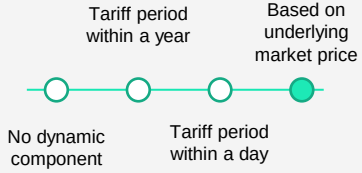
Great-Britain – country fiche (2/2)

Dynamic component (for offtake)



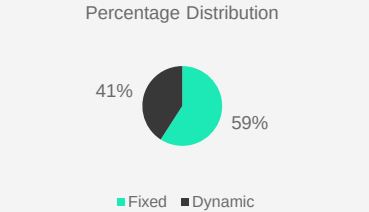
- **BSUoS** charges are **based on the actual costs** for balancing the system and determined on a half-hourly basis.
- BSUoS are charged both **for injection and offtake.**
- Graph represents the interim initial settlement, which is the first estimation of the charges which will be corrected with the actual costs, on 21/12/2022 on a half-hourly basis.

Maturity of Dynamic component



- A dynamic tariff component can be found in the form of time variable BSUoS charges.
- The tariff is determined on a half hourly basis.
- Calculated by dividing the actual cost of managing the system by the produced quantity.

Percentage distribution



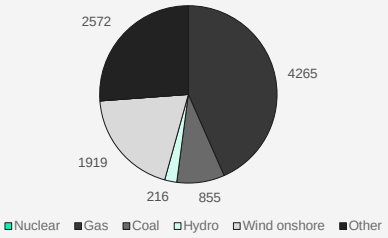
- The annual grid bill has been calculated by considering **a flat load profile with a constant offtake of 10 MW**.
- The dynamic share represents the tariffs for the balancing services BSUoS, the fixed share is made of fixed capacity-based tariffs: Half-hourly tariff, embedded export tariff and the non half-hourly tariff.

Generators in Great-Britain incur the highest injection costs of the benchmarked countries

1. In Great-Britain generators are subject to **high total injection costs** for all technologies, both capacity and energy based.
2. There exists a **difference between technologies.** This is **due to specific charges for offshore wind** and **capacity-based charges** that are inversely proportional to the load factor resulting in a difference in injection tariffs of 12,5 €/MWh between the cheapest technology (onshore wind) and the most expensive technology (offshore wind).
3. **The high tariffs applied to RES** are partly **compensated by the carbon price support tax due for CCGT.**
4. The dynamic component, through **time variable BSUoS charges,** represents **41% of the grid bill** for the analyzed offtake profile.

Ireland – country fiche (1/2)

Installed Capacity



Source: ENTSOE, data for 2022

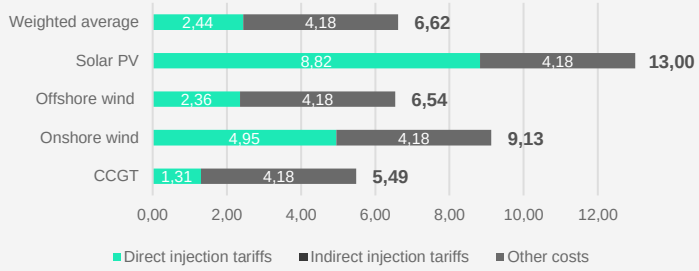
Electricity mix take-aways

- Installed capacity is dominated by fossil-fueled electricity plants (gas and coal), representing over 50%.
- Renewables (wind and hydro) make up about 25% of the installed capacity.
- *Other* category consists primarily of oil and fossil peat further increasing the share of fossil-fuel in the installed capacity.

Tariff structure

Categories	Tariff name	Explanation
Offtake	Demand network capacity charge	• 1320,74 EUR/MW • Charged for each MW of Charging Capacity in the charging period
	Demand Network Unauthorized Usage Charge	• 755,50 EUR/MWh • Charged for metered Consumption energy in excess of Maximum Import Capacity
	Demand Network Transfer Charge	• 2,43 EUR/MWh • For Metered Consumption Energy transferred
	Demand System Services Charge	• 9,54 EUR/MWh • For Metered Consumption Energy transferred in
Injection	Generation Network Location-Based Capacity Charge	• Charge is location and technology specific • Average taken over all generators of a certain technology: • **Conventional 6310 EUR/MWh** • **Wind 8673 EUR/MWh** • **Overall average 7728,5 EUR/MWh**
	Generation System Services Trip Charge:	
	Generation System Services Short Notice Declaration Charge	• Not considered as these charges are specific to the load profile • Relate to reduction of losses, unscheduled variations in availability and efficient operation • Calculated based on power and/or energy
	Generation System Services Generator Performance Incentive Charge	
Other	Loss Compensation	• Loss compensation (EUR/MWh) = loss percentage * average DA-price • Average TLAF for generators equals 0,9721, thus average losses equals 2,08% • Average Day-Ahead price for 2022 equals 200,96 EUR/MWh

Injection costs (EUR/MWh)



Explanation & analysis

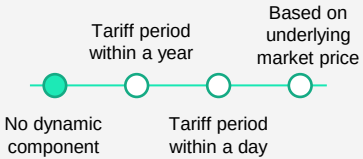
- **Direct injection tariff** consists of location-based capacity charges.
- For capacity charges, as they are location and technology specific, a distinction was made between **conventional** (for CCGT)**, wind** (for onshore and offshore) and **overall average** (for Solar PV).
- **Other costs** consist of **loss compensation** that is **equal** for all generating technologies and represents an **important share** of the total injection costs.
- **The capacity-based tariffs and the load factor differences between generation technologies induces differences** in the injection costs.
- **CCGT**, the technology for which the **injection costs** are **the lowest**, also represents the **highest share in the installed capacity.**

Ireland – country fiche (2/2)

Dynamic component

- No dynamic component.
- Not for injection, neither for offtake.

Maturity of Dynamic component



- No dynamic component.
- No indication for a change towards a dynamic tariff in future tariff periods.

Percentage distribution

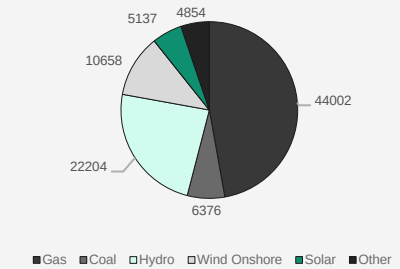
- There is no dynamic tariff applied in Ireland.

