



# Basket risk assessment

In the context of the *Specific Remunerative Regime* introduced in the Spanish Royal Decree, RD-L 413/2014.

**KYOS Energy Analytics**

Q1, 2024– Issue Nr. 6

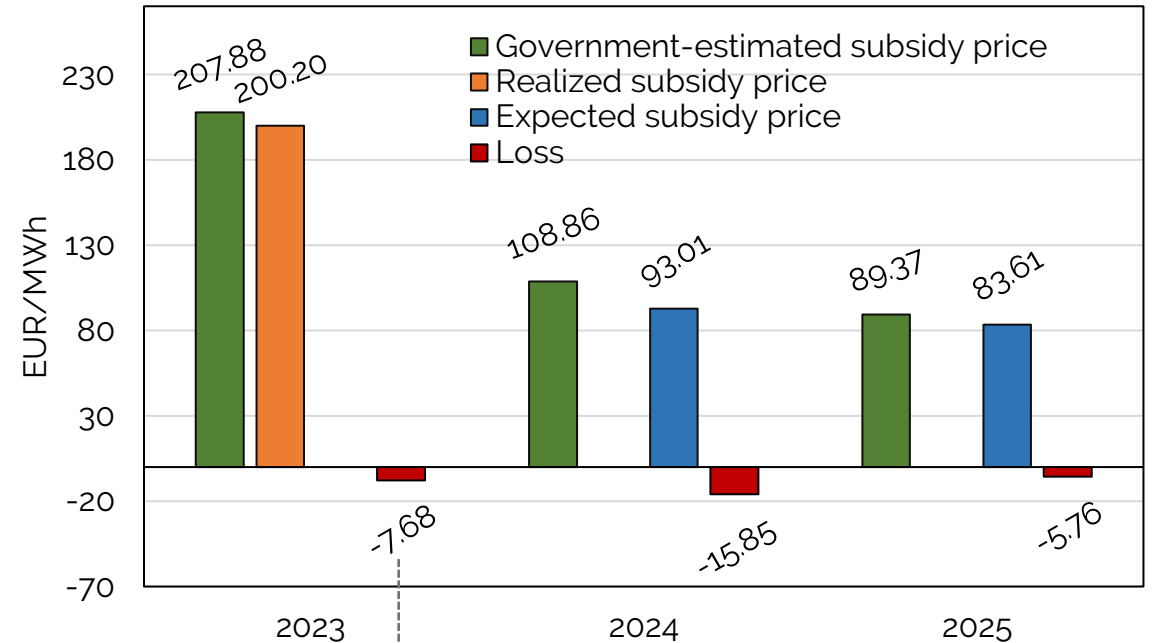
# Expected and realized losses in subsidy price

For renewable energy assets participating in the Spanish subsidy scheme *Specific Remunerative Regime* within the period 2023-2025, the Spanish government has estimated an average fair subsidy price of 135.37 EUR/MWh (207.88, 108.86 and 89.37 for 2023, 2024 and 2025, respectively).

- However, as per trading date **Feb. 27<sup>th</sup>, 2024**, these assets are expected to lose 9.64 EUR/MWh on average due to the differences between these government estimations and expected (or settled) subsidy prices over the three years.
- For example, the government-estimated subsidy price of 207.88 for 2023 settled at 200.20, leading to a loss of 7.68.
- In 2024 and 2025, expected prices may lead to a loss of 15.85 and 5.76, respectively. But these losses might be even larger, as we show next.

A large part of the exposure in this subsidy scheme can be hedged in the forward markets. KYOS is an independent provider of software and advisory services for risk analysis and recommendations on how to manage these financial risks.

Loss in government-estimated subsidy price at 80% capture rate



In 2023, the loss was originally higher, at 22.59 EUR/MWh, but it was contained by the government in the Decree RDL 5/2023.

