

CER Economic Note

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Energy Prices

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1. Introduction

The global energy crisis caused unprecedented volatility in European energy markets. In 2022, about 56.9% of the EU's railway tracks were electrified, a notable jump from 40.2% in 1990. Currently, 80% of the European railway traffic is running on electricity. Although railways are among the largest electricity consumers in many countries and play a vital role in advancing decarbonization by shifting to cleaner energy sources, their high degree of electrification means railway operators are especially vulnerable to price fluctuations and volatility in the energy market.

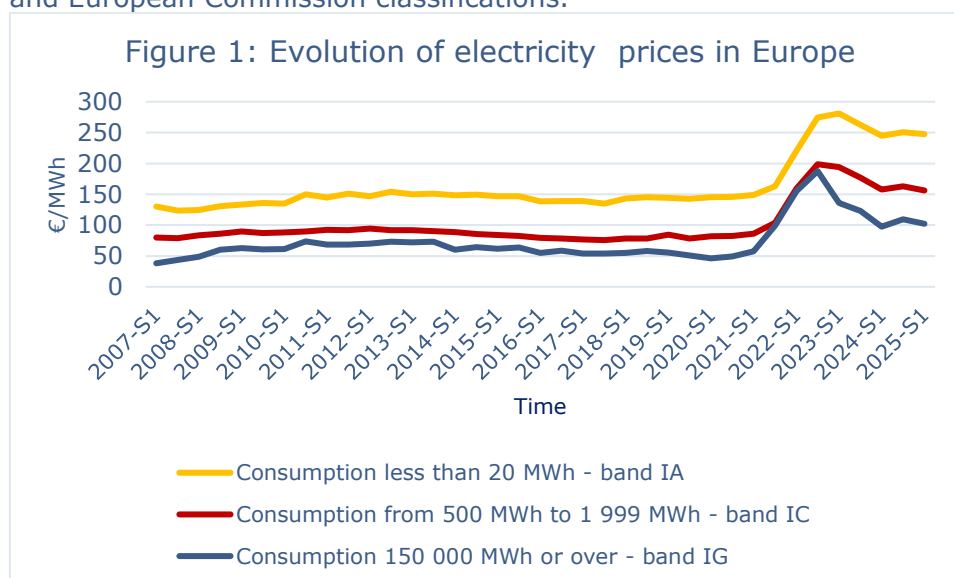
For this reason, CER maintains a tracker of energy prices for railway undertakings (passenger and freight) and infrastructure managers through surveys administered to its members. These surveys have been sent out twice per year since December 2022, with the most recent survey conducted in May 2025. This note complements the latest note on traction electricity prices for railways to assess their current development and additionally focuses on measures taken to face the effects of the crisis such as Power Purchase Agreements (PPAs) and assessing the flexibility of the sector.

2. Evolution of energy prices in Europe

2.1. Electricity prices

We first provide a general overview of the evolution of electricity prices in Europe as a baseline for further comparison with the railway sector including the latest data available which is the second semester of 2024.

Figure 1 illustrates how electricity prices for non-household consumers in Europe have changed since 2007, showing trends for three consumption levels: small users (less than 20MWh), medium users (500–1999MWh), and large users (over 150,000MWh), based on Eurostat and European Commission classifications.



Note: Eurostat data on electricity prices for non-household consumers – bi-annual data from 2007 onwards (nrg_pc_205). Prices do not include taxes and levies and refer to the European Union (27 countries, from 2020).