50% of injection costs are based on the installed capacity, resulting in differences between generating technologies

1. **Capacity charges** for generators are **location specific** to better match tariffs with costs.
2. Capacity-based **charges favor** generation technologies with **higher load**.
3. **Loss compensation costs** make up 50% of the total injection costs for each generation technology. These costs are influenced by the high day-ahead prices observed in the second semester of 2022 across Europe.
4. In Ireland there are **no dynamic tariffs** in the current tariff methodology. Also, there is **no indication to change** it in future tariff periods.

Italy – country fiche

Installed Capacity (MW)



Source: ENTSOE, data for 2022

Installed Capacity take-aways

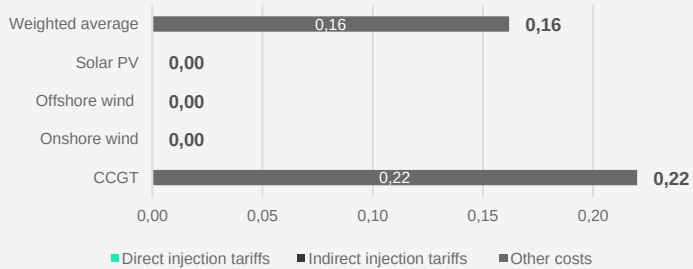
- Installed capacity consists for almost half of gas-powered electricity plants
- RES (onshore wind, hydro and solar PV) represent a share of 31%.
- *Other* category primarily of biomass and geothermal power stations.

Tariff structure

Categories	Tariff name	Explanation
Offtake	Power charge	• 22 333 EUR/MW • Charged for the power used
	Energy charge	• 0,71 EUR/MWh
Injection	/	• No injection tariffs are applied in Italy
Other	Voltage control obligation	• 0,22 EUR/MWh (*) • Obligated costs incurred by generators (only for conventional technologies)

(*) Estimated value

Injection costs (EUR/MWh)

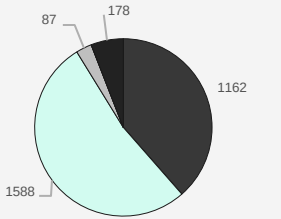


Explanation & analysis

- Italy does **not impose any tariff on generators**, all costs for the operation of the transmission system are born by the final customers.
- The **voltage control obligation for conventional power plants** is the only cost related to the transmission grid operation that generators in Italy incur.
- Dynamic tariffs have not been analyzed for Italy.

Latvia – country fiche

Installed Capacity (MW)



Source: ENTSOE, data for 2022

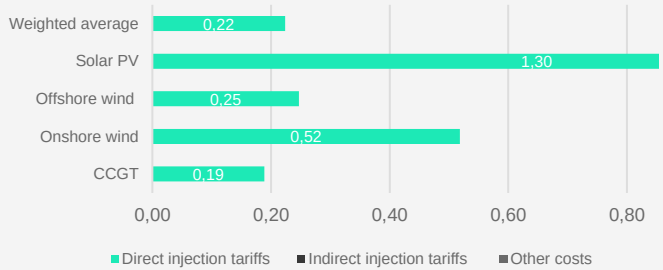
Installed Capacity take-aways

- Installed capacity is dominated by two technologies: hydro power and CCGT.
- Hydro represents a share of 53%.
- Gas-powered electricity plants represent a share of 39%.
- Onshore wind and Solar PV are negligible, representing respectively 3% and 0,5%.
- *Other* category consists of biomass power stations and Solar.

Tariff structure

Categories	Tariff name	Explanation
Offtake	Electricity Transmission tariff	• 1,74 EUR/MWh • Paid by customers with electrical installations connected to 110 kV lines
	Tariff for transmission power maintenance	• 9046 EUR/MW • Paid by customers with electrical installations connected to 110 kV lines
	Reactive energy charge	• 4 EUR/MVArh • For offtake of reactive energy from the grid, charged if tan phi is bigger than 0,4 • 13 EUR/MVArh for feeding reactive energy into the grid
Injection	Tariff for electricity producers	• Capacity based • 908,46 EUR/MW
	Reactive energy charge	• 4 EUR/MVArh • For offtake of reactive energy from the grid, charged if tan phi is bigger than 0,4 • 13 EUR/MVArh for feeding reactive energy into the grid
Other	/	• Generators are not subject to other costs

Injection costs (EUR/MWh)

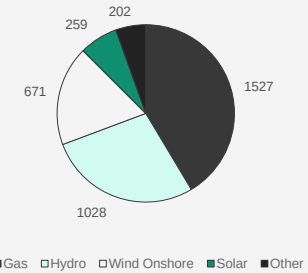


Explanation & analysis

- Latvia applies **direct injection tariffs** on generators in the form of a capacity-based tariff.
- The **impact of the capacity-tariff differs** between generating technologies **due to the load factor difference**, causing the injection costs for Solar PV (lowest load factor) being the highest and injection costs for CCGT's (highest load factor) being the lowest.
- The **weighted average of the injection costs is marginally influenced** by high injection costs for onshore wind and Solar PV due to the limited installed capacity.
- Dynamic tariffs have not been analyzed for Latvia.

Lithuania – country fiche

Installed Capacity (MW)



Source: ENTSOE, data for 2022

Installed Capacity take-aways

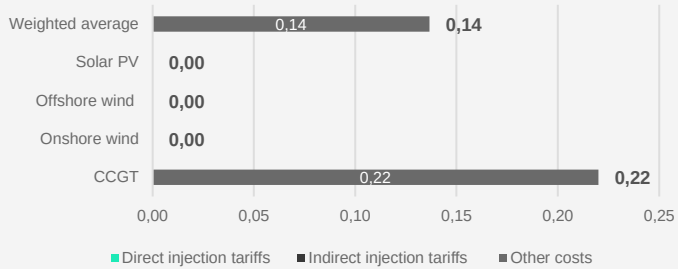
- No coal or nuclear power plants.
- Gas power plants make up 40% of the installed capacity.
- Hydro, including hydro pump storage power plants, represent a share of 28%
- RES (primarily onshore wind & solar PV) make up 25% of the total installed capacity.
- The Other category consists primarily of waste and biomass

Tariff structure

Categories	Tariff name	Explanation
Offtake	Transmission service price ceiling	• 6,83 EUR/MWh
	System service fee	• 17,23 EUR/MWh • Services including balancing, maintenance, regulation of voltage and reactive power, control of frequency and inter-system exchanges.
Injection	/	• There are no injection tariffs in Lithuania.
Other	Voltage control obligation	• 0,22 EUR/MWh (*) • Obligated costs incurred by generators (only for conventional technologies)

(*) Estimated value

Injection costs (EUR/MWh)

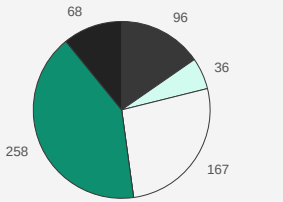


Explanation & analysis

- There are **no injection tariffs** in Lithuania.
- Two facilities (hydroelectric power plants) are responsible for providing black-start service. This service is remunerated based on a regulated price set by VERT (regulatory authority).
- The **graph displays the voltage control obligation** that is incurred by **conventional technologies** only.
- Dynamic tariffs have not been analyzed for Lithuania.

