RÉPUBLIQUE FRANÇAISE
Liberté
Égalité
Fraternité

CRE COMMISSION DE RÉGULATION DE L'ÉNERGIE

Solutions to prevent grid "scarcity" and related considerations for the upcoming tariff

ERRA chairmen meeting

28/10/2024

The effect of energy transition on the grid

Higher penetration of renewable energy and growing electrification reshape grid capacity needs

- In 2023, renewables have reached a record high, accounting for 50% of EU electricity power generation.
- The new European Commission will deliver an electrification action plan. The EU intend to double its share of electricity in final energy consumption from 25% today to about 50% in 2040.

Energy transition is a *physical challenge* paired with unprecedented financing needs

- There is already growing congestion in the EU power grid. *According to ACER, in 2023, congestion management needs rose by 14,5% in 2023 and cost 4.2 billion euros in the EU.*
- Avoiding bottlenecks would require an **expansion of the EU's power grids** at distribution and transmission levels, as well as an **upgrade to smarter grids and more flexibility.**
- The European Commission estimates that the EU's power grid need **€584 billion in investments by 2030**, and an average of €85 billion per annum between 2031 and 2050 to deliver the energy transition in time.

The right regulatory framework helps securing a cost-efficient, timely and location appropriate development of grid capacity, benefiting consumers and society at large.

A snapshot of French grids

Transport

63 kV to 400 kV

105 000 km of lines

Annual investments :
2023 : ~ 2 billions €
Tripling by 2027

Distribution

400 V to 20 kV

1 300 000 kilometers of lines

Covers *95% of mainland* France,

Annual investments :
2023 : 4,5 billions €
7 billions in 2028

A snapshot of the French « toolbox » based on the categories of the RAP-ERRAS's report

Better use of existing grid :

- Pooling investments
- Setting up a congestion management platform
- Mobilising participation in congestion management
- Alternative connection contracts
- Grid enhancing technologies (GETs)
- Incentives for network operators
- Better scarcity signals for grid users (time and location)

Better allocation of existing grid capacities to existing and new users :

- Managing contractual congestion
- Priority lanes
- Cleaning the queue
- More transparency on the available capacities
- Better governance

Expedite construction of the new grids :

- Anticipatory planning/RES zones
- Co-opting/buying in of local communities

Our rationale

The most powerful tool has been the identification of needs, to pool and anticipate infrastructures.

Yet, the network is a non-reversible investment, pre-empting other options over long periods, whereas flexibility is more modular and can spread out the investment.

CRE's current priority is now maximizing the lever of network flexibilities.

Onshore RES generation connection

Driven by a process called S3RENR

Based on a regional mapping of potential generation developments, it aims at anticipating investments while preserving the effectiveness of grid reinforcements

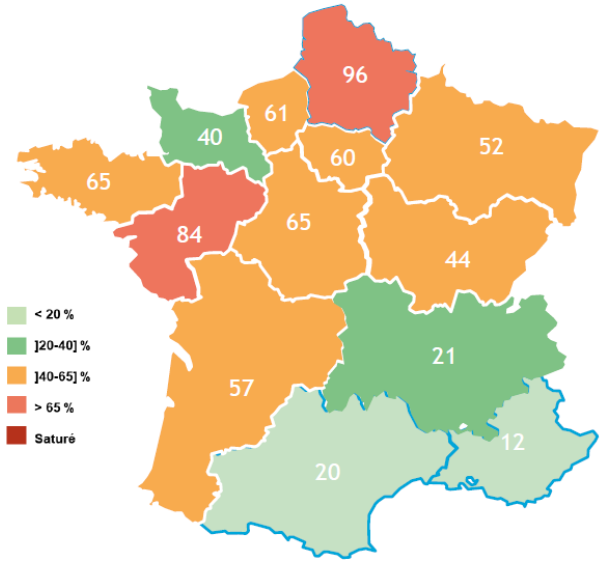
Principle:

- RTE and DSOs establish hosting capacities for renewable energies on a regional scale
- Hosting capacities are secured for 10 years
- Such planning is based on project declarations by potential producers (declarations are mandatory to ensure information is reliable)
- To be connected to the grid, RES producers have to pay all or part of the costs of the infrastructure
- Principle of pooling: when infrastructures serve several projects, costs are split among producers (“quote-part”)