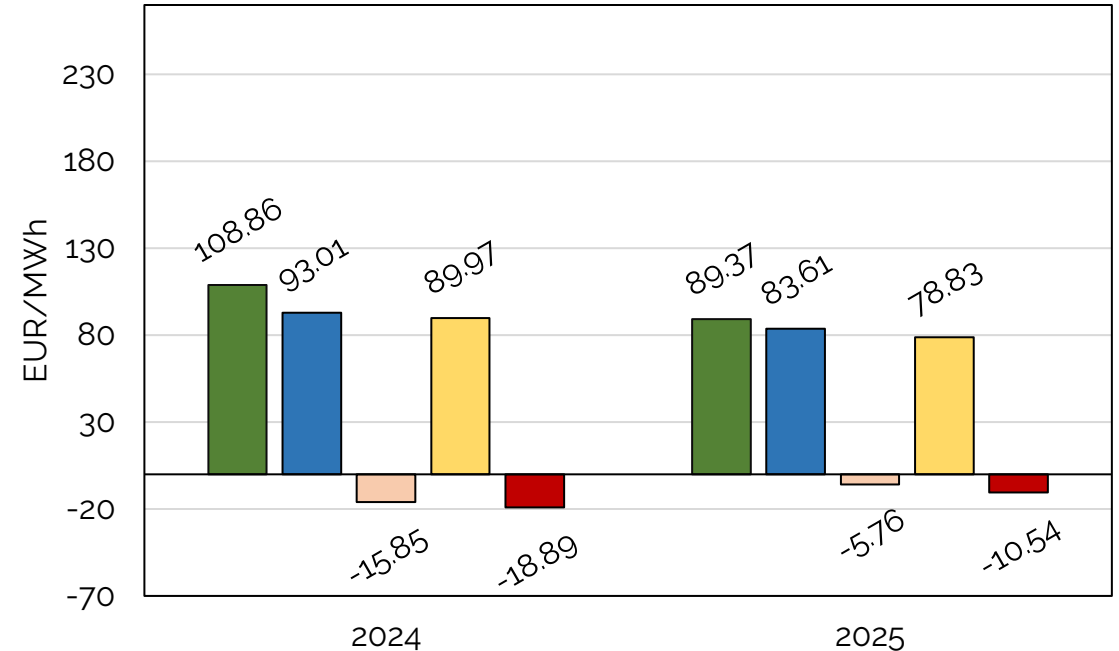
# Expected and realized losses in subsidy price

Using the KYOS Monte-Carlo price simulations engine (see appendix), we determine that:

- The expected average loss of 9.64 EUR/MWh can increase to 12.37.
- This comes from an additional worst-case loss of 3.04 in 2024 and 4.78 in 2025.
- In 2024, approximately 16% of the subsidy price has been settled. This leads to a lower additional worst-case loss in comparison to 2025.
- As 2025 is yet to start its settlement (in Oct. 2024, based on the subsidy guidelines), there is a higher probability of the spot price and forward prices diverging in that year.

Based on the formulation of the subsidy scheme, the subsidy price is reduced when these differences become larger.

## Loss in subsidy price at 80% capture rate



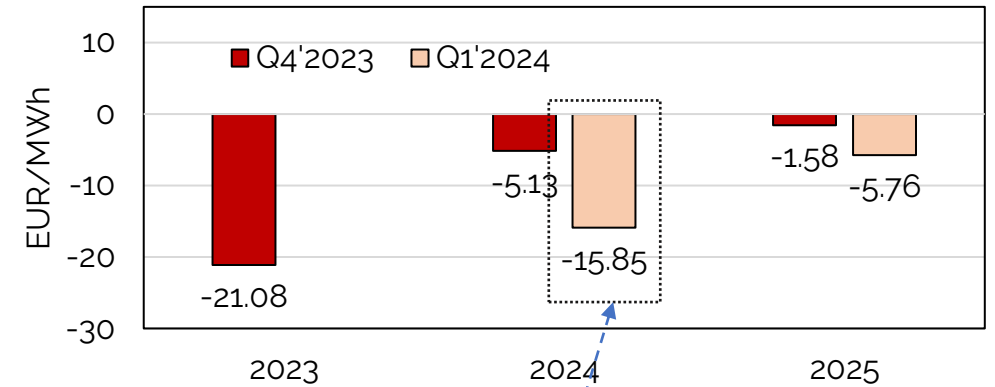
- Government-estimated subsidy price
- Expected subsidy price
- Expected loss
- Worst-case subsidy price
- Worst-case loss