Luxembourg – country fiche

Installed Capacity (MW)

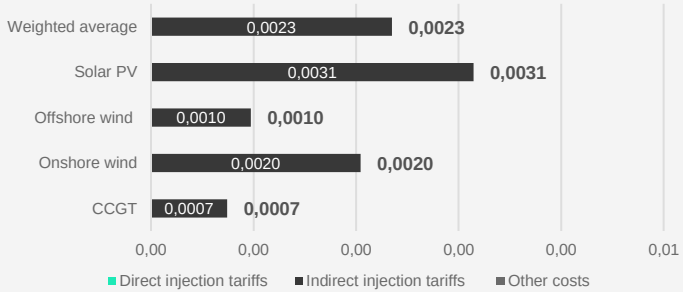


Source: ENTSOE, data for 2022

Tariff structure

Categories	Tariff name	Explanation
Offtake	Tariff for the use of 220 kV	• 10,10 EUR/MWh if < 3.000 h • 2,80 EUR/MWh if > 3.000 h • Grid usage tariff varies according to voltage level and duration of utilization • Costs cover the use of the network and ancillary services.
Injection	Monthly metering tariff	• 119,38 EUR/month
Other	/	

Injection costs (EUR/MWh)



Installed Capacity take-aways

- Luxembourg is highly dependent on electricity import. Luxembourg is also part of the same bidding zone as Germany.
- Over 70% of the installed capacity is of RES (onshore wind, solar PV, and hydro).
- Gas is the only fossil fuel energy conversion technology.

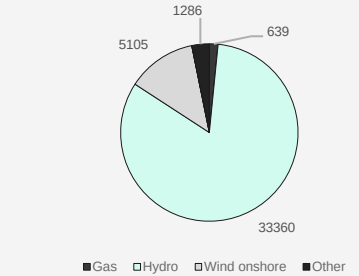
Explanation & analysis

- In Luxembourg there is a **monthly metering tariff** for the VHV (Very High Voltage) grid with **negligible impact** when normalized on the yearly production of the theoretical units.
- Luxembourg has a low generation capacity compared to its consumption and is required to **import electricity**. In 2021, more than 80% of electricity demand was supplied by net imports*.
- **No black-start or voltage control obligation** are applied in Luxembourg.
- Luxembourg high voltage grid operates at 220 kV
- Dynamic tariffs have not been analyzed for Luxembourg.

*Source: Statista

Norway – country fiche (1/2)

Installed capacity (MW)



Source: ENTSOE, data for 2022

Installed Capacity take-aways

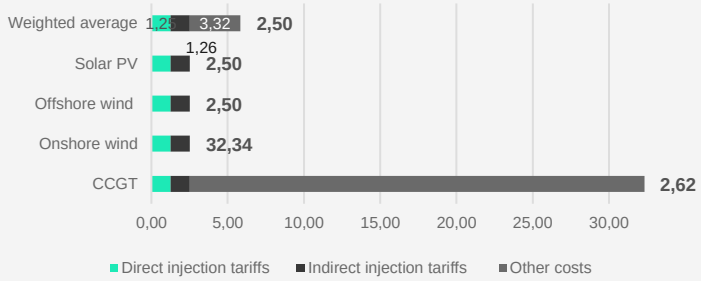
- Hydro power is the main electricity source of Norway and represents about 75% of the installed capacity.
- With 95% all renewables combined make up almost the entire installed capacity.

Tariff structure

Categories	Tariff name	Explanation
Offtake	Energy component	• Formula: Energy Component (EUR/MWh) = Area electricity price (day-ahead) * margin loss rate • Reflects the load that grid users put on the network and is directly related to the loss rates • Loss rates differ between daytime, nighttime & weekends, for calculation purposes the average estimated 2022 loss rate was used: 1% • Average electricity price: 109 EUR/MWh
	Fixed Component	• Power based • Charged for the consumption during peak load hours, the average of last 5 year is used
	Reactive power	• 3,9 EUR/kVAr • Tariff is charged when the reactive energy offtake is larger than 10MVAr
Injection	Energy component	• Idem as for offtake
	Fixed component: Feed-in tariff	• 1,25 EUR/MWh • Energy based • Direct feed-in tariff
	Fixed component: system operating costs	• 0,15 EUR/MWh • Energy based
Other	CO_2-tariffs	• 68,7 EUR/tCO_2 applied on top of the EU-ETS.
	Voltage control	• 0,22 EUR/MWh (*) • Energy based • Obligated costs incurred by generators (only for conventional technologies)
	Blackstart obligation	• 0,12 EUR/MWh (*) • Obligatory service for all generators that have a significant impact on the reconstruction of the network (mainly gas power plants and hydro)

(*) Estimated values

Injection costs (EUR/MWh)

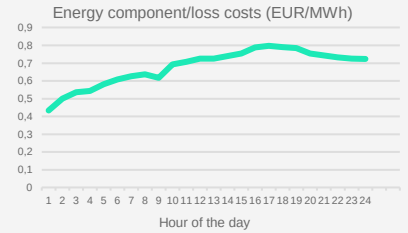


Explanation & analysis

- **Direct injection tariffs** represent around 50% of injection costs (when excluding CO_2-tariffs) and are equal for all generating technologies.
- **Indirect injection costs** include costs for **system operation and loss coverage** that are equal for all technologies.
- **Other costs,** including CO_2-tariffs, Blackstart obligation and voltage control obligation differ between CCGT-technology and RES-technology as **RES are exempted** from the **Voltage control** and the **Blackstart obligation**
- **CO_2-tariffs** in “Other costs” **is the key difference driver** between RES and CCGT generators.
- **CCGT’s** have the **highest injection costs** and that this is also the **lowest installed capacity in Norway.**

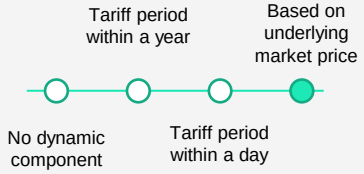
Norway – country fiche (2/2)

Dynamic component



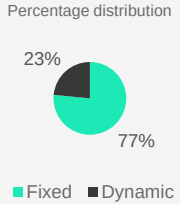
- A dynamic component is present in **the Energy component,** which covers the grid losses, and is directly related to electricity price.
- **Loss coverage (per MWh) = Pt, e * F** where Pt, e= hourly day-ahead price per area, & F=loss factor per connection point.
- Average of the estimated losses (1%) and average over all price zones (109,88 EUR/MWh) was used for the calculation.

