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Energy infrastructure unit investment cost (UIC) indicators

24 April 2026

Report in PowerPoint format

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Key messages

1

Building knowledge on infrastructure costs supports planning decisions

- Large-scale investments in grid infrastructure will be required over the coming decades.
- Such knowledge is relevant for transparent and informed planning decisions.

2

UIC indicators show an increase in infrastructure costs above inflation

- UIC indicators increase across most infrastructure categories compared to previous edition (2023).
- Further work is needed to precisely estimate sharp cost increases observed in recent years.

3

The analysis shows significant volatility and third-country dependence risks

- A substantial part of energy infrastructure costs corresponds to materials and manufacturing.
- Both cost components pose several risks in terms of market exposure.

4

Data representativeness remains a concern for multiple infrastructure categories

- Inputs for several energy infrastructure categories remains limited and concentrated in a few countries.
- Sector specificities might explain part of such gaps.

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Structure of the report

1 **Introduction:** Improving transparency around investment costs
Legal basis, potential uses and context of UIC 2026

2 **Methodology brief:** Ensuring reliable cost benchmarks through standardised data collection
Data collection, treatment of data, calculation of indicators and definition of indicators

3 **Results:** Identifying typical costs and variations across infrastructure categories
UIC indicators, cost breakdown and UIC cost evolution

4 **Way forward:** From insight to action
Key contributions and potential improvements

Annex I: Summary of UIC Indicators

Annex II: Complementary indicators

Annex III: Sensitivity - UIC indicators accounting for labour costs

Annex IV: Methodology

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1. Introduction

Improving transparency around investment costs

This section explains why infrastructure cost monitoring matters, what the TEN-E Regulation requires, which projects ACER assesses and how the indicators contribute to transparent decision-making.

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Benchmarking energy infrastructure investment costs

Legal background

Under the **TEN-E Regulation** (Article 11(9)), ACER is required to establish and publish a **set of indicators** and corresponding reference values every three years for the assessment of unit investment costs (UICs) for comparable projects of the energy infrastructure categories listed in **Annex II**.

Scope of the assessment and data collection

ACER's data assessment focuses on commissioned projects under infrastructure categories listed in **Annex II** of the TEN-E Regulation.

ACER requested project promoters falling within the categories above to provide data from 14 October 2025 until 30 January 2026 via MONIP Tool.

Potential uses

ACER's final UIC indicators can serve as **benchmark on the evaluation of infrastructure projects.** (For example, does a project fall within the cost range of existing infrastructure? Is there any reason to justify that a project is significantly outside of the range?). The TEN-E Regulation indicates that such indicators may be used for TYNDP CBA, yet there are limitations on this*.

* Historical data provide only partial guidance on future cost trends. Consequently, project promoters are expected to employ the most realistic cost assumptions in their projections.

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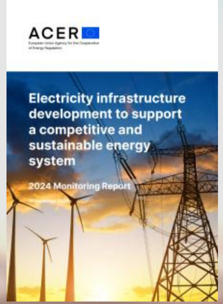
Ensuring transparency and informed decision making

Massive electricity grid investments planned to support renewable energy growth

Electricity grids are essential to integrate variable renewable energy sources (vRES). By 2030, **1100 GW of vRES are expected** in the EU. This figure is foreseen to rise sharply throughout that decade*.

RES provide cheap energy and reduce dependency on third countries compared to fossil fuels. However, **containing grid costs is key for EU competitiveness**. ACER's latest infrastructure report shows that grid investment could reach up to EUR 2600 billion between 2025 and 2050. This includes both transmission and distribution.

Many of these **investments are already ongoing**. According to ENTSO-E's latest Ten-Year Network Development Plan (TYNDP), transmission system operators plan to invest on over 150,000 km of lines and cables from 2025 to 2030. This distance equals circling the equator 3.8 times.



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December '24

Hydrogen infrastructure development remains slow and uncertain

The development of gas infrastructure is more uncertain, particularly of hydrogen. ACER's 2025 European hydrogen markets report shows that only 55 km of new hydrogen pipelines were commissioned in 2024.

Read now

December '25

UIC indicators inform planning decisions

This report presents the Unit Investment Cost indicators, providing factual data and analysing potential risks. Building knowledge around infrastructure costs supports better planning decisions. It improves transparency. Unit Investment Cost indicators can serve as benchmark when assessing individual project costs, including grid-enhancing technologies (as proposed in ACER's 2026 position paper on output performance indicators.

Indicators can support network planning assessments and decisions. The TEN-E Regulation states that Unit Investment Cost indicators may be used as reference costs for the Cost-Benefit Analysis in TYNDP. The assessment may also help national regulatory authorities (NRAs) make informed Cross-border Cost Allocation (CBCA) decisions.

*Source: TYNDP Scenarios 2024, National Trends Scenario.

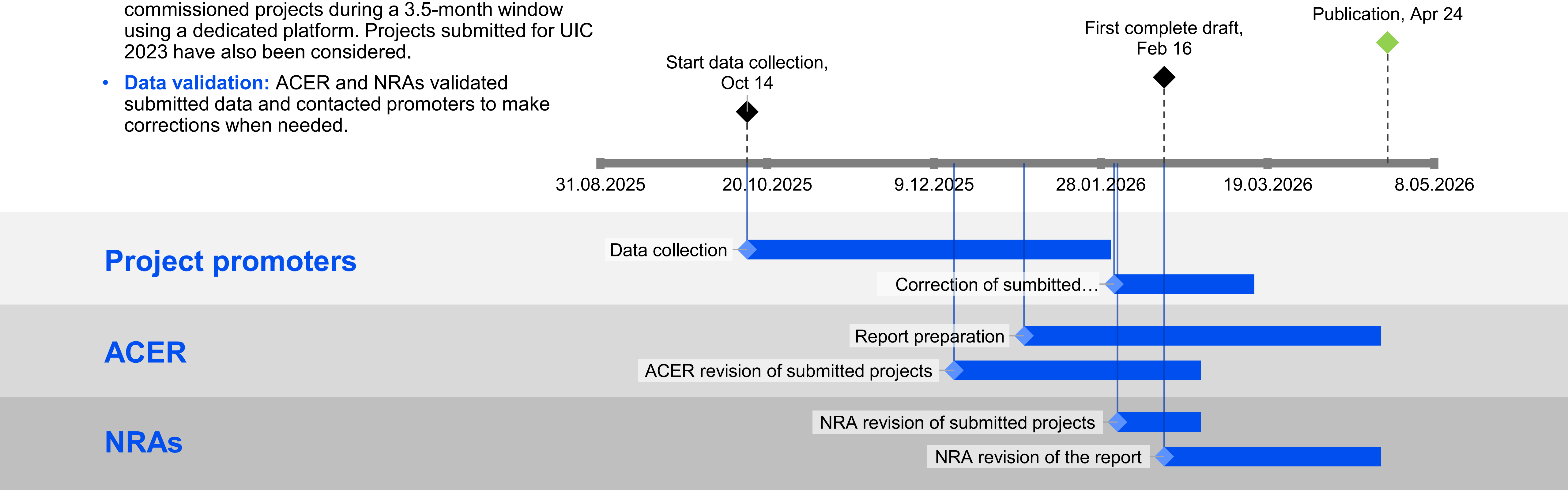
2. Methodology brief

Ensuring reliable cost benchmarks through standardised data collection

This section explains how ACER collected and analysed infrastructure cost data, which categories and projects were included, how unit investment costs were calculated and the quality checks applied to ensure reliable indicators.

Data collection and UIC 2026 timeline

- **Data collection:** Project promoters (mostly TSOs), submitted technical and economic data on commissioned projects during a 3.5-month window using a dedicated platform. Projects submitted for UIC 2023 have also been considered.
- **Data validation:** ACER and NRAs validated submitted data and contacted promoters to make corrections when needed.



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Making costs comparable across time and projects

Thresholds: focusing on substantial, completed projects

The minimum thresholds were applied as follows:

- Transportation pipelines / transmission lines: length of more than 5 km
- Historic costs of more than EUR 20 thousand

Only commissioned projects are considered.

Collected information about planned or infrastructure currently being implemented was analysed in the chapter on new infrastructure categories.

Treatment of cost increases: making costs comparable across time and projects

In order to effectively compare the investment costs from different years, all nominal values of the investments were adjusted for inflation.

UIC 2026 edition follows the same approach as UIC 2023: general inflation in the form of HICP (harmonised index of consumer prices) published by Eurostat. Table 1 includes a table with the inflation rates used in this exercise.

Higher inflation rates in recent years imply larger adjustments to historical investment costs in the latest assessment.

Table 1: Inflation rates used in the UIC assessment (source: Eurostat*)

Country	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
AT	1.5	0.8	1.0	2.2	2.1	1.5	1.4	2.8	8.6	7.7	2.9	3.6
BE	0.5	0.6	1.8	2.2	2.3	1.2	0.4	3.2	10.3	2.3	4.3	3.0
BG	-1.6	-1.1	-1.3	1.2	2.6	2.5	1.2	2.8	13.0	8.6	2.6	3.5
CY	-0.3	-1.5	-1.2	0.7	0.8	0.5	-1.1	2.3	8.1	3.9	2.3	0.8
CZ	0.4	0.3	0.6	2.4	2.0	2.6	3.3	3.3	14.8	12.0	2.7	2.3
DE	0.8	0.7	0.4	1.7	1.9	1.4	0.4	3.2	8.7	6.0	2.5	2.3
DK	0.4	0.2	0.0	1.1	0.7	0.7	0.3	1.9	8.5	3.4	1.3	1.8
EE	0.5	0.1	0.8	3.7	3.4	2.3	-0.6	4.5	19.5	9.1	3.7	4.8
ES	-0.2	-0.6	-0.3	2.0	1.7	0.8	-0.3	3.0	8.3	3.4	2.9	2.7
FI	1.2	-0.2	0.4	0.8	1.2	1.1	0.4	2.1	7.2	4.3	1.0	1.8
FR	0.6	0.1	0.3	1.2	2.1	1.3	0.5	2.1	5.9	5.7	2.3	0.9
GR	-1.4	-1.1	0.0	1.1	0.8	0.5	-1.3	0.6	9.3	4.2	3.0	2.9
HR	0.2	-0.3	-0.6	1.3	1.6	0.8	0.0	2.7	10.7	8.4	4.0	4.4
HU	0.0	0.1	0.4	2.4	2.9	3.4	3.4	5.2	15.3	17.0	3.7	4.4
IE	0.3	0.0	-0.2	0.3	0.7	0.9	-0.5	2.4	8.1	5.2	1.3	2.1
IT	0.2	0.1	-0.1	1.3	1.2	0.6	-0.1	1.9	8.8	5.9	1.1	1.7
LT	0.2	-0.7	0.7	3.7	2.5	2.2	1.1	4.6	18.9	8.7	0.9	3.4
LU	0.7	0.1	0.0	2.1	2.0	1.6	0.0	3.5	8.2	2.9	2.3	2.5
LV	0.7	0.2	0.1	2.9	2.6	2.7	0.1	3.2	17.2	9.1	1.3	3.8
MT	0.8	1.2	0.9	1.3	1.7	1.5	0.8	0.7	6.1	5.6	2.4	2.4
NL	0.3	0.2	0.1	1.3	1.6	2.7	1.1	2.8	11.6	4.1	3.2	3.0
PL	0.1	-0.7	-0.2	1.6	1.2	2.1	3.7	5.2	13.2	10.9	3.7	3.3
PT	-0.2	0.5	0.6	1.6	1.2	0.3	-0.1	0.9	8.1	5.3	2.7	2.2
RO	1.4	-0.4	-1.1	1.1	4.1	3.9	2.3	4.1	12.0	9.7	5.8	6.8
SE	0.2	0.7	1.1	1.9	2.0	1.7	0.7	2.7	8.1	5.9	2.0	2.6
SI	0.4	-0.8	-0.2	1.6	1.9	1.7	-0.3	2.0	9.3	7.2	2.0	2.5
SK	-0.1	-0.3	-0.5	1.4	2.5	2.8	2.0	2.8	12.1	11.0	3.2	4.2

*Eurostat. (n.d.). *HICP – annual data (average index and rate of change) (prc_hicp_aind)* [Data set]. European Commission. https://ec.europa.eu/eurostat/databrowser/view/prc_hicp_aind/default/table?lang=en

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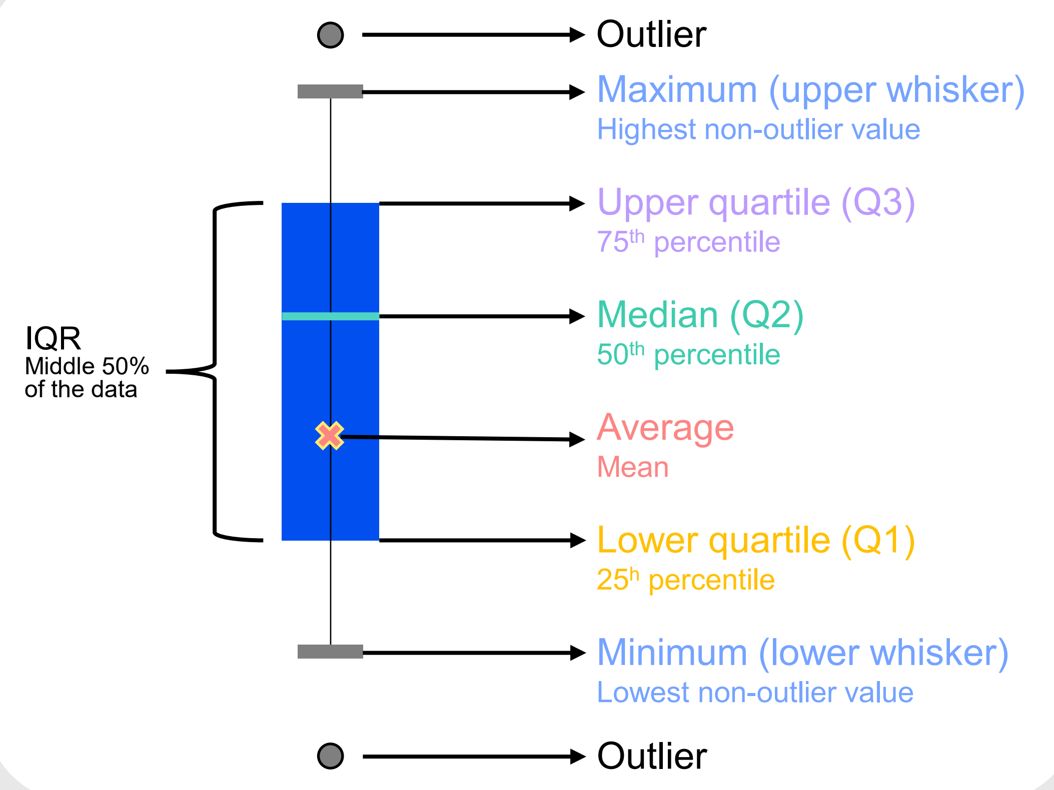
Cost distribution identifies typical projects and outliers



A boxplot summarizes the distribution of a dataset using key values and highlights its spread:

- **The box** represents the **interquartile range (IQR),** which contains the middle 50% of the data.
  - The bottom of the box is the **lower quartile (Q1, 25th percentile)**.
  - The top of the box is the **upper quartile (Q3, 75th percentile)**.
- **The line inside the box** is the **median (Q2)**, or 50th percentile. Half of the data lies above this value and half below it.
- **The dot inside the box** marks the **average (mean)**.
  - When the mean and median are close, the data are fairly symmetric.
  - When they are far apart, the data may be skewed.
- **The whiskers** extend to the **minimum and maximum non-outlier values**, showing the overall spread of the data.

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Outlier removal and validation for reliable indicators

Extreme outliers are excluded to prevent data distortion

Outliers were removed from the dataset before the calculation of the UIC indicators **if they were above the upper or under the lower quartile values by a factor of 1.5 of the interquartile range**, in line with the Tukey-Boxplot method. This step is particularly important for smaller data sets, where one or a couple of outliers can significantly distort the average UIC indicator for an asset.

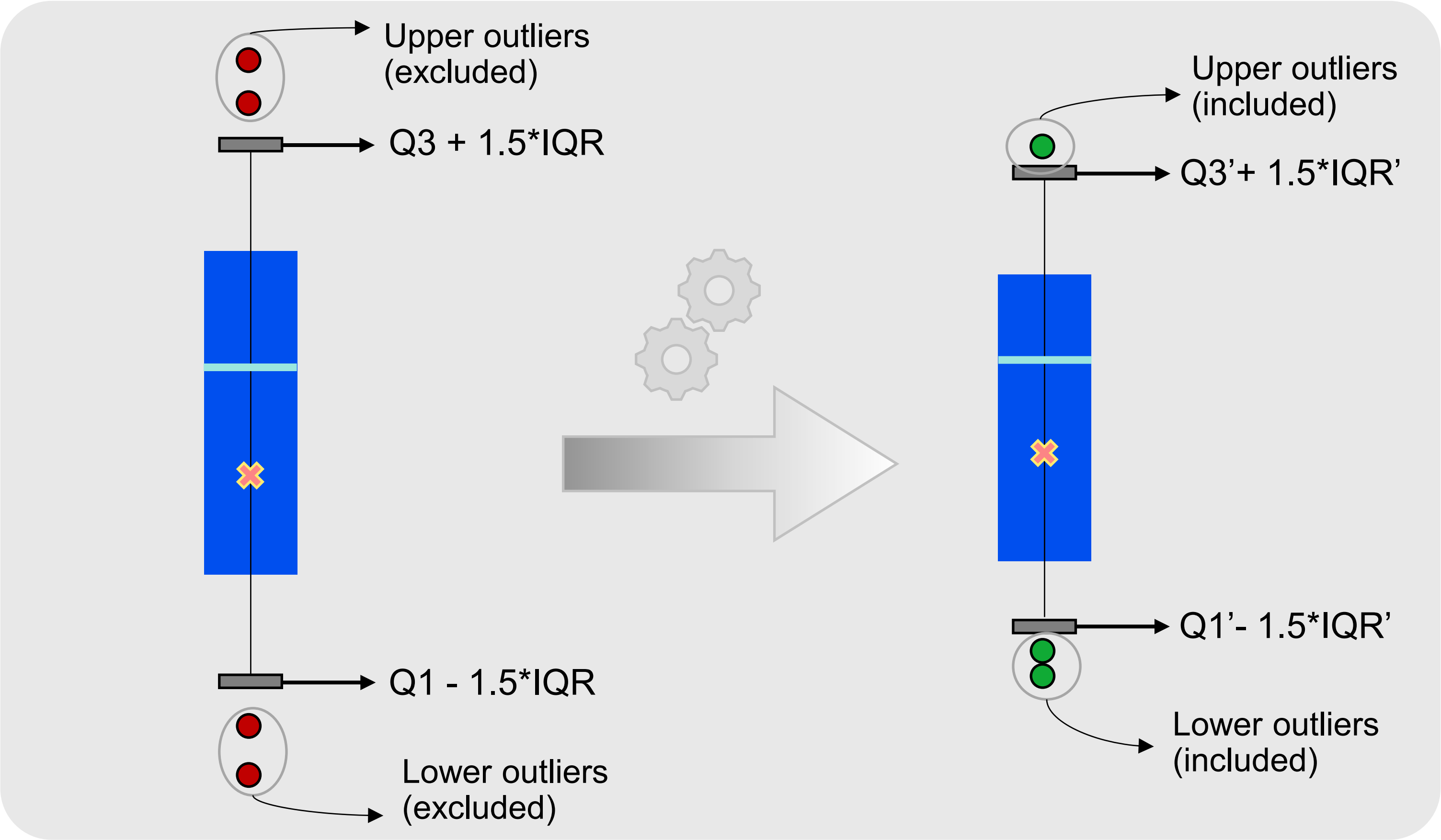
Once outliers have been removed from the datasets, statistics are **recomputed to obtain the final indicators**.

At least 3 valid projects ensure statistical reliability

To ensure the confidentiality of the data for each category, ACER applied a minimum threshold on the number of data points. **Results for categories with at least 3 valid assets** (i.e. non-outliers meeting all requirements) are to be published.

Data quality confirmed through promoter verification

In cases where values were falling significantly outside the usual range, promoters were contacted to confirm or correct their data if needed.



*Note: In the boxplot visualisations in this report the upper and lower whisker are adjusted to the closest data point (e.g. if Q3' + 1.5 * IQR = 2.5 Meur/asset and the closest data point is 2.2 Meur/asset, the whisker will indicate 2.2 rather than 2.5).

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Definition of indicators

Electricity

Asset category	Unit
Overhead line	million EUR/km
Underground cable	million EUR/km
Submarine cable	million EUR/km
Offshore transmission cable	million EUR/km
AC substation	million EUR/asset
Offshore AC substation	million EUR/asset
Offshore DC substation	million EUR/asset
Transformer	million EUR/asset
Electricity storage	million EUR/h
HVDC converter	million EUR/MW
SSSC*	million EUR/MVA
Synchronous condensers	million EUR/asset
Advanced conductor	million EUR/km
APFC*	million EUR/MVA
Digital Twin	
DLR*	million EUR/km
Other voltage regulator/booster	million EUR/asset
STATCOM*	million EUR/asset
Topology optimisation software	million EUR/asset

Hydrogen

Asset category	Unit
Pipelines	million EUR/km
Compression station	million EUR/MW
Storage	million EUR/ton
Processing facilities	million EUR/asset
Other equipment	million EUR/asset

Smart gas grid equipment

Asset category	Unit
Compression station**	million EUR/MW
Processing plant	million EUR/asset
Advanced equipment	million EUR/asset
Other equipment	million EUR/asset

Infrastructure for gas / biomethane / hydrogen blending

Asset category	Unit
Pipelines	million EUR/km
Compression station	million EUR/MW
International stations	million EUR/asset
Storage	million EUR/Mm3
LNG*	million EUR/Mm3

Electrolyser

Asset category	Unit
Electrolyser facility	million EUR/MW
Other equipment	million EUR/asset

CO_2

Asset category	Unit
Pipelines	million EUR/km
Processing facilities	million EUR/asset

Legend:

Included in assessment

Not included due to limited sample (n < 3)

*SSSC: Static Synchronous Series Compensator; APFC: Advanced Power Flow Control; DLR: Dynamic Line Rating; STATCOM: Static Synchronous Compensator; LNG: Liquified Natural Gas.; ** Reported together with compression stations within infrastructure for gas, biomethane and hydrogen blending. Note: Additional indicators are computed in Annex II of this report.

3. Results

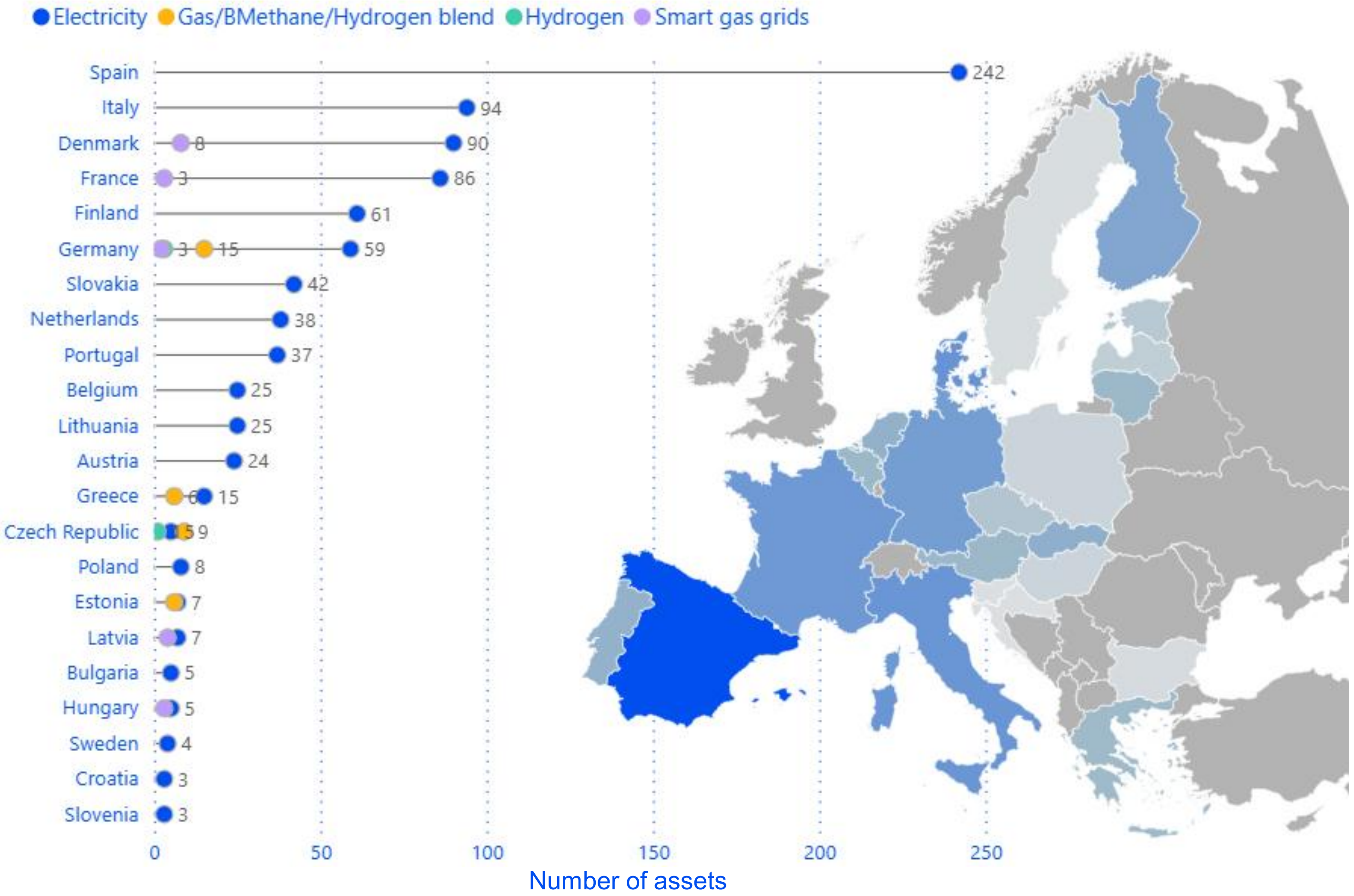
Identifying typical costs and variations across infrastructure categories

This section presents Unit Investment Cost indicators for electricity and gas infrastructure, showing typical cost ranges, variations across categories and key factors driving cost differences.

Strong electricity coverage, gaps in emerging sectors

UIC data collection shows a significant (yet uneven) response

Number of commissioned assets submitted per country and infrastructure category



Outcome per country

- Response levels show only moderate correlation with country size.
- Such divergences may impact the representativeness of the assessment.

