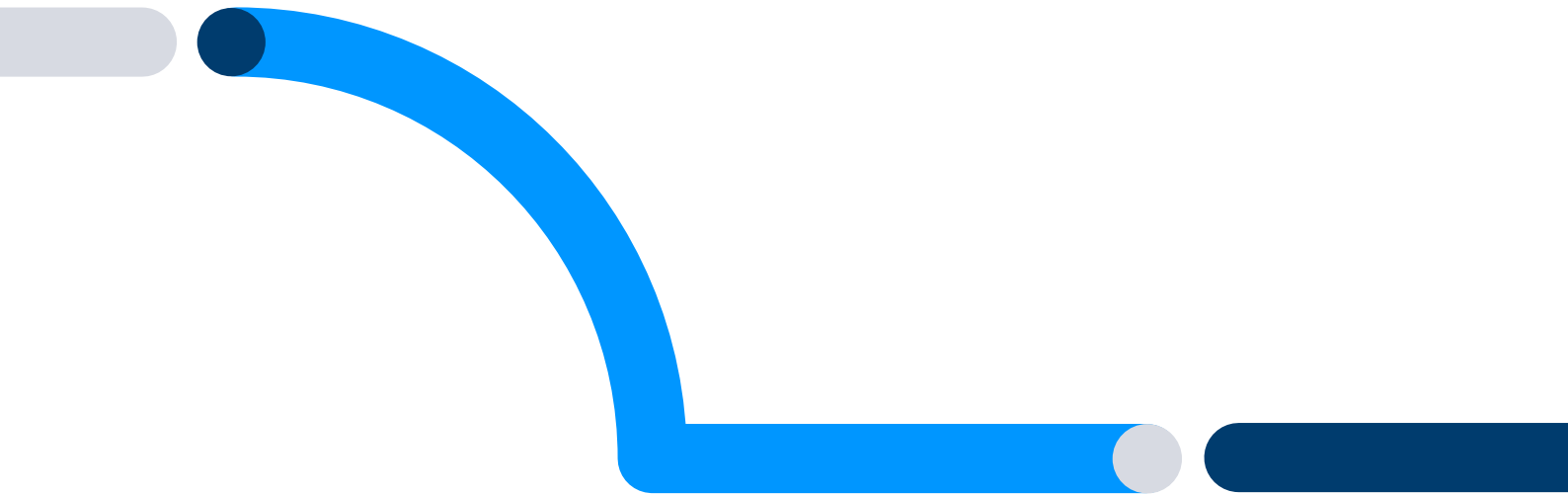


red eléctrica

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Consideration of the ACER Opinion 11/2025 on the NRAA of Spain

Public information

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1 Context

Red Eléctrica has performed, for the Spanish peninsular power system, a National Resource Adequacy Assessment (NRAA) as a complement to the European Resource Adequacy Assessment (ERAA) edition 2024 by adapting some relevant assumptions and some modelling features. The main purpose of this edition has been to assess national adequacy considering a limited number of national specificities in comparison to the ERAA 2024 that are relevant for the Spanish system, in terms of both modelling and hypotheses.

Following Article 24.3 of the Electricity Regulation 943/2019, the NRAA was published at Red Eléctrica's website ([here](#) the document, [here](#) the web section) and submitted to ACER on the 8th of September of 2025. Accordingly, ACER has published the Opinion 11/2025 of 7th November 2025 on the National Resource Adequacy Assessment of Spain at ACER's website ([here](#) the document, [here](#) the web section).

In this Opinion, *overall, ACER finds the assessment is clear and well-executed, complementing the European assessment* and concludes the following:

- *Table 3 presents ACER's assessment of whether the differences between the Spanish NRAA and the ERAA 2024 are justified.*
- *ACER considers most of the differences between the Spanish NRAA and the ERAA 2024 edition to be justified. However, ACER finds two differences – #5 and #9 – not justified. The previous section explains ACER's position and offers recommendations for improvements. In particular to (i) review battery capacity assumptions in light of evolving market frameworks; and (ii) consider an optimised gas turbine maintenance schedule that could better reflect the evolution of the Spanish system.*
- *The overall impact of these two differences on adequacy results (LOLE) is, however, limited. The lower battery capacity and constrained gas turbine availability under the fixed maintenance profile are ultimately offset by the reduced gas turbine decommissioning observed in the EVA modelling phase, thereby keeping the overall impact on LOLE low. However, the precise effect on system adequacy can only be accurately quantified through dedicated adequacy modelling using sensitivity scenarios.*
- *Considering the above, overall, ACER is of the view that the Spanish NRAA provides robust adequacy findings. ACER also recognises that the extended geographical scope and EVA investment modelling is a good practice, on par with the ERAA 2024 module.*

The present report considers what is established according to Article 24.3, with regard to that *the body that is responsible for the national resource adequacy assessment shall take due account of ACER's opinion, and where necessary shall amend its assessment. Where it decides not to take ACER's opinion fully into account, the body that is responsible for the national resource adequacy assessment shall publish a report with detailed reasons.*

One of the main functions of Red Eléctrica, as TSO of the Spanish power system, is to monitor system adequacy to guarantee the continuity and security of the electricity supply. Given this role, European and National adequacy assessments are one of the main analyses that allow monitoring of system adequacy in the long term. In this sense, Red Eléctrica actively participates and contributes in the ERAA in every edition and has decided to perform two NRAAs as a complement to the ERAA.

In particular, when launching the NRAA 2025 in mid-April in view of the ERAA 2024 results, a collaborative framework was established, not only at national level with the Ministry and the Regulatory Authority, but also at European level. Red Eléctrica finds this framework very positive, as it has even allowed to refine the scope of the project at an early stage and to produce a more valuable analysis. In this regard, it was found that the assumptions and the methodology that were introduced in the NRAA 2025 were reasonable and consistent with the European and Spanish regulation as well as with the evolution of the power system of Spain up to that moment.

2 Recommendations from the Opinion

ACER's Opinion states that most of the assumptions and methodological differences between the ERAA 2024 study and the NRAA 2025 study are considered justified and includes recommendations for improvements for two (of a total of ten) that considers not justified, which are assessed in this section of the present report.

2.1 To review battery capacity assumptions in light of evolving market frameworks

Section 3.3 of the Opinion includes an evaluation of the differences between the ERAA and the NRAA in terms of storage input data, which contains two recommendations:

1. *The initial storage assumptions (prior to the EVA investment modelling), should consider the potential removal of barriers and the anticipated developments in the electricity system that could facilitate greater storage deployment in the coming years.*
2. *In future assessments, consider incorporating into EVA multiple revenue streams available to storage resources – already covered under the ERAA methodology – such as intraday market energy arbitrage and grid support services. This becomes particularly important when the initial assumptions on storage capacity deployment are low. As the energy transition accelerates, the performance of EVA should evolve accordingly, to better reflect the business models of non-fossil flexible resources.*

For clarity of the reader, these two recommendations end in the final recommendation “review battery capacity assumptions in light of evolving market frameworks”, as one recommendation is oriented not to a revision of the current NRAA 2025, but to future ERAA or NRAA assessments (also in light of paragraph 32 “The Spanish NRAA is not asked to improve the EVA module in the current assessment”).

As for the amount of the battery deployment considered in the NRAA 2025, there is currently a consensus at national level that batteries will only develop in the Spanish power system if investors are able to reap sufficient benefits or incentives. Such consideration may suggest a divergence between the readiness of promoter to invest in storage in the short and mid-term in Spain compared to other parts of Europe. Furthermore, numerous forward planning documents of the Spanish Government (the National Energy and Climate Plan; NECP; the Implementation plan and the Energy Storage Strategy) consider a capacity mechanism as a specific measure to reach the storage capacity targets. Additionally, promoters have stated their vision and detected the lack of sufficient incentives in articles in national newspapers and in many roundtables and events organized by the sector.

In the light of these, Red Eléctrica considers justified to consider in the NRAA 2025 only those battery projects to which a public support scheme has already been awarded. These storage projects with public support account currently to a total of 1.5 GW. In fact, the NRAA 2025 considered 100% success in the deployment of the battery projects with public support, which is not always the case as, in some cases, these projects may not achieve the final permits for deployment, or their developers may decide not to go ahead with the project for other reasons.