Maturity of Dynamic component



- **Hourly dynamic component** that is directly **related to the electricity price.**
- The dynamic component is **implemented and being used** in the tariff methodology.

Percentage distribution



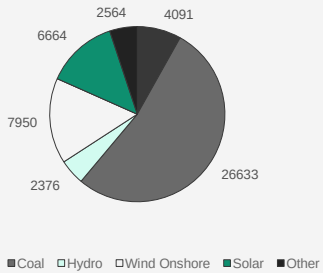
- The annual grid bill has been calculated by considering **a flat load profile with a constant offtake of 10 MW**.
- **Abstraction made of other costs**, such as tariffs for reactive power consumption
- The dynamic share is constructed of the energy component whereas the fixed component is based on the installed capacity

Injection costs are equal between generating technologies when the CO_2-tariffs are neglected

1. **Direct- and indirect injection tariffs** are equal between all generating technologies
2. **CO_2-tariffs drive up total** injection costs for CCGT's.
3. The technology with the **highest injection costs, CCGT,** also has a **low installed capacity** in Norway.
4. **Dynamic component covering the grid losses** and being directly related to the electricity price**, represents 23% of the grid bill** for the analyzed offtake profile.

Poland – country fiche

Installed Capacity (MW)



Source: ENTSOE, data for 2022

Installed Capacity take-aways

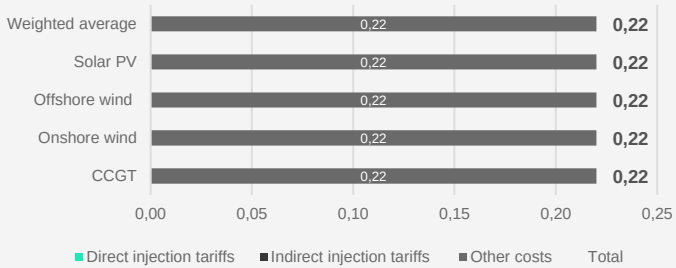
- In Poland there are no existing offshore wind parks nor any nuclear installed capacity.
- Poland is highly dependent on coal power plants (over 50% of installed capacity).
- Renewables (primarily onshore wind & solar PV) make up a total share of 29% in total installed capacity.
- Electricity generation is mainly based on thermal power plants.

Tariff structure

Categories	Tariff name	Explanation
Offtake	Network rate fees	• Fixed component: Group 1: 3,38 EUR/MWh Group 2: 1,75 EUR/MWh • Variable component: 1,30 EUR/MWh • Charges for the service of electricity transmission • Rate depends on consumer group
	Quality fee	• 2,00 EUR/MWh • Cover services of maintaining system quality standards and reliability of current electricity supplies • The fee is multiplied by a coefficient (k) depending on the customer category (special, k=0,10, other, k= 1,01)
Injection	/	• There are no injection tariffs in Poland
Other	Voltage control obligation	• 0,22 EUR/MWh (*) • Obligated costs incurred by generators (for conventional technologies and RES)

(*) Estimated value

Injection costs (EUR/MWh)

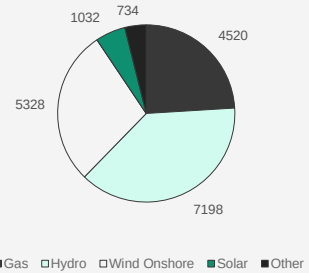


Explanation & analysis

- **No injection tariffs** are applicable to generators.
- **All generators have voltage control obligations** resulting in costs for all generating technologies.
- Dynamic tariffs have not been analyzed for Poland.

Portugal – country fiche

Installed Capacity (MW)



Source: ENTSOE, data for 2022

Installed Capacity take-aways

- Portugal has a diverse energy mix with three main sources: hydro (and pumped hydro), onshore wind, and gas-powered electricity plants.
- RES (primarily onshore wind & solar PV) make up more than 33% in total installed capacity.

Tariff structure

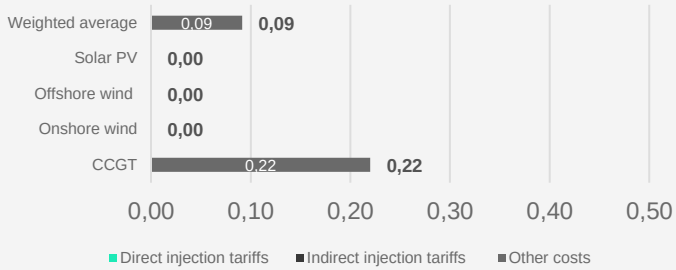
Categories	Tariff name	Explanation

Offtake	Network access fee	• **Power tariff** that is charged on the maximum power offtake per day
		  • Peak hours: 55,1 EUR/MW
		  • Other hours: 2,6 EUR/MW
		• **Active energy tariffs** are split in 4 tariff periods that depending on the hour of the day, the day of the week and the season.
		  • Peak hours: -14,65 EUR/MWh
		  • Full hours: -9,3 EUR/MWh
		  • Normal off-peak hours: -9,35 EUR/MWh
		  • Super off-peak hours:-9,35 EUR/MWh
		• The 2022 tariffs were adapted in July 2022. Hence, the average was taken pro rata the number of months it was applicable. The negative tariffs are caused by government measures to actively lower the electricity prices for consumers following the significant increase that was seen in 2022.
		• **Reactive energy**
		  • Inductive: 1,40 EUR/MVarh
		  • Capacitive: 1 EUR/MVarh
		• Includes global system use fee, tariff for use of the transmission network, tariff for the use of the distribution network, and logistics operation tariff for change of supplier