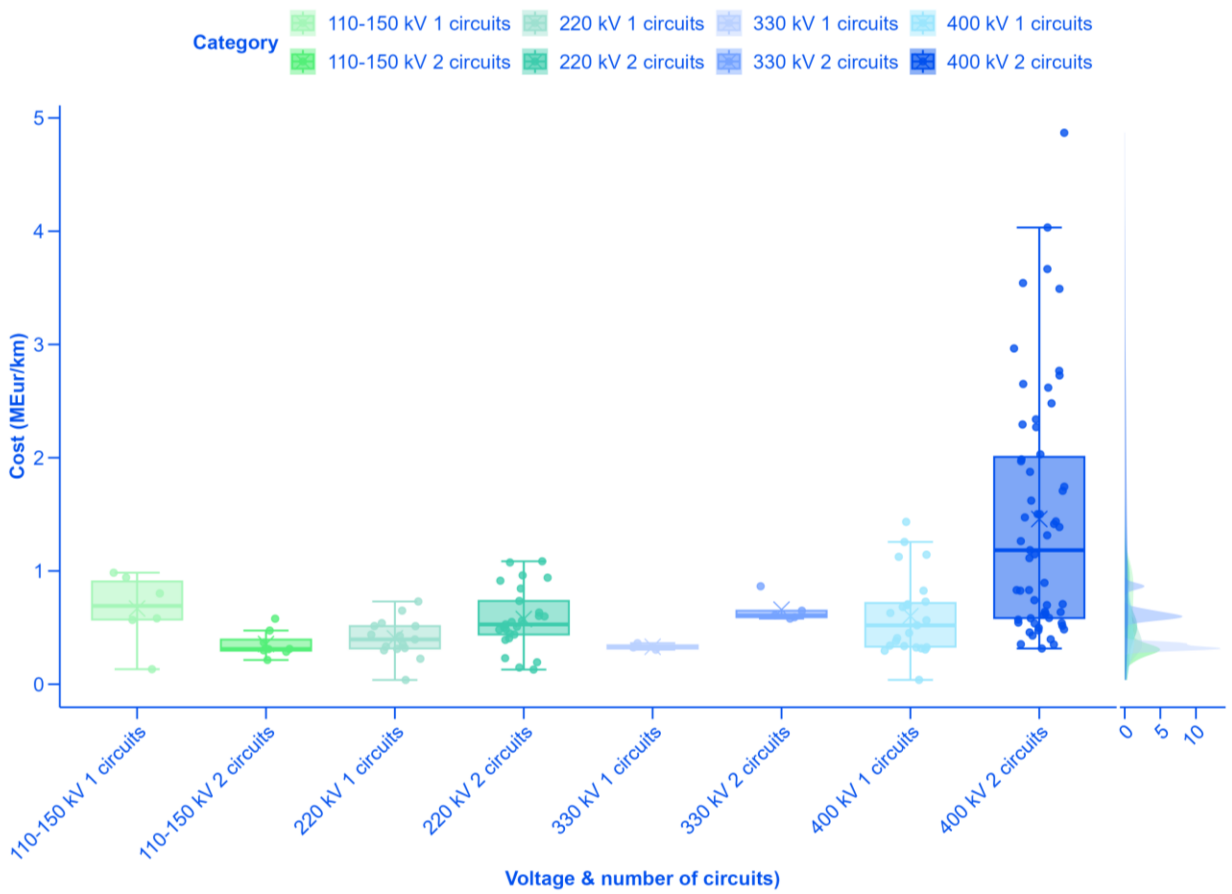
Outcome per infrastructure category

- As in UIC 2023, the response by non-electricity sectors is limited.
- Hydrogen and smart gas grids remain data-scarce.
- Small data samples compromise the assessment.
- Promoters did not submit any electrolyser nor CO_2 commissioned asset.
- The development phase of these sectors can explain the outcome in several cases.

Overhead lines (OHL)

UIC indicators for overhead lines (OHL)

Per length (km)



Observations

- Only 400 kV – 2 circuit assets average above 1 million EUR/km.
- Small samples impact the capacity to identify outliers for some categories (e.g. 110-150kV or 330 kV lines).
- Cost spreads increase at higher voltages.
- Close-to-outlier values typically correspond to shorter routes.

UIC indicators for overhead lines (Meur/km):

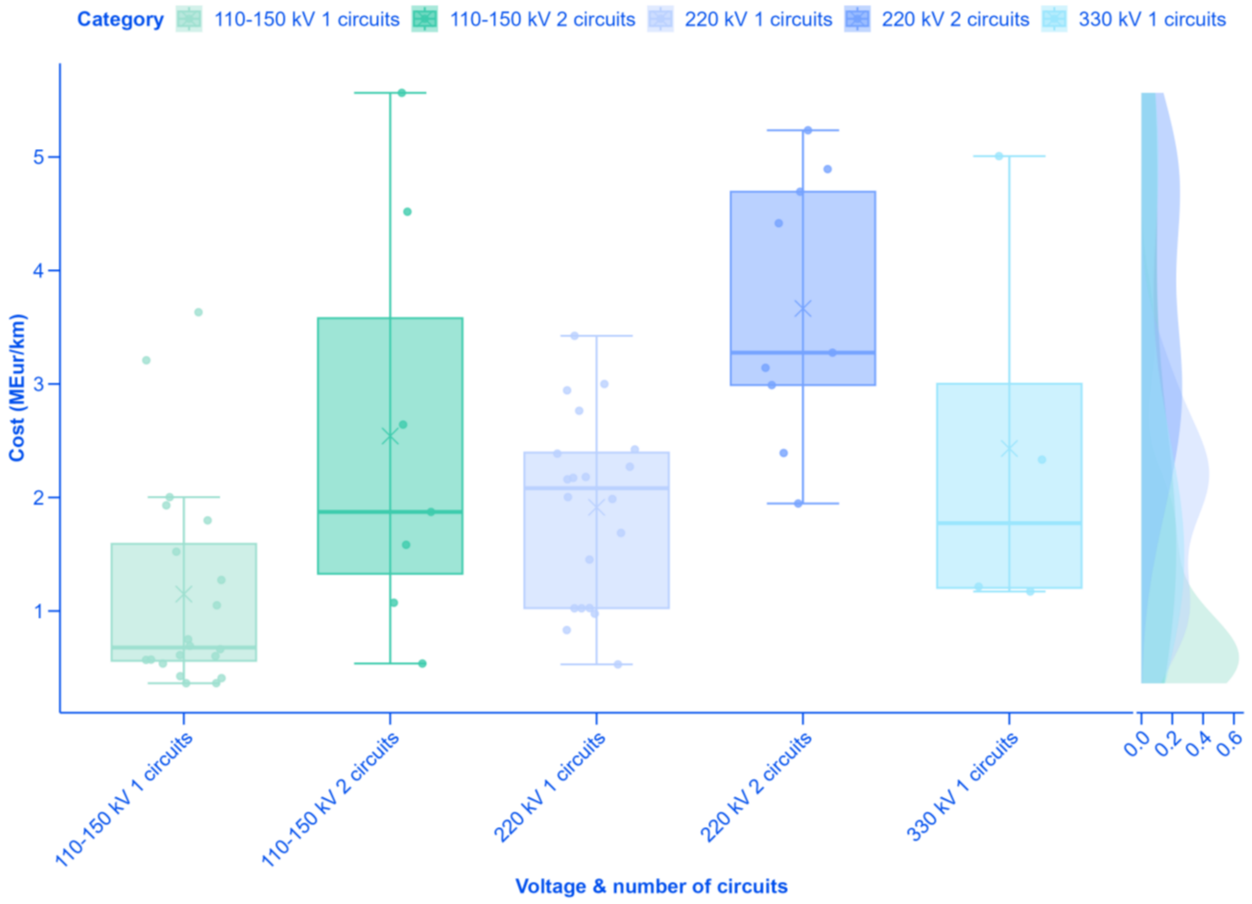
Category	Assets	Avg	P25	Median	P75	Min	Max
110-150 kV 1 circuits	6	0.67	0.57	0.69	0.91	0.13	0.98
110-150 kV 2 circuits	8	0.36	0.30	0.31	0.39	0.21	0.58
220 kV 1 circuits	15	0.41	0.32	0.40	0.51	0.04	0.73
220 kV 2 circuits	25	0.58	0.44	0.53	0.74	0.13	1.09
330 kV 1 circuits	3	0.33	0.32	0.33	0.34	0.31	0.36
330 kV 2 circuits	5	0.66	0.59	0.61	0.65	0.58	0.87
400 kV 1 circuits	23	0.60	0.33	0.52	0.72	0.04	1.43
400 kV 2 circuits	59	1.46	0.58	1.18	2.01	0.32	4.87

Note: The results controlling for apparent power (MVA) and number of bundled conductors are provided in Annex II.

Underground lines

UIC indicators for underground lines

Per length (km)



Observations

- Overall average values x2.5 those of overhead lines
- Terrain type typically increases UIC value by a factor of 2.
- Small samples impact the capacity to identify outliers for some categories (e.g. 330kV).

UIC indicators for underground lines (Meur/km):

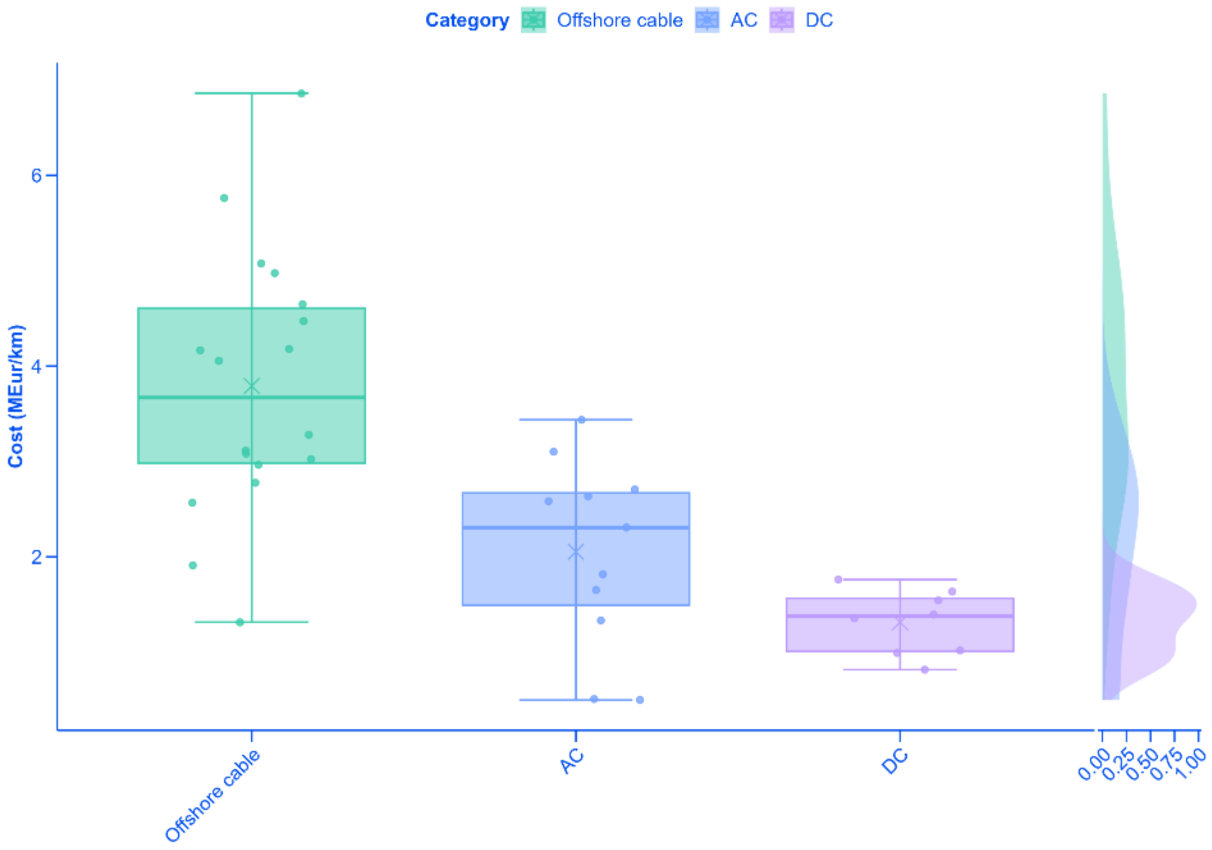
Category	Assets	Avg	P25	Median	P75	Min	Max
110-150 kV 1 circuits	20	1.15	0.56	0.68	1.59	0.36	3.63
110-150 kV 2 circuits	7	2.54	1.33	1.87	3.58	0.54	5.56
220 kV 1 circuits	20	1.91	1.03	2.08	2.40	0.53	3.42
220 kV 2 circuits	9	3.67	2.99	3.28	4.69	1.95	5.24
330 kV 1 circuits	4	2.43	1.20	1.77	3.00	1.17	5.01

Note: The results controlling for apparent power (MVA) are provided in Annex II.

Offshore RES and submarine cables

UIC indicators for offshore RES and submarine cables

Per length (km)



Observations

- Offshore RES cables are twice as expensive per km as submarine cables. Available data on cost breakdown was not enough to determine the drivers.

UIC indicators for offshore and submarine lines (Meur/km):

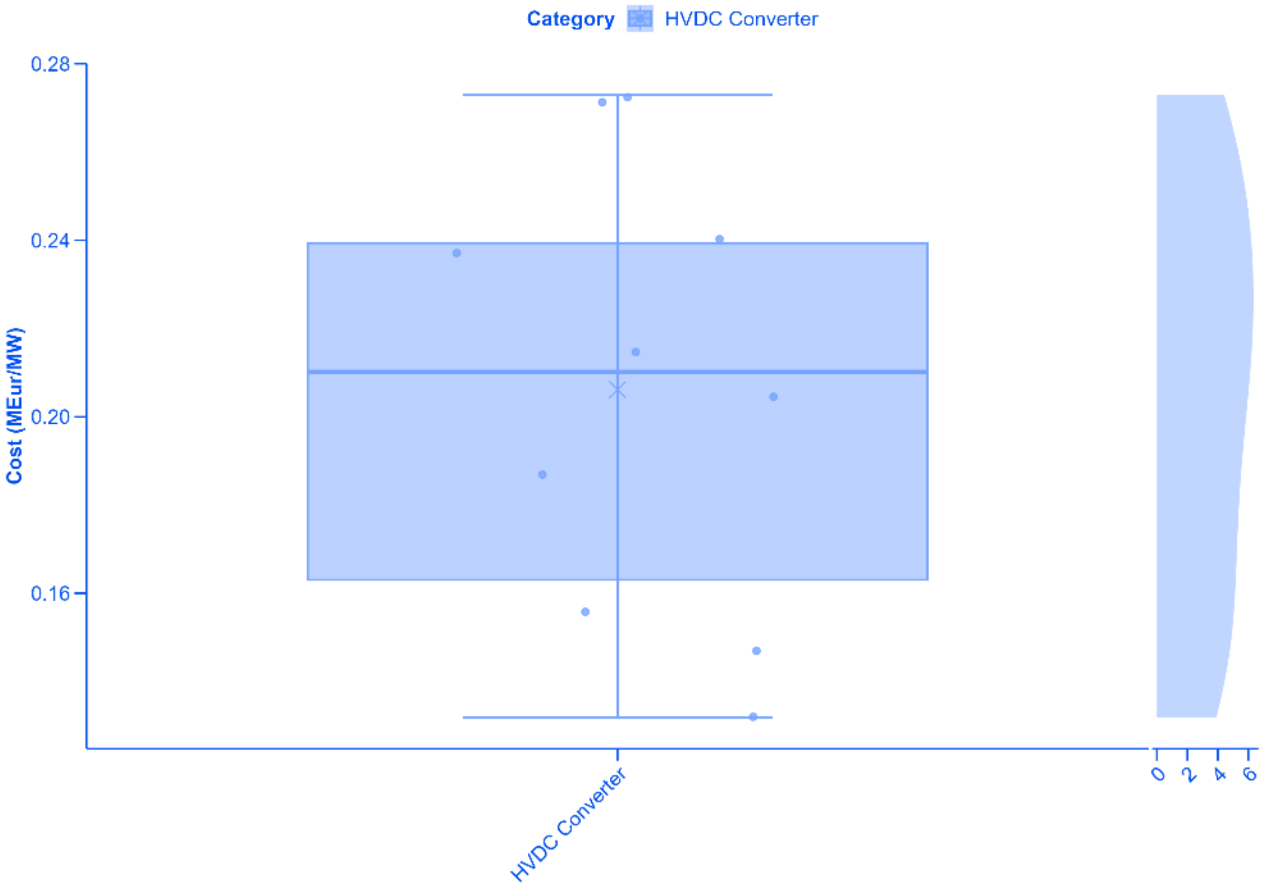
Category	Assets	Avg	P25	Median	P75	Min	Max
AC	11	2.05	1.49	2.30	2.67	0.50	3.44
DC	8	1.31	1.01	1.38	1.56	0.82	1.76
Offshore cable	18	3.79	2.98	3.67	4.61	1.31	6.86

Note: (1) Offshore cable refers to assets connecting renewable energy sources (RES) to the grid, whereas *AC* and *DC* refer to submarine cables. (2) Results controlling for apparent power (MVA) are presented in Annex II. (3) Limited data sample did not allow to differentiate by voltage level despite being a significant cost driver.

HVDC converter stations

UIC indicators for HVDC converter stations

Per power rating (MW)



Observations

- Reported HVDC converter stations exhibit low dispersion when adjusted for power rating, being clustered around the average value.
- Power rating (MW) and the pole configuration (directly related to each other) are the main driver of cost based on observed characteristics.
- Total cost of the station roughly duplicates when increasing its power rating by 500 MW.

UIC indicators for HVDC converters (Meur/MW):

Category	Assets	Avg	P25	Median	P75	Min	Max
HVDC Converter	10	0.21	0.16	0.21	0.24	0.13	0.27

Note: (1) Values reflect a single converter station. (2) Latest tender awards suggest a sharp increase in HVDC converter stations in recent years (see e.g. Adriatic Link or LirIC awards), with Meur/MW costs well above historical maximum values.

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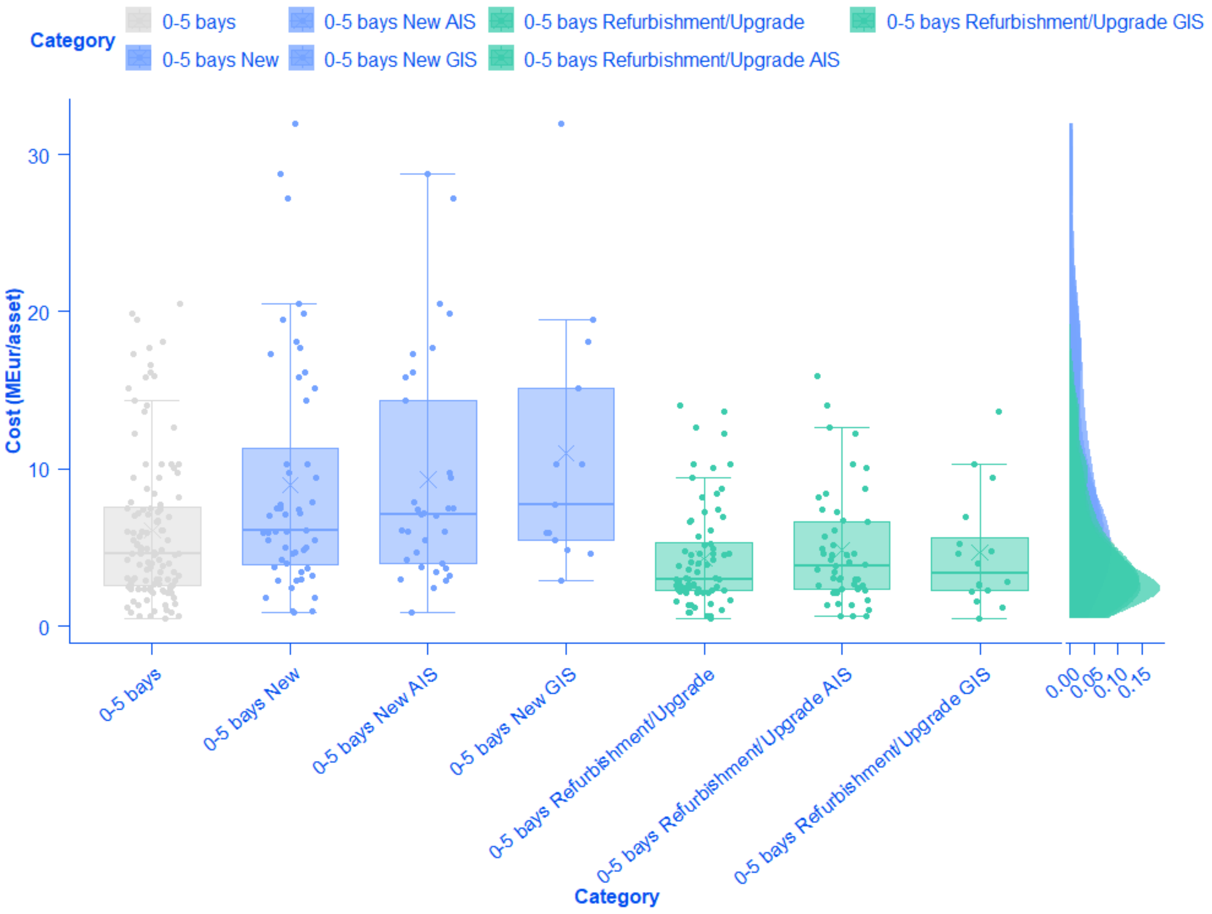
AC Substations (0-5 bays)

UIC indicators of AC substations up to 5 bays

Per asset



Observations

- The analysis shows aggregate results (0-5 bays), the split between new and refurbished/upgraded substations and the split between Air Insulated Substation (AIS) and Gas Insulated Substation (GIS) technologies.
- Collected data was not sufficient to provide UIC indicators for hybrid substations.

UIC indicators for AC substations (Meur/asset):

Category	Assets	Avg	P25	Median	P75	Min	Max
0-5 bays	116	6.09	2.59	4.60	7.53	0.47	20.46
0-5 bays New	52	8.96	3.92	6.06	11.33	0.88	31.97
0-5 bays New AIS	33	9.33	3.99	7.07	14.33	0.88	28.78
0-5 bays New GIS	13	10.98	5.48	7.72	15.11	2.91	31.97
0-5 bays Refurbishment/Upgrade	72	4.32	2.23	3.00	5.32	0.47	14.02
0-5 bays Refurbishment/Upgrade AIS	49	4.83	2.33	3.86	6.64	0.65	15.93
0-5 bays Refurbishment/Upgrade GIS	16	4.66	2.27	3.39	5.65	0.47	13.68

Note: If not explicitly categorised as “New”, “Upgrade” or “Refurbishment”, or if the technology is not indicated, the category represents a combination of all other classes.

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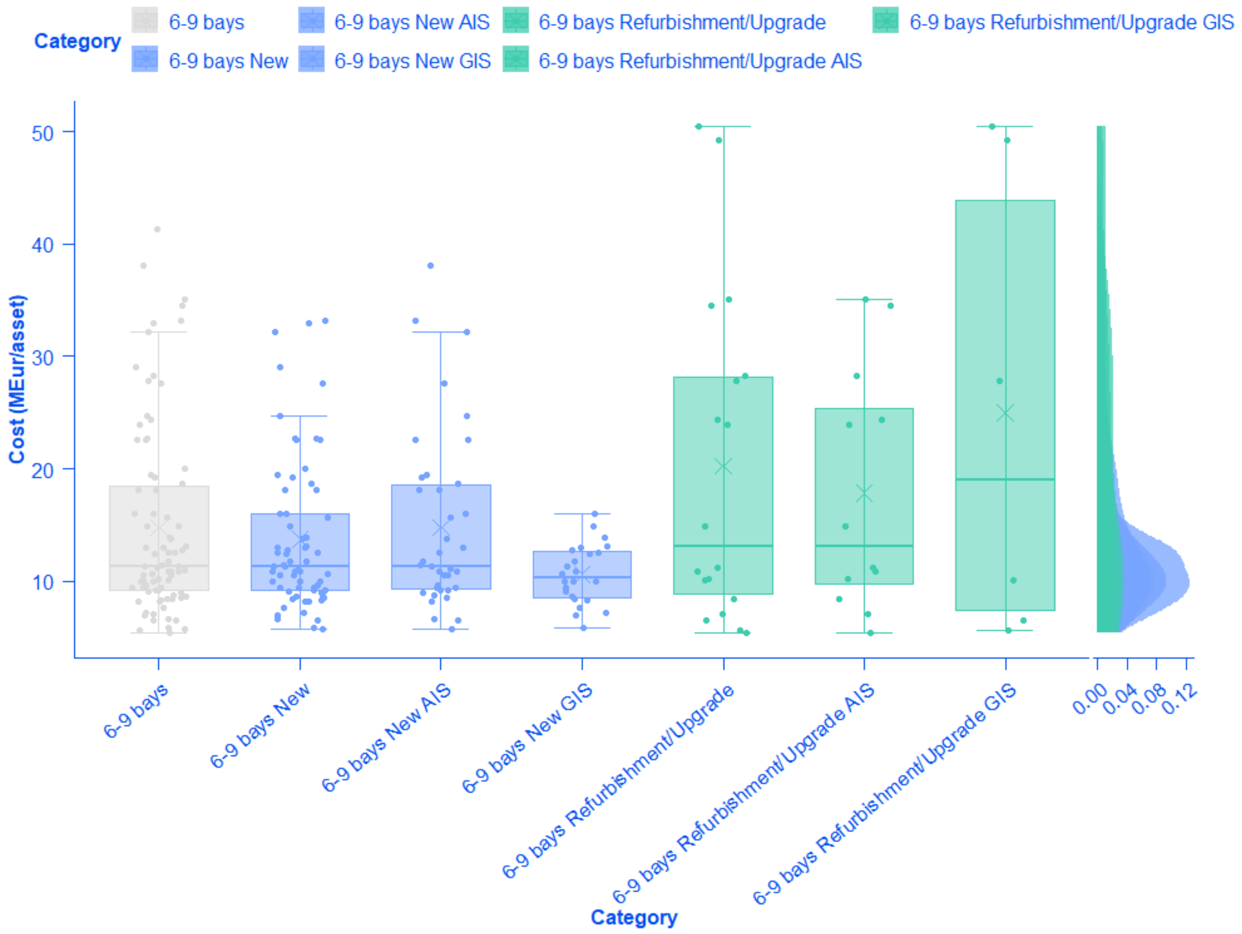
AC Substations (6-9 bays)

UIC indicators of AC substations from 6 to 9 bays

Per asset



Observations

- The analysis shows aggregate results (6-9 bays), the split between new and refurbished/upgraded substations and the split between Air Insulated Substation (AIS) and Gas Insulated Substation (GIS) technologies.
- Collected data was not sufficient to provide UIC indicators for hybrid substations.

