Renewable Energy Share by Bidding Zone in Brazil

A calculation for Renewable Fuel of Non-Biological Origin (RFNBO) certification under the European Union Renewable Energy Directive (EU RED III)

25/09/2025 – v1.1

Context

European Union (EU) market access for Brazilian hydrogen and derivatives requires Renewable Energy Directive (RED III) compliant Renewable Fuel of Non-Biological Origin (RFNBO) certification.

SUBMARKETS

Submarkets are geo electrical areas defined due to relevant and persistent transmission constraints and market settlement needs [1].

HOURLY PRICE

The Brazilian wholesale market settles short-term transactions using a spot reference price, called Difference Settlement Price (PLD), calculated hourly for each submarket[2 3].

BIDDING ZONES

The EU RFNBO rules allow third country producers to rely on an equivalent of the EU "bidding zone" concept if the objective is preserved and hourly prices exist for the geographical area [4 5 6].

COMPLIANT

Under RED III, electricity taken from the grid can be counted as fully renewable for RFNBO production if the electrolyser is located in a bidding zone whose average renewable share in the previous year is ≥ 90% [5].

Key concepts and definitions in Brazil

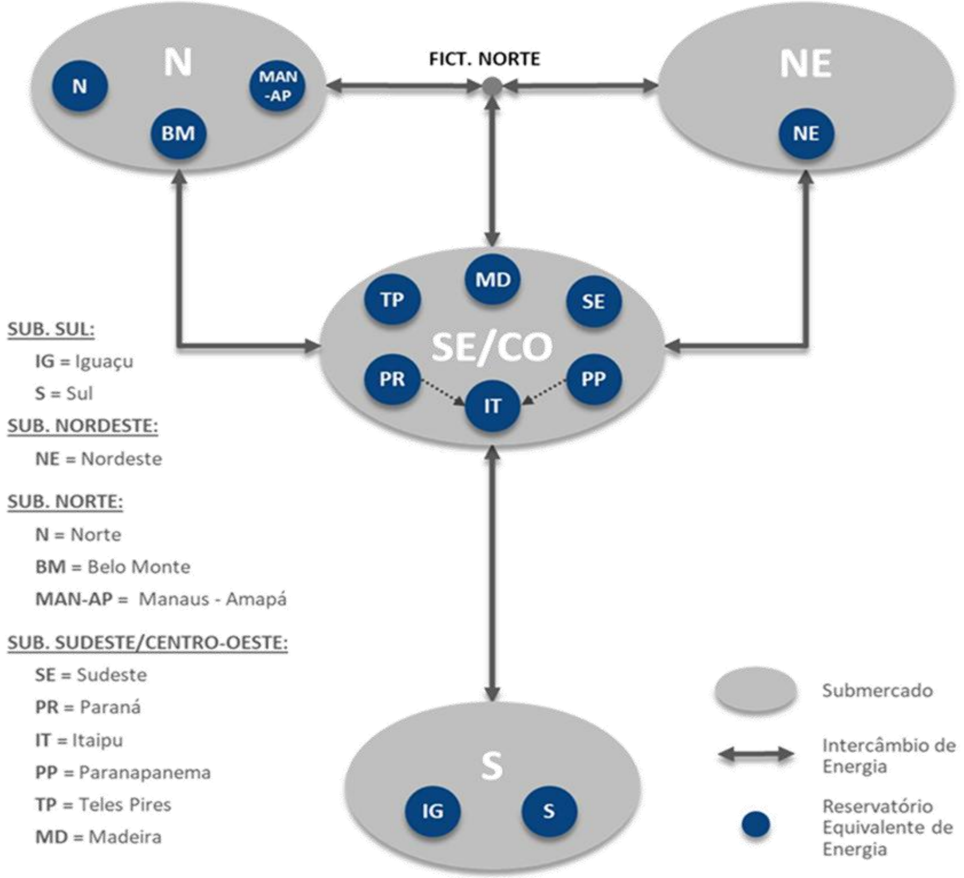
1. Subsystems and Submarkets

- The ONS (National Electric System Operator) defines subsystems as hydrologically homogeneous aggregations for electro energy operation studies; **submarkets** are the market subdivisions where **differentiated prices are established** and whose borders are **set by relevant transmission restrictions** [1]

2. Market settlement (MCP) and PLD

- Chamber of Electric Energy Commercialization (CCEE) accounts and settles short-term market (MCP) transactions. Settlement values use the **PLD defined hourly for each submarket**. The PLD is derived the marginal cost of operation (CMO) and limited by annual regulatory price floors and ceilings set by the Brazilian Electricity Regulatory Agency (ANEEL) [2 3].