Injection	/	• Injection tariff for use of the transmission network was removed from January 1st, 2022
Other	Voltage control obligation	• 0,22 EUR/MWh (*) • Obligated costs incurred by generators (only for conventional power plants)

(*) Estimated value

Injection costs (EUR/MWh)

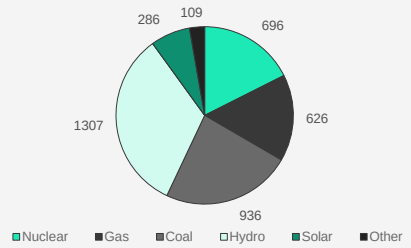


Explanation & analysis

- Directive published in 2021 that described the **removal of injection tariffs** for generators. The removal of injection tariffs is a direct consequence of Spain's removal due to the risk of cross-border competition distortions.
- The network access fee also includes the distribution fee.
- **Voltage control obligation** is only applicable on conventional technologies and thus only CCGT's are subject to these costs in our analysis.
- Portugal has negative tariffs of the access to the network due to governments policies aiming to decrease the effect of the energy crisis.
- Dynamic tariffs have not been analyzed for Portugal.

Slovenia – country fiche

Installed capacity (MW)



Source: ENTSOE, data for 2022

Installed Capacity take-aways

- Installed capacity is dominated by hydro-technology representing 33%.
- Conventional technologies (Coal, gas and nuclear power) represent 58% of the total installed capacity
- Solar represents a minor share of 7%
- Other category consists of oil, biomass, waste and onshore wind

Tariff structure

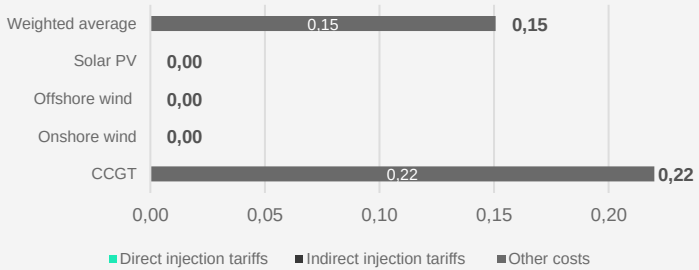
Categories	Tariff name	Explanation

Offtake	Network fee for transmission system	• **Power billing component** based on the number of grid usage hours:
		  • Less than 2500h (12876,36 EUR/MW)
		  • Between 2500h and 6000h (11944,92 EUR/MW)
		  • More than 6000h (11169,24 EUR/MW)
		• **Energy offtake component** that differs over the grid usage hours and between peak- and off-peak time
		  • **Peak time tariffs**, applicable between 6 AM and 10 AM on weekdays:
		  • Less than 2500h (1,49 EUR/MWh)
		  • Between 2500h and 6000h (1,41 EUR/MWh)
		  • More than 6000h (1,54 EUR/MWh)
		  • **Off-peak time tariffs**, applicable during all other times:
		  • Less than 2500h (1,15 EUR/MWh)
		  • Between 2500h and 6000h (1,08 EUR/MWh)
		  • More than 6000h (1,2 EUR/MWh)

	Excessive reactive energy charge	• Where excessive is defined as the reactive energy offtake that exceeds the following factors: tg φind=+0.32868 or tg φkap= - 0.32868 • 3,52 EUR/MVArh
Injection	/	• No tariffs charged to generators
Other	Voltage control obligation	• 0,22 EUR/MWh (*) • Obligated costs incurred by generators (only for conventional technologies)

(*) Estimated value

Injection costs (EUR/MWh)

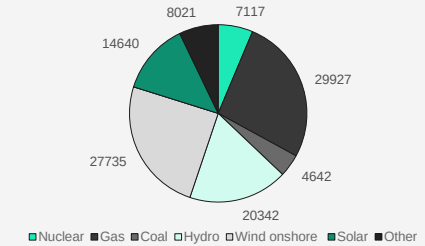


Explanation & analysis

- **Generators are not subject to any tariffs** related to the transmission grid, resulting in zero tariffs for all generating technologies.
- The **voltage control obligation for conventional power plants** is the only cost related to the transmission grid operation that generators in Slovenia incur.
- Dynamic tariffs have not been analyzed for Slovenia.

Spain – country fiche (1/2)

Installed Capacity (MW)



Source: ENTSOE, data for 2022

Installed capacity take-aways

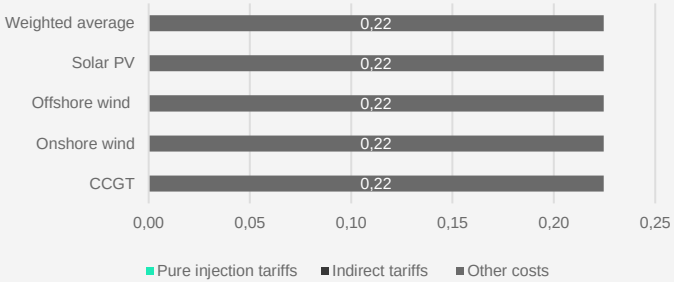
- With over 25% of the installed capacity, gas-powered electricity plants represent an important share of the installed capacity.
- All renewables combined (wind, hydro and solar PV) represent over 50% of the installed capacity.
- Nuclear represents only 6% of the installed capacity.

Tariff structure

Categories	Tariff name	Explanation
Offtake	Power billing	• Capacity based • Billed for contracted power in each hourly period • The tariffs differ according to the 6 tariff periods • Between 10.314 EUR/MWh and 528,7 EUR/MWh
	Energy consumed	• Active energy based • Billed for the energy consumed in each hourly period • The tariffs differ according to the 6 tariff periods • Between 7,05 EUR/MWh and 0,16 EUR/MWh
	Demanded power billing	• Capacity based • Billed for excess power offtake • Depends on metering device • Between 73,8 EUR/MW and 2244 EUR/MW
	Reactive power billing	• Billed for all hourly periods, except period 6 • Billed if reactive energy exceeds 33 % of active energy during a billing period • Varies between 41,5 EUR/MVArh and 62,3 EUR/MVArh depending on the period
Injection	Not applicable	• Injection tariffs have been removed in 2020 by Circular 3/2020 : "Electricity generators are exempted from tariffs and tolls for transmission"
Other	Voltage control	• 0,22 EUR/MWh (*) • Obligated costs incurred by generators

(*) Estimated values

Injection costs (EUR/MWh)

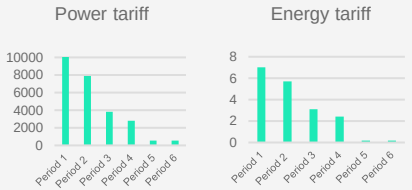


Explanation & analysis

- **No tariff** for the injection of energy on the grid as injection tariff **were removed in 2020.**
- Generators only incur *Other costs* consisting of **voltage control costs.**
- The transmission grid costs are **entirely billed to consumers** (offtake).