UIC indicators for AC substations (Meur/asset):

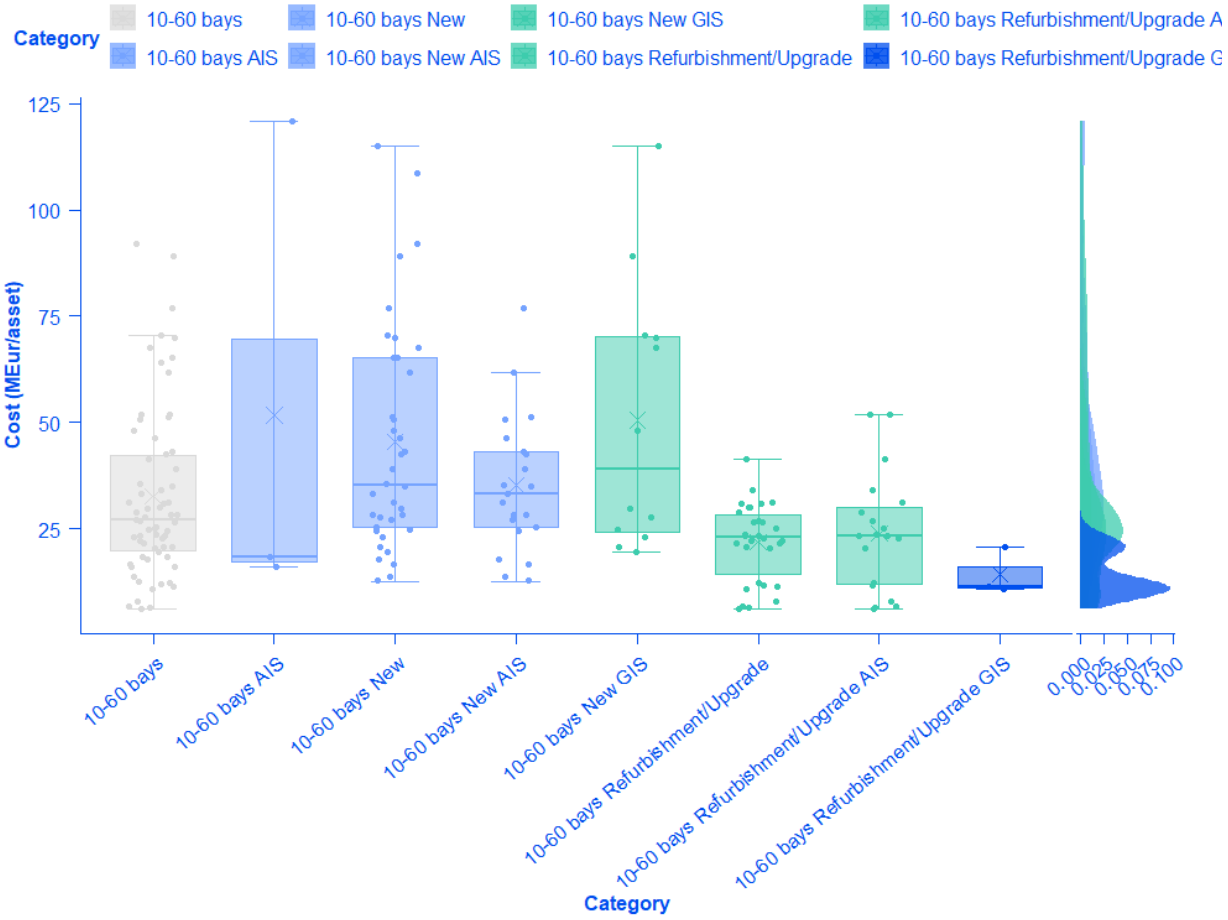
Category	Assets	Avg	P25	Median	P75	Min	Max
6-9 bays	83	14.77	9.15	11.27	18.42	5.39	41.27
6-9 bays New	66	13.72	9.19	11.28	15.99	5.71	33.13
6-9 bays New AIS	38	14.79	9.26	11.34	18.55	5.71	38.06
6-9 bays New GIS	24	10.58	8.54	10.33	12.60	5.80	15.95
6-9 bays Refurbishment/Upgrade	18	20.21	8.83	13.06	28.16	5.39	50.48
6-9 bays Refurbishment/Upgrade AIS	12	17.85	9.77	13.06	25.32	5.39	35.08
6-9 bays Refurbishment/Upgrade GIS	6	24.95	7.39	18.98	43.85	5.60	50.48

Note: If not explicitly categorised as “New”, “Upgrade” or “Refurbishment”, or if the technology is not indicated, the category represents a combination of all other classes.

AC Substations (10-60 bays)

UIC indicators of AC substations from 10 to 60 bays

Per asset



Observations

- The analysis shows aggregate results (10-60 bays), the split between new and refurbished/upgraded substations and the split between Air Insulated Substation (AIS) and Gas Insulated Substation (GIS) technologies.
- Collected data was not sufficient to provide UIC indicators for hybrid substations.

UIC indicators for AC substations (Meur/asset):

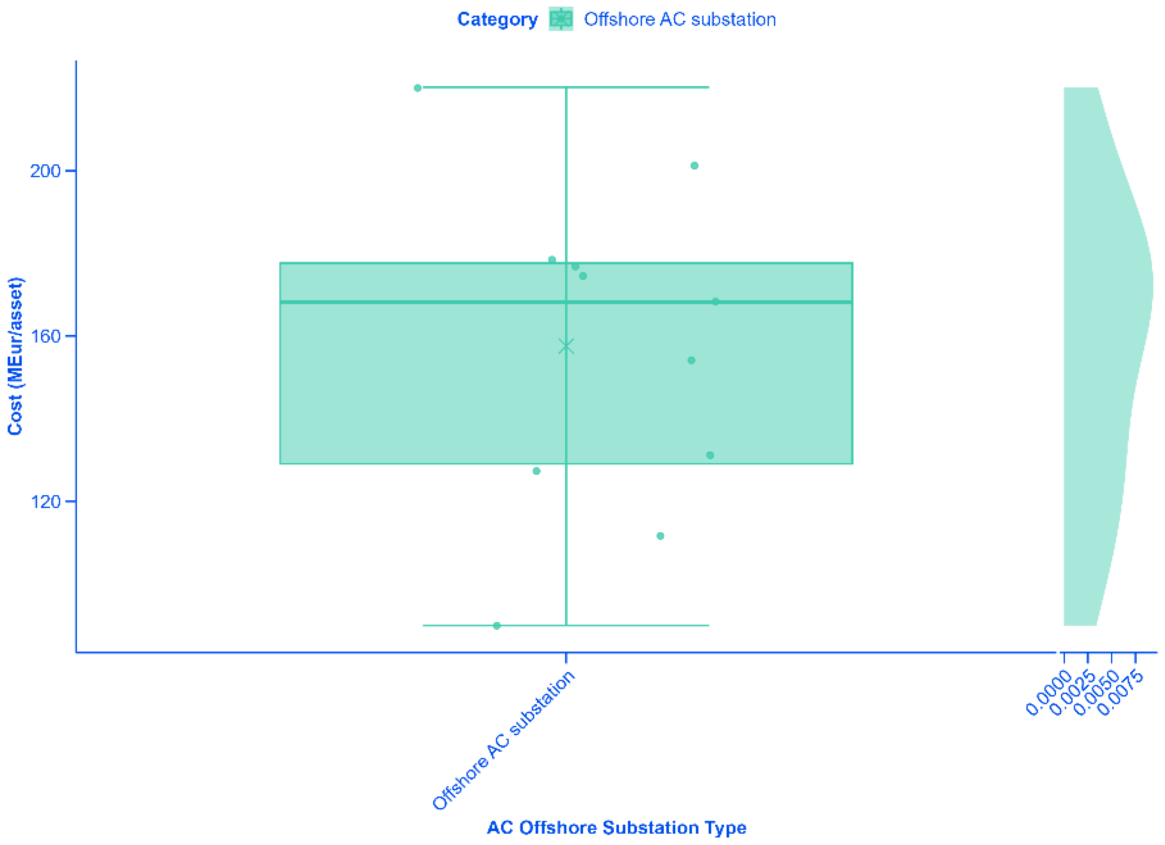
Category	Assets	Avg	P25	Median	P75	Min	Max
10-60 bays	66	32.57	19.78	27.03	42.22	6.12	91.94
10-60 bays AIS	3	51.66	17.11	18.23	69.50	15.98	120.77
10-60 bays New	37	45.33	25.34	35.38	65.14	12.66	115.00
10-60 bays New AIS	21	35.27	25.34	33.32	43.18	12.66	76.98
10-60 bays New GIS	12	50.49	24.30	38.95	70.07	19.62	115.00
10-60 bays Refurbishment/Upgrade	30	21.85	14.19	22.88	28.34	6.12	41.31
10-60 bays Refurbishment/Upgrade AIS	19	23.94	11.98	23.29	29.97	6.12	51.92
10-60 bays Refurbishment/Upgrade GIS	3	14.23	10.95	11.23	16.01	10.67	20.80

Note: If not explicitly categorised as “New”, “Upgrade” or “Refurbishment”, or if the technology is not indicated, the category represents a combination of all other classes.

Offshore AC Substations

UIC indicators for offshore AC substations

Per asset



Observations

- Relatively high dispersion is largely explained by the number of bays of the substation, but available data did not allow to provide a more granular analysis.
- 7 out of the 11 assets correspond to 10 to 33 bays substations.

UIC indicators for AC Substations (Meur/asset):

Category	Assets	Avg	P25	Median	P75	Min	Max
Offshore AC substation	11	157.57	129.07	168.19	177.66	89.97	220.2

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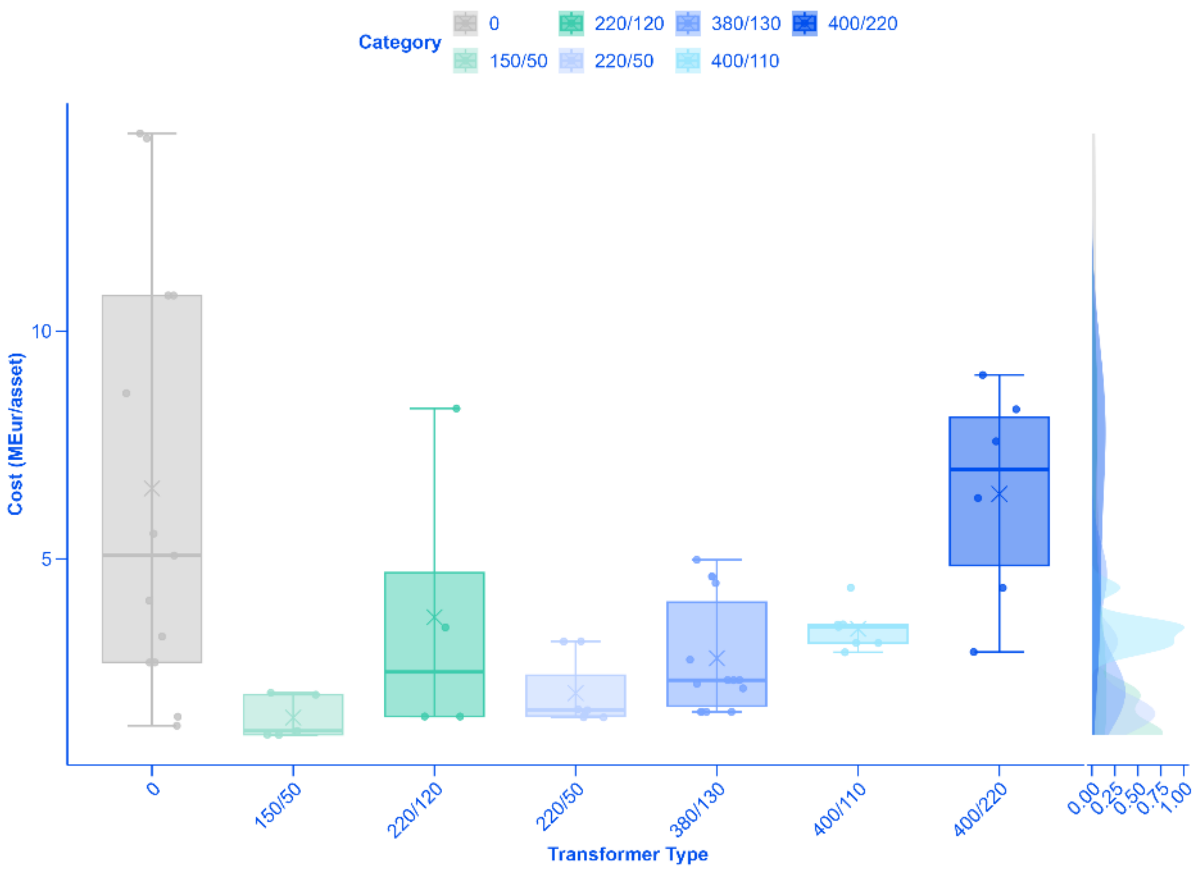
Transformers

UIC indicators for transformers

Per asset



Observations

- For statistical purposes, voltage levels of the underlying assets have been adjusted (max. 20 kV) to the closest category.
- 11 transformers could not be categorised into any of the groupings and are represented by “0”.
- A recent IEA report indicates that the price of power transformers rose by 75% since 2019 (no specific mention to voltage levels).

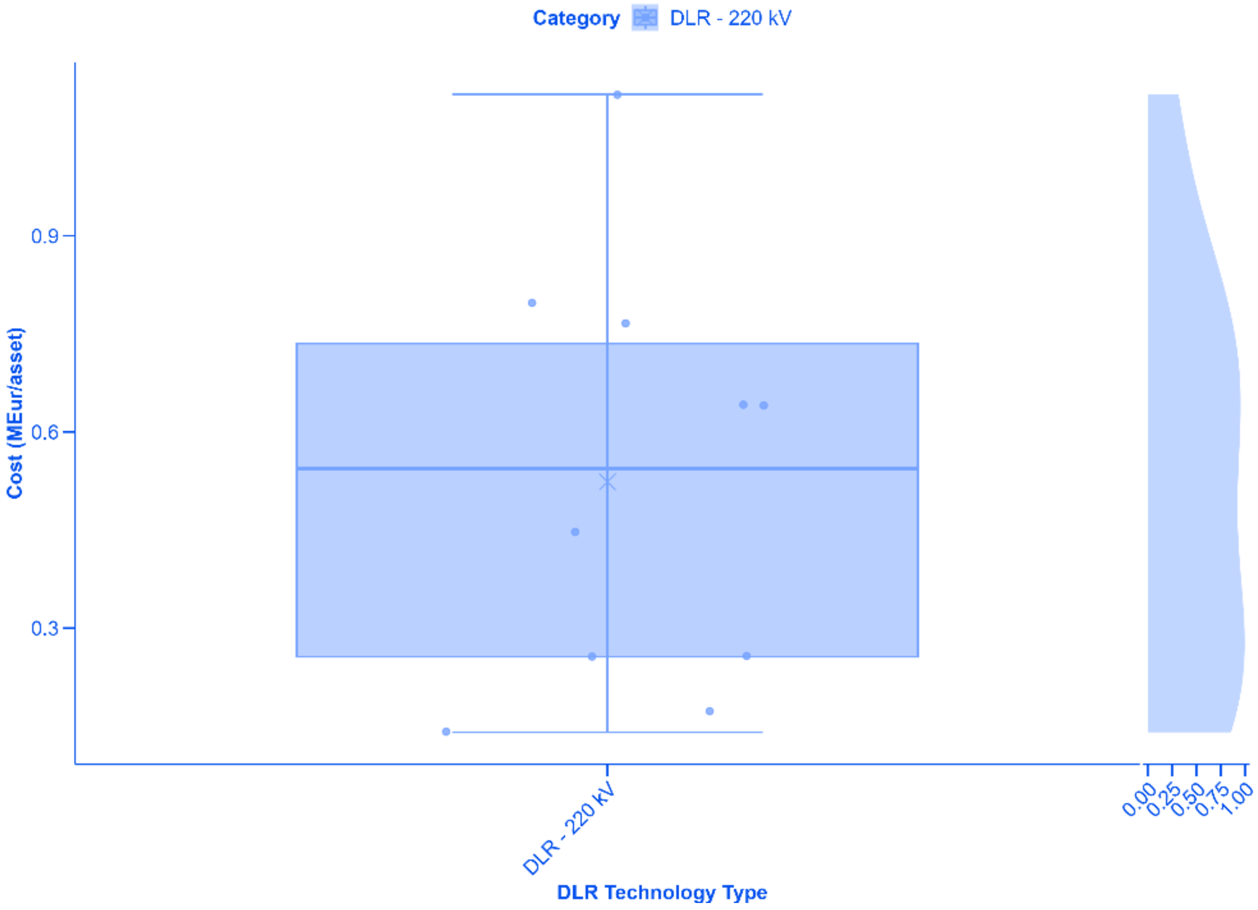
UIC indicators for transformers (Meur/asset):

Category	Assets	Avg	P25	Median	P75	Min	Max
0	13	6.55	2.73	5.08	10.78	1.34	14.34
150/50	5	1.52	1.15	1.23	2.02	1.14	2.06
220/120	4	3.72	1.54	2.52	4.70	1.54	8.30
220/50	7	2.06	1.55	1.68	2.45	1.53	3.19
380/130	14	2.82	1.77	2.34	4.05	1.65	4.98
400/110	7	3.47	3.16	3.51	3.56	2.95	4.37
400/220	6	6.43	4.86	6.96	8.11	2.96	9.04

Dynamic line rating

UIC indicators for dynamic line rating (DLR)

Per asset



Observations

- Only 1 TSO has reported DLR assets.
- All assets are atmospheric sensor + software based.
- UIC 2026 includes DLR for the first time.

UIC indicators for DLR (Meur/asset):

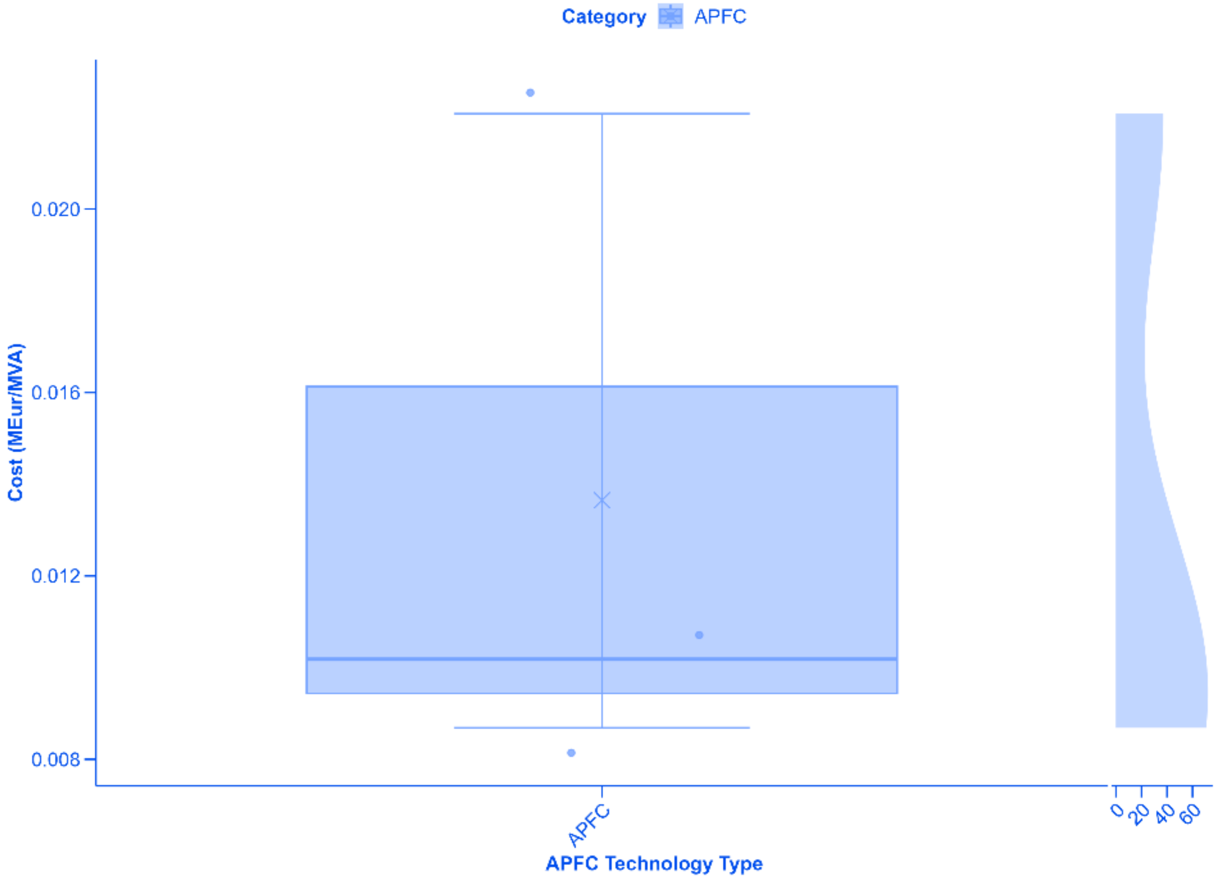
Category	Assets	Avg	P25	Median	P75	Min	Max
DLR - 220 kV	10	0.52	0.26	0.54	0.74	0.14	1.12

Note: (1) The results controlling for length covered by the asset (km) and number of sensors are provided in Annex II. (2) Data has been collected per line. Therefore, results can be interpreted as costs per line.

Advanced Power Flow Control

UIC indicators Advanced Power Flow Control (APFC)

Per MVA



Observations

- ACER collected 3 assets, all from a single country, during the data collection. This can impact the representativity of this indicator.
- Asset with higher UIC value corresponds to lower apparent power (i.e. lower UIC denominator).

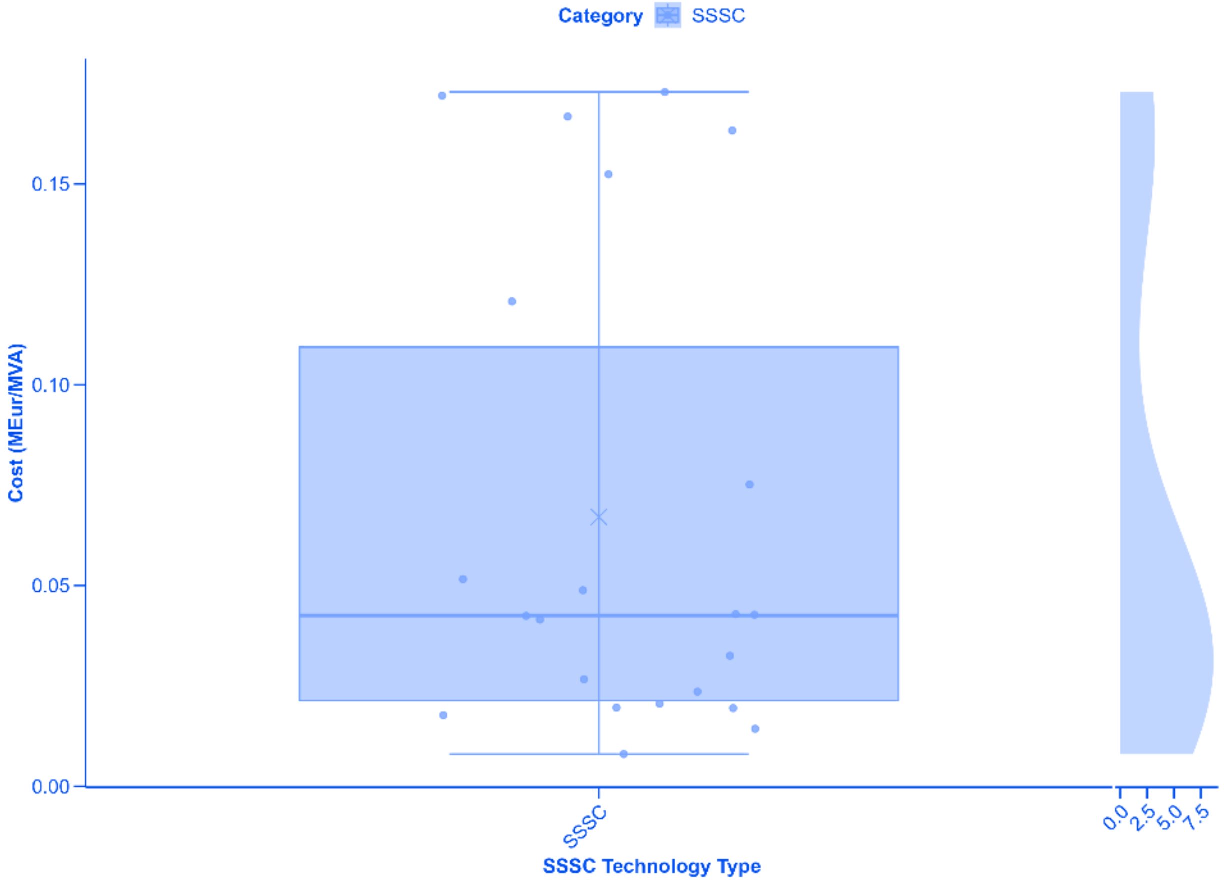
UIC indicators for transformers (Meur/MVA):

Category	Assets	Avg	P25	Median	P75	Min	Max
APFC	3	0.01	0.01	0.01	0.02	0.01	0.02

Static Synchronous Series Compensators (SSSC)

UIC indicators for Static Synchronous Series Compensators (SSSC)

Per MVA



Observations

- 2 countries reported commissioned SSSC, showing significant differences on costs between them.