System representation: Submarkets, equivalent energy reservoirs and inter zonal exchanges in the planning model (NEWAVE) [2]



3. Bidding-Zone Equivalence (EU → Brazil)

- Regulation (EU) 2019/943 defines a **bidding zone** as the largest geographical area within which market participants can exchange energy **without capacity allocation; cross-zonal capacity** governs exchanges between bidding zones [4].
- For **third countries**, Delegated Regulation (EU) 2023/1184 and the European Commission Q&A specify that, to assess equivalence, certifiers should verify the existence of **rules establishing hourly electricity prices for a geographical area**; if so, that area is to be **treated as a bidding zone** for applying the methodology [5 6].
- In that sense, Brazil's four submarkets (N, NE, SE/CO, S) meet the criterion through the hourly PLD and relevant transmission restrictions. Therefore, for RFNBO purposes, **each submarket is equivalent to a bidding zone** [2 6].

4. Counting Grid Electricity Fully Renewable

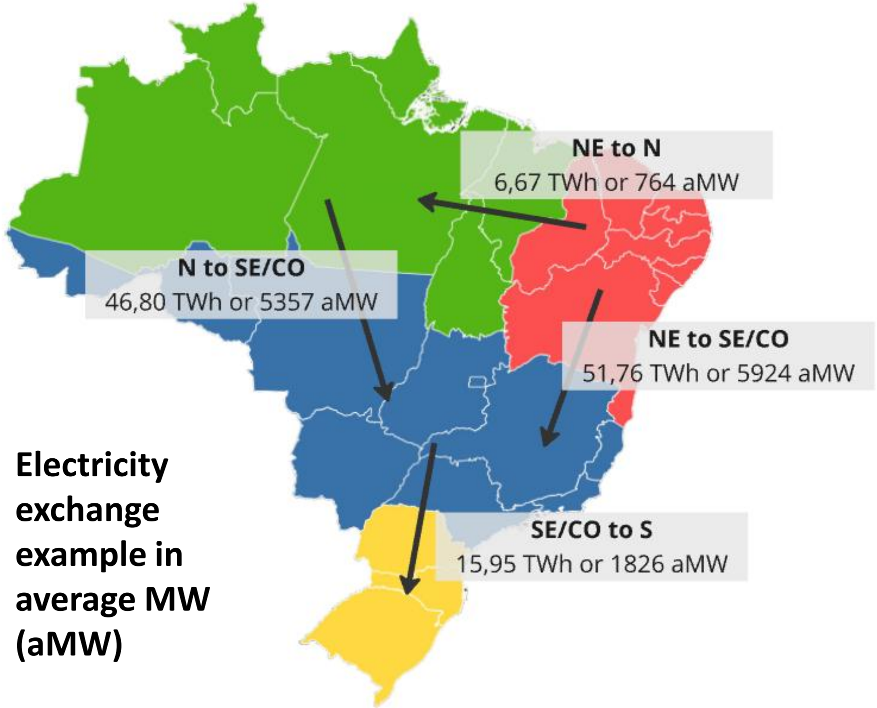
- Under Article 4(1) of Delegated Regulation (EU) 2023/1184, **electricity taken from the grid can be counted as fully renewable for RFNBO production if the electrolyser is located in a bidding zone whose average renewable share in the previous year is ≥ 90%.** Once this threshold is reached, it applies for the following 5 consecutive years [5].

Key concepts and definitions in the EU

5. EU Methodology for the Average Renewable Share

Accounting rules (Directive (EU) 2018/2001, Article 7 and Annex II) [7]:

- Denominator must account for imports minus exports of electricity between bidding zones, which is equivalent to electricity exchange provided by ONS [8]
- Apply normalization hydropower, 15-year normalisation using installed capacity and actual generation; and onshore and offshore wind, up to 5-year normalisation based on capacity-weighted averages [7].
- Gross electricity production is measured at generator terminals, excluding the production of electricity in pumped storage units as well as the electricity used to produce RFNBOs [5 7 9].



Electricity exchange example in average MW (aMW)

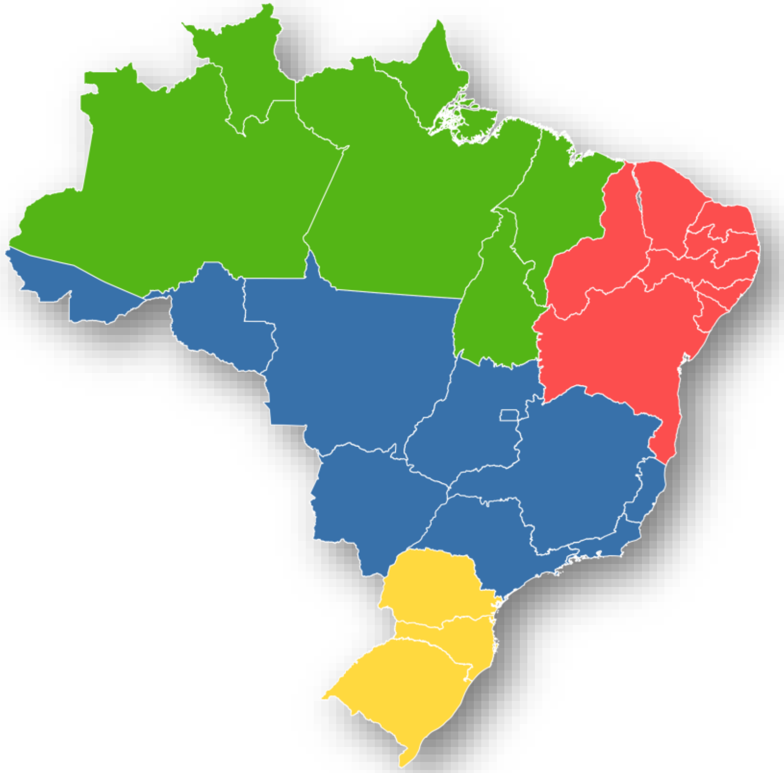
$$\text{EU RES-E \%} = \frac{\text{Quantity of electricity produced from renewable sources + self-consumers + RES-E communities}}{\text{Gross electricity production from all energy sources + [imports - exports] - pumped storage generation}}$$ [5 7 9]