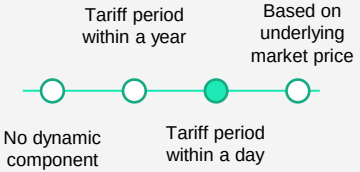
Spain – country fiche (2/2)

Tariff periods for offtake



- Multiple tariff periods are applicable **only for offtake.**
- The tariff periods are applicable for **both power- and energy tariffs.**
- Significant difference in the height of the tariff between different time periods.[1]

Maturity of Dynamic component



- **6** different **price periods.**
- Depending on the **season** (high-, medium high-, middle- and low-season), **the day of the week** and **the hour of the day.**[1]
- Small variations in price period timing between geographical locations (peninsula, Balearic islands, Canary islands,…).

Percentage Distribution

- There is no dynamic tariff applied in Spain.

The Spanish TSO does not impose any form of injection tariff on generators

1. **Generators do not pay injection tariffs** to the TSO. The injection tariffs for generators were removed in 2020. All transmission grid costs are paid by consumers.

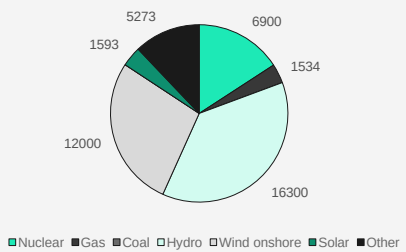
2. The **voltage control obligation forms a cost** that Spanish generators incur when they are connected to the transmission grid.

3. The transmission tariff for offtake **contains a 6 time periods with different tariff heights** that are applicable on the power- and energy offtake. The tariff periods **depend on the season and the hour of the day.**

1. Appendix C contains the details on when the price periods apply

Sweden – country fiche (1/2)

Installed Capacity (MW)



Source: ENTSOE, data for 2022

Installed Capacity take-aways

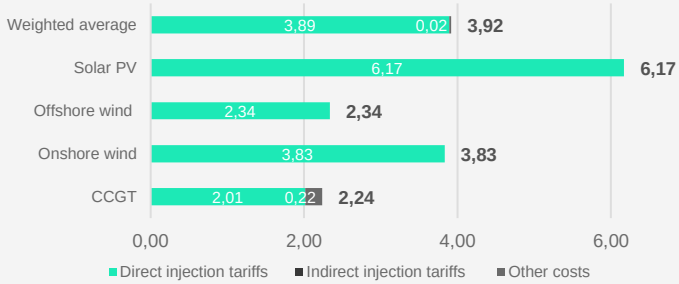
- Renewables make up more than 60 percent of the installed capacity.
- Nuclear power plants make up roughly 15% of installed capacity
- *Other* category consists primarily of combined heat-power (CHP) plants for local and industrial use.
- Less than 10% of the installed capacity is fossil fueled (excluding CHP).

Tariff structure

Categories	Tariff name	Explanation
Offtake & Injection (Universal charges)	Energy Charge	• Formula: Energy Charge = Loss Coefficient * (Day-ahead price + risk premium) • With: 1. Price for purchasing the energy losses: actual hourly prices for electricity in each area on the day-ahead market, average taken for calculation, average DA-price: 92,31 EUR/MWh 2. The risk premium amounts 0,92 EUR/MWh 3. Loss coefficient: determined by network calculations, different values for offtake and injection, average loss coefficient: 1,05%
	Capacity Charge	• Consists of 3 components 1. Regular capacity plan: subscribed annual capacity, price based on geographical location, average for injection: 5094 EUR/MW, average for offtake: 10156 EUR/MW 2. Temporary capacity plan: additional subscribed capacity to regular plan, for 7 day period, charge based on capacity ($1/200^{th}$ of the annual capacity charge per subscription week and per kW) and energy (1/500 of the annual capacity charge per kWh used) 3. Excess charge: tariff for capacity overruns, First hour of overrun 52 EUR/MW for the capacity that is exceeded, For second hour 128 EUR/MW • Exception if overrun is due to faults or operation diversions
Other	CO_2-tariffs	• Exemption for firms subject to EU – ETS
	Voltage control	• 0,22 EUR/MWh (*) • Obligated costs incurred by generators (only for conventional technologies)

(*) Estimated value

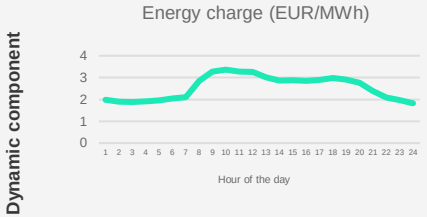
Injection costs (EUR/MWh)



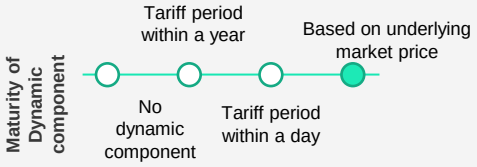
Explanation & analysis

- **Direct injection tariffs** consists of **Energy charge**, which compensates for losses and is based on the based on the energy injected and **capacity charges.**
- **Abstraction** is made **of temporary and excess charges** in capacity component fueled are load profile specific.
- **The 275% difference in total costs between technologies** is due to **capacity charge** and **load factor difference.**
- **Abstraction** is made of the **dynamic price effect** in the **Energy Charge** as the average Day-Ahead price is used for the calculations.
- **Energy Charge is equal** for all technologies.
- **Other costs** consist of **voltage control obligation** which is only applicable for CCGT, lower the price difference between CCGT and other technologies.

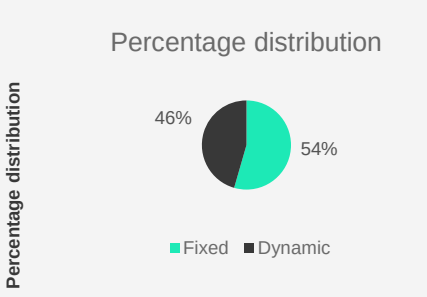
Sweden – country fiche (2/2)



- Dynamic component **through the Energy charge which covers grid losses**, directly related to Day-Ahead electricity price.
- **Equal dynamic component** for injection and offtake.
- **Loss coverage = ($P_{t,e}$ + r) * F** where $P_{t,e}$= hourly day-ahead price per area, r = risk premium & F=loss factor per connection point.



