ENTSO-E

# European Resource Adequacy Assessment 2021

**Name:** Charlotte Roig-Ramos / Sébastien Méraud

**Organization**: UFE

**Your feedback on ERAA 2021**

**6. The ERAA target methodology is set to support the achievement of the EU 2030 climate and energy objectives set out in Article 1(a) of Electricity Regulation. Do you agree that the ERAA 2021 is already an important analysis in view of EU ambitious climate and energy targets?**

- Strongly agree
- Agree
- Neutral
- **Disagree**
- Strongly disagree
- Don't know

**7. How is the ERAA 2021 useful to you or your business?**

- Adequacy situation in the mid-term drives our business decisions.
- The results of ERAA are a support for our policy or regulatory decisions.
- We are interested in understanding the methodology of ERAA for research purposes.
- **We are interested in understanding the methodology of ERAA for business/consulting purposes.**
- Other (please explain)

**In case you checked the box "Other", or in case you want to give additional explanations, please provide your comments in the text box below:**

Regarding question 6, UFE considers that the primary goal of ERAA and of its methodology is to contribute to ensuring security of supply by highlighting potential future resource adequacy issues considering the choices made and climate objectives pursued. The objective is not to support the EU climate objectives as such.

As an outcome of the Clean Energy Package, the Electricity Regulation introduced the European Resource Adequacy Assessments (ERAA) as a cornerstone for setting up and maintaining capacity mechanisms (capacity markets and strategic reserves). As France has a market-wide capacity mechanism in place and considers to reform it after the initial 10-year approval by DG COMP, UFE believes important to ensure that ERAA will

ultimately be fit for purposes. As mentioned in Q6 above, UFE believes that the current ERAA 2021 is not mature enough to fulfill the goals mentioned in the electricity regulation. In any case, the national resource adequacy assessments (NRAA) should be used as a complement to better assess the adequacy issues faced by France and the need for having a capacity mechanism in place.

Regarding question 7, in the future, the ERAA could be a useful tool for mid-term business and investment decisions. However, at this stage, the underlying methodology still needs further improvements to provide reliable results.

**8. In your opinion, what are the most important methodological achievements of the 2021 ERAA edition? Rank your answers from 1 (most important) to 5 (least important).**

- Pan-European Adequacy simulation →2
- Economic Viability Assessment → 1
- Flow-Based Market Coupling → 4
- Temperature-Detrended Climate Database → 3
- Other → 5

**In case you checked the box "Other", or in case you want to give additional explanations, please provide your comments in the text box below:**

While some methodological achievements were realized in this 2021 ERAA edition, we believe that further improvements on these achievements should be made in the next edition. Please refer to the comments made in the next questions.

**9. Are the ERAA 2021 Economic Viability Assessment results and conclusions in line with your expectations?**

- Yes, in line with my expectations
- **Mixed answer, somewhat in line with my expectations**
- No, not in line with my expectations
- No opinion

**Additional comments:**

The Economic Viability Assessment (EVA) was long overdue. UFE welcomes this methodological improvement.

However, it is important to stress that some limitations in the modelling approach are affecting downwards the level of our expectations towards the EVA results and conclusions. For example, the use of a single year (2025) to assess economic viability is questionable. UFE believes that ERAA should include a year-per-year trajectory until the end of horizon and starting from the following year. A complete picture (with a trajectory) needs to be provided because asset management decisions (mothballing, closure, reconversion, investment, etc) are usually based on a set of years, not a single year.

UFE also shares the methodological reservations expressed by RTE and listed in the Country Report Annex of ERAA 2021. One example is the lack of a comprehensive stochastic approach: in reality, decisions will be made

for each asset under uncertainty. This fundamental aspect is not properly integrated in the modelling as all simulated MC scenarios are independent and embed perfect foresight in the simulation. A real stochastic approach could help alleviate this modelling issue.

Despite these methodological shortcomings and sometimes questionable approaches (addressed in comments to Q13 and Q17), UFE welcomes the results of the assessment, which seem to provide at this stage a rather correct vision of adequacy issues, at least at the 2025 horizon for France.