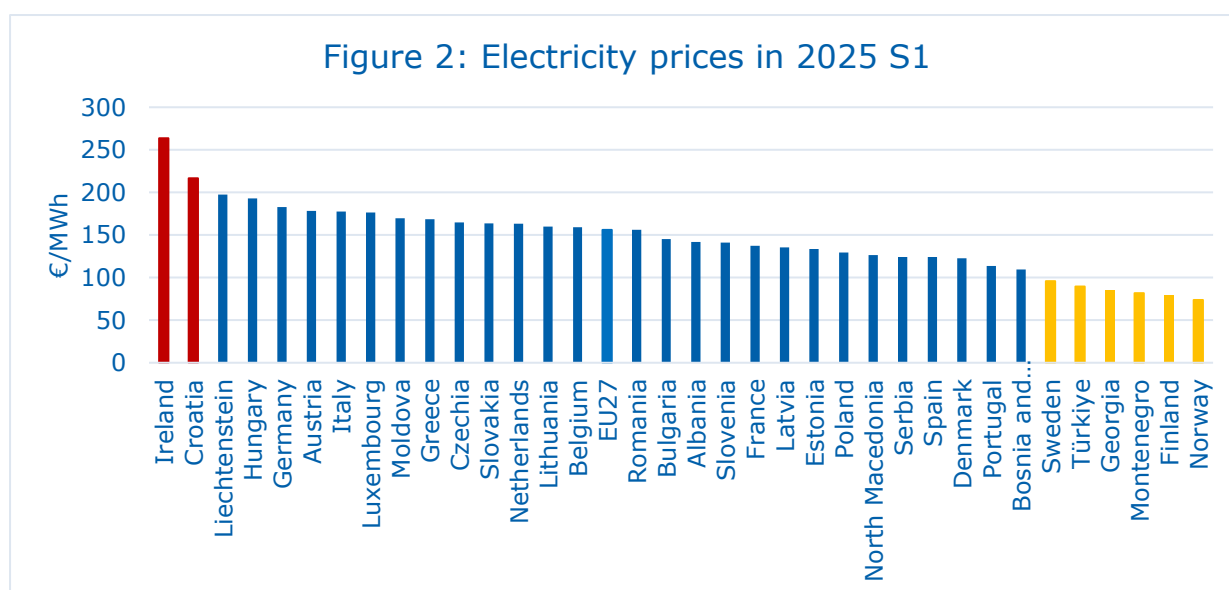
All consumption bands show strong increases in 2025 compared to 2021, reflecting sustained high energy prices post-2021. Peak volatility occurred in 2022–2023, coinciding with the European energy crisis as a result of COVID19 recovery and Russia's invasion of

Ukraine. While prices eased somewhat in 2024–2025, none of the segments returned to pre-crisis levels. Focusing on the large consumers – Band IG, we observe a dramatic increase in electricity prices in 2022–2023. Prices fell back to near 2021–S2 levels by 2025. This indicates some normalisation in wholesale energy markets but still higher than pre-crisis costs. While smaller users pay far higher prices per unit of energy, the percentage change in Band IG is very high settling around 78% between 2025 and 2021.

In this context, although electricity prices in 2025 have eased somewhat from the extreme peaks of 2022–2023, they remain significantly higher than in both 2021 and 2015 across all consumption bands. The data show that small and medium consumers, in particular, continue to face sustained price pressures, while even large industrial users are still paying well above pre-crisis levels. This persistence of elevated electricity costs highlights the ongoing need for improved energy efficiency measures and the accelerated integration of alternative energy sources, and ensuring access to affordable and stable energy particularly for electrified mobility, such as railway transport.

2.2. Electricity prices in 2025 S1

In this section, we present the most recent snapshot of electricity prices based on Eurostat data for the first semester of 2025. The average electricity price for the EU-27 stands at around 156 €/MWh for this consumption band. The highest prices are recorded in Ireland (264 €/MWh), followed by Croatia (217 €/MWh), and Hungary (193 €/MWh) all well above the EU average. At the other end of the spectrum, the lowest prices ranging between 70 €/MWh and 100 €/MWh—are observed in Norway, Finland, Montenegro, Georgia, Sweden, and Türkiye. Even as wholesale market pressures have somewhat moderated since the 2022–23 peak, the share of taxes and levies remains substantial, the share of taxes and levies in electricity prices remains substantial, accounting for approximately 18% in the EU. This underscores the ongoing challenge of securing affordable, stable electricity access across Member States.



Note: Eurostat data on electricity prices for non-household consumers - bi-annual data from 2007 onwards (nrg_pc_205). Prices do not include taxes and levies and refer to the European Union (27 countries, from 2020). Additionally, consumption from 500 MWh to 1 999 MWh (band IC) is considered.

3. Results from the latest CER energy survey

The latest survey includes inputs from 20 different railway companies and 15 countries. More precisely, the data from infrastructure managers cover 7 countries, while the data from railway undertakings include 15 countries.