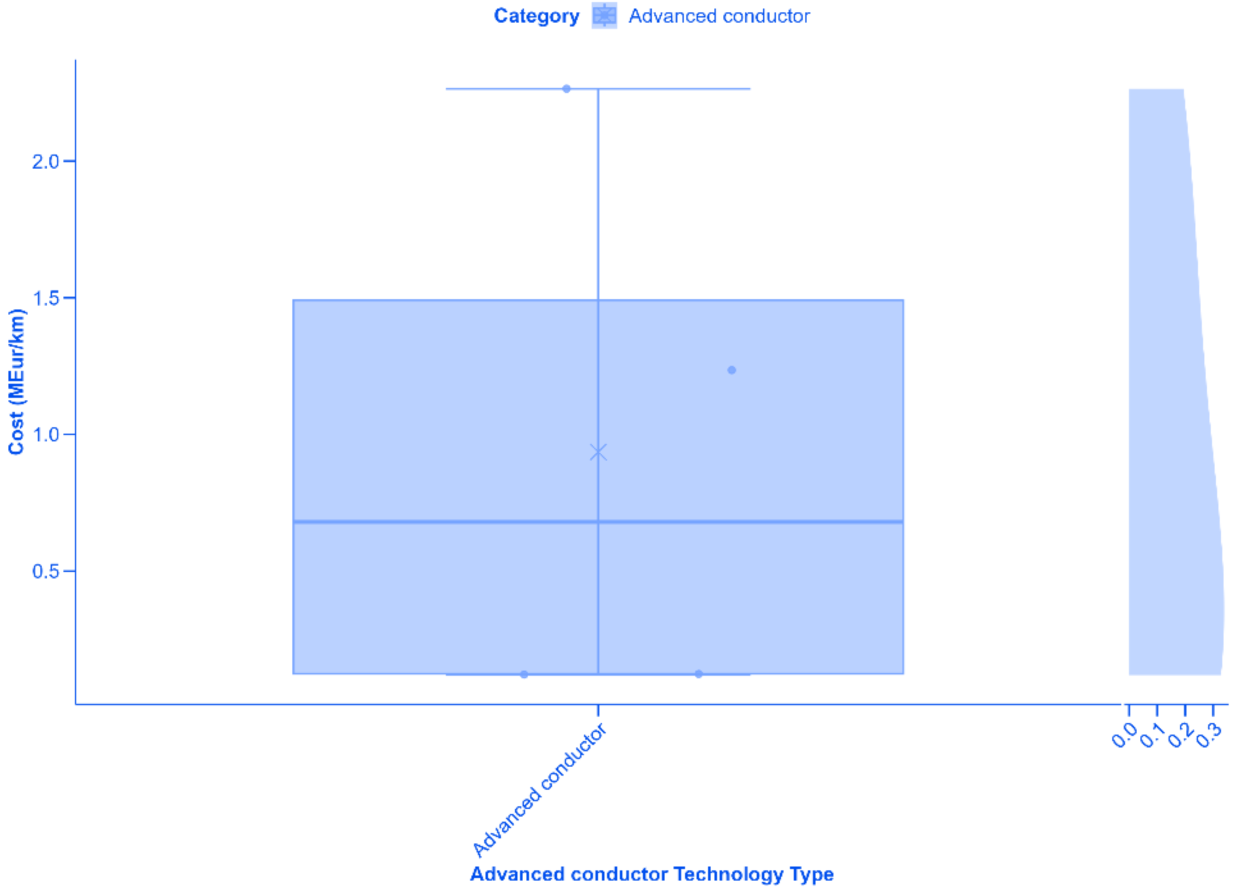
UIC indicators for transformers (Meur/MVA):

Category	Assets	Avg	P25	Median	P75	Min	Max
SSSC	22	0.07	0.02	0.04	0.11	0.01	0.17

Advanced conductor lines

UIC indicators advanced conductor lines

Per length (km)



Observations

- All projects correspond to overhead lines.
- Assets with higher UIC values correspond to significantly shorter lines (denominator magnitude) and reporting a higher average capacity increase.

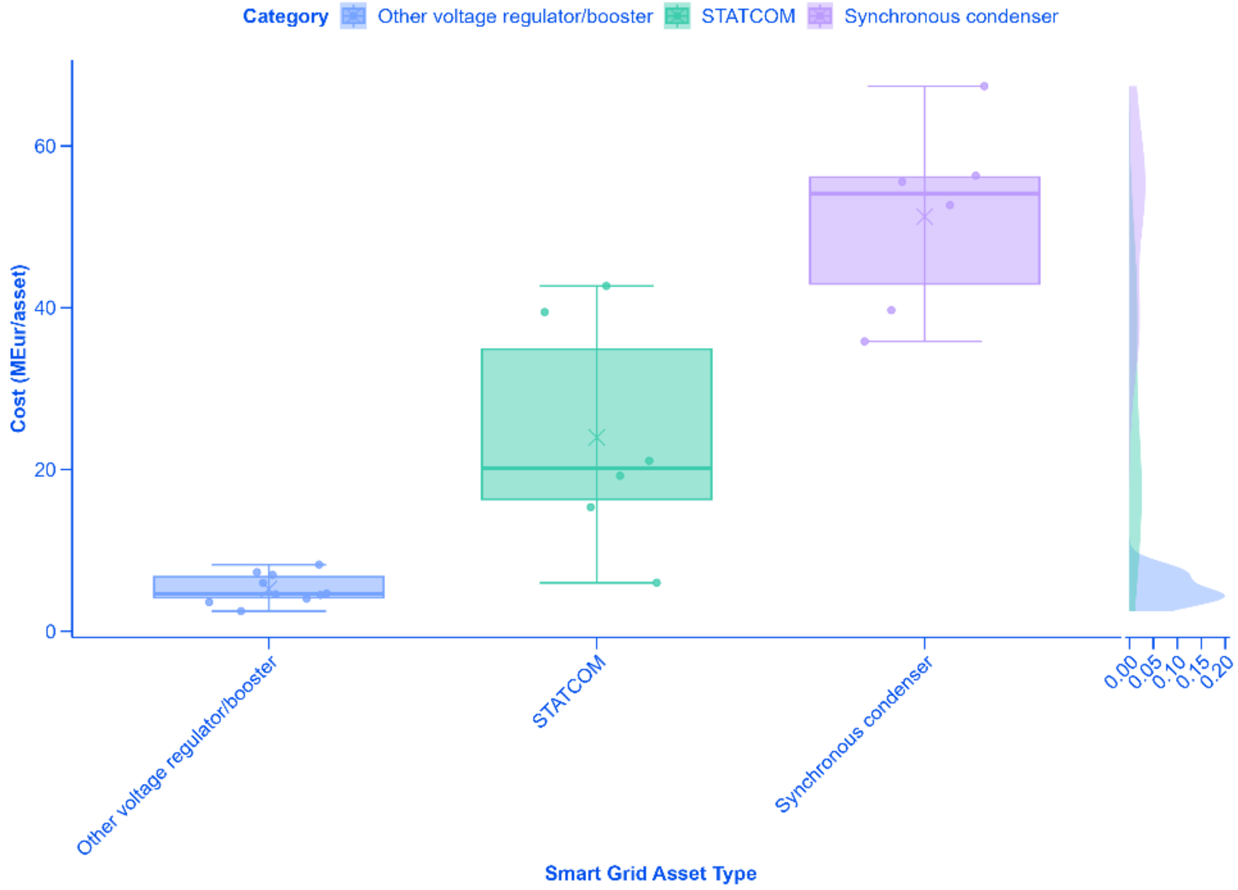
UIC indicators for transformers (Meur/km):

Category	Assets	Avg	P25	Median	P75	Min	Max
Advanced conductor	4	0.94	0.12	0.68	1.49	0.12	2.26

Other grid technologies

UIC indicators for synch. condensers, STATCOM and other regulators

Per asset



Observations

- Other smart grid and network efficiency technologies have been grouped under “other grid technologies” and measured per asset cost.
- Cost spread of STATCOM is mostly explained by the country in which the asset was commissioned. Cost spreads of other assets remain within reasonable ranges.

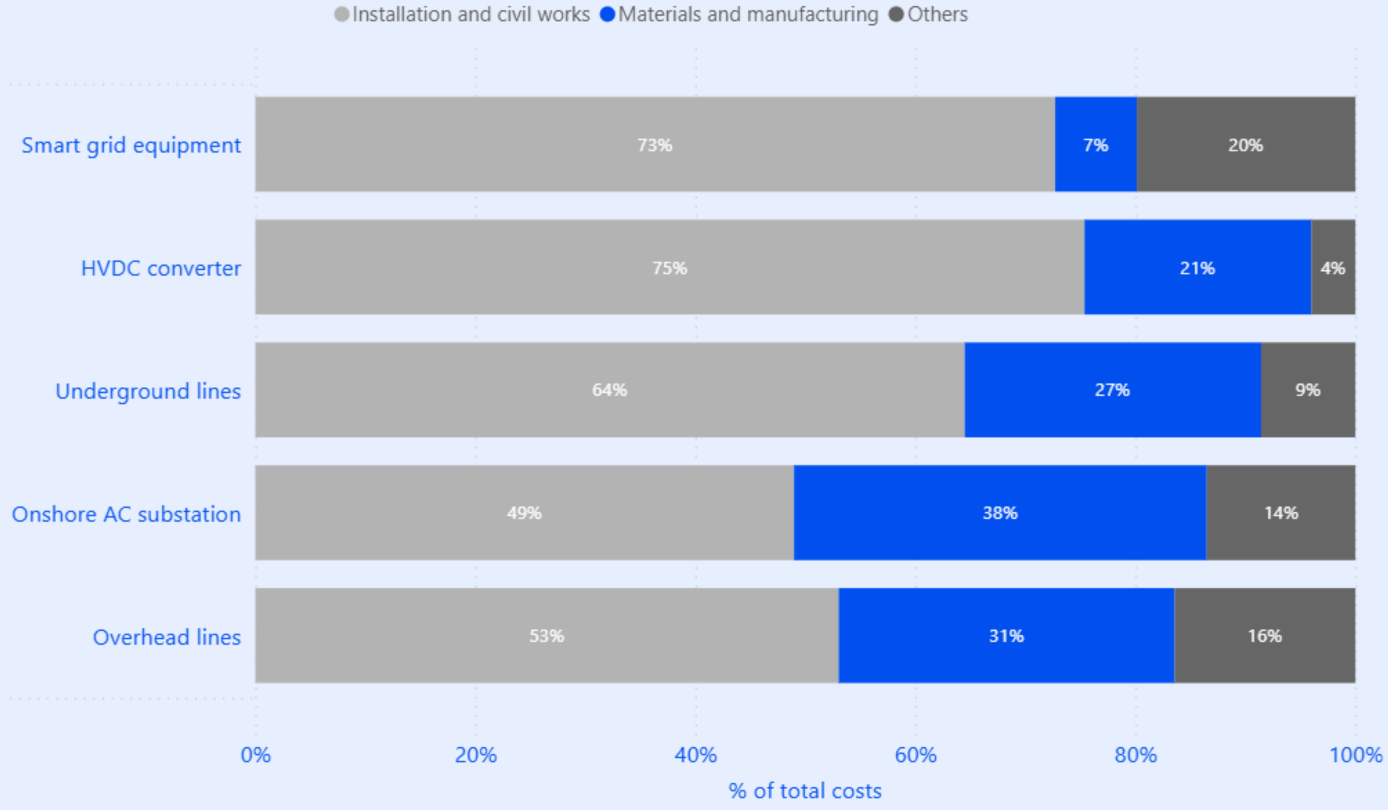
UIC indicators for transformers (Meur/asset):

Category	Assets	Avg	P25	Median	P75	Min	Max
Other voltage regulator/booster	10	5.23	4.13	4.63	6.73	2.49	8.24
STATCOM	6	23.97	16.31	20.16	34.86	6.00	42.68
Synchronous condenser	6	51.25	42.95	54.13	56.14	35.84	67.39

Spotlight: Electricity cost drivers

1 out of 3 invested euros comes from materials and manufacturing

% or total costs of submitted electricity infrastructure assets



Summary

2 main cost components:

- **Installation and civil works:** This includes labour, construction and infrastructure development.
- **Materials and manufacturing**: Production and acquisition of key components and raw materials.

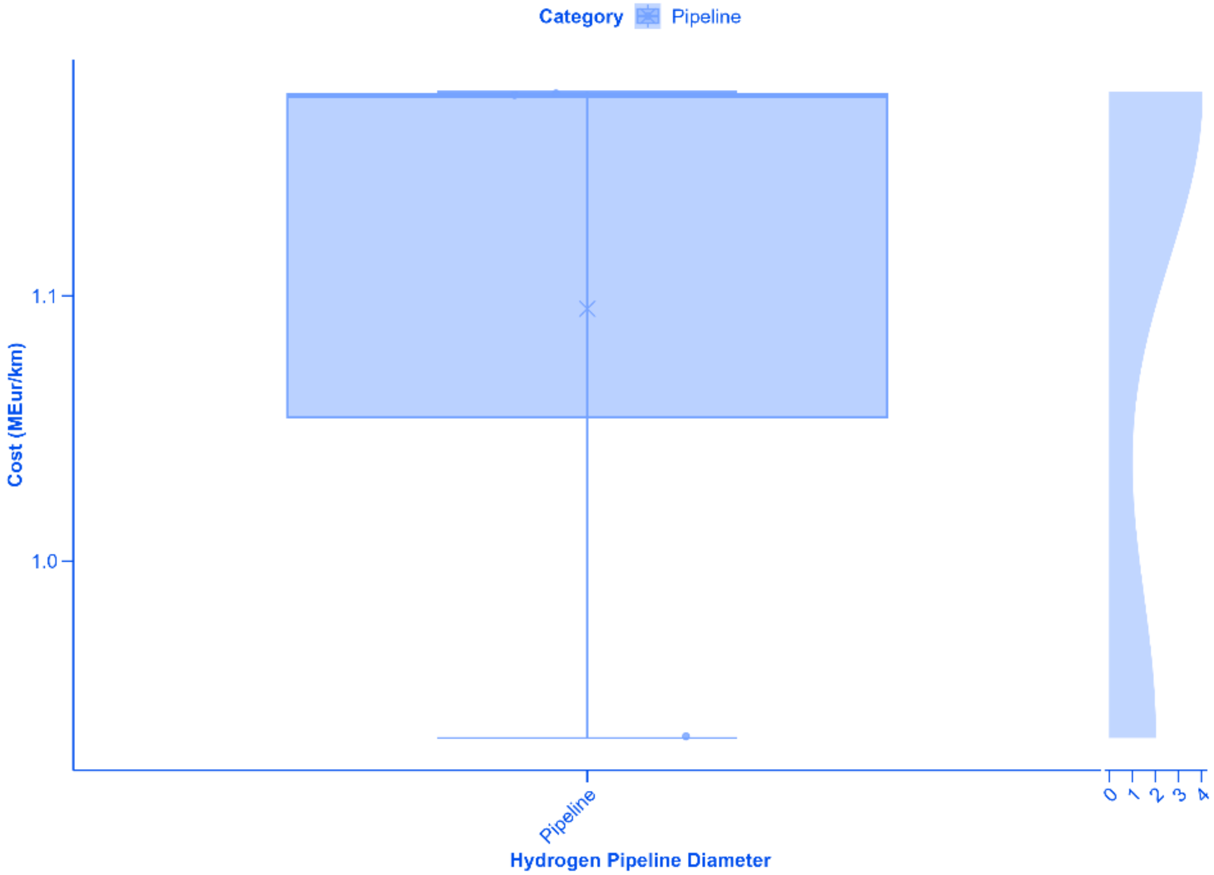
Policy implications:

- Installation and civil works are subject to larger **divergences across countries** but are expected to be relatively more stable.
- Materials and manufacturing:
  - More **volatile** and subject to rapid increases in a context of increased demand (electrification).
  - **Supply chain dependency** on:
    - Third countries.
    - Reduced number of suppliers.

Hydrogen pipelines

UIC indicators for hydrogen pipelines

Per km



Observations

- While the results indicate minimal dispersion, the limited sample and underlying sector uncertainty call for cautious interpretation of the findings.
- All considered assets correspond to repurposed hydrogen pipelines.

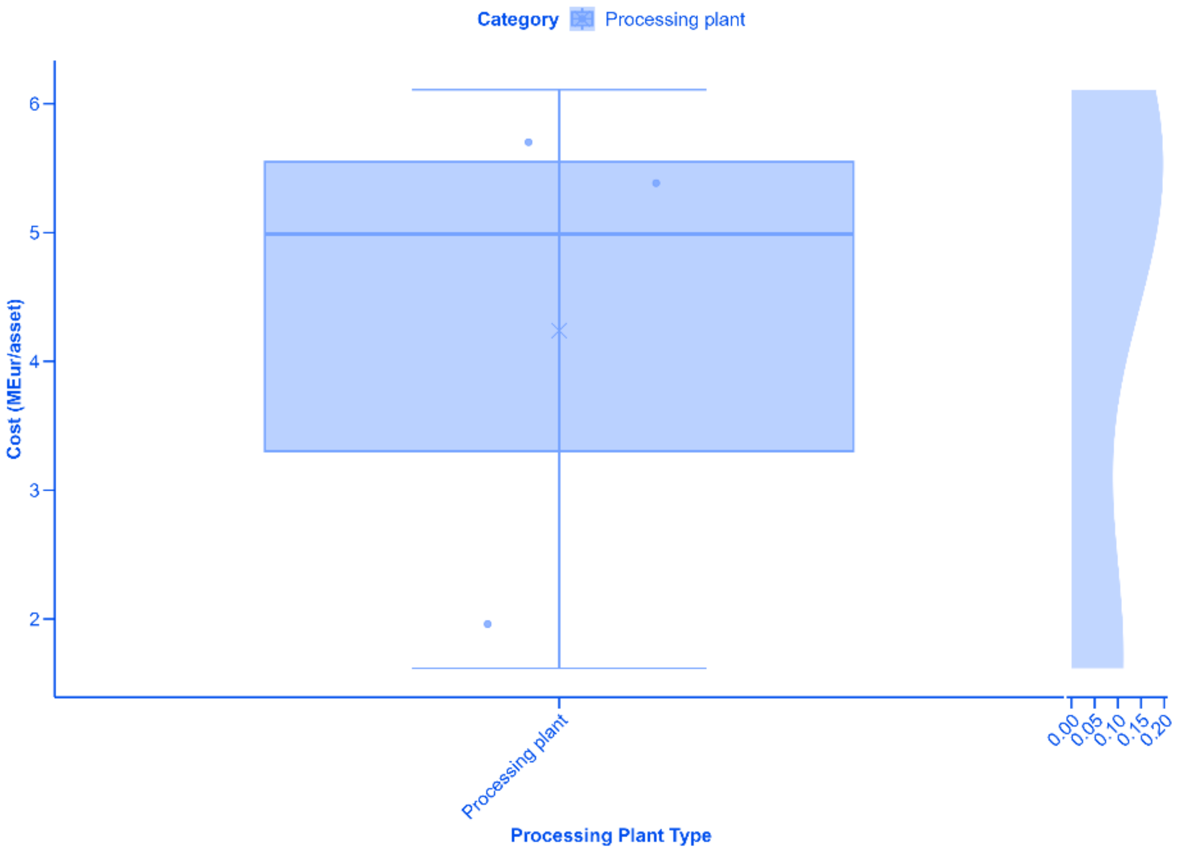
UIC indicators for H2 pipelines (Meur/km):

Category	Assets	Avg	P25	Median	P75	Min	Max
Pipeline	3	1.1	1.05	1.18	1.18	0.93	1.18

Smart gas grid processing plants

UIC indicators for smart gas grid processing plants

Per asset



Observations

- Infrastructure category included for the first time in UIC 2026.
- Limited number of assets calls for caution when interpreting the results.
- Projects correspond to biogas and hydrogen injection plants.

UIC indicators for processing plants (Meur/asset):

Category	Assets	Avg	P25	Median	P75	Min	Max
Processing plant	3	4.24	3.3	4.99	5.55	1.62	6.11

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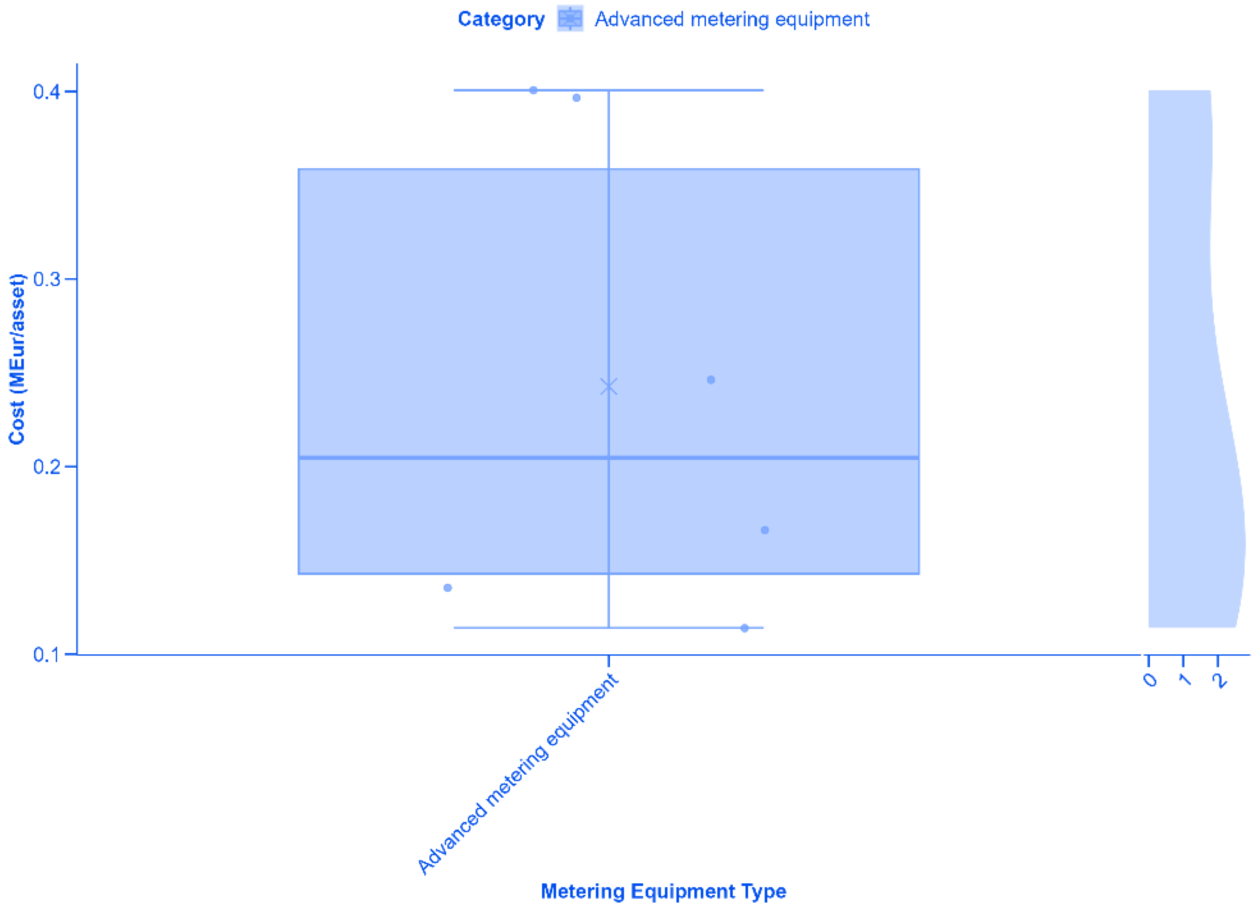
Smart gas grid metering equipment

UIC indicators for advanced metering equipment

Per asset



Observations

- Gas grid metering equipment consists of chromatographs, gas metering and control units and flow meters.
- Differences in costs respond to the complexity of the asset.

UIC indicators for metering equipment (Meur/asset):

Category	Assets	Avg	P25	Median	P75	Min	Max
Advanced metering equipment	6	0.24	0.14	0.2	0.36	0.11	0.4

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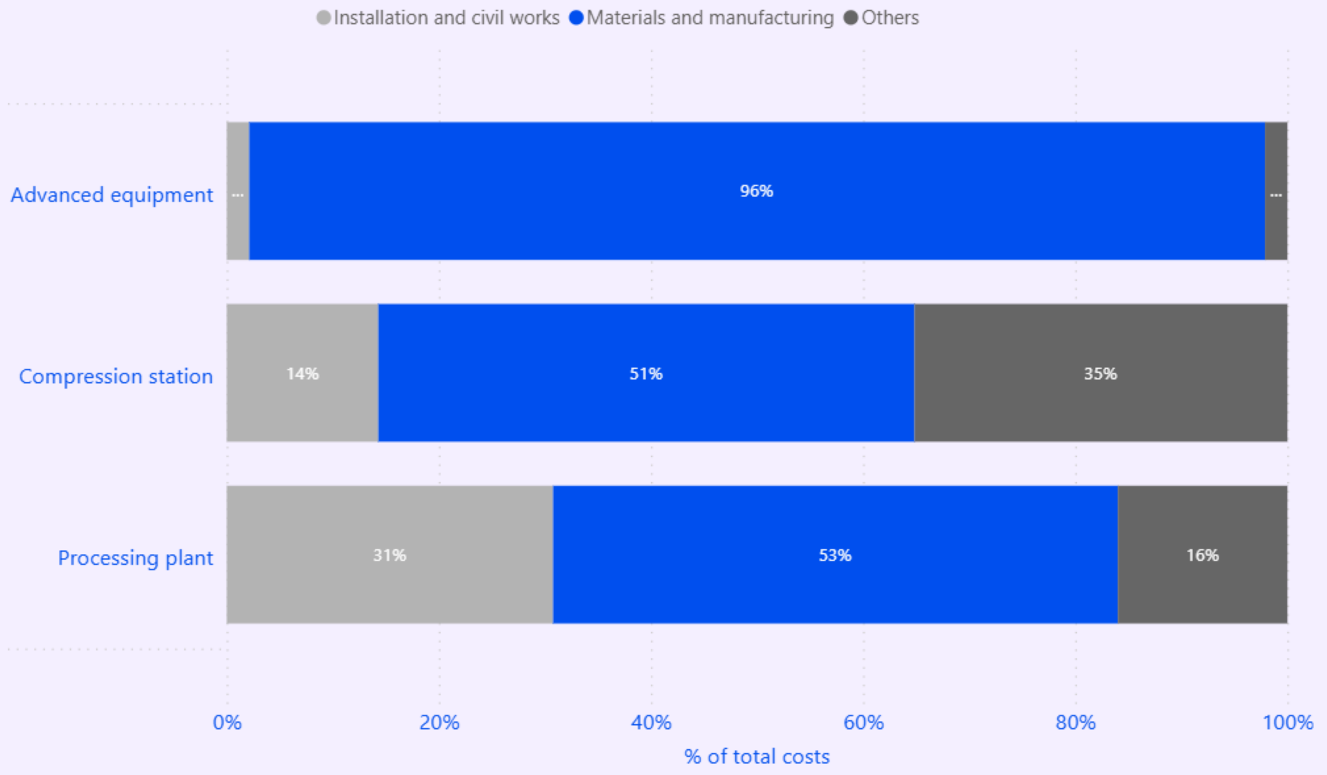
Spotlight: smart gas grid cost drivers

Electricity | Hydrogen | Smart gas grid | GBH blending | Electrolyser | CO_2

Volatile costs represent the main cost driver

% or total asset costs of submitted smart gas grid infrastructure assets



Observations

1 main cost component:

- **Materials and manufacturing** (namely referring to the production and acquisition of key components and raw materials), represent over half of costs across all categories. In the case of advanced equipment, materials and manufacturing represent more than 95% of the costs.

