Definition of the type and format of data and the methodology for the analysis by transmission system operators and distribution system operators of the flexibility needs at national level

in accordance with Article 19e of Regulation (EU) 2019/943 as amended by Regulation (EU) 2024/1747 of the European Parliament and of the Council of 13 June 2024

November 8th, 2024

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Disclaimer for the public consultation:

This is a draft version of the FNA Methodology for the purpose of public consultation. The document will be subject to further legal review.

It is an intermediate step and both Associations are committed to consult at an early stage. Therefore, the document will be subject to changes both on technical and legal content.

The respondents are kindly invited to provide feedback on the technical content.

Additional explanatory material is provided in the form of slides for the benefit of respondents.

Table of Contents

Article 1. Subject matter and scope

1. In accordance with Article 19e(4) of Regulation (EU) 2019/943, this methodology (hereinafter referred to as 'Flexibility Needs Assessment' (FNA) methodology) shall:
    a. define the type and format of data that TSOs and DSOs are to provide at national level to the regulatory authorities or another authority or entity designated in accordance with Article 19e(1) of Regulation (EU) 2019/943; and
    b. develop a methodology for the analysis at national level by TSOs and DSOs of the flexibility needs in accordance with Article 19e(4) of Regulation (EU) 2019/943.

Article 2. Definitions

Disclaimer for the public consultation: The definitions proposed in this article are still preliminary and non-exhaustive. They will be reviewed and integrated towards the final version of the methodology to also ensure consistency with definitions in relevant Regulations]

1. For the purposes of this FNA methodology, the terms used shall have the meaning given to them in Article 2 of Directive (EU) 2019/944, Article 2 of Regulation (EU) 2019/943, Article 2 of Regulation (EU) 2024/1747, and Article 2 of Agency for the Cooperation of Energy Regulator (the "ACER") Decision 24/2020 on the ERAA methodology.
2. In addition, for FNA methodology the following definitions shall apply:
    a. 'Local service' means energy or capacity procured by a TSO or DSO to solve congestion or voltage issues they have identified in their systems;

    b. 'Designated Authority or Entity' means the regulatory authority or another authority or entity designated by a Member State to adopt the report as referred in Article 19e(1) of Regulation (EU) 2019/943;

    c. 'Congestion issue' means a situation when the electric current flow through a physical asset exceeds operational limits;

    d. 'Voltage issue' means a situation when voltage is above, or below operational limits;

    e. 'Flexibility network needs' means upwards or downwards activation of electricity fed in or consumed from the network that would be required to prevent or solve congestion or voltage issues, consistently with ensure operational limits. These activations include contractual mechanisms such as redispatching, rules-based actions, local services or Flexible Connection Agreement.

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Article 3. Roles and responsibilities

1. TSOs and DSOs of each Member State shall be responsible for providing the required data and analysis pursuant to Article 19e(3) of Regulation (EU) 2019/943 in accordance with the definitions and procedures established in this FNA methodology.
2. TSOs and DSOs are directly responsible for ensuring the correctness and completeness of the data they provide. It is the sole responsibility of each TSO and each DSO to take all necessary measures to guarantee that the submitted data adheres to the required standards and is in accordance with the defined data types and formats as specified in this methodology.

Article 4. Confidentiality obligations

1. Any confidential information received, exchanged or transmitted pursuant to this FNA methodology shall be subject to the conditions of professional secrecy laid down in paragraphs 2, 3 and 4 of this Article.
2. The obligation of professional secrecy shall apply to any person or authorities including the Designated Authority or Entity subject to the provisions of this FNA methodology.
3. Confidential information received by the persons or authorities including the Designated Authority or Entity referred to in paragraph 2 of this Article in the course of their duties may not be divulged to any other person or authority, without prejudice to cases covered by national law, the other provisions of this FNA methodology or other relevant Union legislation.
4. Without prejudice to cases covered by national law or Union legislation, regulatory authorities, bodies or persons who receive confidential information pursuant to this FNA methodology may use it only for the purpose of carrying out their duties under this methodology, except where written consent has been provided by the primary owner of the data.