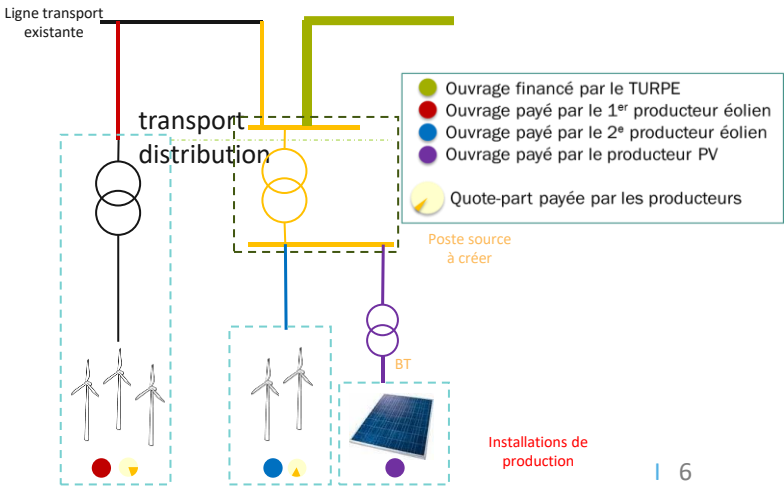
Connection costs are split between the interested producer, the group of connected producers and the transmission tariffs

NB : Counterpart for consumption is being developed !

Rate of allocation of connection capacities per region



Connection costs splitting



The exemple of optimal sizing

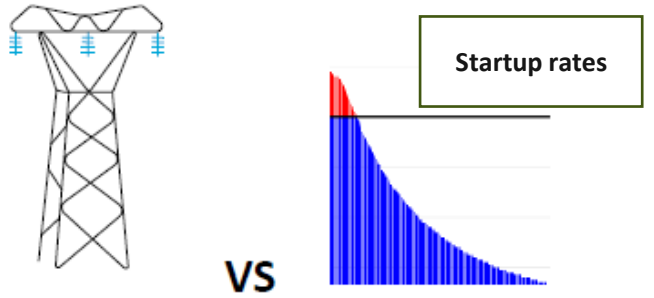
To avoid investing in capacities that are only useful for a few hours a year, optimal sizing seeks an economic optimum between :

(i) resorting to occasional production curtailments, with a particular emphasis on assessing their economic and environmental impact, and,

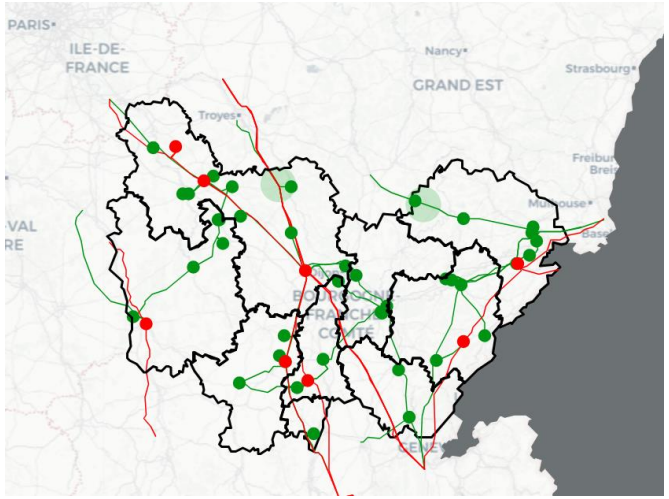
(ii) development or reinforcement of network infrastructure.

The renewable integration schemes set **standardized coefficients by region,** to simplify the modeling of the economic optimum.

In lines with it's the current tariff's incitation, the SO **publish** **forecast information** on the residual transit constraints identified on the public transmission system over a 3 to 5 year timeframe, by region, as an initial basis for **identifying the most suitable network locations for participating in congestion management**, in return for remuneration.