**If no, what did you expect differently (multiple answers are possible; specific zones and technologies can be mentioned in the accompanying text box below):**

- More retirements
- Fewer retirements
- More investments
- Fewer investments

**Additional comments:**

The question is not fully relevant as the consequences of the "EVA decision for 2025" are not considered for the next target years. For instance, the EVA decisions could lead to adequacy standards that are not satisfied for the following years or to NECP plans being not viable (e.g. impossibility to manage the intermittency of renewable generation).

Furthermore, the reliability (LOLE) assessed in a scenario without CM assumes a perfect foresight and perfect coordination of decentralized market players and depends strongly on exogenous parameters: price cap, CAPEX annuity, etc. In practice, market failures, coordination problems, uncertainties and risks exist. UFE believes that the current methodology does not fully capture these issues and that the EVA results obtained by ENTSO-E should therefore be considered with extreme care and appropriate disclaimers.

**What are your key takeaways from the EVA results and conclusions?**

UFE shares the national view on adequacy and economic viability expressed by RTE and described in the Country Report Annex of ERAA 2021: the ERAA 2021 results seem to be in line with national generation adequacy report published by RTE in March 2021;

Although the ERAA 2021 results are globally consistent with the NRAA, several methodological approaches could lead to potential discrepancies and impact conclusions. Thus, The EVA methodology should be further improved before being assessed in more details.

**10. Are the ERAA 2021 Flow Based Market Coupling proof of concept results and conclusions in line with your expectations?**

- Agree
- **Neutral**
- Don't agree
- Don't Know

**Additional comments:**

UFE first wants to thank contributors for this proof of concept (POC) initiative and for the detailed annexes providing hypotheses, processes, and results. This makes the initiative more transparent and insightful for stakeholders.

In terms of results, UFE would like to recall the importance, when assessing the power system resource adequacy, to well consider the physical feasibility of the resulting flows. In this regard, UFE notes that the requirement for a minimum level of available trans-zonal capacity (MACZT) of 70% reduces the link between physical and commercial exchange capacity. Hence, this could lead to a significant underestimation of adequacy issues. UFE thus recommends to take into account transmission capacities that reflect to the best possible extent the real capabilities of the network during stress events.

UFE also invites to be very cautious about the utilization of the Flow-Based Market Coupling for the mid and long-term horizons. Uncertainties increase over time, even more when considering the spatial modelling of every asset: network development including internal evolutions, spatial settlement of production including, spatial distribution of load, available remedial actions, etc.

**What are your key takeaways from the Flow-Based market coupling proof of concept results?**

The FBMC methodology should be further improved before being assessed in more details.

**11. Should any additional analysis of results be considered in future ERAA reports?**

More analysis of the results should be provided: the current report is rather descriptive regarding the results obtained, while further analysis of the fundamentals behind the results should be reported. As such, we do not have enough data to cross-check in details the validity of the results obtained and whether they fit with the economic rationale. In particular, ENTSO-E should better document why they believe their implementation of new features are delivering according to the principles set elsewhere (electricity regulation, ACER methodology, economics and valuation approaches, etc.).

## Methodology implementation roadmap

**12. What are in your opinion the most important features to be developed in future ERAA editions with regards to the adequacy assessment? Rank your answers from 1 (most important) to 7 (least important).**

- Improvement of demand forecasting methodology
- Inclusion of climate change in the PECD
- Consideration of more recent climate years in the adequacy simulations
- Improvements of the results' analysis (describe in comment below) → 1
- Increase of the number of target years
- Improvements of the maintenance optimization methodology (describe in comment below) → 2
- Other

**Additional comments:**

The roadmap for ERAA should be compliant with the elements foreseen in the Electricity Regulation and in ACER methodology. In this respect, impact of climate change, number of target years and use of recent years should not be a point for discussion as these elements are already specified in / required by the ACER methodology. Eventually, the above features will need to be integrated in the future ERAA editions. Therefore, UFE encourages accelerating the integration and development of these elements.