This assumption is considered unjustified in the ACER's Opinion, based on the following arguments:

- The Opinion indicates that the RES to battery ratio considered for Spain in the NRAA is lower than the one resulting at EU level according to ERAA 2024 scenario. However, in the opinion of Red Eléctrica such broad level ratio should serve only as orientation and does not consider specific factors that occur in one Member State and not in others, for example, specific issues related to permitting or the availability of pump-hydro storage or hydro basins already.

Furthermore, the use of such ratio as an assumption to the NRAA scenario could introduce a self-fulfilling prophecy effect. If the battery assumptions that result from the application of such is sufficient, no adequacy issues will be identified, so no capacity mechanism can be established, and the battery ratios may not be reached due to insufficient investment signal for these projects. This is considered the case for batteries in Spain.

Precisely, this is the reason why Red Eléctrica thought that it was necessary to perform the NRAA 2025 in order to avoid this self-fulfilling effect, which is present in ERAA due to the requirement to consider a NECP compliant scenario. In fact, there is clearly a risk of this effect as the Spanish NECP considers a capacity mechanism as a specific measure to reach the storage capacity targets.

- The Opinion indicates that the scenario is not compliant with NECP in terms of storage assumptions, an ERAA methodology requirement. However, several points need to be considered:
 - The ERAA methodology is the methodological basis for the NRAA, but the core value of a NRAA is to consider national particularities with impact on adequacy that are not reflected in the European assessment.
 - In addition, as stated previously, Spanish NECP considers a capacity mechanism as a specific measure to reach the capacity targets, and in the NRAA the only assumptions that have been modified in terms of capacity with regards to the ERAA are those where a capacity mechanism is assumed to be the key element to trigger the investments needed to reach those capacity targets: batteries and pumped storage.
- The Opinion includes arguments which are linked to expectations of evolving market framework. For example, paragraph 38 refers to the likelihood of storage deployment thanks to the measures reflected in the Spanish Implementation plan and in the Energy Storage Strategy aiming to address possible barriers for deployment among which is the implementation of a capacity mechanism as well. Also, paragraph 39 refers to the Iberian blackout report and the likelihood of measures that will facilitate more storage development as one of the key recommendations of the report (one of which is the recommendation to introduce a capacity mechanism). Those evolutions, while desirable and expected, present uncertainties both on the effectiveness and implementation time. Of all the measures, a capacity mechanism is, in Red Eléctrica's view, the one which will have the highest impact on storage deployment and probably the only one that can be available in the required timeframe. Measures introduced in the last years have proved to have insufficient impact (considering that the current battery capacity is 32 MW), such as the possibility for storage to participate in all the existing balancing and non-frequency services.

Due to the impact that a lack of supply adequacy has on the society and economy of a country, adequacy assessments should be based as much as possible on certainties and, in this sense, the only certain incentives that the Spanish peninsular power system currently has in place for battery development that are relevant for the purpose of the NRAA 2025 are the support scheme aids that were considered and that are limited to 1.5 GW of battery capacity (considering an optimistic 100% success rate).

In any case the deployment of these projects needs to be monitored, considering that the deadline set for these support schemes is early 2026, requests for deadline extension are already spoken of.

Considering the recommendation reflected in the Opinion, Red Eléctrica has launched an additional set of simulations (EVA+ADQ) with a higher battery capacity evolution. Despite the Opinion does not provide an indication of what range of battery capacity would be considered appropriate, there has been a recent (24/10/2025) publication of a [proposal of provisional resolution for an additional public support scheme for storage](#). In this new set of simulations, which have been launched merely to prove the robustness and validity of the conclusion of the NRAA, the following alternative assumptions on battery capacity have been considered, and are compared in the figure with the assumptions from ERAA 2024 and NRAA 2025:

- 2030: on top of the capacity considered in the NRAA, all the 2016 MW of provisionally awarded battery capacity (on October 2025) has been considered (again with an optimistic 100% success rate). This makes a total of 3.5 GW of capacity, which is approximately 50% of the capacity considered in the ERAA 2024 for this target year.
- 2035: on top of the capacity considered for 2030 in this new simulation, extra capacity has been added up to 75% of the ERAA 2024, making a total of 10 GW of batteries capacity. In light of the lack of concrete elements to define an increased capacity value, 75% is understood as a compromise between the 50% that resulted for 2030 and a possible alternative proposal of 100%.