Policy implications:

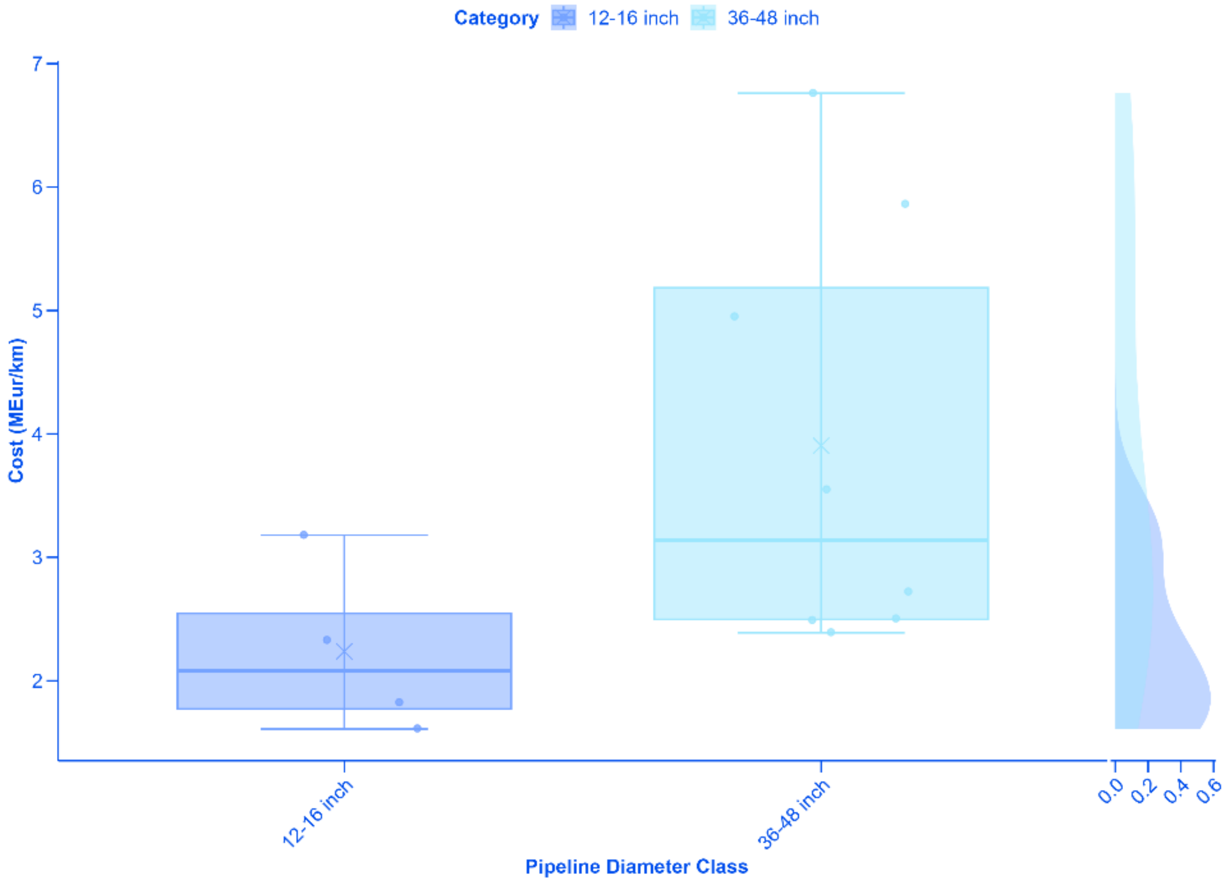
- The high share of materials and manufacturing costs implies strong exposure to global supply chain dynamics and commodity price volatility, with potential impacts on investment cost predictability and project delivery timelines.
- Such share is notably larger than for other infrastructure categories.

Note: Cost breakdowns are based on assets provided by a limited number of promoters.

GHB pipelines

UIC indicators for gas, hydrogen and biomethane[1] blending pipelines

Per length (km)



Observations

- Pipeline diameter shows to be the largest driver of costs.
- Cross-country variations may also explain part of the cost spreads.
- All 12-16 inch pipelines and 6 out of 8 36-48 inch pipelines are hydrogen ready.

UIC indicators for GBH pipelines (Meur/km):

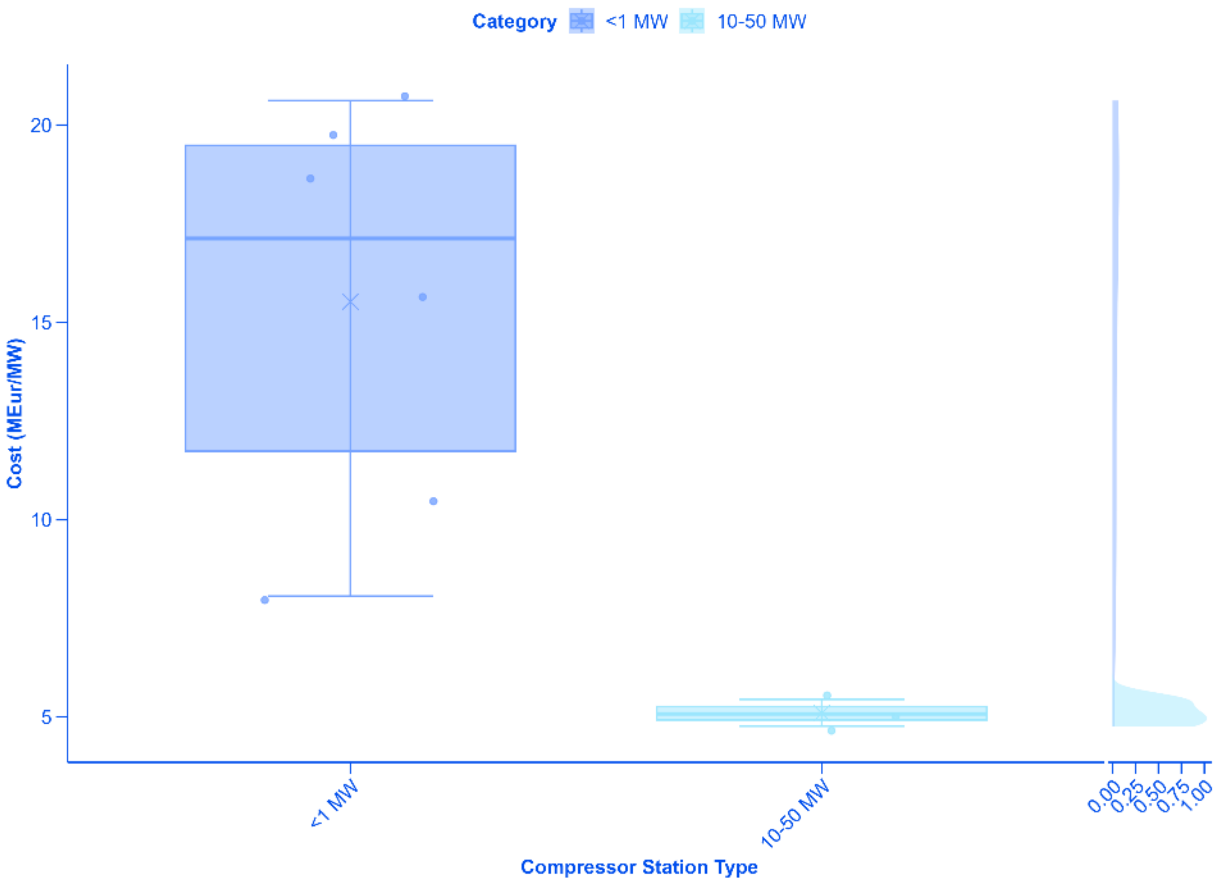
Category	Assets	Avg	P25	Median	P75	Min	Max
12-16 inch	4	2.24	1.77	2.08	2.55	1.61	3.18
36-48 inch	8	3.90	2.50	3.14	5.18	2.39	6.76

Note: Gas, hydrogen and biomethane blending infrastructure refers to natural gas assets that can be utilised for hydrogen and low-carbon gases.

GHB Compression station

UIC indicators for GHB blending[2] compression stations

Per installed power (MW)



Observations

- Based on analysed data, throughput capacity (ncm/h) explains part of the spread of compression stations under 1 MW.

UIC indicators for GBH compression stations (Meur/MW):

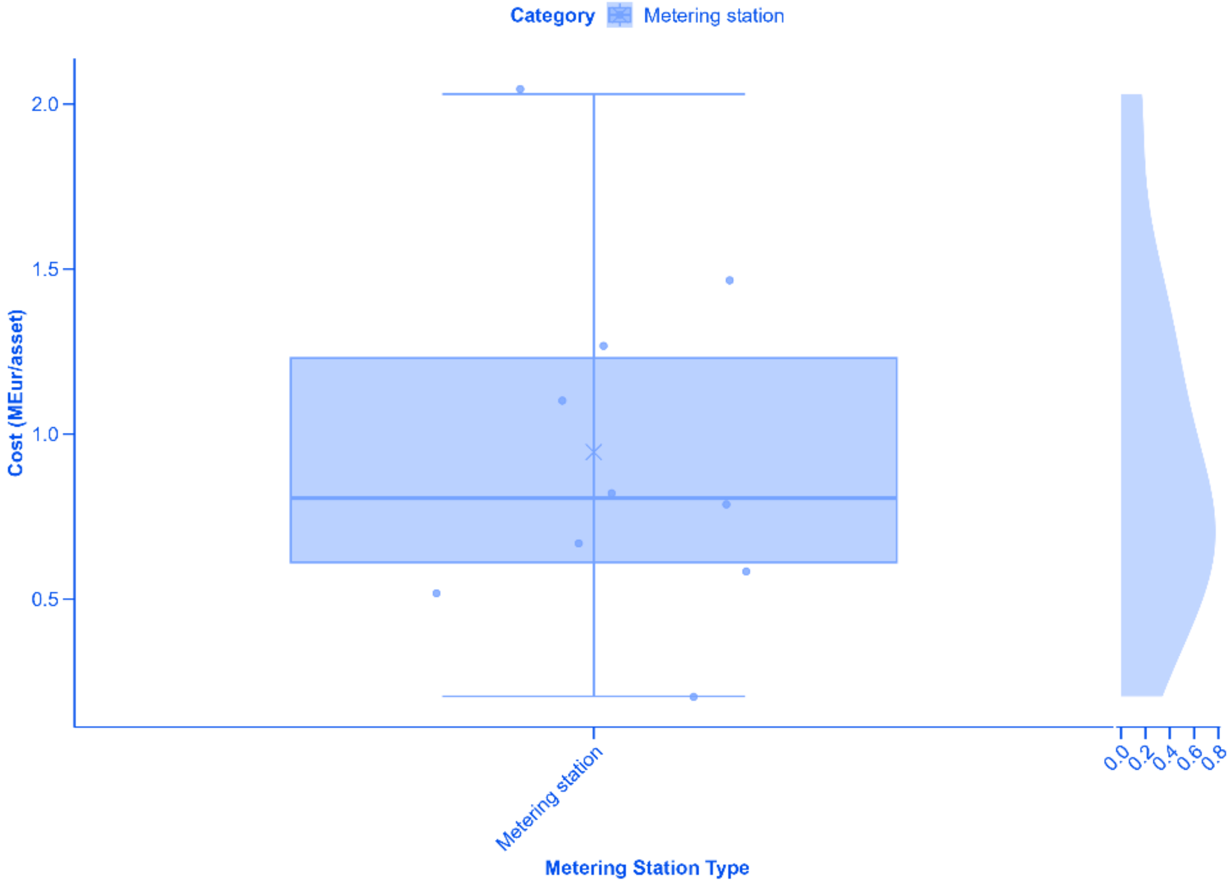
Category	Assets	Avg	P25	Median	P75	Min	Max
10-50 MW	3	5.10	4.92	5.08	5.26	4.77	5.45
<1 MW	6	15.52	11.74	17.13	19.48	8.06	20.62

Note: (1) Assets under "<1 MW" correspond to assets submitted under smart gas grid category. (2) Gas, hydrogen and biomethane blending infrastructure refers to natural gas assets that can be utilised for hydrogen and low-carbon gases.

GHB metering equipment

UIC indicators for GHB blending[2] metering equipment

Per asset



Observations

- Costs of clean gas blending metering equipment are notably higher (x4) on average than those of natural gas (reported under "smart gas grid" category) yet showing a significant spread.

UIC indicators for GBH pipelines (Meur/asset):

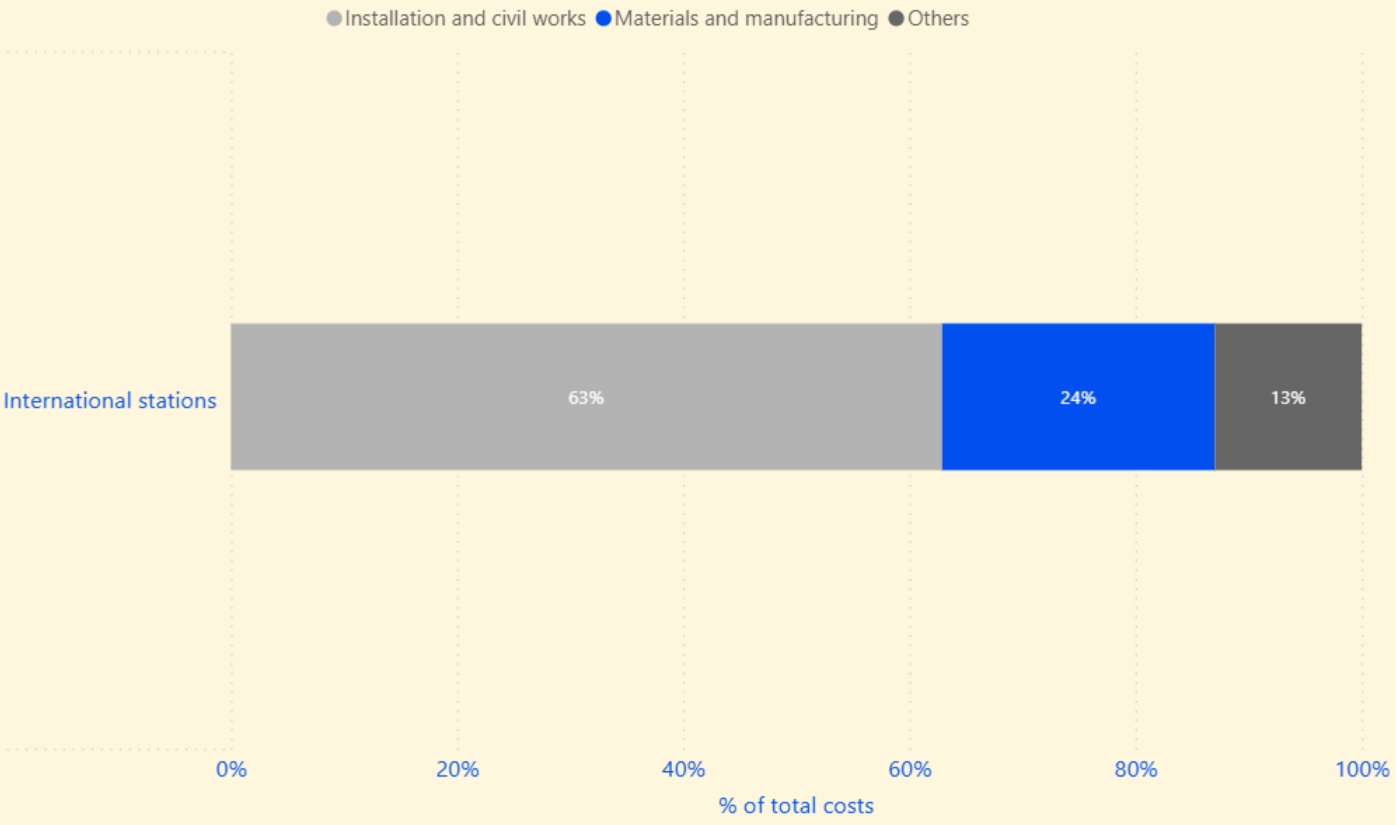
Category	Assets	Avg	P25	Median	P75	Min	Max
Metering station	10	0.95	0.61	0.81	1.23	0.21	2.03

Note: Gas, hydrogen and biomethane blending infrastructure refers to natural gas assets that can be utilised for hydrogen and low-carbon gases.

Spotlight: GHB blending cost drivers

Installation and civil works **remain the largest cost driver**

% or total asset costs of submitted GHB blending infrastructure assets



Observations

2 main cost components:

- **Installation and civil works** (including labour, construction and infrastructure development) are significantly above half of total costs for pipelines in this category.
- Despite representing a lower share than for other infrastructure categories, **materials and manufacturing** remains a significant cost driver.

Policy implications:

- Dependency on national contexts and their regulatory frameworks, but less subject to volatile markets or geopolitical context.

Note: (1) Gas, hydrogen and biomethane blending infrastructure refers to natural gas assets that can be utilised for hydrogen and low-carbon gases. (2) Breakdown of cost components was not provided for other GHB subcategories.

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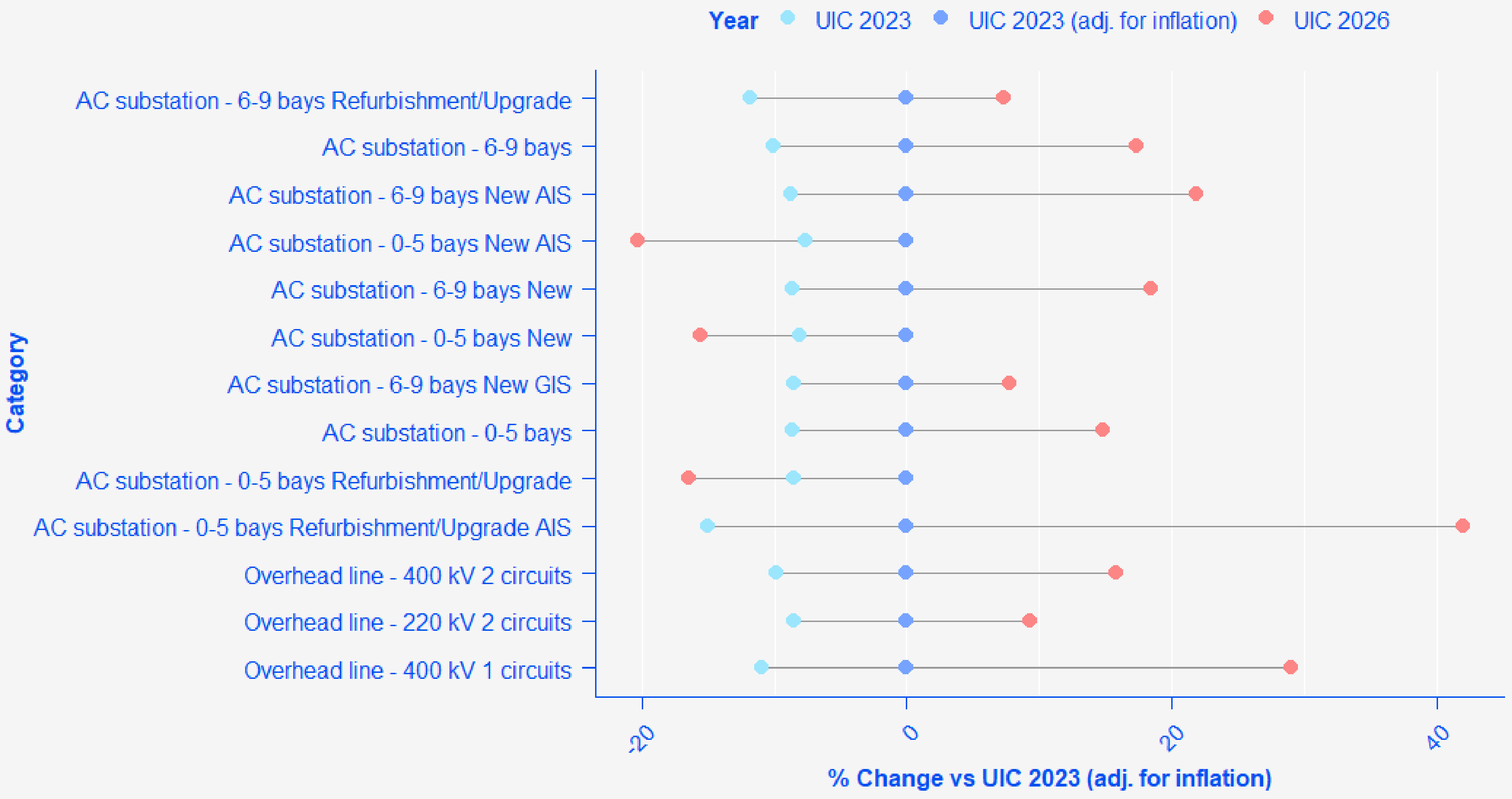
Spotlight: Cost variation with respect to UIC 2023

Electricity | Hydrogen | Smart gas grid | GBH blending | Electrolyser | CO_2

UIC 2026 shows rising values, with many categories increasing notably faster than inflation

% change of average values of UIC 2026 and inflation-adjusted UIC 2023 with respect to last edition



Observations

The analysis the describes the increase of average costs with respect to the latest edition (UIC 2023).

To ensure data representativeness, only categories with 16 or more assets in both editions are included.

UIC 2026 results show an overall increase in infrastructure costs well above **inflation.**

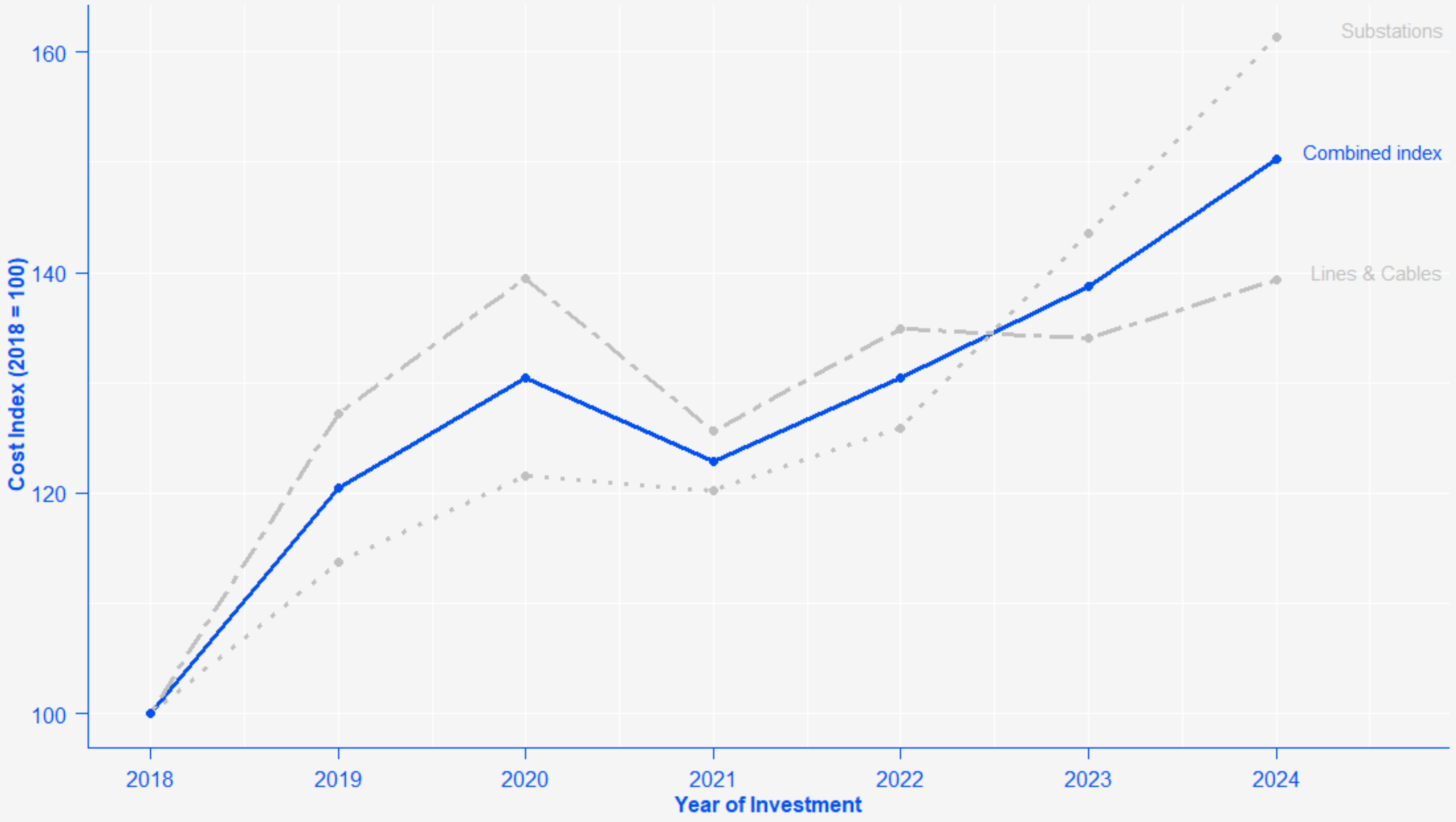
Limitations: The analysis does not account for differences of the submitted assets beyond its categorisation.

Note: Since inflation adjustments are computed at the country level, the resulting values may differ across categories.

Spotlight: Increases in energy infrastructure costs

Collected data shows signs of infrastructure cost increases well above inflation

Energy infrastructure cost index (2018=100) based on submitted data for UIC



Observations

The analysis provides signs of an overall increase in costs above inflation levels accounting for asset-specific heterogeneity.

Energy infrastructure costs increase **exceeds 6% above inflation on a yearly basis** since 2018.

Such results are consistent with previous publications flagging recent cost trends (see e.g. IEA's *Building the Future Transmission Grid* report, page 26).

An accurate estimation of such coefficients, could enable the implementation of a mechanism to correct for time effects beyond inflation. This would enhance UIC indicators by accounting for recent cost trends.