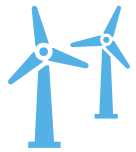
Equilibrium situation reached :
Cost of infrastructure = cost of energy curtailed



Forecasted residual transit constraints in 3 to 5 years

Grid flexibility snapshot

Enedis and RTE are testing the use of flexibility to respond to new local grid issues through projects and experiments of varying degrees of maturity :



Accelerating the connection of renewable energies

Adapting grid capacity calculation and curtailment devices

Alternative to reinforcement investments

Local flexibility tender

Trade-off criteria

Alternative to investment for user connection

Smart connection offers

Early connection offers

Meeting immediate short-term needs

Local flexibility tenders

The different maturities of grid flexibility projects (1/2)

Accelerating the connection of renewable energies

RTE – Mature/Advanced

Optimizal grid sizing principles in renewable connection schemes (S3RENR).

Curtailment volumes can be minimized with new adaptive zone automatons.

Enedis – Experimental

Comparable principle tested with the regulatory sandbox in two areas.

No flexibility yet due to delays, but mass generalization in preparation.

Alternative to reinforcement investments :

Local flexibility tender (Medium to long term)

RTE – Experimental

Local flexiblity tender concluded in 1 area with a 59MW battery connected to HV

Trade-off criteria

Enedis – In development

The HV reinforcement study process now integrates a systematic evaluation of the flexibility tradeoff.

To date no case favoring flexible solutions has been identified

The different maturities of grid flexibility projects (2/2)

Alternative to investment for user connection

Smart connection offers

Restriction of the power injected or drawn-off at certain times. Limitation is perennial.

TSO and DSO - First cases

TSO: Storage (2 operating, 12 in queue)

DSO: Renewable producers (3 accepted)

Early connection offers

Users are connected before connection work is completed. Limitation is temporary.

DSO – Starting

Meeting immediate short-term needs

Local flexibility tenders

DSO – Advanced

Every year since 2020. in 2024, 40 zones covered, 46 MW.

Technology neutral and based on market Possible without locational prices

Potential gains from flexibility

The use of optimal sizing on the electricity transmission system is expected to bring significant collective gains :

- Nearly 7 billion euros for the community over fifteen years (2021-2035) with less than 0,3% of renewable energy curtailed on average. To put this into perspective, the French TSO estimates that it will need to invest 100 billion euros between now and 2040 to enable a successful energy transition.
- In regions with strong VRE growth, it has already freed between 10 and 30% of additional transport capacities.

Other solutions could further increase the gains for society.

For instance, Enedis estimates that the first 3 renewable production **smart connection offers** accepted by renewable energy projects have resulted in a gain of €3 million.

→ The next grid tariffs should strengthen the means and incentives for RTE and Enedis to better mobilize the physical flexibilities of the power system.

Perspectives for the next grid tariffs (2025-2028)

CRE had already started incentivizing flexibility in the current tariffs (2020-2024) :

- Full coverage of operating costs linked to the implementation of flexibilities
- Opportunity to experiment with new solutions through the regulatory sandbox
- Financial incentive for the TSO to set up the contractual framework for the alternative to network reinforcement local flexibilities tender.

For the next tariff, CRE is currently consulting stakeholders on :

- Allocating 20% of the economic gains generated by local flexibility to the TSO and the DSO
- Associating individual financial incentives with the calendar of most projects
- Introducing common priority projects with joint penalties in case of delays

Goal :

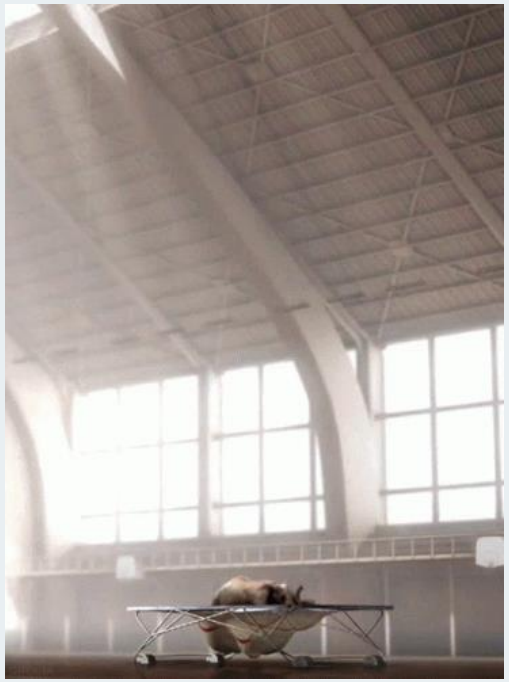
- Systematically using flexibilities as part of network sizing
- Facilitating participation in flexibility mechanisms
- Further developing flexible connection offers
- Improving the coordination of the SO in the activation of flexibilities