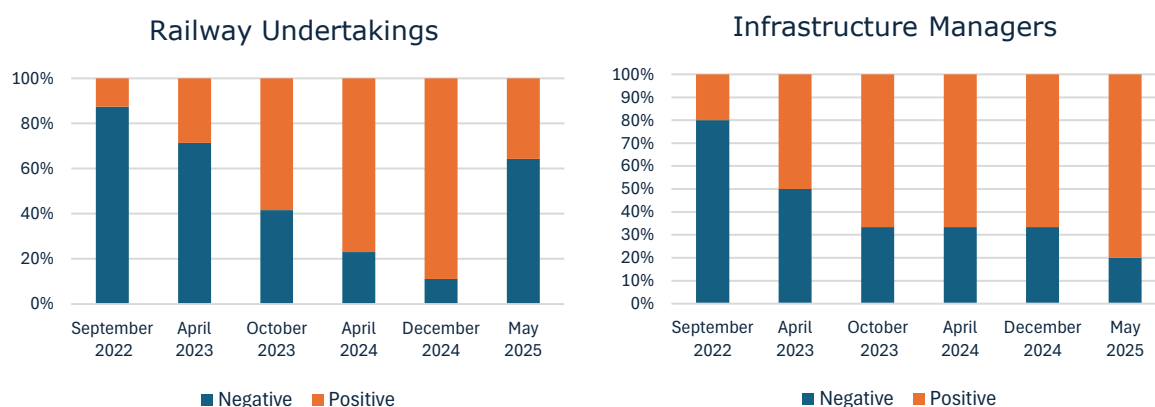
3.1. Electricity prices in 2025

The latest data shows that the railway sector is still highly exposed to electricity price shocks. Currently, railways pay, on average, more than 120 €/MWh for electricity traction. Compared to the average of over €140/MWh recorded in December 2024, electricity prices in the latest May 2025 survey declined by nearly 17%. Looking back at September 2022, May 2025 prices are 28% lower and show a downward trend for a recovery.

When comparing traction electricity prices for railways from the CER Energy Survey with Eurostat data for the highest consumption band (Band IG: 150,000 MWh and above), it appears that railway undertakings and infrastructure managers continued to pay above-average prices, even as market conditions began to stabilise. In the first semester of 2025, the average Eurostat price for Band IG stood at around 102 €/MWh, while the CER survey reported an average of approximately 120 €/MWh for traction electricity. This suggests that, although electricity costs for the rail sector have declined compared with the 2022–2023 peak, they remain elevated relative to industrial averages, indicating only a partial recovery from the energy crisis.

Despite the decrease in prices registered in the latest survey for the first half of 2025, railway undertakings reporting to the CER Energy Survey have become more pessimistic about the future evolution of electricity prices, a shift from the last period in December 2024. Conversely, infrastructure managers have shown growing optimism, with the proportion expressing positive expectations increasing. As explained in the last note, future price expectations are defined as positive if the reported electricity price forecast is lower than the actual one and negative otherwise.

Figure 3: Future price expectations



Note: Data from CER Energy Survey. Percentages are calculated over the total number of responses for which both the current value and the forecast of electricity prices were available.

Due to data limitations, we will analyse price trends for a few countries only. It appears that some countries have experienced a substantial decrease in the prices such as Spain, Denmark and Slovakia. These countries have in common PPAs for electricity from renewable sources. We also notice a high price volatility from Italy and Hungary.

Spain, Denmark, and Slovakia

From the latest survey results, a clear observation is that Spain and Denmark's prices paid by operators has decreased substantially compared to September 2022 levels. Spain's passenger undertakings registered a decrease of around 403% in comparison to September 2022 and a decrease of around 68% in comparison to December 2024. As for freight undertakings, prices decreased by 80% compared to September 2022 and 68% in comparison to December 2024.

For Denmark, we also see a substantial decrease in the prices paid by passenger undertakings. For instance, there was a decrease of 71% from the prices registered in May 2025 in relation to the levels in September 2022. In comparison to the survey results in December 2024, there was a decrease of 31%.

Similarly, Slovakia's infrastructure managers have registered the highest decrease of prices of 69% since 2022. In comparison to December 2024, there was a decrease of almost 13%.

A more detailed analysis of these countries' PPAs can be found in Section 4.

Italy and Hungary

Italy is characterized by highly volatile prices with the latest survey registering a rise in prices by almost 66% compared to data collected from last December. Its RUs (passenger and freight) and IM have still registered a decrease in prices of almost 28% since September 2022. Although the country signed a 12-month PPA, which typically locks in prices and provides cost stability, this alone cannot fully cover against overall market fluctuations. The electricity market remains, therefore, highly volatile due to several structural factors.