# Comparison to the previous report (Q4' 2023)

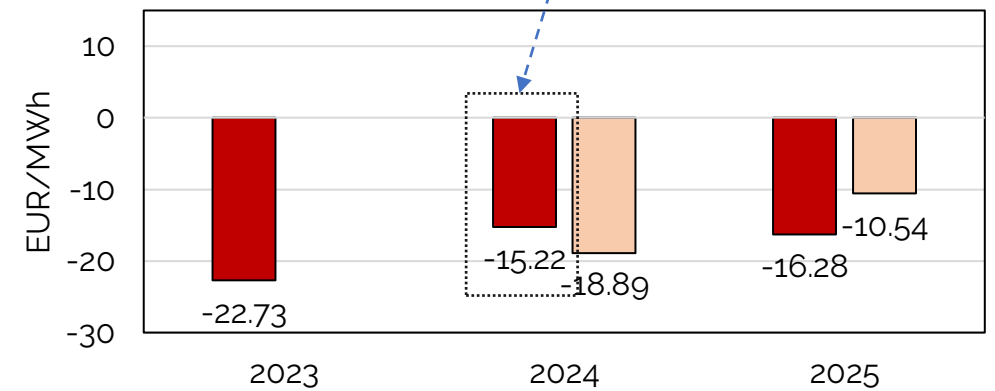


2023	<ul style="list-style-type: none"> <li>In our previous report (Q4'23), we estimated an expected loss of 21.08 and a worst-case scenario of 22.73 for 2023. Without the government's adjustment of the subsidy price, the loss would have settled in between, at 22.59 EUR/MWh.</li> <li>This was expected as most of the price had already been settled by Q4'2023.</li> </ul>
2024	<ul style="list-style-type: none"> <li>Last quarter, we showed that the risk of the 2024 subsidy price settling at a lower level than expected was quite large (15.22 - 5.13 = 10.09).</li> <li>In Q1'24, the expected loss is 15.85 for 2024. This is close to what we estimated to be the worst-case scenario (15.22) in the previous report.</li> </ul>
2025	<ul style="list-style-type: none"> <li>In the previous report, the distribution of subsidy losses was large (i.e. see risk, 16.28 - 1.58 = 14.70), driven by many possible large differences between spot prices and forward prices. As the subsidy gains were equally large, the resulting distribution average was small (1.58).</li> <li>As 2025 comes closer to its settlement in this quarter, the distribution width is narrower (now, 10.54 - 5.76 = 4.78), but it has also shifted towards the losses (i.e. -5.76 &lt; -1.58), showing that possible subsidy gains are not expected to be as large as in the previous quarter.</li> </ul>

**Expected loss in subsidy price at 80% capture rate**



**Worst-case loss in subsidy price at 80% capture rate**



# Conclusion

- As per trading date **Feb. 27<sup>th</sup>, 2024** asset owners in the Spanish subsidy scheme *Specific Remunerative Regime* are expected to lose 9.64 EUR/MWh on average within the period 2023-2025.
- Hedging in the forward markets would have helped mitigate this loss, especially in the case of its original trajectory (14.73), prior to the government's reassessment of the 2023 subsidy price.
- Currently at 9.64, the loss can increase to 12.37 if the worst-case scenarios for 2024 and 2025 materialize. These two years have non-negligible exposures of 3.04 and 4.78, respectively, which would add up to the realized loss of 7.68 from 2023.
- In our Q4'23 report, we expected a loss of 5.13 and a worst-case scenario of 15.22 for 2024, resulting in a risk of 10.09.
- The fact that in this report the expected loss (15.85) is close to what we specified as the worst-case scenario in the previous quarter, highlights the importance of mitigating exposures in due time when the risk is large.
- KYOS, as an independent provider of software and advisory services, has the tools and experience to provide in-depth analysis and recommendations on how to manage these financial risks.