Article 5. Data needed to run the analysis – General provisions

1. The data needed to run the analysis by the TSOs shall be sourced by either national or European studies, provided consistency with European Resource Adequacy Assessment (ERAA) and National Resource Adequacy Assessments (NRAA) is ensured.
2. Data shall be provided by TSOs for at least one of the time horizons considered in the latest published ERAA and/or NRAA complying with the 5 to 10 years requirement in Articles 23 and 24 of Regulation (EU) 2019/943.
3. Data shall be provided by DSOs considering the time horizons used in the distribution network development plans (hereafter referred as DNDP).
4. If data provided by TSOs and DSOs are derived from studies referring to different time horizons, interpolation and/or extrapolation may be applied.
5. For TSOs, when applicable, input data shall be provided for at least the same climate years as those considered in the latest published ERAA/NRAA for the chosen time horizon(s).
6. Consistency among TSOs and DSOs input data is ensured by the use of scenarios aligned with the same national policy targets.

Article 6. Needs covered – General provisions

1. The methodology for the analysis by TSOs and DSOs at national level shall assess the following flexibility needs:
    a. System needs:
        i. RES integration needs pursuant to Article 8 of this methodology;
        ii. ramping needs pursuant to Article 9 of this methodology; and
        iii. short-term flexibility needs pursuant to Article 10 of this methodology.
    b. Network needs at distribution level pursuant to Article 11 of this methodology.
    c. Network needs at transmission level pursuant to Article 12 of this methodology.
2. TSOs and DSOs may, if they deem it relevant, extend the analysis to other flexibility needs.
3. Flexibility needs pursuant to paragraph 1 and 2 shall be expressed in a technologically neutral manner through indicators with relevant metrics, including capacity, energy and duration.
4. Flexibility needs pursuant to paragraph 1 and 2 shall be characterised based on relevant timeframes (including hourly, daily, seasonal or yearly and others if applicable).

Article 7. System needs – General provisions

1. Scenarios to be used for the assessment of system needs shall include at least one scenario consistent with one of the reference scenarios of the ERAA or the NRAA and associated availability of economic dispatch results. TSOs may run the assessment for additional scenarios, either included within the set of reference scenarios of the ERAA or additional ones.
2. For the quantification of system needs, the minimum set of data needed to run the analysis shall include those related to either the latest published NRAA pursuant to Article 24 of Regulation (EU) 2019/943 or to the ERAA. It also shall include data to be collected by TSOs at national level. The complete list is provided below in table 1.

TABLE 1 - List of data to run the analysis

Input		Unit	Type of data	Granularity	Climatic years	Minimum quality
Economic dispatch results	Demand profile	GW	Time series	Hourly	The same as ERAA/NRAA	Aggregated demand
	Generation profiles (RES, thermal, Must Run, other)	GW	Time series	Hourly	The same as ERAA/NRAA	Cluster - ENTSO-E's categories
	Batteries, DSR, other flexibility profile	GW	Time series	Hourly	The same as ERAA/NRAA	Cluster - ENTSO-E's categories
	Import/export profile	GW	Time series	Hourly	The same as ERAA/NRAA	-
	RES generation curtailment	GW	Time series	Hourly	The same as ERAA/NRAA	
Installed capacities	Generation units capacity	GW	Fixed value	-	-	Cluster - ENTSO-E's categories

	Batteries, DSR, other flexibility resources	GW	Fixed value	-	-	Cluster - ENTSO-E's categories
	NTC	GW	Fixed value	-	-	-
Technical constraints of flexible generation units	Ramp-up limit	MW/min	Fixed value	-	-	
	Ramp-down limit	MW/min	Fixed value	-	-	
	Start time	Hours	Fixed value	-	-	
	Shut down time	Hours	Fixed value	-	-	
	Pmax and Pmin	GW	Fixed value	-	-	
Forecast error	Forecast error RES	GW	Time series	Hourly		
	Forecast error demand	GW	Time series	Hourly		

3. TSOs may provide additional data and data with higher granularity than the one referred in table 1.

Article 8. System needs – RES integration

The RES integration needs is calculated to cover surplus renewable energy that needs to be curtailed, typically during low demand and high renewable generation conditions. It follows system constraints and cannot be stored, shifted or exported by available storage, demand response, other non-fossil flexibility resources or transmission capacity.

To quantify system needs associated to RES integration the following actions shall be carried out:

1. TSOs shall extract an indicator for RES generation curtailment from ERAA or NRAA market dispatch results. This indicator represents a value per hour and per climate year for each target year with the injections which could not be accommodated following system or transmission constraints, considering copper plate conditions.
2. The TSOs shall characterize the indicator in terms of energy, duration and interval with the aim of evaluating the ability of the system to cope with periods of excess generation resulting in RES generation curtailment by means of at least:
    a. the average, maximum and minimum amount of curtailment;
    b. a probability distribution of the curtailment and relevant percentiles (e.g. 99.9%);
    c. a heat map of the curtailment in function of time and day;
    d. the correlation between curtailment and system conditions such as at least the wind generation, solar generation, demand.
3. The TSOs shall use the results of the characterization to provide an overview of the total excess generation resulting in RES generation curtailment in the system expressed at least on, seasonal, weekly and daily basis which shall be used to verify the achievement of national targets for RES integration.
4. National target for RES integration shall be derived from the latest approved National Energy and Climate Plan or other relevant national regulation/source.
5. The TSOs may use the results of the characterization to optimise dummy flexibility variables to determine the non-fossil flexibility needs to meet RES integration targets at least on seasonal, weekly and daily basis. The dummy flexibility variables shall be optimised to individually minimise each determined flexibility need and meet annual national RES integration targets. Characterization into different timeframes can

make use of residual load time series, to be extracted by ERAA/NRAA market dispatch results and can rely on time-decomposition or other characterization approaches.

6. Whenever deemed relevant and depending on availability of data, TSOs and DSOs may determine additional RES curtailment and unavailability of flexible resources due to network limitations on transmission system and distribution system-level which are not accounted for in market results. If relevant, TSOs and DSOs may use them for the fine-tuning of the above-mentioned curtailment indicator and dummy flexibility variables.

Article 9. System needs – Ramping needs

The Ramping needs is calculated to cover expected hourly residual load variations taking into consideration the technical constraints of flexible generation units.

To quantify system needs associated to ramping the following actions shall be carried out:

1. In case economic dispatch results of the ERAA or NRAA already take into account the technical constraints of flexible generation units reported in table 1 of Article 7, the TSOs shall analyse the behaviour of shortage and excess indicators (such as the energy not served and the RES generation curtailment) and verify if the occurrence of shortage or excess condition was associated to the aforementioned constraints. TSOs shall then implement actions reported in paragraphs 5 and 6 of this Article.
2. Alternatively, in case economic dispatch results of the ERAA or NRAA do not already take into account technical constraints of flexible generation units reported in table 1 of Article 7, the TSOs shall extract the hourly residual load from ERAA or NRAA input data. This indicator represents a value per hour and per climate year with the demand to be covered by dispatchable units, calculated as the total load minus renewable generation (wind, solar and all other non-dispatchable generation) and must run generation.
3. For each hour the TSOs shall extract the dispatch schedule of the dispatchable units and use of interconnections and verify their residual capability to provide ramp-up and ramp-down capacity to manage the residual load variation expected for the following hour. Residual capability shall be assessed considering:
    a. actual up – and downward hourly ramping capability of flexible generation units (on a unit by unit or aggregated level) limited by minimum and maximum power constraints;
    b. wherever relevant, additional constraints for specific technology types; and
    c. wherever possible, additional cross-border flexibility considering remaining transmission capacity.
4. The TSOs shall determine the uncovered up- and downward ramp (capacity gap) as the difference between the hourly residual load variation and the ramping capability.
5. The TSOs shall analyse the uncovered ramp in terms of capacity, duration and intervals in accordance at least with the following criteria:
    a. the average amount of uncovered ramp;
    b. a probability of distribution of the uncovered ramp;
    c. a heat map of the uncovered ramp in function of time and day; and
    d. the correlation between uncovered ramps and specific system conditions (such as the wind generation, solar generation, demand,…).

6. Whenever deemed relevant and depending on availability of data, TSOs and DSOs may determine unavailability of flexible resources due to network limitations on transmission system and distribution system-level which are not accounted for in market results. If relevant, TSOs and DSOs may use them to fine-tun the above-mentioned uncovered ramps indicator.

Article 10. System needs – Short-term flexibility needs

The short-term flexibility needs are calculated to cover unexpected variations of the demand, renewable generation or forced outage of assets taking into consideration technical constraints of flexible generation units.

To quantify system needs associated to short-term flexibility needs the following actions shall be carried out:

1. The TSOs shall determine the short-term flexibility needs as the 0.1 and 99.9 percentile of the probability distribution of the prediction risk being determined by the residual load forecast error for each target year. The residual load forecast error shall represent the sum of the prediction errors of wind power, solar power and other non-dispatchable power including the prediction error of the load after extrapolation for each hour in the target year:
    a. the TSOs may use separate distributions to represent forecast errors in at least one-time frame between day-ahead and real-time (e.g. day-ahead forecast, intra-day forecast, last forecast);
    b. the TSOs may use separate distributions to represent different time periods (e.g. hour of day, day of week, season) or different system conditions (e.g. high or low renewable or load conditions); and
    c. the TSOs may combine the prediction risk probability distribution with other system needs (e.g. the probability distribution of the forced outage risk of large generation and transmission units).