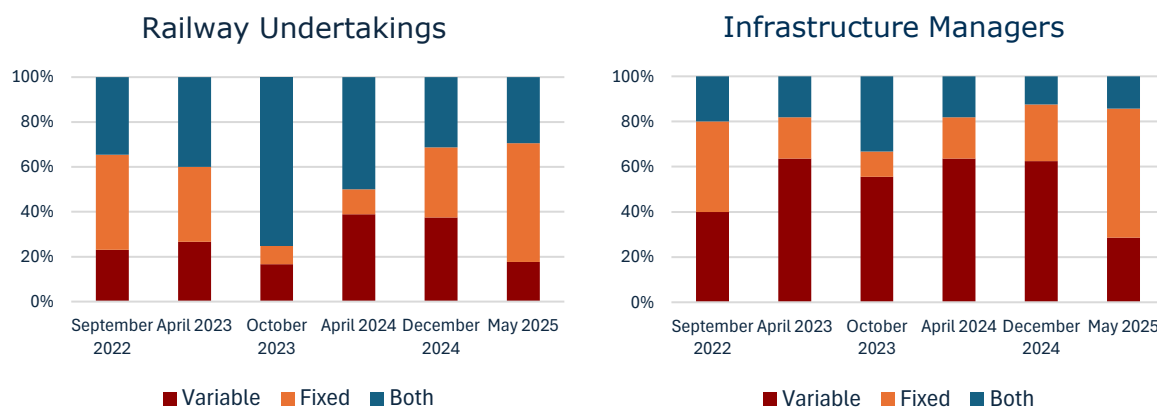
Similarly, Hungary experienced highly volatile prices for its passenger railway undertakings and infrastructure managers. Prices for its passenger railway undertakings have been following a downward trend since its peak in April 2023 with prices dropping below September 2022 levels by 29% in May 2025. Its infrastructure managers registered a decrease in prices of around 48% since September 2022, and a decrease of almost 37% compared to December 2024. As seen in figure 2, Hungary holds high electricity prices which could make it more vulnerable to market fluctuations or changes in supply and demand which can lead to significant percentage changes in costs.

3.2. Electricity contracts

In this part, we look at the latest data on the type of energy contracts that railway undertakings and infrastructure managers hold.

Some railway undertakings and infrastructure managers gradually decreased the duration of their contracts from previous periods to shorter, one-year contracts. From the latest results, most railway undertakings and infrastructure managers hold one-year contracts.

Figure 4: Type of contracts



Note: Data from CER Energy Survey. Percentages are calculated over the total number of respondents who provided an answer to the survey question on the energy contract type.

Across railway undertakings and infrastructure managers, the most common form of energy contract from the latest survey is the one with fixed prices. The share of respondents indicating fixed contracts has grown since the last survey. Conversely, the share of variable contracts has decreased from the last period and the share of mixed contracts combining fixed and variable prices has stayed around the same as last period.

4. Power Purchase Agreements (PPAs) in the Railway Sector

In this section, we take a closer look at the Power Purchase Agreements (PPAs) signed by railway operators to better understand their impact on price stability and sustainability. PPAs play a critical role in mitigating price volatility by providing long-term, fixed-price contracts, often established directly with renewable energy producers, providing railways with stable pricing and reducing their exposure to market price volatility. This price stability not only mitigates risks from fluctuating energy costs but also encourages investments in renewable energy, which tends to be more cost-effective over the long term. This is a measure to hedge against electricity market volatility while advancing commitment to clean energy.

For example, Renfe signed a five-year financial PPA with Sonnedix in June 2025, securing 1.45 TWh of solar electricity to power its passenger services. This contract ensures stable pricing and supports Renfe's sustainability goals. Additionally, Renfe and Iberdrola España entered into a Virtual PPA for onshore wind energy, covering 370 GWh annually for ten years until 2035. In Denmark, DSB partnered with European Energy to build a Solar Park, committing to purchase 80 GWh per year over ten years, with 30% of the park's electricity dedicated to DSB once completed at the end of 2025. Meanwhile, Slovakian railways (ZSR) have confirmed a combined electricity supply contract extending through the end of 2026.

Research consistently demonstrates that PPAs could deliver significant cost savings compared to conventional grid purchases. These contracts provide price stability, enabling rail operators to plan budgets effectively and accelerate the adoption of sustainable technologies. Despite overall market volatility, PPAs remain a reliable hedge against energy price spikes, with the risk of PPA prices exceeding market prices generally low.