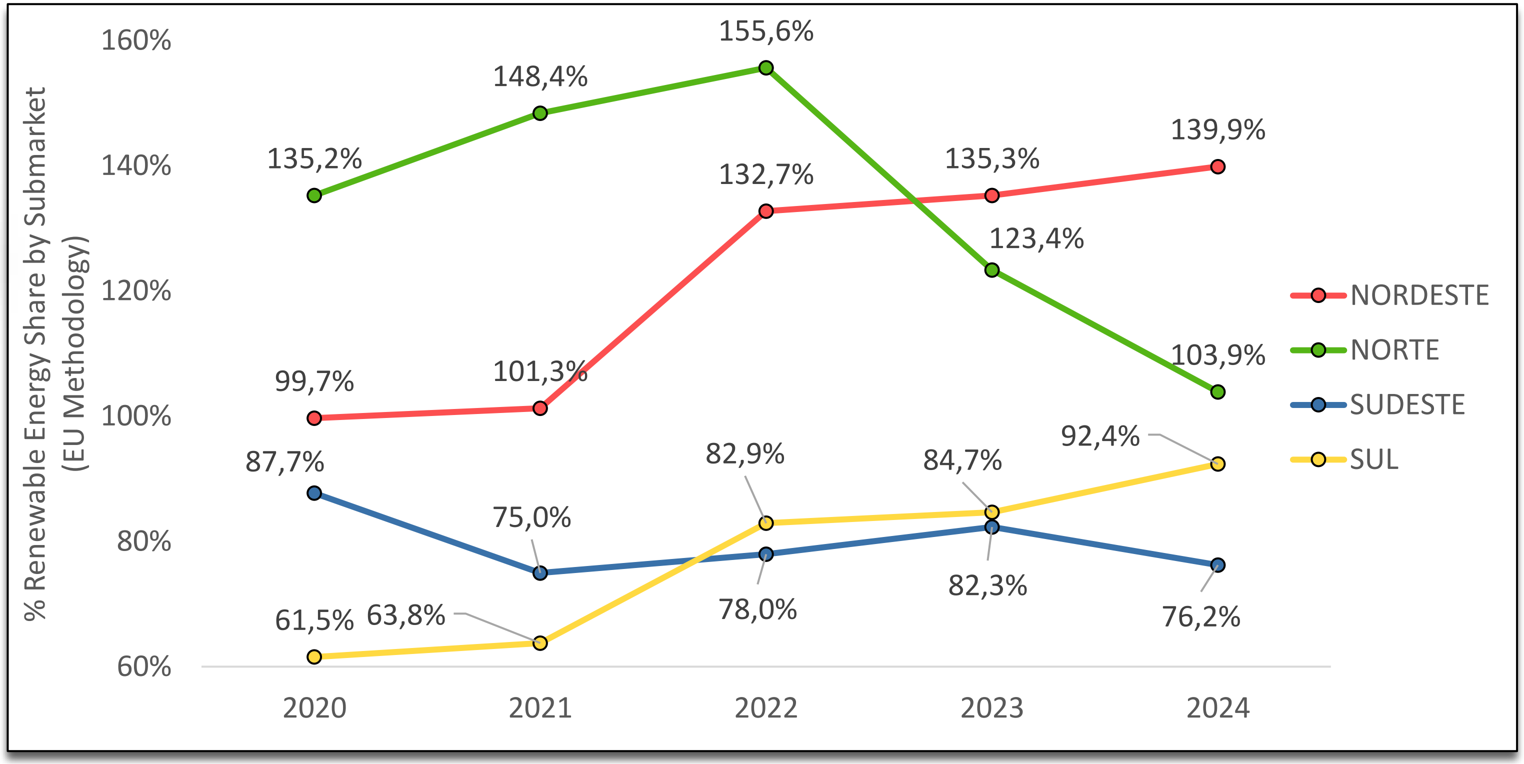
If **Bidding zone is an IMPORTER**
Denominator go UP
RES-E % go DOWN

If **Bidding zone is an EXPORTER**
Denominator go DOWN
RES-E % go UP

Results

CCEE gathered 25 years historical generation data and applied the EU methodology for this calculation*.





*The consulting firm HINICIO has reviewed the methodology and results for the Northeast submarket for the purpose of RFNBO pre-certification.

References

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