Decision expected by January 2025

Takeaways

- **No matter the solution used, the reliability of publicly available data is of foremost importance.**
- **Investment in flexibilities carries less risk of stranded costs than networks.**
- **The regulator's role is to push system operators towards flexibility solutions** (since their remuneration - based on capital costs - gives them a bias in favor of network development)
    - **Result-driven and technological neutral calls for tender** is the best tool to secure the most efficient flexibility solutions on the long run.
    - It **lets the market take the risk** in a time where the different business models for batteries are not fully stabilized.
    - It **does not close the door to other flexibility solutions** (e.g. agregation of demand side response)

Electrical system seeking flexibility…



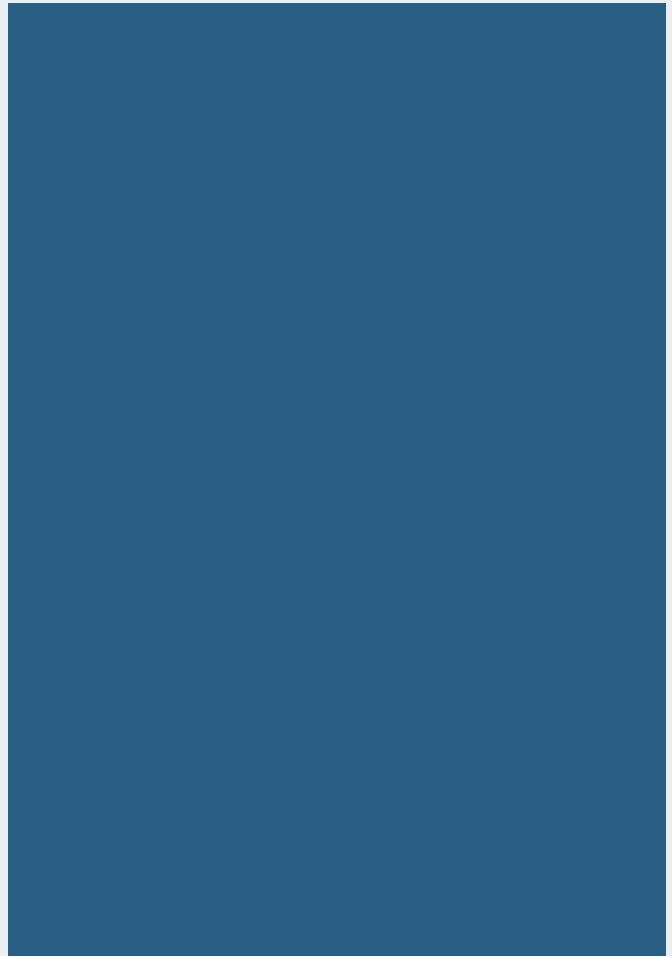
Ivan Faucheux

Amélie Redortier

ivan.faucheux@cre.fr

amelie.redortier@cre.fr

ANNEXES



The exemple of the Reflex project (1/3)

Goal : Accelerating the connection of renewable energies to the distribution grid