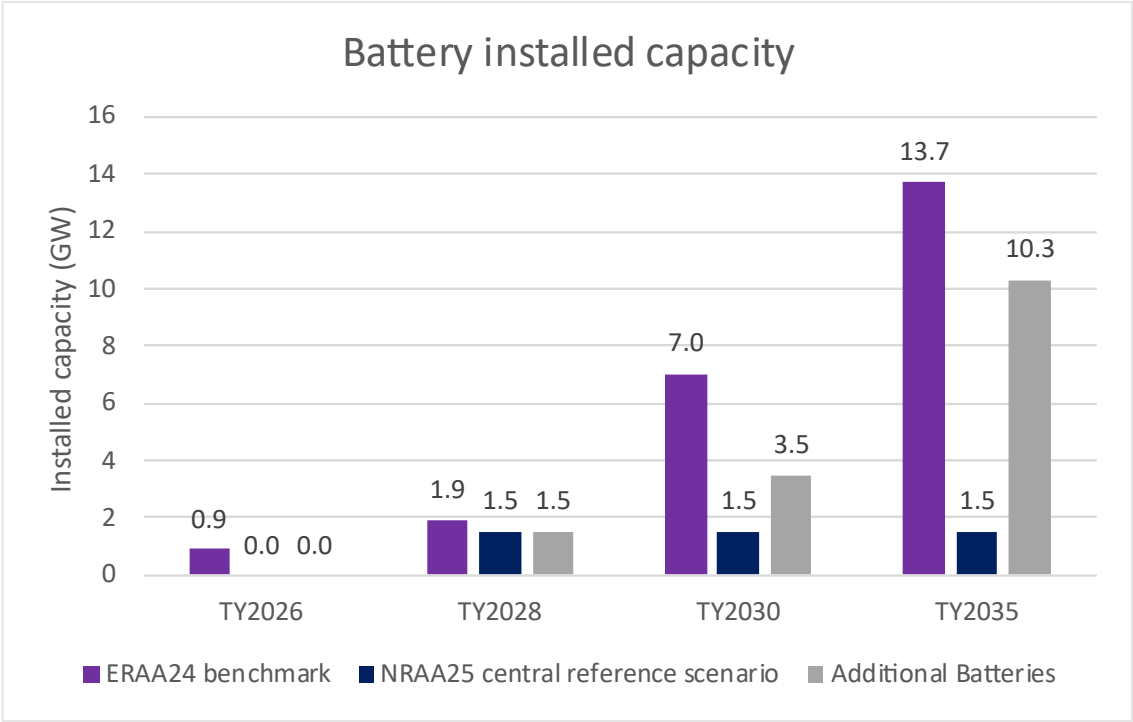


Figure 1. Battery installed capacity in ERAA 2024, NRAA 2025 and in this new simulation.

When the EVA simulation is repeated with these modified battery assumptions, the volume of combined cycle that would be economically non-viable rises from the 3.5 GW capacity identified in the NRAA to 4.6 GW, as shown in the following figure. As was already shown in figure 47 of the NRAA report and also stated in the Opinion, it is confirmed that the impact is considerably low.