The extrapolation towards the target year shall take into account the projected increase of the load and the installed capacity of wind power, solar power and other non-dispatchable power in line with the reference scenario of ERAA or NRAA while taking into account expected forecast improvements.

2. For each hour the TSOs shall extract from the ERAA or NRAA market dispatch results the dispatch schedule of the dispatchable units and use of interconnections to calculate the residual availability of flexibility resources.
   The analysis shall assess the up – and downward ramping capability in at least one time frame between 5 minutes and 5 hours per dispatchable unit capped following minimum and maximum power constraints; Residual capability shall be assessed considering:
    a. actual up – and downward hourly ramping capability of dispatchable units (on a unit by unit or aggregated level) limited by minimum and maximum power constraints;
    b. wherever relevant, additional constraints for specific technology types; and
    c. wherever possible, additional flexibility from cross-border (remaining transmission capacity for intra-day and balancing) considering remaining transmission capacity.

3. The TSOs shall determine the uncovered short-term flexibility needs (capacity gap) for each of the analysed timeframe as the difference between the short-term flexibility needs and the availability of flexibility resources.

    a. The TSOs shall relate the conditions of short-term flexibility needs to similar system conditions assessed for the flexibility resources (such as comparing the needs and resources during high renewable conditions).
    b. The TSOs shall relate the short-term flexibility needs to the relevant time scale of the flexibility resources (such as comparing the needs and resources for reaction in 5 minutes).

4. The TSOs may further analyse the contribution of the TSOs' balancing market. In this case:
    a. the TSOs' balancing needs shall be evaluated pursuant to Article 157 of Commission Regulation (EU) 2017/1485; and
    b. the TSOs' balancing means shall be evaluated based on the individual capabilities of assets.

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5. The TSOs shall analyse the uncovered short-term flexibility needs in terms of capacity, duration and intervals and shall include at least:
    a. the average amount uncovered short-term flexibility needs;
    b. a probability distribution of the uncovered short-term flexibility needs;
    c. a heat map of the uncovered short-term flexibility needs in function of time and day; and
    d. the correlation between uncovered ramps and specific system conditions (such as at least the wind generation, solar generation, demand,…).

6. Whenever deemed relevant and depending on availability of data, TSOs and DSOs may determine unavailability of flexible resources due to network limitations on transmission system and distribution system-level which are not accounted for in market results. If relevant, TSOs and DSOs may use them to fine-tune the above-mentioned uncovered short-term flexibility needs indicator.

Article 11. DSO flexibility network needs (DFNN)

1. Each DSO shall assess their network flexibility needs regarding their own network over the next 5 to 10 years.
2. At national level, DSOs shall define how they organize to assess network needs and provide the required data and analysis specified in this Methodology. In particular:
    a. Each DSO can assess network needs or provide data or analysis individually or through a group of several DSOs.
    b. To assess network needs, or provide data or analyses, DSOs may use or aggregate data collected by, or data or analysis provided by themselves and other DSOs.
    c. If DSOs uses other DSO's data to assess their flexibility network needs, the DSO using such data from another DSO shall ensure relevance of the data and the method used to process the data in a way that it is meaningful and consistent for the relevant needs.
    d. Methods to process data from other DSOs may consist of extrapolation, analogy or other relevant method.
3. DSOs shall assess the network needs and provide the required data and analysis in according to the following principles:
    a. as a basis to produce their DSO flexibility network needs, DSOs that develop DNDPs shall use the scenarios, methods and data developed in their latest published DNDP pursuant to Article 32(4) of Directive (EU) 2019/944;
    b. where DNDP information is not sufficient or available, DSOs shall provide the data based on their internal assessments from other sources, which shall be based on the following principles:
        i. reflect the most plausible futures of the electricity distribution system for the next five to ten years, including anticipatory needs;
        ii. be consistent among TSOs and DSOs input data pursuant to Article 5(6); and
        iii. encompass, at least, current and forecasted electricity demand, generation and energy storage capacities and consider national energy and climate plans, local energy strategies.
4. To provide meaningful and useful data of flexibility network needs to fulfil the purpose of national flexibility needs assessment, DSOs shall define the relevant temporal, spatial and voltage granularity of data referred in table 2 considering the availability of data and methods, scenario uncertainties, or other relevant criteria. DSO shall aim using a nationally coordinated temporal and spatial granularity. The granularity of data shall have the following characteristics:
    a. temporal granularity of DSO flexibility network needs shall consist of time horizons (such as specific years within 5-10 years horizon), and for a given time horizon the related event (season/ months, days within a week, hourly period of occurrence);

b. spatial granularity of DSO network flexibility needs shall be smaller or equal to:
    i. the bidding zone when a country has more than one bidding zone; or
    ii. the Member State area
c. voltage granularity shall consist of needs per voltage level or aggregating between different voltage levels.