Limitations: The results are subject to a significant margin of error and should therefore be viewed as indicative. The short data period and the long commissioning periods of some projects limit the capacity to extract year-specific effects. Moreover, specified models might not fully capture non-modelled project-specific characteristics. This implies that results should be interpreted as a trend rather than as a fully accurate yearly index. Looking at contract- or tender-level data would enable a more precise analysis.

Note: (1) Methodological notes in Annex IV. (2) The cost index is calculated using real costs (i.e. the values represent increases above inflation). (3) The limited number of assets collected for non-electricity categories prevented their inclusion in the analysis.

4. Way forward

From insights to actionable knowledge

This section concludes the analysis by outlining its key contributions and identifying areas for improvement.

From insights to actionable knowledge: Way forward

UIC indicators are a first step to increased transparency on costs

With respect to UIC 2023, over 400 additional assets were considered in the analysis, allowing for greater granularity and robustness.

Rising costs require careful oversight

In this edition, the analysis has been extended to further look into cost drivers and evolution.

A significant part of energy infrastructure costs remains subject to volatility and third-country dependence. This is further reflected by a well-above-average increase in overall costs.

In such context, regulatory oversight, stronger cooperation on supply chains and better use of existing infrastructure can alleviate bottlenecks.

Further work is needed towards a clearer picture of infrastructure costs

There is limited knowledge on the expected costs and their evolution in the last years. Network planning would benefit from further transparent analysis.

Looking at the data from different angles and using alternative methodologies would likely reveal additional insights. Moreover, this analysis looks only at historical costs, limiting timely action and direct use of the indicators.

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Annex I: Summary of UIC indicators

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Annex I: Summary of indicators – Electricity (1/3)

Table I.1: UIC Indicator results for electricity infrastructure categories

	Category	Subcategory	Unit	Assets	Avg	P25	Median	P75	Min	Max
Electricity	Overhead lines	110-150 kV 1 circuits	Meur/km	6	0.67	0.57	0.69	0.91	0.13	0.98
		110-150 kV 2 circuits	Meur/km	8	0.36	0.3	0.31	0.39	0.21	0.58
		220 kV 1 circuits	Meur/km	15	0.41	0.32	0.4	0.51	0.04	0.73
		220 kV 2 circuits	Meur/km	25	0.58	0.44	0.53	0.74	0.13	1.09
		330 kV 1 circuits	Meur/km	3	0.33	0.32	0.33	0.34	0.31	0.36
		330 kV 2 circuits	Meur/km	5	0.66	0.59	0.61	0.65	0.58	0.87
		400 kV 1 circuits	Meur/km	23	0.6	0.33	0.52	0.72	0.04	1.43
		400 kV 2 circuits	Meur/km	59	1.46	0.58	1.18	2.01	0.32	4.87
	Underground lines	110-150 kV 1 circuits	Meur/km	20	1.15	0.56	0.68	1.59	0.36	3.63
		110-150 kV 2 circuits	Meur/km	7	2.54	1.33	1.87	3.58	0.54	5.56
		220 kV 1 circuits	Meur/km	20	1.91	1.03	2.08	2.4	0.53	3.42
		220 kV 2 circuits	Meur/km	9	3.67	2.99	3.28	4.69	1.95	5.24
		330 kV 1 circuits	Meur/km	4	2.43	1.2	1.77	3	1.17	5.01
	Offshore cables	Offshore cable	Meur/km	18	3.79	2.98	3.67	4.61	1.31	6.86
	Submarine cables	AC	Meur/km	11	2.05	1.49	2.3	2.67	0.5	3.44
		DC	Meur/km	8	1.31	1.01	1.38	1.56	0.82	1.76
	HVDC converter	HVDC Converter	Meur/MW	10	0.21	0.16	0.21	0.24	0.13	0.27

*ACER has computed additional indicators to adjust the granularity of the data. These are available in Annex II.

Annex I: Summary of indicators – Electricity (2/3)

Table I.2: UIC Indicator results for electricity infrastructure categories

	Category	Subcategory	Unit	Assets	Avg	P25	Median	P75	Min	Max
Electricity	AC substations	0-5 bays	Meur/asset	116	6.09	2.59	4.6	7.53	0.47	20.46
		0-5 bays New	Meur/asset	52	8.96	3.92	6.06	11.33	0.88	31.97
		0-5 bays New AIS	Meur/asset	33	9.33	3.99	7.07	14.33	0.88	28.78
		0-5 bays New GIS	Meur/asset	13	10.98	5.48	7.72	15.11	2.91	31.97
		0-5 bays Refurbishment/Upgrade	Meur/asset	72	4.32	2.23	3	5.32	0.47	14.02
		0-5 bays Refurbishment/Upgrade AIS	Meur/asset	49	4.83	2.33	3.86	6.64	0.65	15.93
		0-5 bays Refurbishment/Upgrade GIS	Meur/asset	16	4.66	2.27	3.39	5.65	0.47	13.68
		6-9 bays	Meur/asset	83	14.77	9.15	11.27	18.42	5.39	41.27
		6-9 bays New	Meur/asset	66	13.72	9.19	11.28	15.99	5.71	33.13
		6-9 bays New AIS	Meur/asset	38	14.79	9.26	11.34	18.55	5.71	38.06
		6-9 bays New GIS	Meur/asset	24	10.58	8.54	10.33	12.6	5.8	15.95
		6-9 bays Refurbishment/Upgrade	Meur/asset	18	20.21	8.83	13.06	28.16	5.39	50.48
		6-9 bays Refurbishment/Upgrade AIS	Meur/asset	12	17.85	9.77	13.06	25.32	5.39	35.08
		6-9 bays Refurbishment/Upgrade GIS	Meur/asset	6	24.95	7.39	18.98	43.85	5.6	50.48
		10-60 bays	Meur/asset	66	32.57	19.78	27.03	42.22	6.12	91.94
		10-60 bays AIS	Meur/asset	3	51.66	17.11	18.23	69.5	15.98	120.77
		10-60 bays New	Meur/asset	37	45.33	25.34	35.38	65.14	12.66	115
		10-60 bays New AIS	Meur/asset	21	35.27	25.34	33.32	43.18	12.66	76.98
		10-60 bays New GIS	Meur/asset	12	50.49	24.3	38.95	70.07	19.62	115
		10-60 bays Refurbishment/Upgrade	Meur/asset	30	21.85	14.19	22.88	28.34	6.12	41.31
		10-60 bays Refurbishment/Upgrade AIS	Meur/asset	19	23.94	11.98	23.29	29.97	6.12	51.92
		10-60 bays Refurbishment/Upgrade GIS	Meur/asset	3	14.23	10.95	11.23	16.01	10.67	20.8
	Offshore AC substations	Offshore AC substation	Meur/asset	11	157.57	129.07	168.19	177.66	89.97	220.2

*ACER has computed additional indicators to adjust the granularity of the data. These are available in Annex II.

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Annex I: Summary of indicators – Electricity (3/3)

Table I.3: UIC Indicator results for electricity infrastructure categories

	Category	Subcategory	Unit	Assets	Avg	P25	Median	P75	Min	Max
Electricity	Transformers	0	Meur/asset	13	6.55	2.73	5.08	10.78	1.34	14.34
		150/50	Meur/asset	5	1.52	1.15	1.23	2.02	1.14	2.06
		220/120	Meur/asset	4	3.72	1.54	2.52	4.7	1.54	8.3
		220/50	Meur/asset	7	2.06	1.55	1.68	2.45	1.53	3.19
		380/130	Meur/asset	14	2.82	1.77	2.34	4.05	1.65	4.98
		400/110	Meur/asset	7	3.47	3.16	3.51	3.56	2.95	4.37
		400/220	Meur/asset	6	6.43	4.86	6.96	8.11	2.96	9.04
	Smart grid and network efficiency	DLR - 220 kV	Meur/asset	10	0.54	0.26	0.56	0.76	0.14	1.15
		APFC	Meur/MVA	3	0.01	0.01	0.01	0.02	0.01	0.02
		SSSC	Meur/MVA	22	0.07	0.02	0.04	0.11	0.01	0.17
		Advanced conductor	Meur/km	4	0.94	0.12	0.68	1.49	0.12	2.26
		Other voltage regulator/booster	Meur/asset	10	5.23	4.13	4.63	6.73	2.49	8.24
		STATCOM	Meur/asset	6	23.97	16.31	20.16	34.86	6	42.68
		Synchronous condenser	Meur/asset	6	51.25	42.95	54.13	56.14	35.84	67.39

*ACER has computed additional indicators to adjust the granularity of the data. These are available in Annex II.

Annex I: Summary of indicators – H2, SGG & GBH

Table I.4: UIC Indicator results for energy infrastructure categories

	Category	Subcategory	Unit	Assets	Avg	P25	Median	P75	Min	Max
Hydrogen	Pipelines	Pipeline	Meur/km	3	1.1	1.05	1.18	1.18	0.93	1.18
Smart gas grid	Processing plant	Processing plant	Meur/MW	3	4.24	3.3	4.99	5.55	1.62	6.11
	Advanced equipment	Advanced metering equipment	Meur/asset	6	0.24	0.14	0.2	0.36	0.11	0.4
GBH blending	Pipelines	12-16 inch	Meur/km	4	2.24	1.77	2.08	2.55	1.61	3.18
		36-48 inch	Meur/km	8	3.9	2.5	3.14	5.18	2.39	6.76
	Compression station	<1 MW	Meur/MW	6	15.52	11.74	17.13	19.48	8.06	20.62
		10-50 MW	Meur/MW	3	5.1	4.92	5.08	5.26	4.77	5.45
	Metering station	Metering station	Meur/asset	10	0.95	0.61	0.81	1.23	0.21	2.03

*ACER has computed additional indicators to adjust the granularity of the data. These are available in Annex II.

Annex II: Additional indicators

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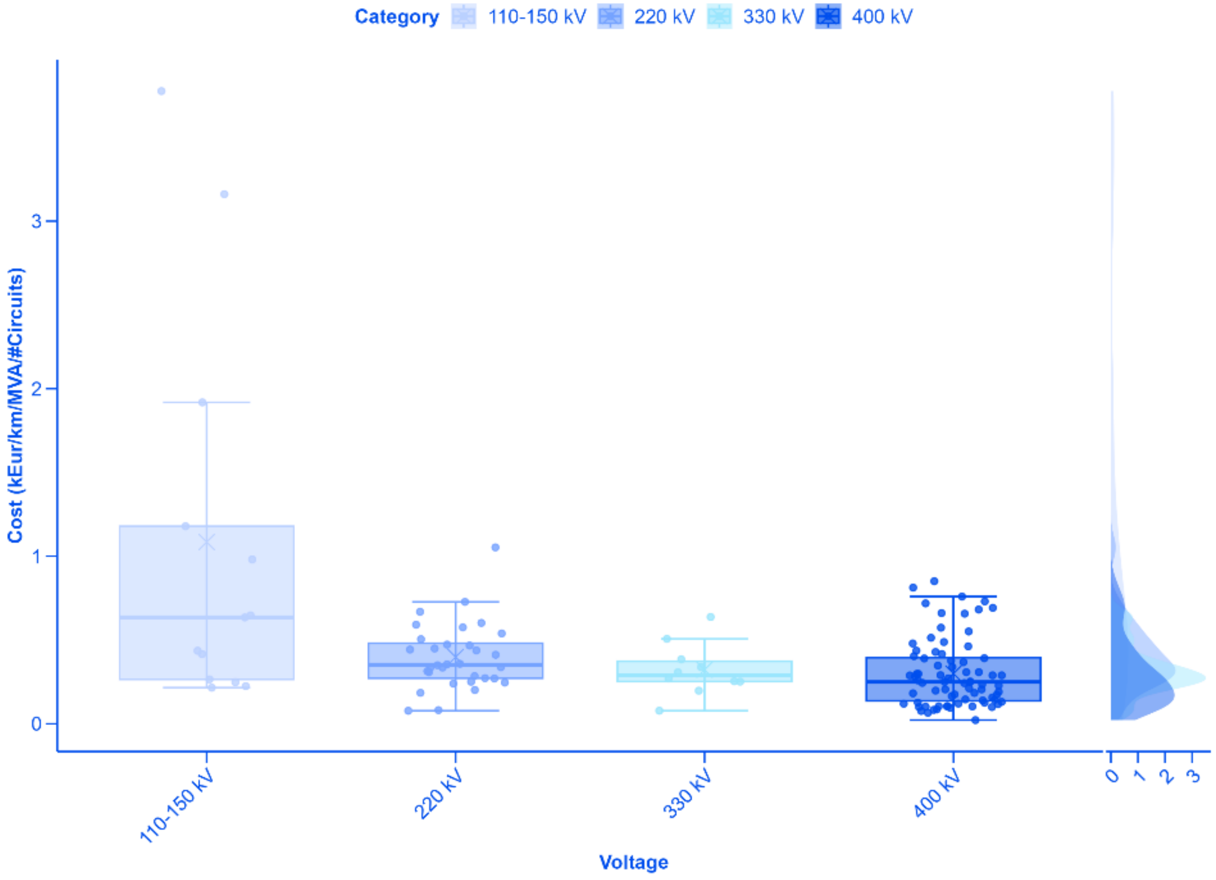
Annex II: Additional indicators – Overhead lines

Additional UIC indicators for overhead lines (OHL)

Thousand Euro per km, per MVA and per circuit



Observations

- Controlling for differences in apparent power and number of circuits smooths the distributions across all voltage levels.
- Outliers in 110-150 kV correspond to lines under 10 km.
- These numbers allow for comparability with other studies (see e.g. cost assumptions in TYNDP or in national NDPs).
- Cost spreads at higher voltages observed in Section 3 disappear.

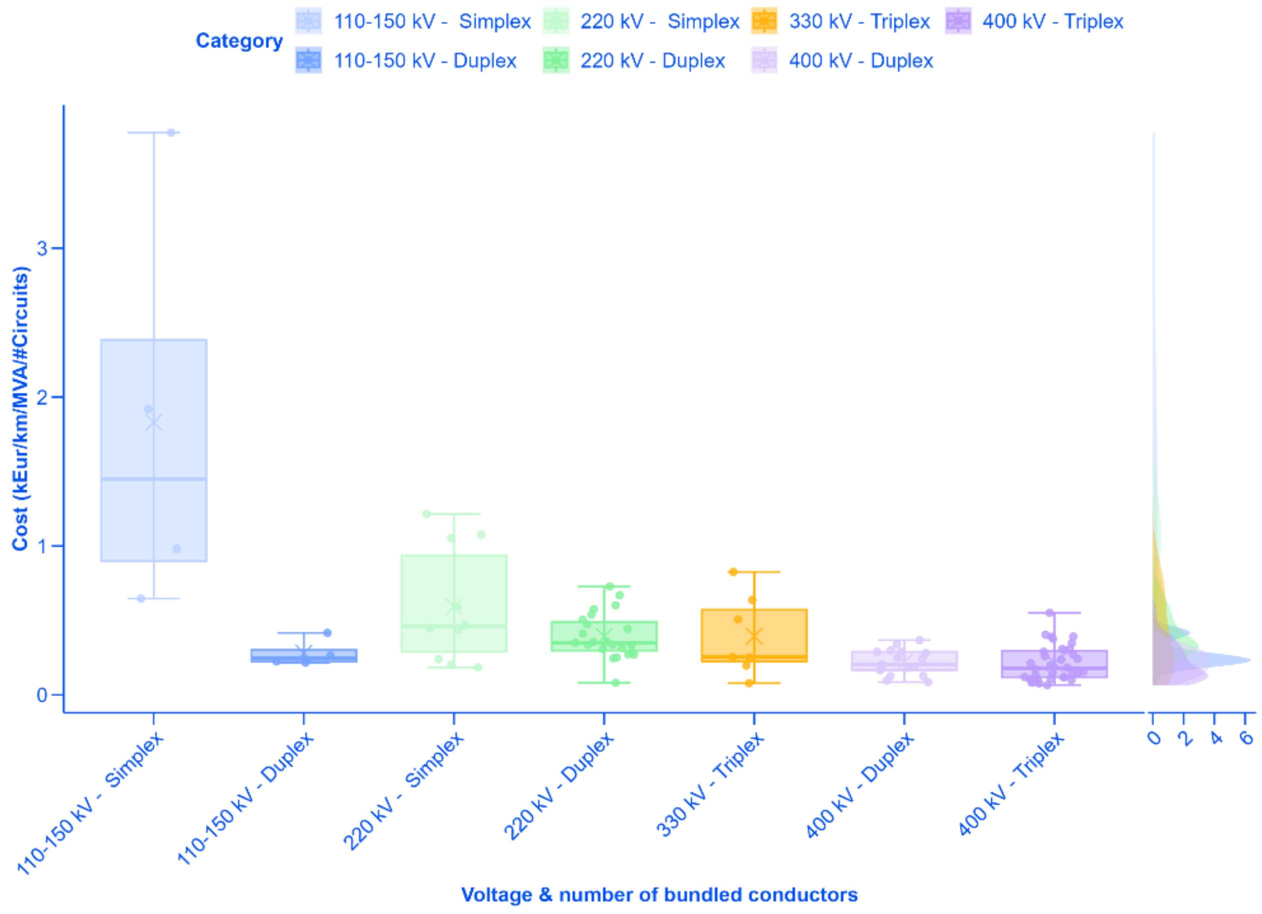
UIC indicators for overhead lines (Meur/km/MVA/circuit):

Category	Assets	Avg	P25	Median	P75	Min	Max
110-150 kV	13	1.08	0.26	0.63	1.18	0.22	3.78
220 kV	32	0.40	0.27	0.35	0.48	0.08	1.05
330 kV	10	0.32	0.25	0.29	0.37	0.08	0.64
400 kV	76	0.30	0.14	0.25	0.39	0.02	0.85

Annex II: Additional indicators – Overhead lines

Additional UIC indicators for overhead lines (OHL)

Thousand Euro per km, per MVA and per circuit



Observations

- Increasing spreads at higher voltage levels are mostly explained by apparent power.
- The number of bundled conductors plays an important role in determining the cost of overhead lines.
- 110-150 kV: Simplex indicators are mostly driven by shorter lines, explaining the disparity with the duplex category for the same voltage level.

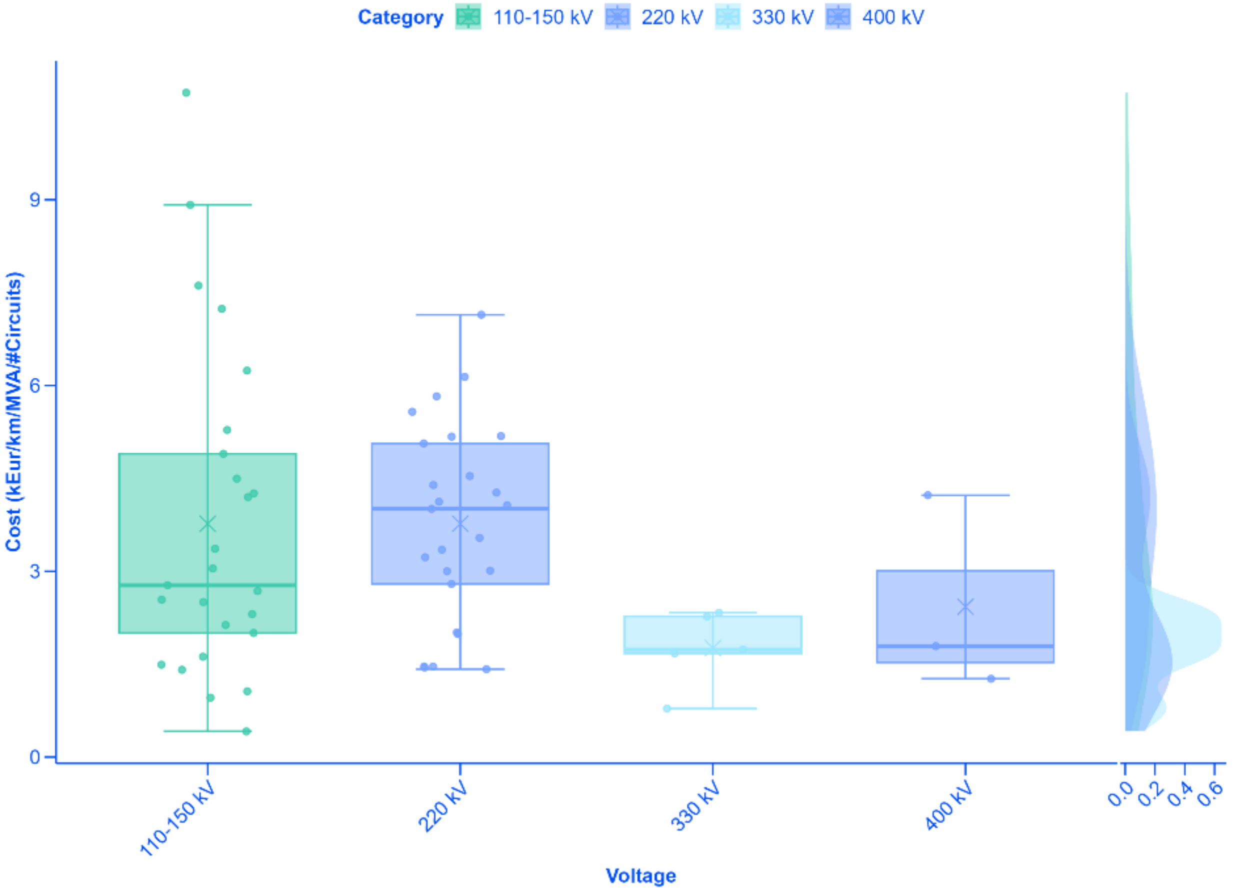
UIC indicators for overhead lines (Meur/km/MVA/circuit):

Category	Assets	Avg	P25	Median	P75	Min	Max
110-150 kV - Simplex	4	1.83	0.90	1.45	2.38	0.65	3.78
110-150 kV - Duplex	4	0.28	0.22	0.24	0.30	0.22	0.42
220 kV - Simplex	10	0.59	0.29	0.46	0.94	0.18	1.21
220 kV - Duplex	23	0.39	0.30	0.35	0.49	0.08	0.73
330 kV - Triplex	7	0.39	0.22	0.25	0.57	0.08	0.83
400 kV - Duplex	17	0.22	0.17	0.20	0.29	0.08	0.37
400 kV - Triplex	34	0.21	0.12	0.18	0.30	0.07	0.55

Annex II: Additional indicators – Underground lines

Additional UIC indicators for underground lines

Thousand Euro per km, per MVA and per circuit



Observations

- Although controlling for differences in apparent power and number of circuits smooths distributions, there are still significant spreads.
- These numbers allow for comparability with other studies (see e.g. cost assumptions in TYNDP or in national NDPs).

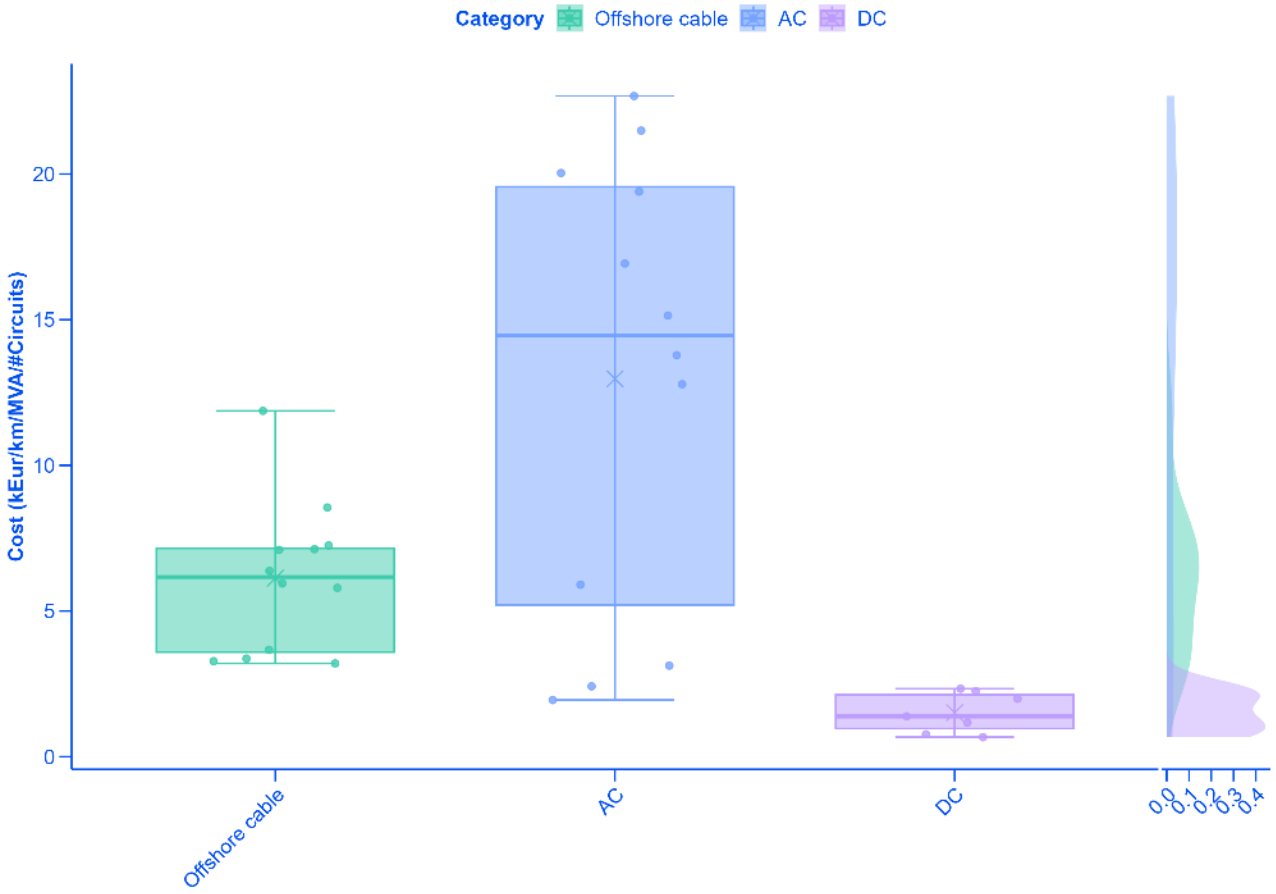
UIC indicators for overhead lines (Meur/km/MVA/circuit):

Category	Assets	Avg	P25	Median	P75	Min	Max
110-150 kV	25	3.77	2.00	2.77	4.90	0.42	10.73
220 kV	25	3.77	2.79	4.01	5.06	1.42	7.14
330 kV	5	1.76	1.67	1.73	2.27	0.78	2.33
400 kV	3	2.43	1.53	1.79	3.01	1.27	4.23

Annex II: Additional indicators – Offshore

Additional UIC indicators for offshore lines

Thousand Euro per km, per MVA and per circuit



Observations

- Unlike for OHL and underground lines, controlling for differences in apparent power and number of circuits does not significantly smooth the indicators across all voltage levels.