Regarding improvement of demand forecasting methodology, this is not specific to ERAA and part of the core business of TSOs. Unfortunately, UFE notices that in some countries such an approach is not fulfilled.

As pointed before, the analysis of results should be further improved and go beyond a description of the results obtained. Regarding the maintenance optimization methodology, the key question is whether the outcome of this approach is in line with the expected/realized maintenance periods by asset owners.

Lastly, UFE calls for a better inclusion of external stakeholders in the development of the future ERAA as established in Art. 27 of the Electricity Regulation.

**13. What are in your opinion the most important features to be developed in future ERAA editions with regards to the Economic Viability Assessment (EVA)? Rank your answers from 1 (most important) to 7 (least important)**

- Consideration of a combined multi-year EVA → 2
- Inclusion of additional technologies as investment candidates in the EVA (name technologies in comments). → 7
- Stochastic EVA, instead of current deterministic approach → 3
- Increased number of climate years (CY) for the EVA → 5
- Improvement in the methodology for CY scenario reduction for the EVA → 6
- Implementation of the EVA on a Flow-Based model instead of an Net Transfer Capacity model → 4
- Other → 1

**Additional comments:**

UFE bears in mind that the underlying ERAA methodology is to be improved and complemented during the next exercises to provide a more robust picture. Here are some comments on the present methodology (including some essential aspects not mentioned in the list above), with view towards further improvements:

One of the major points is that the current EVA methodology **does not represent market failures or other market realities like uncertainties and risks**. The fact that market failures, coordination problems, uncertainty and risks are not captured undermines the robustness of EVA. Indeed, putting aside some implementation issues, the assessment of the reliability metric (LOLE) assumes a perfect foresight and perfect coordination of decentralized market players (via the market signals). The value of the LOLE result depends strongly on some exogenous parameters (price cap, CAPEX Annuity, FOM Annuity) but relying primarily on these 3 parameters is not representative of the complexity of the power system. This explains the need for a detailed modelling approach that considers somehow uncertainty and a complete set of consecutive years.

*Regarding uncertainty and risk representation:*

- Current EVA methodology (in particular, in the scenario without capacity mechanism - CM) is based on the addition/withdrawal of assets using an iterative economic optimality search process. **The current process underestimates essential dimensions like market failures, coordination problems, investment risks** linked to uncertainties, volatility and more generally complexity of asset management (operations, decommissioning, mothballing, investments). **This can result into a circular assessment** which can by construction provide targeted reliability standards.

- **The choice to use a "perfect foresight" principle** to define planned outages and simulate the operation of assets whose optimization is based on opportunity costs (e.g. hydro or storage) may **limit the relevance of the assessment**. Indeed, the choices made in reality (with regard to operation and maintenance of assets) will likely deviate from the assumptions taken and the outcome will then necessarily be less "optimal" compared to a "perfect foresight" scenario but certainly more in line with an approach that takes into account uncertainty.

*Regarding the optimization method:*

- **The use of the National Estimate scenario (bottom-up aggregation of NECPs) as the starting point for the EVA should be analyzed further**. First, these remain estimates whose actual materialization should not be taken for granted. Second, the starting point of an iterative algorithm can affect the results (i.e., steady states). This should be discussed

- In the ERAA, investment and retirement of units are optimised deterministically for each scenario individually to meet the reliability standard. At the end, the average number of units by technology is taken over all scenarios to build the "optimal" generation fleet. In the national report, RTE uses a standard stochastic approach, whereby investment and retirement of units are optimised over all scenarios (simulated all together) to meet the reliability standard and build the optimal generation fleet. Deterministic optimization combined with averaging number of units to build the "simulated" generation fleet used to compute LOLE is likely to lead to inconsistent results. **A real stochastic approach could help alleviate this modelling issue.**

*Regarding price cap modelling:*

- **A price cap of 15,000 €/MWh is used as the central scenario in this EVA. This assumption has to be justified** Relatedly, it would be more appropriate to swap price caps in considered scenarios, i.e. use the 3k€ (resp. 15k€) cap as the central (resp. sensitivity) scenario, provided that the modelled prices are able to materialize in practice.