- Dynamic component directly related to the day-ahead price.



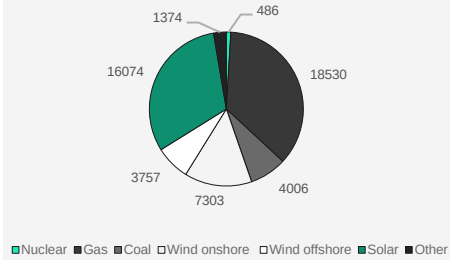
- The annual grid bill has been calculated by considering **a flat load profile with a constant offtake of 10 MW**.
- **Abstraction made of other costs**, such as temporary capacity plans and excess charges.
- The **dynamic share** consists of the **Energy charge** that covers grid losses, the **fixed share** is made up of the **Capacity charge.** As the dynamic component is linked to the DA-price it is influenced by the high prices seen in 2022.

Injection costs differ 275% between the cheapest and most expensive generating technology

1. In Sweden, **the tariff structure of the transmission grid is universal** and the same tariff components are charged for injection and offtake
2. **Capacity Charge** makes up **more than 50 %** of the total injection costs creating significant differences between generating technologies (higher costs for RES and lower for CCGT).
3. The cost incurred by **the voltage control obligation for CCGT** slightly **reduces the gap with renewable generating technologies.**.
4. The **Dynamic component** in transmission tariffs for both injection and offtake **through loss coverage tariff** is calculated based on the DA-price, **representing 46% of the grid** bill for the analyzed offtake profile.

The Netherlands – country fiche (1/2)

Installed Capacity (MW)



Source: ENTSOE, data for 2022

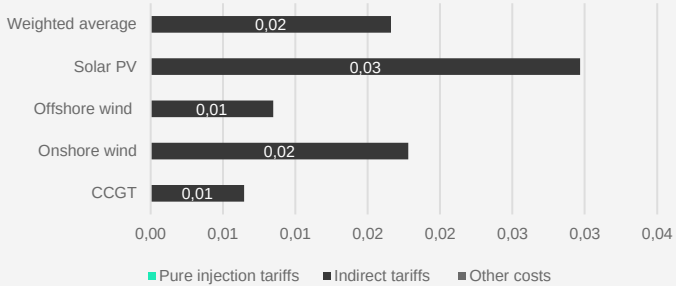
Installed capacity take-aways

- Gas-powered electricity plants represents more than a third of the total installed capacity.
- RES in the (Wind & Solar PV) make up a large share of the total installed capacity (50%).
- Nuclear makes up only a minor share of the installed capacity in the Netherlands.
- Other category consists of waste, biomass and hydro power.

Tariff structure

Categories	Tariff name	Explanation
Offtake & Injection (Mutual tariff)	Transmission services tariff	• 12.478,96 EUR/year • For each party connected to the HV-grid
Offtake	Transmission-related consumer tariff: kW contracted	• 15,21 EUR/kW
	Transmission-related consumer tariff: kW max per month	• 1,65 EUR/kW • Paid on the peak offtake in a month period
	Transmission-related consumer tariff: kW contracted (max 600h)	• 7,61 EUR/kW • Specific tariff for consumers that only use the grid during a maximum period of 600 hours
	Transmission-related consumer tariff: kW contracted (max 600h)	• 0,57 EUR/kW • Paid on the peak offtake for consumers that apply the 600 hour scheme, the peak is determined on a weekly basis

Injection costs (EUR/MWh)



Explanation & analysis

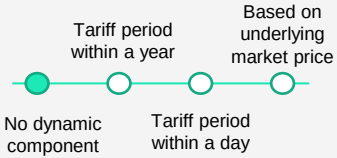
- Injection tariff consists of **one annual fixed tariff.**
- Difference between technologies in the Netherlands due to **difference in load factor,** but the absolute difference is negligible compared to other countries.

The Netherlands – country fiche (2/2)

Voluntary tariff periods for offtake

- In the Netherlands there is no dynamic tariff component implemented.
- To mitigate congestion issues there is a proposal to introduce a voluntary variable tariff.
- A consumer can, in exchange for compensation, opt to give part of the subscribed transport capacity back to the TSO during peak hours.
- On the details of the change (compensation form, implementation date,…) no decision has been made.

Maturity of Dynamic component



- No dynamic component implemented and no intention to implement one in the future tariff methodologies.

Percentage distribution

- There is no dynamic tariff applied in The Netherlands.

Injection costs in The Netherlands are negligible compared to other countries

1. In the Netherlands generators **only pay an annual fixed tariff** for the use of the grid.
2. **Normalized on a €/MWh basis for theoretical power plants, the tariff differs between generating technologies**, being the highest for technologies with a low load factor (solar PV), but **negligible compared to other countries.**
3. Currently, **The Netherlands do not have a dynamic tariff component implemented,** neither is there an investigation to change this in the short term. There is nevertheless a proposal to introduce a voluntary tariff period scheme for consumer to valorize their flexibility in peak hours.