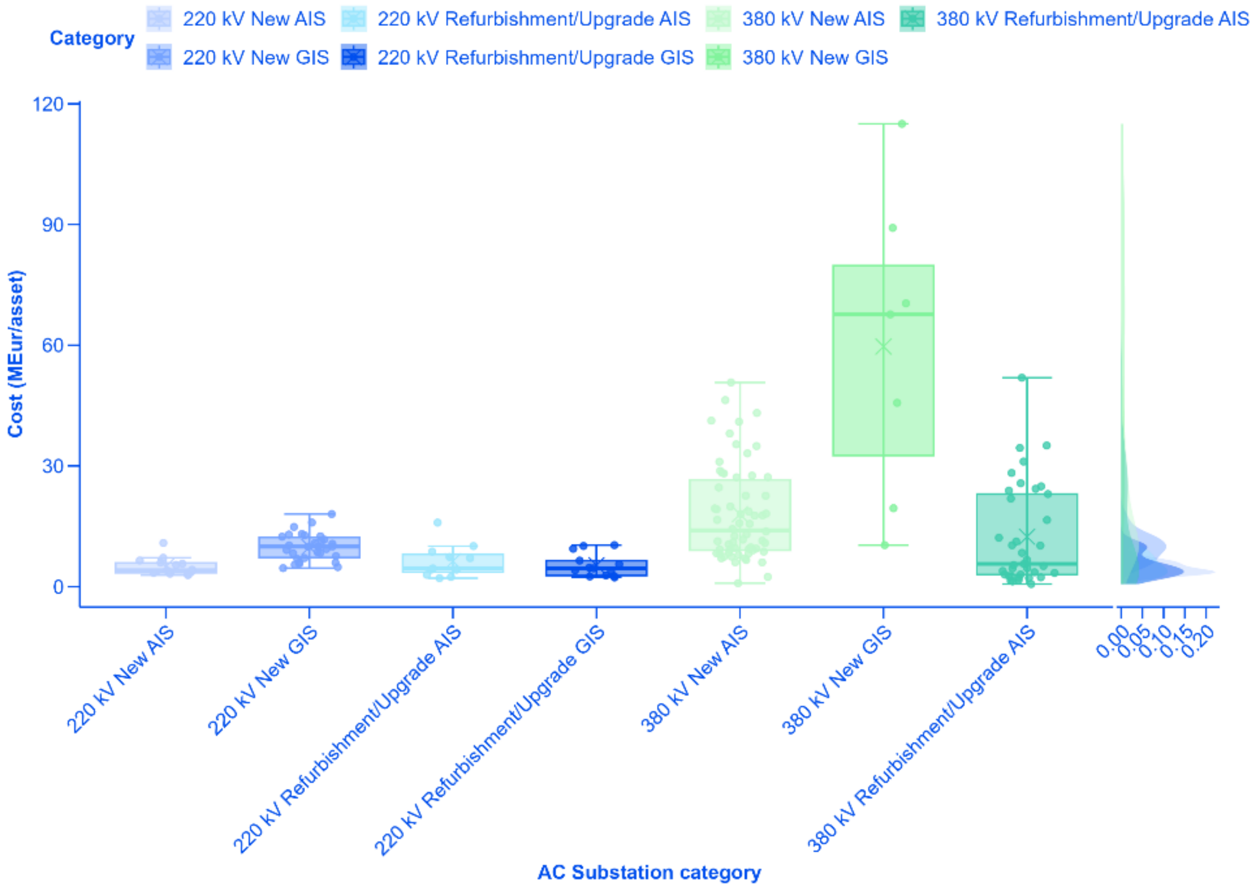
UIC indicators for overhead lines (Meur/km/MVA/circuit):

Category	Assets	Avg	P25	Median	P75	Min	Max
AC	12	12.97	5.21	14.46	19.56	1.95	22.68
DC	7	1.51	0.97	1.38	2.13	0.68	2.33
Offshore cable	12	6.13	3.59	6.17	7.15	3.20	11.87

Annex II: Additional indicators – AC substations

Additional UIC indicators for AC substations

Million Euro per asset



Observations

- Despite being a relevant factor, voltage alone does not prevent large spreads.
- As shown in the following slide, the number of bays is one of the main factors behind this issue.

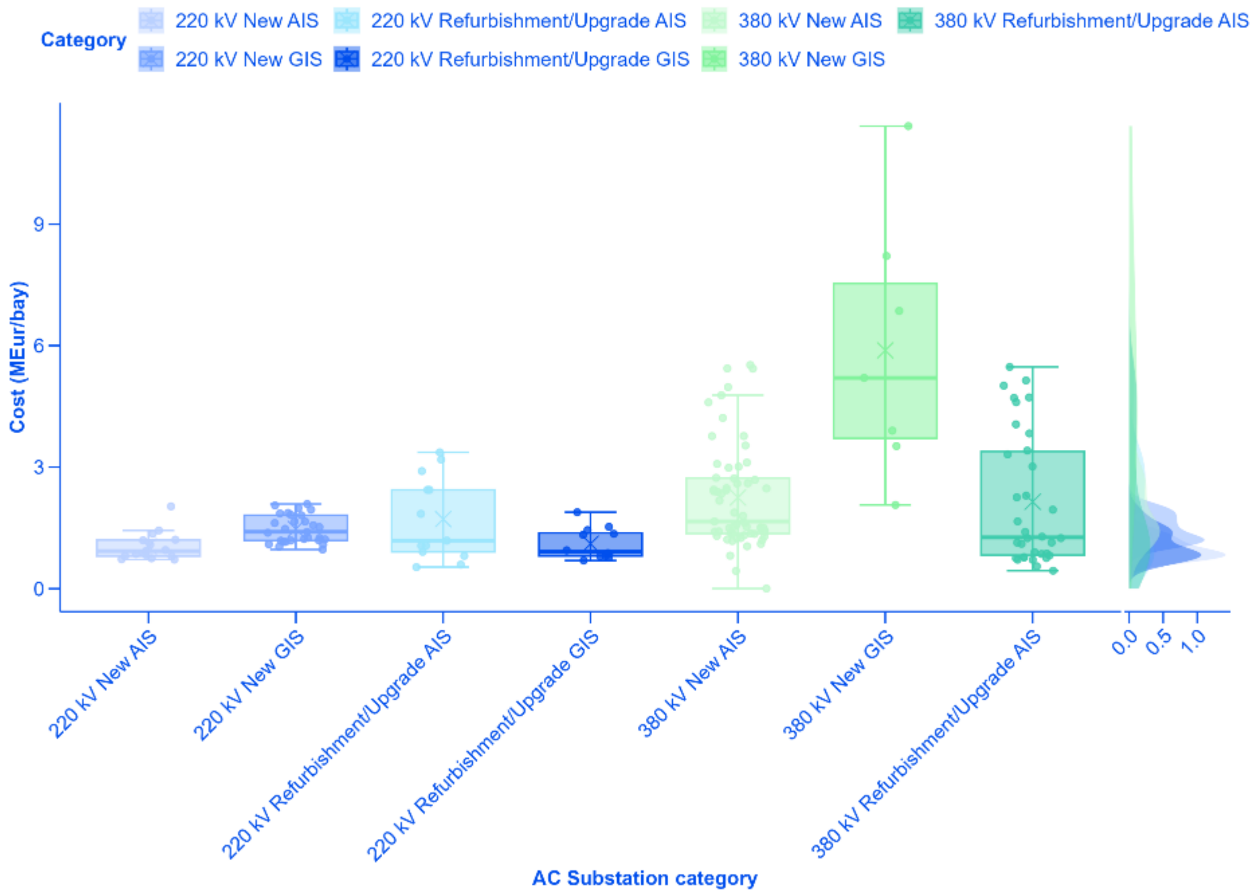
UIC indicators for AC Substations (Meur/asset):

Category	Assets	Avg	P25	Median	P75	Min	Max
220 kV New AIS	14	4.98	3.47	4.09	5.91	2.87	10.87
220 kV New GIS	30	9.85	7.24	9.95	12.25	4.62	18.06
220 kV Refurbishment/Upgrade AIS	11	6.34	3.60	4.54	8.05	2.12	15.93
220 kV Refurbishment/Upgrade GIS	13	5.35	2.78	4.58	6.48	2.30	10.33
380 kV New AIS	62	18.00	9.06	14.04	26.53	0.88	50.75
380 kV New GIS	7	59.67	32.60	67.66	79.77	10.32	115.00
380 kV Refurbishment/Upgrade AIS	37	12.41	3.02	5.67	23.02	0.65	51.92

Annex II: Additional indicators – AC substations

Additional UIC indicators for AC substations

Million Euro per bay



Observations

- Including a control for the number of bays of the substation improves the clustering of the indicators as shown by the density plots.

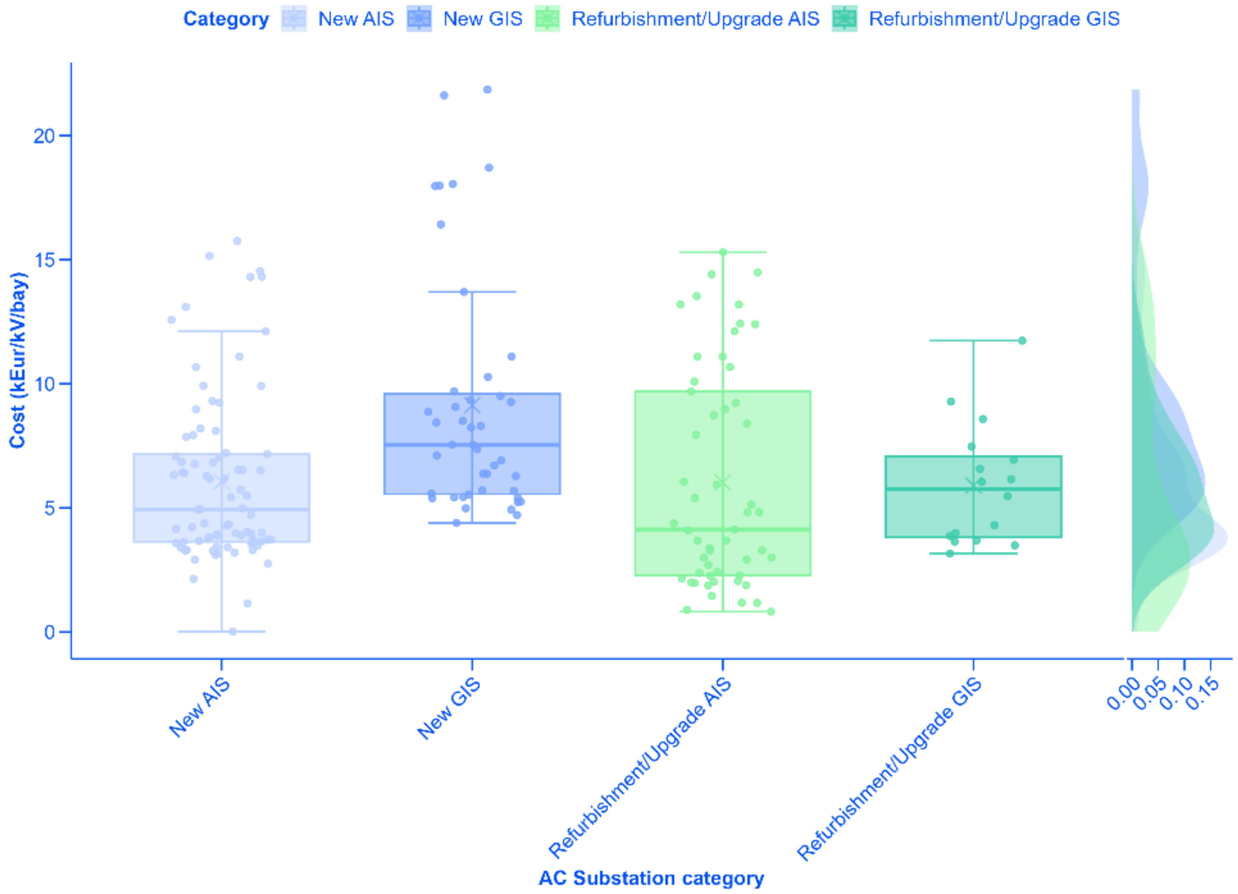
UIC indicators for AC Substations (Meur/bay):

Category	Assets	Avg	P25	Median	P75	Min	Max
220 kV New AIS	15	1.05	0.80	0.93	1.20	0.72	2.03
220 kV New GIS	29	1.47	1.19	1.40	1.81	0.97	2.09
220 kV Refurbishment/Upgrade AIS	13	1.72	0.91	1.19	2.44	0.53	3.37
220 kV Refurbishment/Upgrade GIS	12	1.11	0.81	0.91	1.38	0.70	1.89
380 kV New AIS	59	2.25	1.36	1.66	2.73	0.00	5.52
380 kV New GIS	7	5.88	3.71	5.20	7.54	2.06	11.42
380 kV Refurbishment/Upgrade AIS	34	2.14	0.83	1.27	3.39	0.44	5.47

Annex II: Additional indicators – AC substations

Additional UIC indicators for AC substations

Thousand Euro per kV per bay



Observations

- Non-linearity between voltage and cost increases spreads.

UIC indicators for AC Substations (kEur/kV/bay):

Category	Assets	Avg	P25	Median	P75	Min	Max
New AIS	81	6.05	3.63	4.93	7.16	0.01	15.75
New GIS	43	9.13	5.55	7.53	9.60	4.39	21.85
Refurbishment/Upgrade AIS	53	6.02	2.28	4.13	9.69	0.82	15.30
Refurbishment/Upgrade GIS	16	5.90	3.81	5.76	7.07	3.16	11.74

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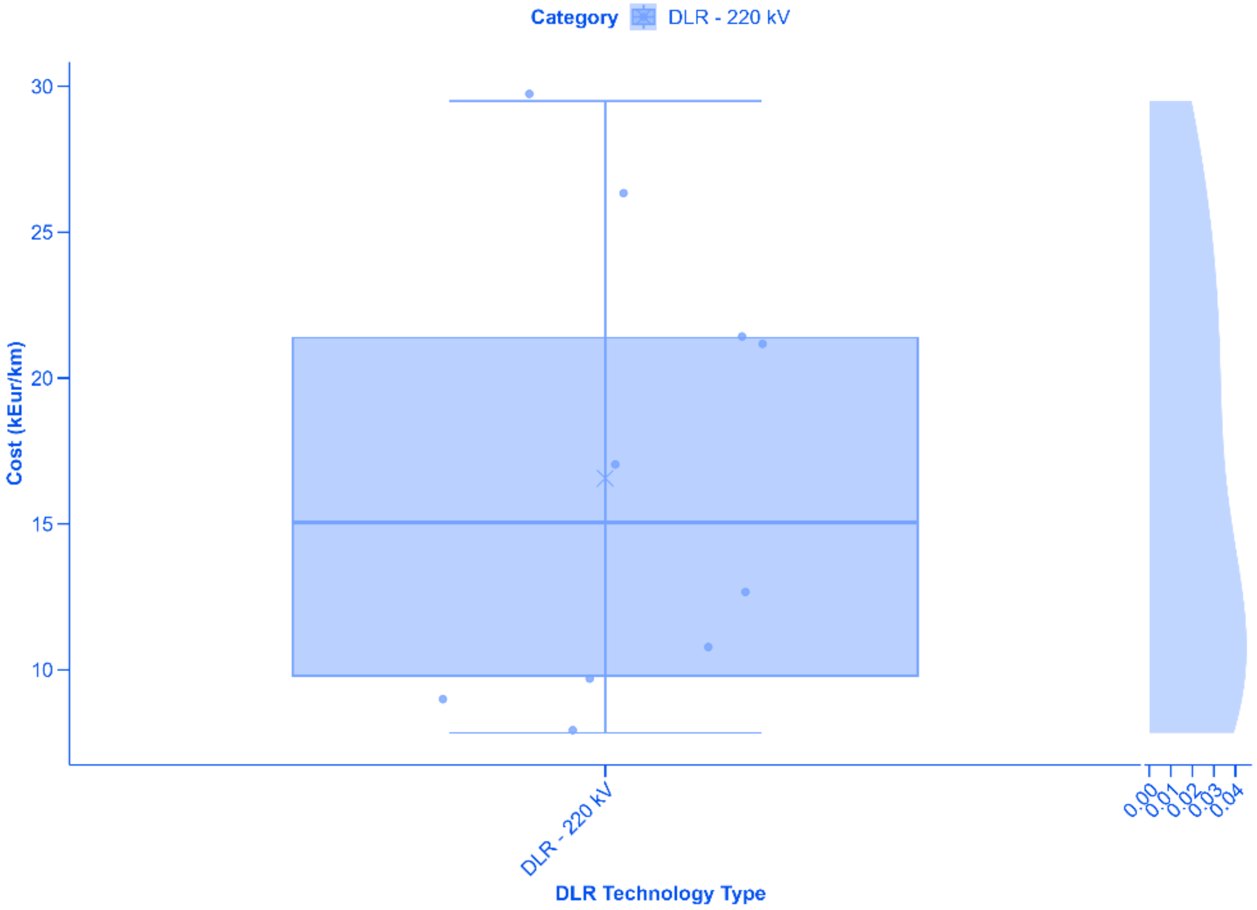
Annex II: Additional indicators – Dynamic line rating

UIC indicators for dynamic line rating (DLR)

Per km



Observations

- Only 1 TSO has reported DLR assets.
- All assets are atmospheric sensor + software based.
- UIC 2026 includes DLR for the first time.
- Although length covered by the asset is shown to be a relevant factor, nonlinearity increases the spread of the indicator.

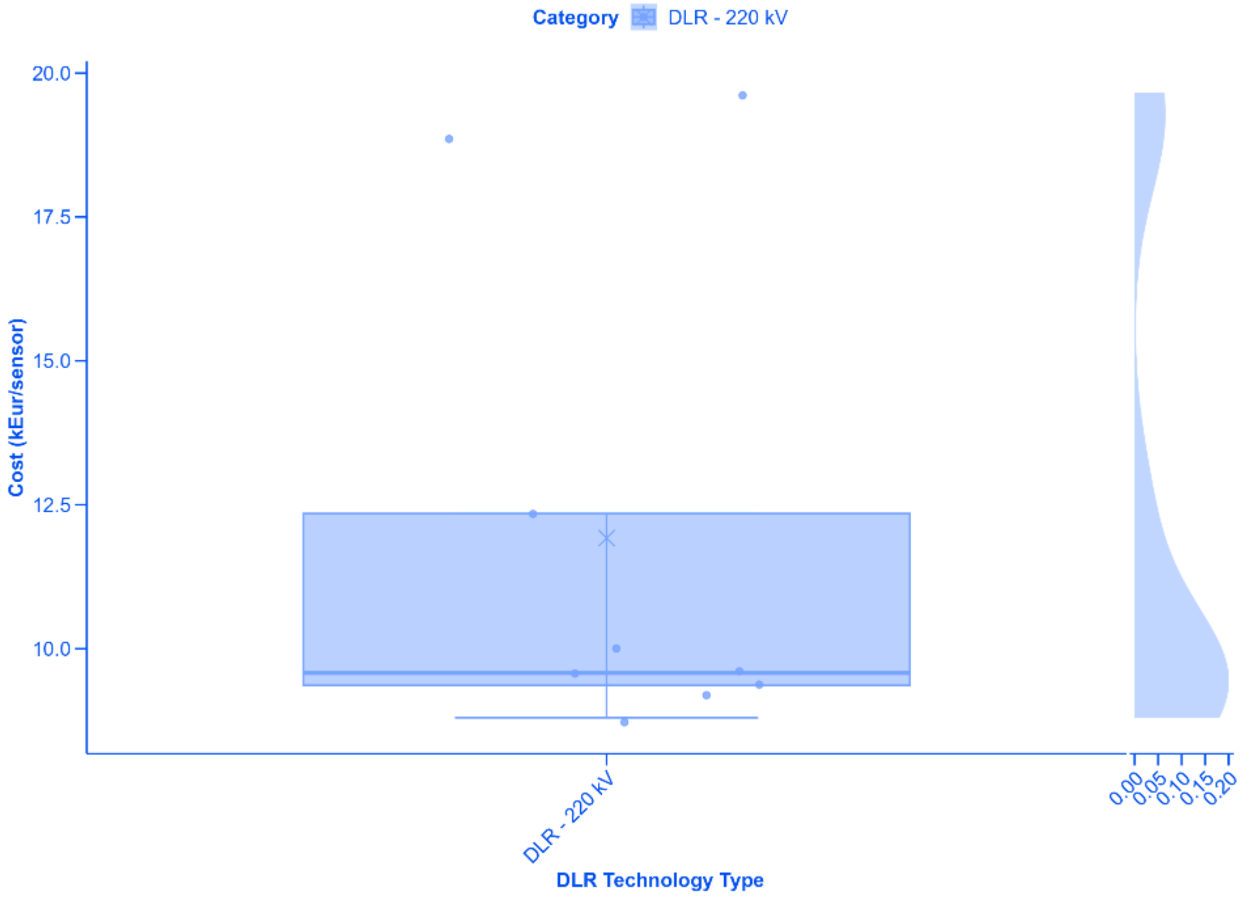
UIC indicators for DLR (kEur/km):

Category	Assets	Avg	P25	Median	P75	Min	Max
DLR - 220 kV	10	16.57	9.79	15.05	21.39	7.83	29.5

Annex II: Additional indicators – Dynamic line rating

UIC indicators for dynamic line rating (DLR)

Per sensor



Observations

- Only 1 TSO has reported DLR assets.
- All assets are atmospheric sensor + software based.
- UIC 2026 includes DLR for the first time.
- Indicators are better clustered (around 11 thousand EUR per sensor) than when presenting the results per kilometre. However, the limited sample does not allow to effectively remove outliers.

UIC indicators for DLR (kEur/sensor):

Category	Assets	Avg	P25	Median	P75	Min	Max
DLR - 220 kV	9	11.92	9.36	9.58	12.35	8.8	19.66

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Annex III: Sensitivity analysis

Accounting for differences in labour costs

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Annex III: Labour-cost approach – Electricity (1/3)

Table III.1: UIC Indicator results for electricity infrastructure categories accounting for cross-country differences on labour costs

	Category	Subcategory	Unit	Assets	Avg	P25	Median	P75	Min	Max
Electricity	Overhead lines	110-150 kV 1 circuits	Meur/km	5	0.82	0.68	0.81	0.94	0.67	1.01
		110-150 kV 2 circuits	Meur/km	7	0.37	0.35	0.36	0.4	0.29	0.45
		220 kV 1 circuits	Meur/km	14	0.39	0.32	0.39	0.47	0.05	0.69
		220 kV 2 circuits	Meur/km	25	0.6	0.48	0.55	0.77	0.14	1.13
		330 kV 1 circuits	Meur/km	3	0.44	0.43	0.44	0.46	0.41	0.47
		330 kV 2 circuits	Meur/km	5	0.88	0.81	0.83	0.9	0.69	1.17
		400 kV 1 circuits	Meur/km	23	0.7	0.39	0.67	0.89	0.05	1.45
		400 kV 2 circuits	Meur/km	59	1.48	0.61	1.26	2.13	0.37	4.58
	Underground lines	110-150 kV 1 circuits	Meur/km	21	1.21	0.53	0.64	1.85	0.34	3.39
		110-150 kV 2 circuits	Meur/km	6	2.02	1.34	1.68	2.32	0.73	4.28
		220 kV 1 circuits	Meur/km	20	1.89	0.97	1.98	2.36	0.49	3.56
		220 kV 2 circuits	Meur/km	9	3.69	2.84	3.1	4.91	1.85	5.51
		330 kV 1 circuits	Meur/km	4	2.3	1.11	1.66	2.84	1.08	4.78
	Offshore cables	Offshore cable	Meur/km	18	3.64	2.85	3.85	4.39	1.21	6.52
	Submarine cables	AC	Meur/km	9	2.46	2.19	2.39	2.68	1.61	3.4
		DC	Meur/km	8	1.43	1.22	1.43	1.61	0.75	2.18
	HVDC converter	HVDC Converter	Meur/MW	10	0.23	0.19	0.23	0.26	0.12	0.41

Annex III: Labour-cost approach – Electricity (2/3)

Table III.2: UIC Indicator results for electricity infrastructure categories accounting for cross-country differences on labour costs

Category		Subcategory	Unit	Assets	Avg	P25	Median	P75	Min	Max
Electricity	AC substations	0-5 bays	Meur/asset	117	6.43	2.7	4.68	7.98	0.43	22.51
		0-5 bays New	Meur/asset	52	9.54	4.11	6.44	11.78	1.03	30.27
		0-5 bays New AIS	Meur/asset	33	9.88	4.2	7.51	14.93	1.03	27.81
		0-5 bays New GIS	Meur/asset	13	11.66	5.81	9.08	18.12	2.69	30.27
		0-5 bays Refurbishment/Upgrade	Meur/asset	73	4.44	2.41	3.1	5.45	0.43	15.14
		0-5 bays Refurbishment/Upgrade AIS	Meur/asset	49	4.73	2.43	3.79	6.22	0.61	15.14
		0-5 bays Refurbishment/Upgrade GIS	Meur/asset	15	4.13	2.23	2.95	4.97	0.43	10.71
		6-9 bays	Meur/asset	82	15.18	9.6	11.82	19.91	5.6	42.61
		6-9 bays New	Meur/asset	67	14.54	9.69	11.91	18.75	6.07	36.33
		6-9 bays New AIS	Meur/asset	39	15.97	9.83	11.95	21.29	6.07	39.39
		6-9 bays New GIS	Meur/asset	25	11.4	8.95	11.3	13.23	6.15	20.03
		6-9 bays Refurbishment/Upgrade	Meur/asset	18	22.03	9.15	13.86	35.59	5.6	49.63
		6-9 bays Refurbishment/Upgrade AIS	Meur/asset	12	20.71	9.78	13.86	32.58	5.6	43.97
		6-9 bays Refurbishment/Upgrade GIS	Meur/asset	6	24.69	7.81	18.6	43.01	5.95	4
		10-60 bays	Meur/asset	64	31.47	21.2	26.72	39.65	7.4	84.75
		10-60 bays New	Meur/asset	35	42.63	24.87	33.68	55.31	14.25	110.05
		10-60 bays New AIS	Meur/asset	21	34.84	24.97	32.92	43.91	14.25	81.74
		10-60 bays New GIS	Meur/asset	11	48.16	23.87	34.25	67	21.33	110.05
		10-60 bays Refurbishment/Upgrade	Meur/asset	30	22.19	15.91	22.01	28.48	7.4	42.02
		10-60 bays Refurbishment/Upgrade AIS	Meur/asset	20	27.01	13.68	23.04	34.2	7.4	63.07
		10-60 bays Refurbishment/Upgrade GIS	Meur/asset	3	14.2	10.24	10.5	16.3	9.98	22.1
	Offshore AC substations	Offshore AC substation	Meur/asset	11	149.52	123.23	159.51	168.7	83.13	209.22