- RTE has modelled the price caps consistently with the new Regulation, being increased by 1000 €/MWh automatically 5 weeks after when market prices reach 60% of the current price cap. **This has not been explicitly modelled in the ERAA.**

*Other issues:*

- **EVA should transition from a single year to a multi-year assessment**. The number of target years is insufficient and should include a year-per-year trajectory until 2030, starting from 2022 (see Q9).

- For adequacy studies, it seems important to have **a sufficient number of climate years** in order to represent climate events well and to assess the thermal capacities needed. The way climate years are selected is not clear enough: are there any weighting factors related to "selected" climate years (as foreseen in the ACER methodology)? Moreover, we encourage ENTSO-E to increase the number of climate years in the EVA process.

- Some forward-looking aspects should be added in the design of the sensitivities:
    - **Result sensitivity analysis should include higher carbon price levels than those currently used** (40€/tCO2 in the main case and 60€/tCO2 in an alternative scenario) given currently prevailing EUA prices (fluctuating around 80€/tCO2).

- **Sensitivity analysis should be more ambitious on low thermal capacity**: Germany still has many GWs of coal/lignite units by 2030 in all scenarios as they are not affected in the sensitivity analysis, which contradicts somehow the current decarbonization trend as well as the political agreement on German energy policy and expected coal/lignite phase-out by 2030). The results obtained are therefore not necessarily relevant for Germany, but also for surrounding countries (as adequacy should be considered at least at regional/multi-country level).

**14. In your opinion, which items should be prioritized for future ERAA editions including ERAA 2022? Rank your answers from 1 (highest priority) to 7 (lowest priority)**

- Modelling and sizing of Implicit DSR → 1
- Modelling of Electrolysers → 4
- Causal analysis (as part of results' analysis) → 3
- Modelling of dynamic price caps → 2
- Consideration of shortage pricing → 6
- More granular Value of Lost Load (VoLL) values per bidding zone → 5
- Improvement of the demand regression model → 7

**Additional comments:**

Before contemplating the addition of new features/items in future ERAA editions, we believe that the current elements like stochastic multi-year EVA should be further improved.

Regarding the modelling of dynamic price caps, we refer to our comment developed in question 13 on this point, with the need to justify the assumption of a price cap of 15000 €/MWh and that it would be more appropriate to use the 3 000 €/MWh as the central scenario.

Among the new features, Modelling and sizing of implicit DSR is of importance, especially for the smart charging of EVs with view to the development of E-mobility.

The question raised is whether new features would impact (i) the adequacy assessments and to which extent (first order / second order ?), (ii) the economic viability assessments (first order / second order ?). This should help find the trade-off between “must have” features and “nice to have” features, keeping in mind the nature of the ERAA exercise (prospective modelling, which will always have limitations on its own).

**15. Which additional scenarios or sensitivities would you be interested to see in future ERAA editions? Rank your answers from 1 (most interested) to 6 (least interested).**

- Sensitivities on the CO2 price assumptions → 1
- Different price cap → 6
- Scarcity pricing → 5
- Sensitivities on the demand levels → 2
- Extreme weather conditions → 4
- Other → 3

**Additional comments:**

As highlighted in Q14, the question is whether the additional scenarios or sensitivities are bringing added value in anticipating properly adequacy issues over the horizon of the exercise (10 years). The faster decommissioning of coal/lignite capacity, driven by high CO2 prices, by national energy policies or by EU decarbonization targets, is clearly an important aspect for future ERAA editions.

Another important element is whether the considered levels of residual demand (=demand-RES) are properly anticipated, not only in terms of absolute value (range), but also in terms of duration (e.g. Dunkelflaute events) or changes/variations.

Sensitivities on different levels of cross-border capacities would also be insightful.