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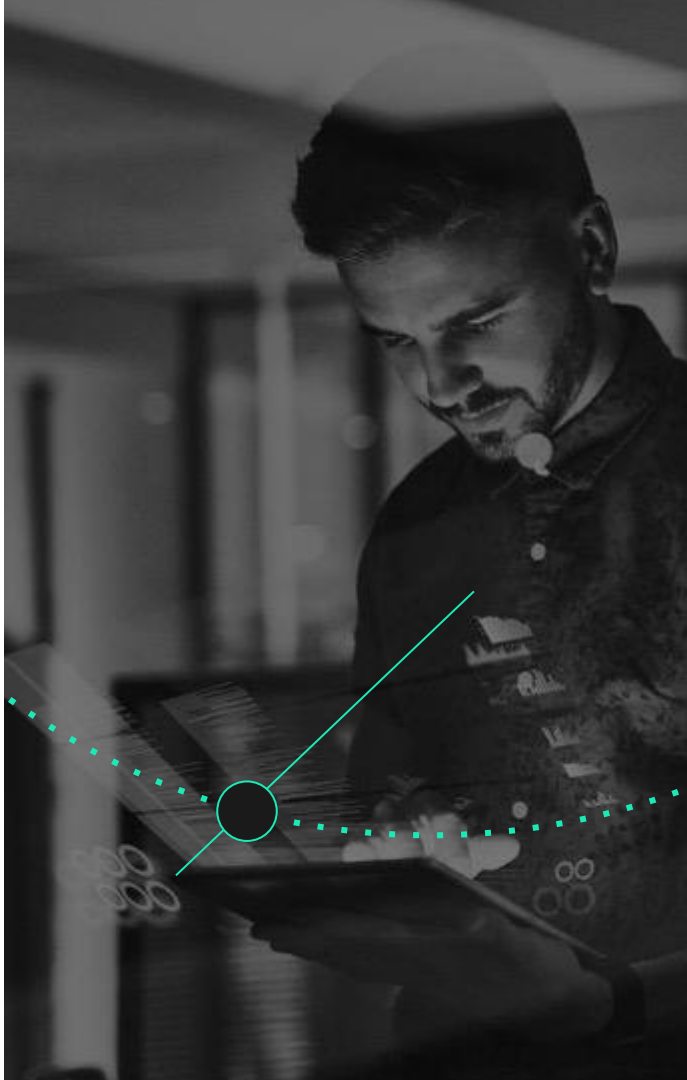


Appendix

Appendix A – Load factor Solar PV

The load factor is a parameter used as input data for the calculation of the total injection costs and total injection tariffs per technology. For Solar PV, it is only considered if the country where tariffs are based on the installed capacity or as an annual fixed tariff (in **bold underlined**)

Country	Austria	Belgium	Denmark	Estonia	Finland	France	Germany	Great-Britain	Ireland	Italy	Latvia	Lithuania	Luxembourg	Norway	Poland	Portugal	Slovenia	Spain	Sweden	The Netherlands
Load factor	0.11	0.13	0.13	0.07	**0.11**	**0.17**	**0.11**	**0.10**	**0.10**	0.13	**0.08**	0.09	**0.13**	0.11	0.11	0.23	0.11	0.23	**0.11**	**0.13**

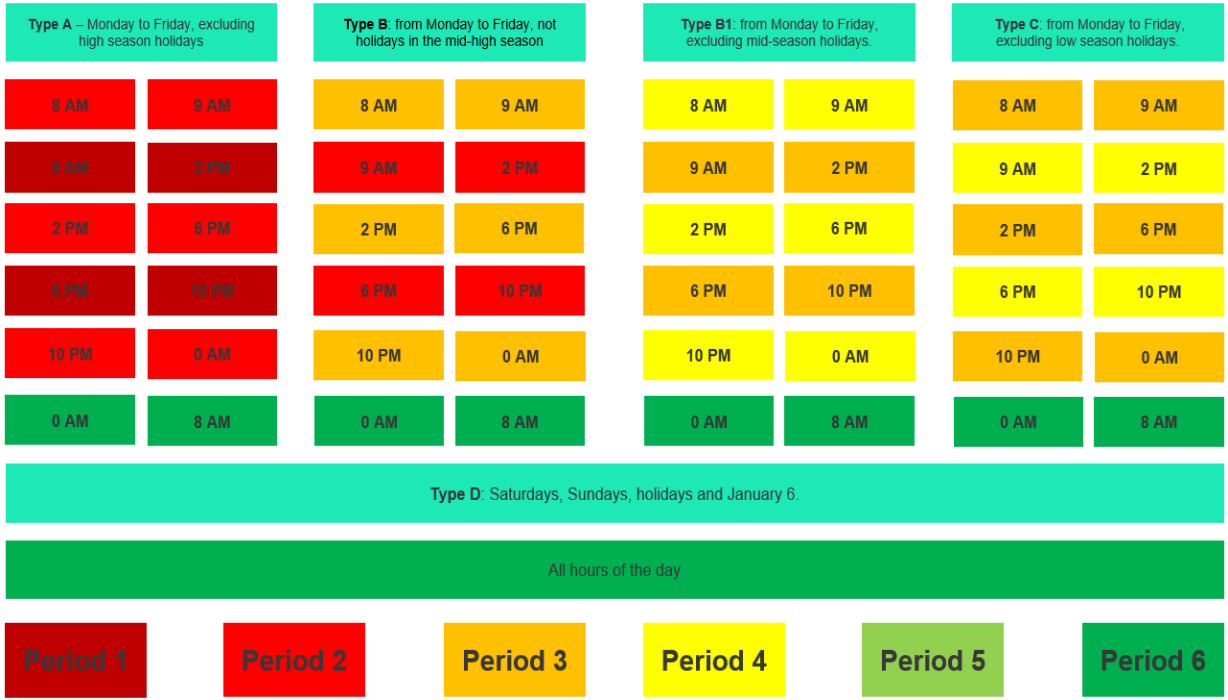
Appendix B – Detail of the time periods used for dynamic tariffs by RTE

Explanation

- Table shows the **detail of** the times **when each of the 5 tariff periods is applicable**
- In essence a distinction is made between two seasons: **High season** and **Low Season**
- Within each season a specific hour can fall in one of two categories based on the grid use by the hour: **Peak Hours** or **Off-Peak Hours**
- Tariff periods differ also between weekdays (upper section of the table) and weekends/public holidays (lower section of the table), note that during weekens/holidays only 2 tariff periods are applicable: **high season peak** and **low season peak**

Source: TURPE 6, RTE

Appendix C – Detail of the time periods used for dynamic tariffs by REE



Explanation

- Table shows the **detail of** the times **when each of the 6 tariff periods is applicable,** only for the peninsula region
- The seasons on the peninsula are determined as:

i. High season: January, February, July and December.
ii. Medium high season: March and November.
iii. Middle season: June, August and September.
iv. Low season: April, May and October.

- The times of day are determined as:

i. Type A: from Monday to Friday, excluding high season holidays.
ii. Type B: from Monday to Friday, not holidays in the mid-high season.
iii. Type B1: from Monday to Friday, excluding mid-season holidays.
iv. Type C: from Monday to Friday, excluding low season holidays.
v. Type D: Saturdays, Sundays, holidays and January 6.

Source: Red Electrica Espana, REE

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  - https://ec.europa.eu/eurostat/databrowser/view/NRG_IND_PEH/default/table?lang=en&category=nrg.nrg_quant.nrg_quanta.nrg_ind.nrg_ind_
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