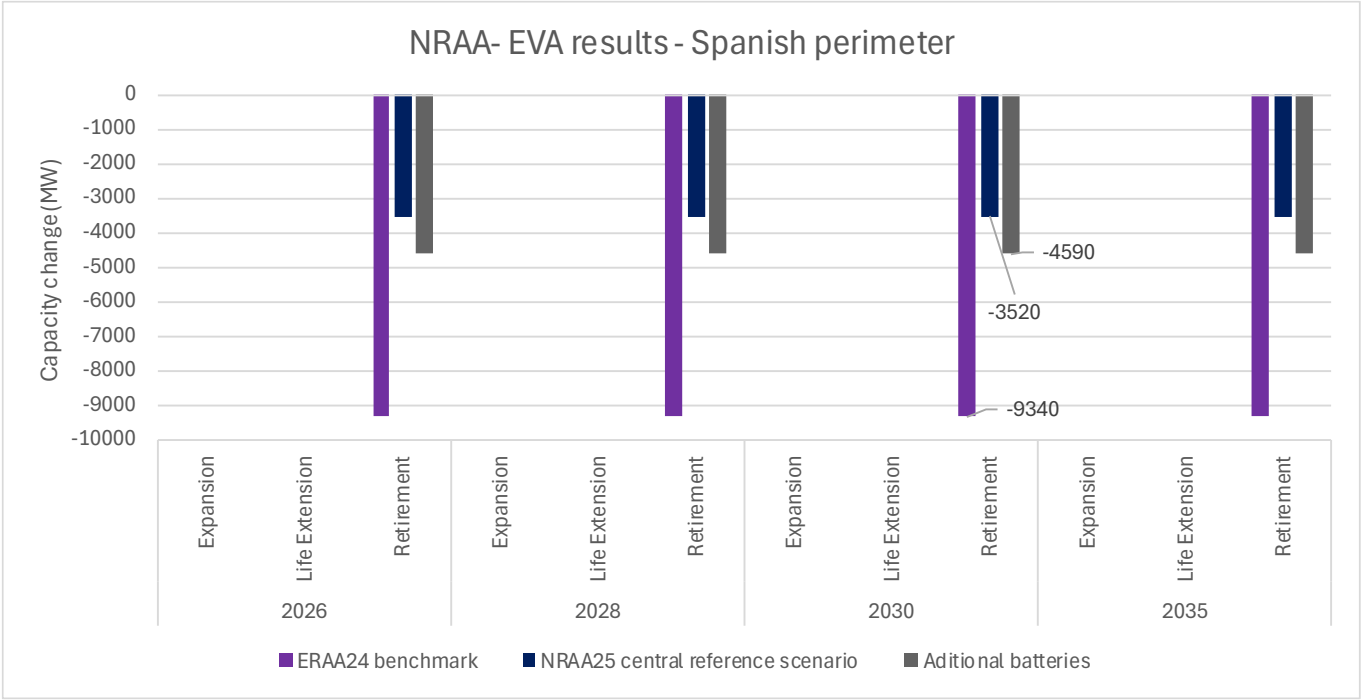


Figure 2. Spanish economic viability results in ERAA 2024, NRAA 2025 and in this new simulation.

Finally, when the adequacy simulations are performed for 2030 considering these modified battery assumptions and the new value of non-viable combined cycles, the loss of load expectation indicator calculated as the average of the 36 weather scenarios (which are the average of 5 forced outage patterns, meaning 180 Montecarlo samples for each hour of the year) moves from the 2.41 h/y identified in the NRAA to a value of 1.67 h/y, still above the reliability standard of 1.5 h/y.