**16. Being the first implementation of the ERAA methodology, ERAA 2021 assesses target years 2025 and 2030. The number of target years will increase in future editions in order to better represent the target 10-year time horizon. From the ranges listed below, which time frames do you find most important to model in ERAA? Rank your answers from 1 (most important) to 4 (least important).**

- 1 to 3 years ahead → 4
- 4 to 5 years ahead → 1
- 6 to 7 years ahead → 3
- 8 to 10 years ahead → 2

**Additional comments:**

EVA should transition from a single-year to a multi-year assessment. The number of target years is insufficient and should include a year-per-year trajectory until 2030 (starting from 2022). Information for a single year is not that meaningful unless a complete picture is provided, because what is important for investment decisions is the trajectory.

Modelling the 4 to 5 years ahead, or the 8 to 10 years ahead make the more sense, considering the 5 to 10 years horizons of ERAA. The identification of short-term adequacy issues (e.g. in the next 3 years) are probably best dealt with by the national resource adequacy assessments made by TSOs.

**17. Do you have additional suggestions or comments?**

**UFE welcomes the ERAA report as a valuable tool to be complemented by the national resources adequacy assessments to provide a European outlook of adequacy issues. UFE welcomes that the ERAA report** highlights, if necessary, the need for specific measures to tackle such issues, **notably capacity mechanisms**. **Especially the integration of an Economic Viability Assessment (EVA) is a long-awaited improvement** to the previous Mid Term Adequacy Assessment (MAF) reports methodology, though improvements to this EVA are still required.

**UFE believes the ERAA report should focus on resource adequacy concerns and** the ability of the system to balance power injections and power withdrawals to avoid load shedding. Indeed, the ERAA results are to be compared with a reliability standard in compliance with Electricity Regulation.

Given the contribution of transmission capacities in achieving adequacy at a regional or European level, UFE recommends at least **to consider transmission capacities that reflect to the best possible extent the real**

**capabilities of the network during stress events,** instead of taking into account artificial increases stemming from capacity calculation methodological aspects (inclusion of the 70% rule). It is important to note that the resulting network constraints may have to be dealt with through cross-border remedial actions (e.g. countertrading) whose availability is not guaranteed in tense situations. **This could lead to a significant underestimation of adequacy issues compared to the current ERAA 2021 report.**

**From a general point of view, the ERAA methodology should strive to align more with the requirements of the Electricity regulation and the methodology validated by ACER, to ensure the reliability of the assessment's results**. Indeed, while the full methodology will be deployed in 2024, there is still room for improvement and the implementation challenges of the methodology should not be underestimated.

Furthermore, as emphasized previously by ENTSO-E itself, the **implementation challenges** should not be underestimated. UFE takes note that ENTSO-E will need at least 4 years to fully implement the methodology. Since the resource adequacy assessment has a direct impact on the possibility for Member States to introduce or maintain capacity mechanisms pursuant to Article 21 of the Electricity Regulation 943/2019, UFE calls on ENTSO-E to put sufficient resources on the implementation of the ERAA methodology. In the meantime, UFE expects national adequacy assessments foreseen in Article 24 of Regulation 943/2019 to play a key role, not only as regards hypotheses and complementary sensitivities – which will remain true even after the full implementation of the ERAA – but also as regards methodological aspects of the ERAA still to be improved or that are not yet implemented at European level but may be implemented earlier at national level by more advanced TSOs.

Here are some other important improvements put forward by UFE:

- **Ensure that the EVA is properly elaborated in the methodology**, implemented in the ERAA modelling framework and used in the scenarios and sensitivities.
- Define sufficient alignment and comparability with national TSO input data and assumptions, and ensuring their effectiveness.
- Define an extensive delineation of the different scenarios and sensitivities: for example, the treatment of capacity mechanisms (i.e. strategic reserves and capacity markets) and the impact of decarbonisation targets.
- Improve and clarify the methodology to avoid circular assessment which could by construction provide targeted reliability standards. The current process underestimates **essential dimensions like investment risk linked to uncertainties, volatility and more generally complexity of asset management** (operations, decommissioning, mothballing, investments).