## Loss in government-estimated subsidy price at 80% capture rate

Year	Subsidy price (EUR/ MWh)	Loss in subsidy price (EUR/ MWh)	
		Expected	Worst-case
2023	207.88	Realized: 7.68 (originally, 22.59)	
2024	108.86	15.85	18.89
2025	89.37	5.76	10.54
Average	135.37	9.64	12.37

# Appendix



# Renewable energy support schemes in Spain



- The Spanish government has two subsidy schemes for renewable energy assets: 1) Specific Remunerative Regime-2014 (SRR) and 2) Economic Regime for Renewable Energies - 2020 (ERRE).
- Assets in the SRR get a price for their production, which consists of two parts: i) the price captured in the spot market and ii) a subsidy price backed by the government. This subsidy price is designed to guarantee an internal rate of return (IRR) on the asset investment based on an estimated 'fair' subsidy price.
- If the market price is e.g. much higher than the fair price, this translates to a shorter time of subsidy support, because the IRR is then expected to be reached sooner. On the other hand, a lower market price results in a longer subsidy support.
- The market price the government monitors to make the adjustments above is a *basket* of prices (a linear combination of a spot index and a forward index). Given that asset owners are exposed to the capture price as they sell energy in the spot market, but their subsidy price is exposed to the forward market, there is a risk that the subsidy price (and thus the IRR) settles below their fair estimate.
- Hereinafter, we describe the process that we follow to measure this risk.

## Support schemes in Spain for renewable energy assets

Description	Specific Remunerative Regime	Economic Regime for Renewable Energies
<b>Inception</b>	Introduced in the Royal Decree 413/2014	Introduced in the Royal Decree 960/2020
<b>Award mechanism</b>	Tender	Tender
<b>Offered product</b>	Capacity	Capacity and/or energy
<b>Awarded price</b>	Same for all	Pay-as-bid
<b>Purpose</b>	Return on the investment and operation of the assets	Fixed price received for the energy produced

In 2024, 47% of the installed capacity in Spain is under these two subsidy schemes. There is approximately 50 GW of capacity under the SRR scheme and 8 GW under the ERRE.

# KYOS Analytical Platform for risk assessment



1. Build Spanish power forward curve	<ul style="list-style-type: none"> <li>To build the Spanish power forward curve, we use the KYOS forward curve builder (KyCurve). This model shapes the curve using month, quarter, and year end-of-day settlement prices from OMIP. The model then refines the curve with seasonal, daily and hourly shapes.</li> <li>In the upper plot to the right, we show the resulting forward curve until the end of 2025.</li> </ul>
2. Simulate future and spot prices	<ul style="list-style-type: none"> <li>Using our Monte-Carlo simulation engine (KySim), we generate many paths of forward and spot prices around the forward curve. KySim captures short-term, long-term and seasonal volatility in forward prices, mean-reversion and regime switches in daily spot prices, and weather-driven volatility in hourly spot prices.</li> <li>In the lower plot to the right, we show the resulting simulations for 2025.</li> </ul>
3. Assess subsidy price risk	<ul style="list-style-type: none"> <li>Using the KYOS internal tools, we have assessed the risk in the subsidy price by applying the rules and conditions as laid in the Royal Decree RD-L 413/2014 to a large number of simulation paths, which show realistic forward price levels and hourly shapes.</li> </ul>