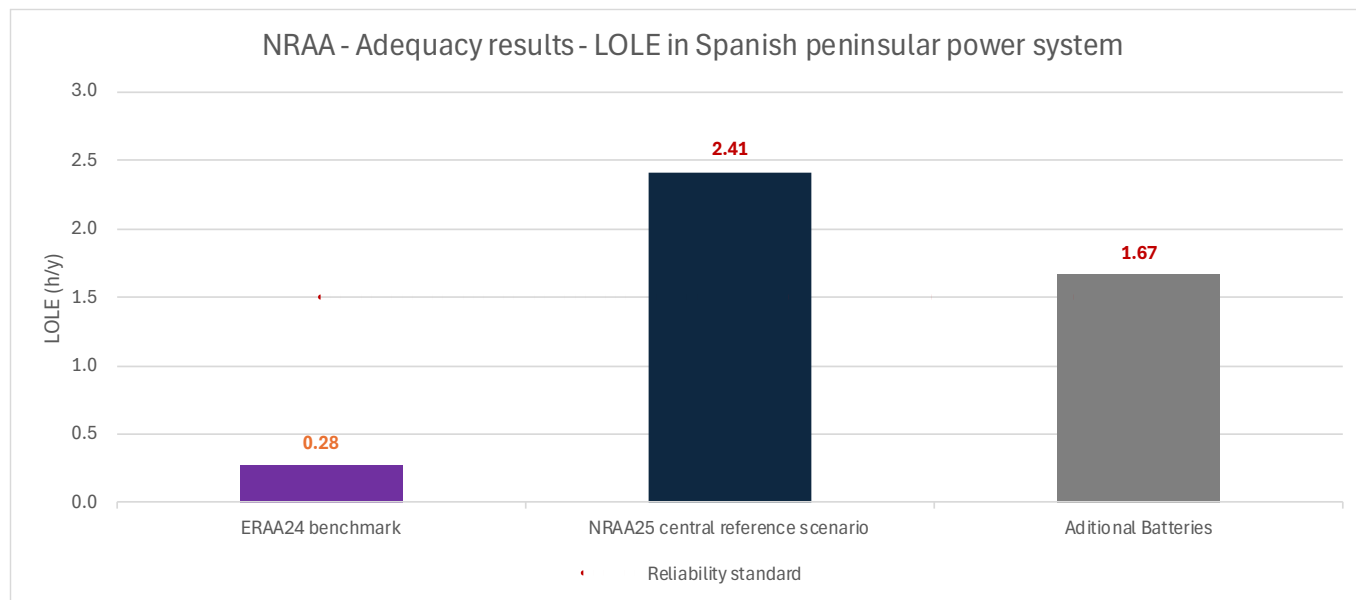


Figure 3. Spanish adequacy results in the ERAA 2024, NRAA 2025 and in this new simulation.

The results of this set of new simulations confirms the robustness of the adequacy risks identified for target year 2030 in the NRAA central reference scenario and demonstrates that the main conclusion extracted from the NRAA 2025 assessment, and also present in ERAA 2022, NRAA 2023, ERAA 2023 and ERAA 2024, remains valid: the energy market itself will not suffice to achieve proper system adequacy in Spain, and it is critical for adequacy to implement additional measures such as a capacity mechanism. As mentioned, such mechanisms, already considered in the NECP as a measure to reach the targets, allow to achieve the desired level of decarbonization and electrification in time and with the required level of adequacy.

2.2 To consider an optimised gas turbine maintenance schedule that could better reflect the evolution of the Spanish system.

Section 3.4 of the Opinion includes an evaluation of the differences between the ERAA and the NRAA in terms of gas turbines input data, which contains two recommendations:

3. *That future assessments apply different CCGT forced outage rates per sub-technology as categorised in ERAA – specifically CCGT old 1, old 2, present 1, present 2, new and Carbon Capture and Storage (CCS). This distinction is particularly important for Spanish assessment, as a significant share of CCGT capacity is decommissioned during the EVA phase. Decommissioning begins with the least technically efficient and oldest power plants, which typically have the highest outage rates. Applying different outage rates per sub-technology ensures that the remaining generators after the EVA phase are not burdened by the poor performance characteristics of the decommissioned old units.*
4. *That the NRAA moves away from a fixed maintenance profile and considers adopting an approach based on optimised planned maintenance, allowing for partial overlap with scarcity periods, as observed historically. This would better align maintenance profiles with the evolving Spanish electricity system.*

For clarity of the reader, these two recommendations end in the final recommendation “consider an optimised gas turbine maintenance schedule that could better reflect the evolution of the Spanish system”, as one recommendation is orientated to future assessments.

This recommendation, based on a requirement set in the ERAA methodology, assumes that the maintenance of the combined cycles will be optimized to avoid scheduling maintenance when adequacy risks are likely to occur. While this is of course desirable from the system operation perspective and may be a possibility contemplated in other European countries, there are no legal tools that allow the Spanish TSO to approve or not the maintenance of generation units, although traditionally the generators are collaborative (when possible) to adapt their schedules if it is beneficial for the system. Also, the market does not offer sufficient incentives to do so in the absence of a capacity mechanism. Finally, the Opinion indicates that an optimized maintenance would better align maintenance profiles with the evolving Spanish electricity system, but there is no justification on why this would be.