Project Summary

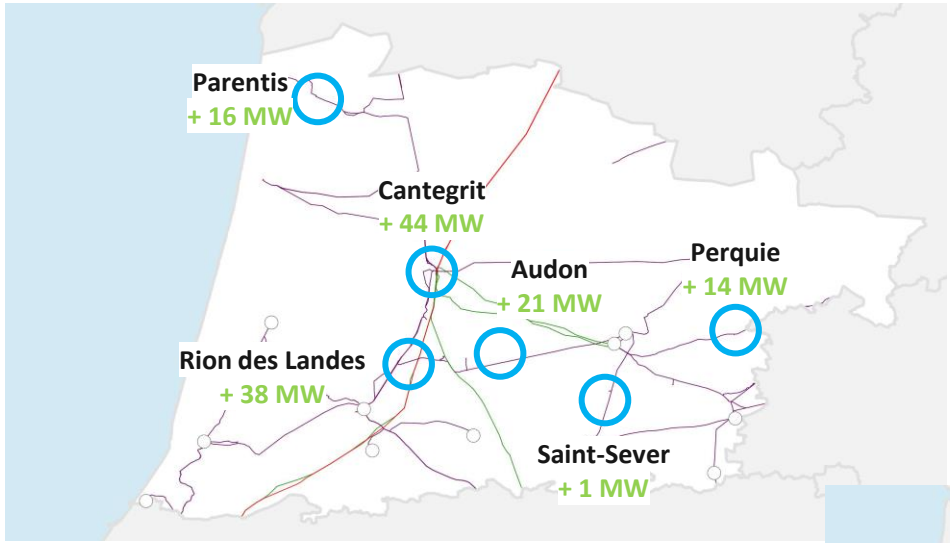
Enedis is testing flexibilities (inter-sector expansion, clipping, local flexibility) to optimize the sizing of its network in order to incorporate more renewable energies with a constant investment volume. Taking these flexibilities into account would make it possible to connect 215 MW more renewable energy than with conventional rules in the experimental areas, without additional investments. Thus, some wind and photovoltaic installations can be connected without waiting for additional work (especially in the source stations) in return for occasional curtailment of producers.

Derogations

The DGEC has granted a derogation to Enedis allowing it to offer connections conditions integrating the optimization of HV/HTB transformer substations by releasing new existing connection capacities beyond what conventional dimensioning rules allow. This is made possible by:

1. the natural balancing between production and consumption ;
2. the use of specific limitations on the power injected (subject to the acceptance of the producer, and in exchange for compensation);
3. the use of local flexibility.
4. The experiment is taking place in two geographical areas of Landes (6 substations concerned) and Picardy (4 substations concerned) in order to take into account the regional sensitivity due to the renewable energy sectors.

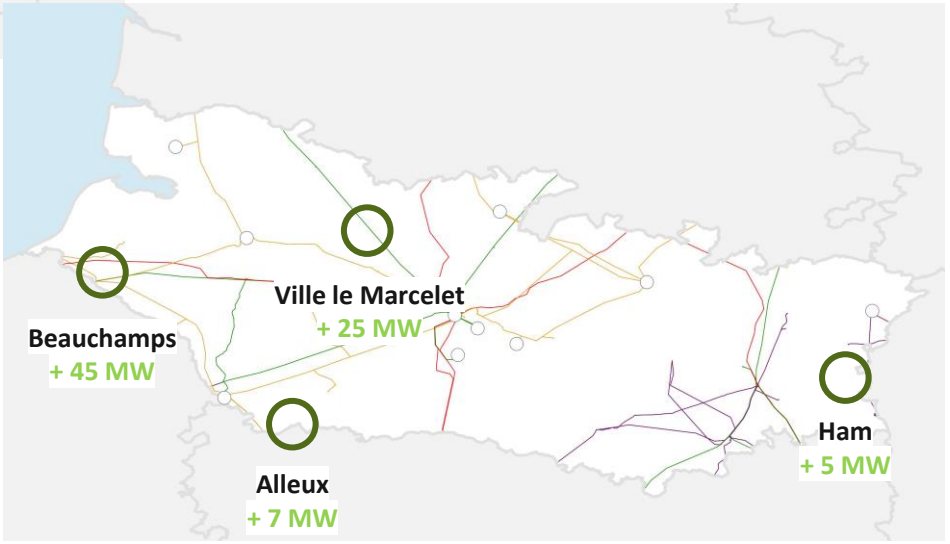
Reflex 2/3



Supplementary capacity

Landes

Picardie



Reflex 3/3

Main take aways

Up to now, only the natural balancing has allowed a significant increase in the capacity of the network to accept new RES production unit without new investments.

With the urgent need of new RES projects, curtailment should increase and therefore the need for flexibility should appear.

Enedis will then launch a call for tenders on the Reflex experiment stations to meet this need for local flexibility.

The end of the experiment is scheduled for 2025. It is only then that Enedis forsees, depending on the results, to generalize it (while RTE has already been doing for a few years).

CRE has proposed to already launch the generalization of this project.