Annex III: Labour-cost approach – Electricity (3/3)

Table III.3: UIC Indicator results for electricity infrastructure categories accounting for cross-country differences on labour costs

Category		Subcategory	Unit	Assets	Avg	P25	Median	P75	Min	Max
Electricity	Transformers	0	Meur/asset	13	6.4	2.59	5.28	10.29	1.66	13.68
		150/50	Meur/asset	5	1.42	1.06	1.15	1.89	1.06	1.93
		220/120	Meur/asset	4	3.66	1.57	2.56	4.65	1.57	7.94
		220/50	Meur/asset	7	2.04	1.61	1.71	2.39	1.57	3.02
		380/130	Meur/asset	14	2.77	1.8	2.4	3.79	1.67	4.75
		400/110	Meur/asset	6	3.27	3.12	3.29	3.5	2.92	3.52
		400/220	Meur/asset	6	6.59	5.15	7.32	7.91	2.78	9.58
	Smart grid and network efficiency	DLR - 220 Kv	Meur/line	10	0.57	0.28	0.59	0.8	0.15	1.22
		APFC	Meur/MVA	3	0.01	0.01	0.01	0.02	0.01	0.02
		SSSC	Meur/MVA	22	0.07	0.02	0.04	0.11	0.01	0.17
		Advanced conductor	Meur/km	4	0.88	0.13	0.64	1.4	0.12	2.13
		Other voltage regulator/booster	Meur/asset	10	5.28	4.19	4.72	6.7	2.5	8.47
		STATCOM	Meur/asset	6	23.76	17.23	20.3	33.35	7.29	40.77
		Synchronous condenser	Meur/asset	6	50.52	42.66	52.65	54.89	35.84	67.02

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Annex III: Labour-cost approach – H2, SGG & GBH

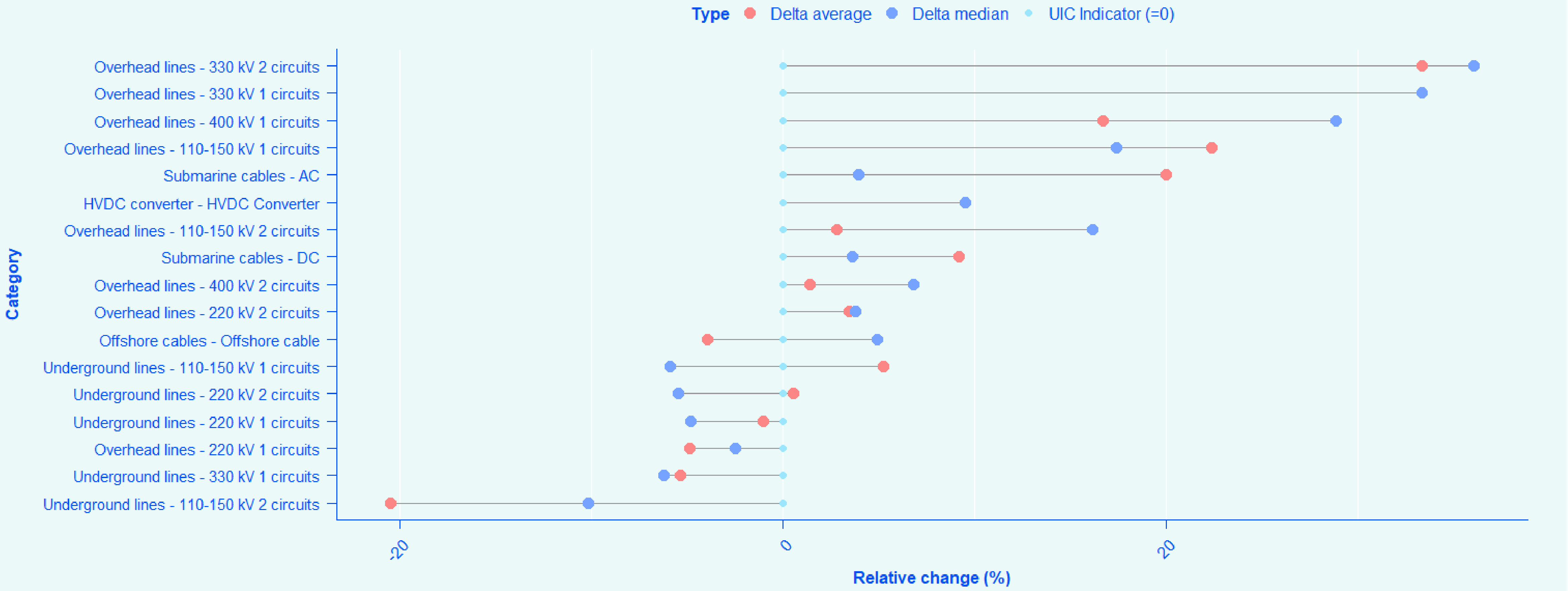
Table III.4: UIC Indicator results for energy infrastructure categories accounting for cross-country differences on labour costs

	Category	Subcategory	Unit	Assets	Avg	P25	Median	P75	Min	Max
Hydrogen	Pipelines	Pipeline	Meur/km	3	1.07	1.03	1.15	1.15	0.91	1.15
Smart gas grid	Processing plant	Processing plant	Meur/MW	3	4.21	3.4	4.76	5.29	2.04	5.83
	Advanced equipment	Advanced metering equipment	Meur/asset	6	0.31	0.18	0.26	0.45	0.15	0.5
GBH blending	Pipelines	12-16 inch	Meur/km	4	2.14	1.69	1.98	2.43	1.54	3.04
		36-48 inch	Meur/km	8	4.07	2.38	3	6.12	2.28	7.11
	Compression station	<1 MW	Meur/MW	6	14.49	11.12	16.03	18.03	7.63	19.08
		10-50 MW	Meur/MW	3	6.08	5.9	6.01	6.23	5.78	6.45
	Metering station	Metering station	Meur/asset	10	1.13	0.73	0.97	1.48	0.25	2.44

Annex III: Labour-cost approach – Overall change

Impact of accounting for labour cost divergences for electricity lines and cables

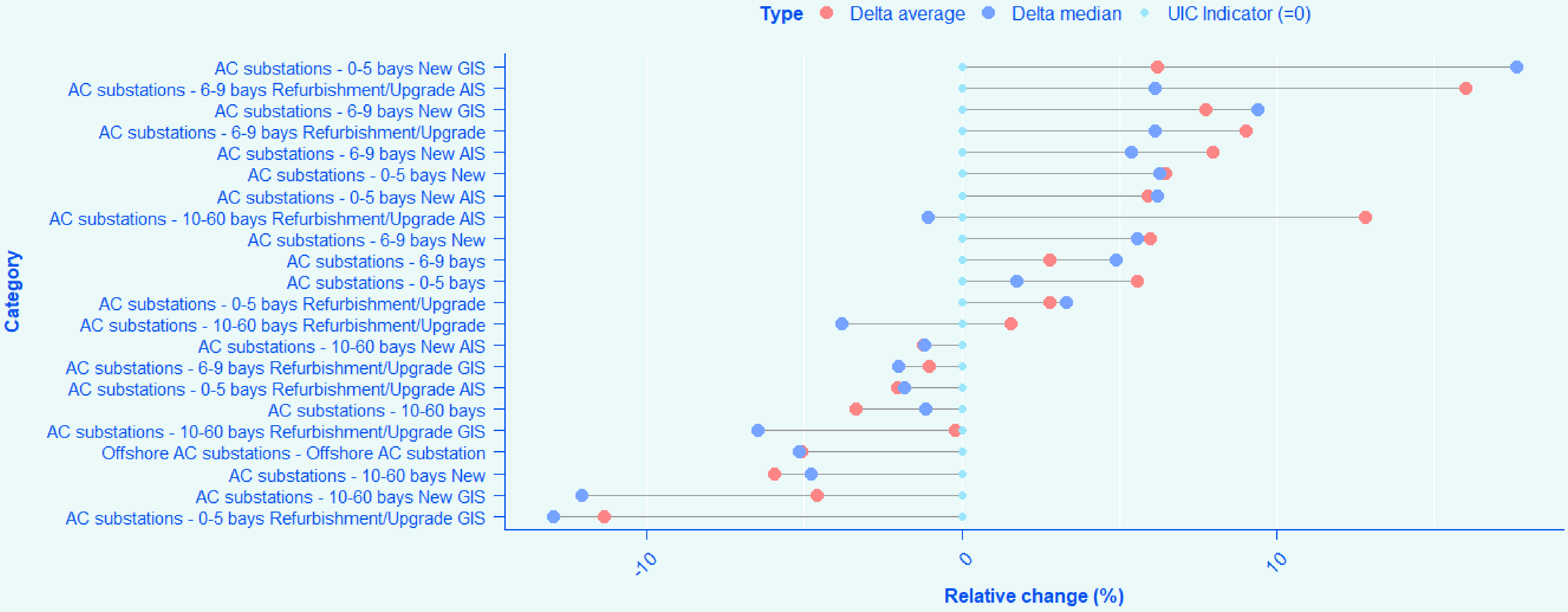
Percentage (%) change with respect to UIC Indicator without labour-cost adjustment



Annex III: Labour-cost approach – Overall change

Impact of accounting for labour cost divergences for AC substations

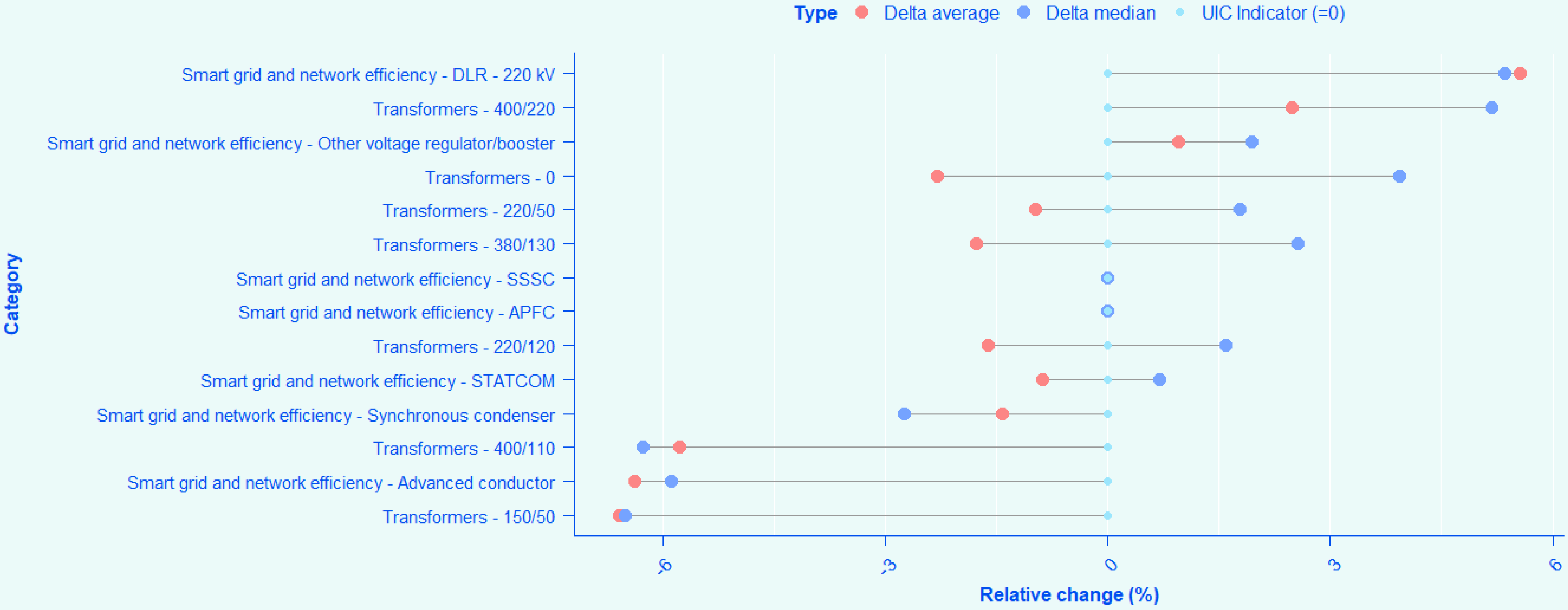
Percentage (%) change with respect to UIC Indicator without labour-cost adjustment



Annex III: Labour-cost approach – Overall change

Impact of accounting for labour cost divergences for network efficiency assets and transformers

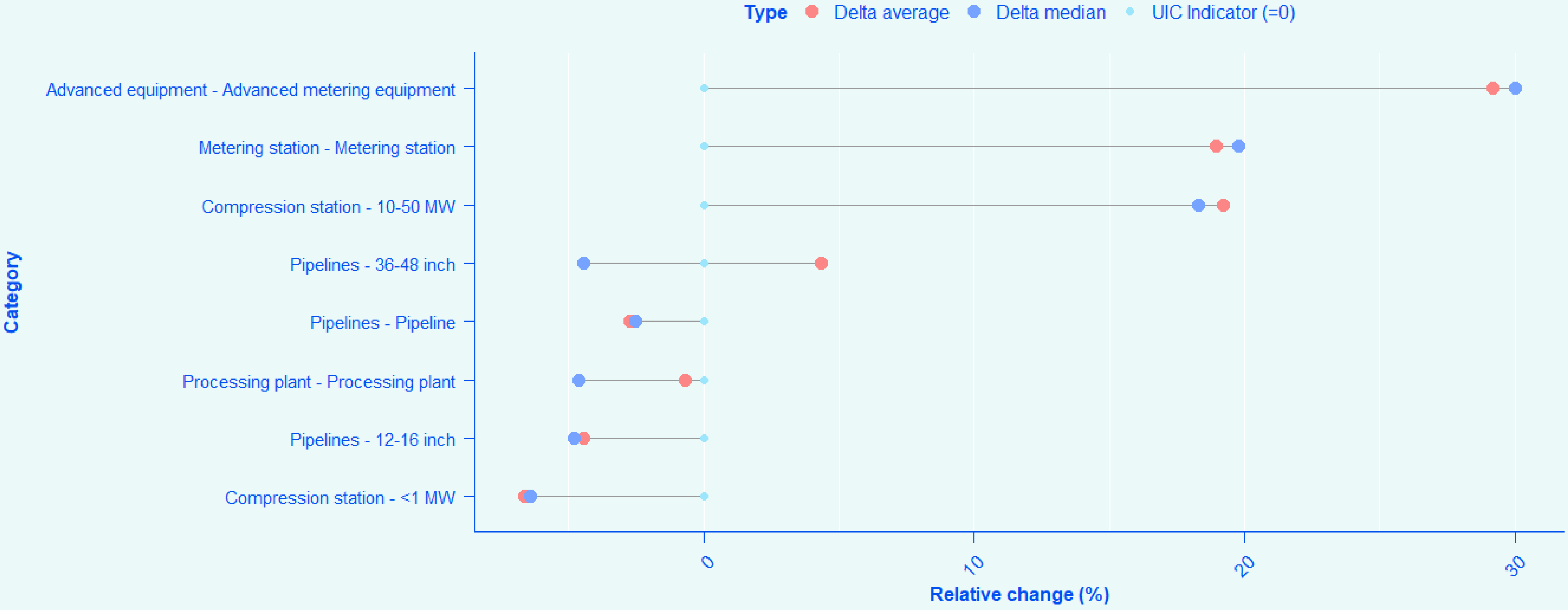
Percentage (%) change with respect to UIC Indicator without labour-cost adjustment



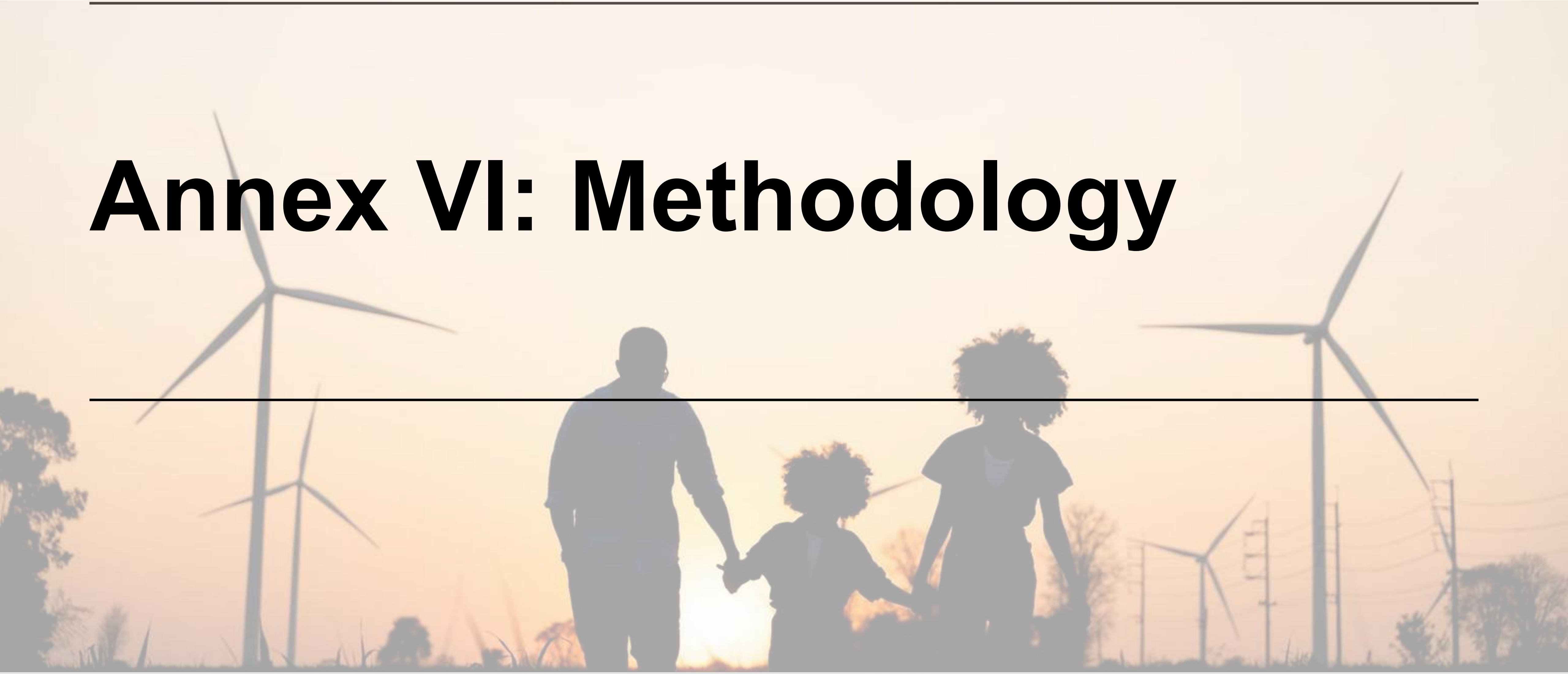
Annex III: Labour-cost approach – Overall change

Impact of accounting for labour cost divergences for H2 and gas, hydrogen and biomethane blending

Percentage (%) change with respect to UIC Indicator without labour-cost adjustment



Annex VI: Methodology



Annex IV: Methodology

UIC Indicators - Standard methodology

- For a full description of UIC Methodology, access UIC 2023. The process has been replicated for UIC 2026.

UIC Indicators - Labour cost sensitivity

- Labour cost sensitivity introduces an additional feature in the computation of indicators to account for such divergences across EU countries. This feature is defined by the formula below, keeping all other steps as per the standard UIC Indicators
- $C'_{i,t} = C_{i,t} * (1 - S) + C_{i,t} * S * F_{c,t}$, where:
  - $C'_{i,t}$ -> Adjusted cost after labour cost correction.
  - $C_{i,t}$ -> Original cost for asset i in year t (not adjusted for inflation).
  - S -> Share of labour costs (estimated as 0.2 for electricity projects and 0.3 for gas projects, based on submitted data).
  - $F_{c,t}$ -> Labour cost adjustment factor for country c in year t . Calculated as the inverse of the labour index ($F_{c,t} = \frac{1}{Labour\ Index_{c,t}}$,)
    - $Labour\ Index$ has been computed using Eurostat's labour costs annual data to compute $Labour\ Index_{c,t} = \frac{LC_{c,t}}{LC_{EU27,t}}$. Individual values are provided in Table IV.1. Since labour costs annual data was not available for all years of the study and countries, missing values were calculated using linear interpolation.
- Such correction allows to account for differences in labour costs across countries, while not interfering with the adjustment for inflation.

Annex IV: Methodology

Estimation of infrastructure cost index

- UIC 2026 provides a first estimation of (inflation-adjusted) cost increases by developing a compound index from 2 independent asset specific indexes: 1) Lines and cables and 2) substations. The following steps have been followed:

  1. **Data preparation:**
     - Filtered datasets to lines and cables and substations due to limited sample for other categories.
     - Imputed missing attributes with zero and flagged such records.
  2. **Cost models:**
     - Estimated two cost models (log-linear regressions), one for each infrastructure category.
     - Each of the models regressed the natural logarithm of the cost by a set of asset-specific characteristics (length, voltage, labour costs, etc.), interaction elements and a set of dummy variables representing the investment year of the project.
  3. **Index calculation**
     - Year coefficients are smoothed using local regression models to reduce noise and focus the analysis on the overall cost trends.
     - Each coefficient is indexed to 100 in 2018 (first year of the series).
     - The combined index is calculated as the simple average of the two sub-indexes.

Limitations: The short data period and the long commissioning periods of some projects limit the capacity to extract year-specific effects. Moreover, specified models might not fully capture project heterogeneity. Interpretation of the analysis should be limited to the overall trend of the series.

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Table IV.1: Labour-costs indexes used to compute adjustment factors ($1 = EU27_t$)

Country	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Austria	1.217	1.231	1.244	1.257	1.270	1.273	1.276	1.279	1.282	1.274	1.277	1.282	1.328
Belgium	1.557	1.545	1.532	1.520	1.508	1.486	1.465	1.445	1.426	1.424	1.436	1.476	1.439
Bulgaria	0.139	0.149	0.158	0.167	0.176	0.191	0.206	0.219	0.232	0.247	0.271	0.292	0.316
Croatia	0.389	0.385	0.380	0.375	0.371	0.378	0.385	0.392	0.398	0.403	0.416	0.451	0.493
Cyprus	0.689	0.669	0.650	0.631	0.613	0.612	0.611	0.610	0.609	0.608	0.620	0.627	0.627
Czechia	0.410	0.408	0.406	0.404	0.402	0.433	0.461	0.488	0.514	0.524	0.535	0.564	0.543
Denmark	1.615	1.614	1.614	1.614	1.613	1.605	1.596	1.588	1.581	1.594	1.554	1.514	1.496
Estonia	0.352	0.370	0.388	0.405	0.422	0.442	0.461	0.479	0.496	0.521	0.541	0.574	0.585
Finland	1.283	1.291	1.300	1.308	1.316	1.284	1.254	1.225	1.197	1.219	1.185	1.163	1.125
France	1.406	1.392	1.378	1.365	1.352	1.356	1.359	1.363	1.366	1.365	1.347	1.329	1.304
Germany	1.250	1.258	1.266	1.274	1.281	1.285	1.289	1.292	1.296	1.295	1.307	1.298	1.296
Greece	0.643	0.631	0.618	0.606	0.594	0.565	0.537	0.511	0.486	0.483	0.485	0.492	0.499
Hungary	0.303	0.304	0.304	0.304	0.305	0.316	0.326	0.336	0.345	0.358	0.353	0.404	0.421
Ireland	1.221	1.215	1.208	1.202	1.195	1.191	1.187	1.183	1.180	1.205	1.254	1.260	1.269
Italy	1.135	1.120	1.106	1.092	1.078	1.065	1.052	1.040	1.028	1.000	0.967	0.937	0.922
Latvia	0.246	0.260	0.274	0.288	0.301	0.321	0.341	0.359	0.377	0.392	0.403	0.423	0.451
Lithuania	0.242	0.254	0.266	0.278	0.289	0.309	0.328	0.346	0.363	0.403	0.432	0.461	0.487
Luxembourg	1.447	1.464	1.480	1.496	1.512	1.553	1.593	1.630	1.665	1.681	1.680	1.696	1.648
Malta	0.484	0.502	0.520	0.538	0.555	0.553	0.552	0.551	0.549	0.559	0.574	0.571	0.570
Netherlands	1.332	1.336	1.340	1.344	1.348	1.342	1.337	1.332	1.327	1.326	1.330	1.348	1.349
Poland	0.324	0.328	0.332	0.336	0.340	0.352	0.363	0.374	0.384	0.399	0.413	0.455	0.516
Portugal	0.545	0.541	0.538	0.535	0.531	0.531	0.531	0.532	0.532	0.535	0.531	0.533	0.543
Romania	0.168	0.178	0.188	0.198	0.207	0.229	0.250	0.270	0.289	0.295	0.314	0.345	0.373
Slovakia	0.365	0.373	0.382	0.390	0.398	0.421	0.443	0.463	0.482	0.500	0.518	0.539	0.552
Slovenia	0.639	0.644	0.648	0.652	0.656	0.676	0.694	0.712	0.729	0.764	0.762	0.799	0.809
Spain	0.865	0.855	0.846	0.837	0.828	0.823	0.819	0.814	0.810	0.795	0.769	0.768	0.761
Sweden	1.529	1.514	1.500	1.486	1.473	1.436	1.402	1.369	1.338	1.417	1.327	1.213	1.203

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ACER
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ACER role and governance

- **Supporting the integration of energy markets in the EU** (by common rules at EU level). Primarily directed towards transmission system operators and power exchanges.
- **Contributing to efficient trans-European energy infrastructure**, ensuring alignment with EU priorities.
- Monitoring energy markets to ensure that they function well, **deterring market manipulation and abusive behaviour**.
- Where necessary, **coordinating cross-national regulatory action**.
- Governance: **Regulatory oversight is shared** with national regulators. **Decision-making** within ACER is collaborative and joint (formal decisions requiring 2/3 majority of national regulators). **Decentralised enforcement** at national level.
- Headquartered in Ljubljana, Slovenia. **Engaged across the EU**.