Red Eléctrica would like to insist that assuming an optimization of the maintenance of combined cycles strongly deviates from the tendencies observed in the last years where it has been observed that there are periods where a high number of units are undergoing maintenance and this fact creates stress situations when combined with low renewable output or high demand levels. The following figure, which is an update of Figure 38 of the NRAA report with the current data regarding planned maintenance of combined cycles for the end of 2025 and new data for 2026, clearly reflects that a very important part of the CCGT fleet systematically has been in maintenance during the October-November-December period in the last years, with peaks of 25% of the fleet on maintenance simultaneously. Similarly, in the January-February-March winter window the average unavailability is lower but in 2025 there has been a peak of also 25% of the fleet unavailable. Regarding this winter season, in 2025 a peak of 23% of unavailability has been already observed in October, and a further peak of 30% is expected in February 2026.

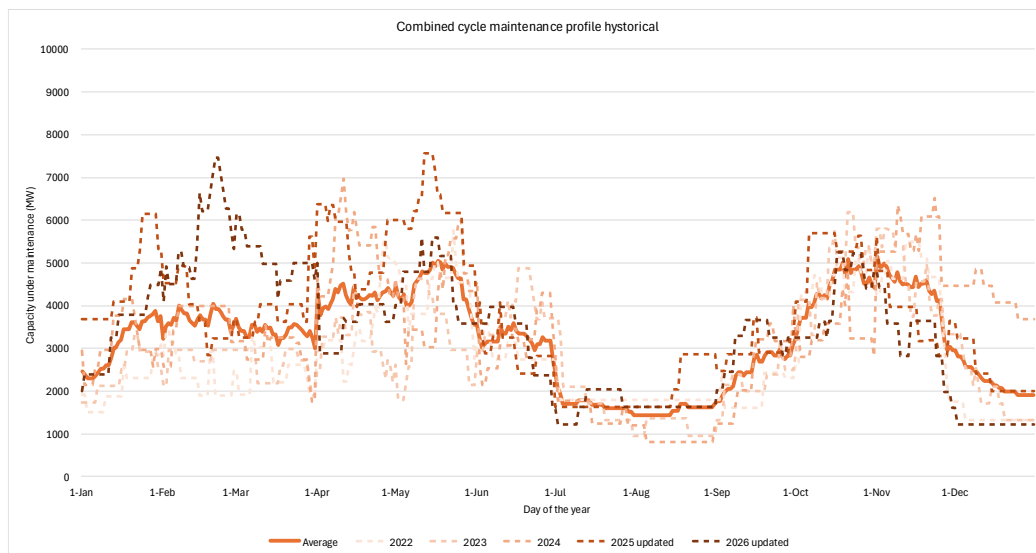


Figure 4. Observed planned unavailability of combined cycles in the 2022-2026 period.

The following figure includes a direct comparison of the averaged maintenance profiles observed historically in 2022, 2023, 2024, and mid-2025 and expected for the rest of 2025 and 2026, and the profiles used in ERAA 2024 and the NRAA 2025 for target year 2030. It is clear that the profile used for target year 2030 in the NRAA central reference scenario (based on data aligned with real life) captures the observed reality with a higher precision than the one used in the ERAA 2024 (based on optimization), in particular for the winter season (November, December, January, February) where the ERAA optimized profile keeps an extremely low unavailability. Again, the ERAA methodology is the basis for the NRAA but should not condition the ability of a NRAA to consider national particularities with impact on adequacy that are not reflected in the European assessment.

Last, using historical evidence has been considered acceptable in the Opinion for the justification of other differences between the ERAA and the NRAA.