5. DSOs shall provide to the Designated Authority or Entity the data listed in table 2.

TABLE 2

Type of data on DSO flexibility network needs	Unit	When for a given time horizon: Related event: Season/ Months, weekly days, hourly period of occurrence	Time horizon (such as specific years within 5-10 year horizon)	Location with respect to the defined spatial granularity	Direction: Upwards or Downwards	Other relevant description (clarifications)
Mandatory data: capacity (see below) Optional data: Capacity (see below)	GW					
Mandatory data: Energy Optional data: Energy	TWh					
Optional data: Continuous duration of network need	Hour					

6. Mandatory data on capacity values in table 2 shall be provided as a maximum for one year or season. It shall describe the needed installed capacity of flexible resources and if available the simultaneous activation of flexible resources over the relevant geographic granularity.
7. In addition, optional data on capacity shall be provided, if available, as:
    a. a maximum or a range of values for typical days;
    b. an hourly profile for typical days;
    c. quantitative statistics (maximum, average or other values) instead of hourly profile; or
    d. description where quantitative data is not available.
8. Mandatory data on energy values in table 2 shall be provided as a maximum or an expected average value per year or per season. In addition, optional data on energy shall be provided, if available, as:
    a. quantitative statistics (maximum, average or other values); or

   b. description where quantitative data is not available.
9. If available, each DSO shall provide to the Designated Authority or Entity data on flexibility network needs to solve congestion or voltage issues during planned or unplanned availability of assets. DSOs shall define the relevant metrics, considering such criteria as unpredictable start time and duration for unplanned outages, load on "recovery" assets, and other relevant criteria.
10. If available, each DSO may, if it deems it relevant, extend the analysis to other flexibility network needs. DSOs shall define the relevant metrics, considering such criteria as unpredictable start time and duration for unplanned outages, load on "recovery" assets, and other relevant criteria.
11. In addition to the data in table 2, each DSO shall provide to the Designated Authority or Entity the following information:
    a. source of data and the studies used to provide network needs;
    b. scenario(s) used to define future generation, loads and energy storages on DSO network;
    c. methods used to assess the Distributed Flexibility network needs;
    d. if applicable, the data or assumptions where DNDP data or studies need to be completed;
    e. reasons to provide optional data in a quantitative manner or describe the circumstances under which DSO flexibility network needs occur or other relevant criteria enabling to assess capability types of DSO flexibility network needs; and
    f. relevance of the above points to provide meaningful and useful data to fulfil the purpose of the national flexibility needs assessment.

Article 12. TSO network flexibility needs

1. Whenever deemed relevant and whenever data is available TSOs at national level may quantify RES curtailment and unavailability of flexible resources due to congestions at transmission level and use it to fine tune the analysis of system needs pursuant to Articles 11, 12 and 13 of this methodology.

Article 13. Delegation - DSOs

1. DSO may delegate all or part of any tasks with which it is entrusted under this methodology to one or more DSOs or an organisation representing DSOs in case they can carry out the respective function at least as effectively as the delegating DSO. The delegating DSO shall remain responsible for ensuring compliance with the obligations under this methodology.
2. Prior to the delegation, the delegated party shall demonstrate to the delegating DSO its ability to meet the tasks to be delegated.
3. In the event that all or part of any tasks specified in this methodology are delegated to another DSO, or an organisation representing DSOs, the delegating DSO shall ensure that suitable confidentiality agreements in accordance with the confidentiality obligations of the delegating DSO have been put in place prior to the delegation.

Article 14. Guiding criteria

Article 15. Derogations

Article 16. Implementation of the regulation at national level

1. The TSOs and DSOs of each Member State shall provide data and analyses at national level to the Designated Authority or Entity pursuant to the FNA methodology no later than 10 months after its

approval by ACER, and every two years thereafter. TSOs and DSOs at national level shall agree on the relevant timeline to provide data and analysis at national level to the Designated Authority or Entity.

Article 17. Updates/refinements of the methodology

1. ENTSO-E and EU DSO Entity are entitled to propose updates and amendments to the FNA methodology when possible improvements are identified. ENTSO-E and EU DSO Entity shall send their proposals to ACER with corresponding justifications.

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