However, PPAs also have limitations. Their long duration can pose financial risks for both energy producers and consumers if market prices shift significantly. Rising prices can

disadvantage producers, while falling prices may pose a risk to consumers. Additionally, PPAs are complex agreements that require considerable time and effort to negotiate.

Barriers and drivers behind the uptake of long-term PPAs vary substantially across EU Member States. For example, France and Ireland feature strong pools of credible off takers and viable unsubsidized renewable projects, but market growth is currently hindered by a lack of integrated government support for PPA structures. In contrast, Iberia and the Nordics continue to expand their PPA activity—driven by solar and wind—while Germany and the Netherlands benefit from robust corporate green mandates and competitive technologies. Italy's PPA landscape shows promise but requires greater involvement from utilities and energy traders to hedge zone-specific risks effectively. Central and Eastern European countries present highly attractive economics for PPAs and renewables investment, yet have limited experience, less policy support, and lower investor confidence.

To bridge these regional gaps and overcome market barriers, financial institutions can play a pivotal role by providing financial instruments such as project debt linked to PPAs, construction loans, mezzanine financing, and credit guarantees. Standardization and broader availability of these financial instruments if promoted by national banks or International Financial Institution (such as the EIB) can further reduce complexity and enhance the long-term environmental and economic value of PPAs for the railway sector and beyond.

<https://advisory.eib.org/files/publications/attachments/commercial-power-purchase-agreements.pdf>

5. Flexibility in Energy Consumption

Since PPAs are not always a guaranteed option for price stability and may sometimes be infeasible due to their complexity and constraint by operational factors and regulatory frameworks, the railway sector's potential for energy flexibility remains highly valuable. This flexibility helps manage the impact of fluctuating electricity prices, improves operational efficiency, and supports sustainability goals.

In this case, the railway sector's ability to adjust energy consumption is crucial. Freight operators can vary schedules to optimize energy use during periods of lower prices and reduce consumption when prices spike. Similarly, lighting in stations, heating, and cooling on trains can be modulated with demand. The greatest flexibility is available when trains are stationary, allowing delayed charging or downtime to coincide with cheaper electricity or surplus grid capacity. During passenger peak hours, however, options to reduce consumption are much more limited due to essential service requirements.

Alternatively, following the Belgian example, rail energy buyers may cover part of their demand using long-term, fixed-price PPAs, while the remainder is purchase on the fluctuating spot market. This hybrid approach enables operators to benefit from price stability for core consumption, while keeping some volume flexible to leverage market opportunities or manage risks.

6. Conclusions

The European railway sector faces ongoing challenges from volatile and high electricity prices from the global energy crisis in 2022. Average prices for electricity in the EU-27 ranging from low consumption to high consumption are still higher than pre-crisis levels. However, the electricity prices paid by railway undertakings and infrastructure registered in the latest survey show that there is an overall decrease observed across countries.

Despite recent price decreases, railway undertakings are more pessimistic about future electricity prices, while infrastructure managers remain largely optimistic. This could be largely explained by the latest Eurostat data indicating a slight increase in electricity prices from the last semester in 2024. Currently, railways pay, on average, more than 120 €/MWh for electricity traction, around double the price of pre-crisis levels when comparing to the highest consumption band.

A few countries have reported that they negotiated PPAs of multiple years such as Spain, Denmark and Slovakia and have consequently experienced a great decrease in prices compared to 2022. There are barriers to deployment of PPAs since they are complex and depend on the national regulations, however they have been proven to be an effective hedging strategy against energy price volatility and promote investment in renewable energy.

CER supports Member States in facilitating the deployment of PPAs for which policy support and financial innovation are essential. Enhanced government frameworks, standardized contract structures, and targeted financial instruments, particularly from institutions like the European Investment Bank, can reduce barriers and bolster investment confidence.

Complementing PPAs, the sector's potential for energy flexibility, which is enabled by operational adjustments, such as shifting consumption to off-peak periods or modulating energy use in stations and trains, is crucial. This flexibility helps railways manage price volatility and optimize costs without compromising service reliability.

Sustained efforts in these areas will enable the railway sector to mitigate energy costs, support decarbonisation and strengthen its role as a sustainable backbone for European transport and economic growth.