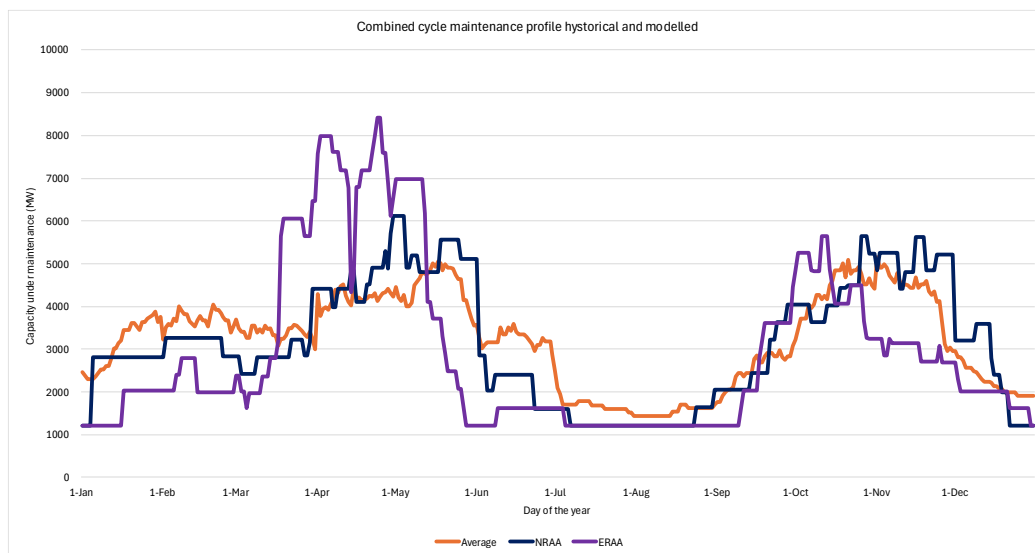


Figure 5. Average observed planned unavailability of combined cycles in the 2022-2026 and representation of planned availability in target year 2030 in the ERAA 2024 and the NRAA.

In the absence of a capacity mechanism that incentivizes the availability of these units in the periods where system stress is more probable, there is no certainty that allows to assume, at least in an assessment evaluating system adequacy in Spain, that an optimization of the maintenance of combined cycle units will take place. This national particularity is better captured in the NRAA than it is in the ERAA.

3 Conclusion

The present report considers what is established according to Article 24.3, with regard to *the body that is responsible for the national resource adequacy assessment shall take due account of ACER's opinion, and where necessary shall amend its assessment. Where it decides not to take ACER's opinion fully into account, the body that is responsible for the national resource adequacy assessment shall publish a report with detailed reasons.*

Red Eléctrica has assessed the two recommendations from the Opinion and considers the following:

1. Regarding the recommendation “*to review battery capacity assumptions in light of evolving market frameworks*”:

Red Eléctrica considers reasonable the expectation of battery development in the Spanish peninsular power system considered in the NRAA due to the explained national particularities. In any case, a new set of simulations (EVA+ADQ) has been performed considering higher capacity of batteries in the horizon (in particular, an additional capacity of 2 GW in target year 2030, a 133% increase). The results of this set of new simulations confirm the robustness of the adequacy risks identified for target year 2030 in the NRAA central reference scenario and demonstrates that the main conclusion extracted from the NRAA 2025 assessment, and also present in ERAA 2022, NRAA 2023, ERAA 2023 and ERAA 2024, remains valid: the energy market itself will not suffice to achieve proper system adequacy in Spain, and it is critical for adequacy to implement additional measures such as a capacity mechanism.

2. Regarding the recommendation “*to consider an optimised gas turbine maintenance schedule that could better reflect the evolution of the Spanish system*”:

Considering the historical observations of 2022, 2023, 2024, 2025 and expectations for 2025 and 2026, an optimization of the maintenance periods of combined cycles is not being observed and, in the absence of a capacity mechanism that incentivizes the availability of these units in the periods where system stress is more probable, there is no certainty that allows to assume, at least in an assessment evaluating system adequacy in Spain, that an optimization of the maintenance of combined cycle units will take place. This national particularity, based on historical evidence, is better captured in the NRAA 2025 than it is in the ERAA2024.

In light of these conclusions, **Red Eléctrica considers that the NRAA provides robust adequacy findings and is a useful tool for decision makers to introduce a capacity mechanism in the Spanish peninsular power system as a key planning measure**, necessary to achieve the desired level of decarbonization and electrification in time and with the required level of system adequacy. These mechanisms have in fact already been considered in the NECP as a measure to reach the targets. Further delays in their implementation will eventually critically increase the possibility of situations without sufficient system adequacy in the years analysed according to the projected system evolution.

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