Negative electricity prices : French case study

Session VI: Capture Rates for Solar and Re-thinking Support Schemes

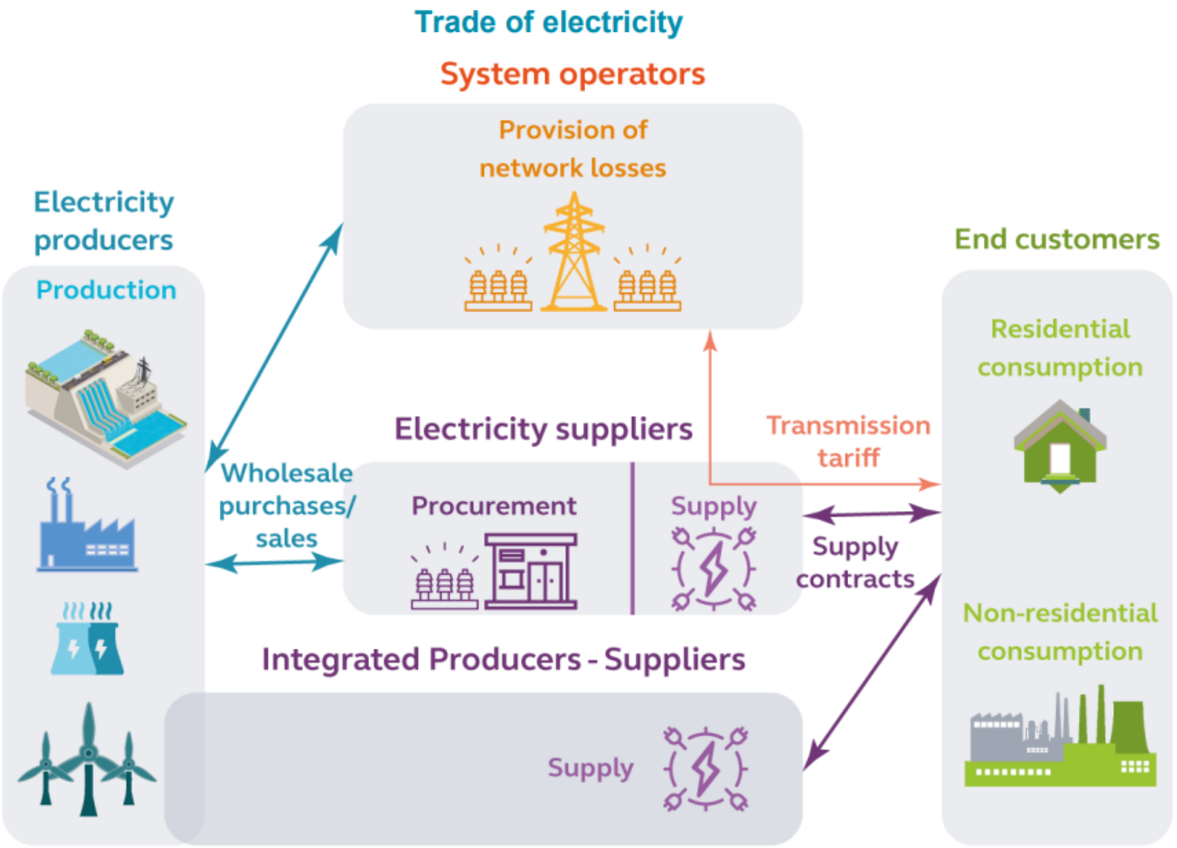
Ivan Faucheux

Commissioner, CRE (French energy regulator)

France

French electricity market: integrated and liberalized

- **Electricity generation and supply is competitive** and cannot be carried out by system operators.
- **The spot market optimizes short-term exchanges between supply and demand.**
  - Spot products are traded for same-day or next-day delivery, within the pan-European coupling mechanisms, among others.
  - **Here, negative prices will refer to the day-ahead market.**
  - Price formation on the day-ahead spot power market is based on marginal cost. The last activated plant sets the price.
  - RTE, the French Transmission System Operation, ensures the real-time balance of the system, if necessary, through the balancing market.
- **In parallel, futures contracts are traded for delivery at a given point in the future.**



Source: Court of Accounts

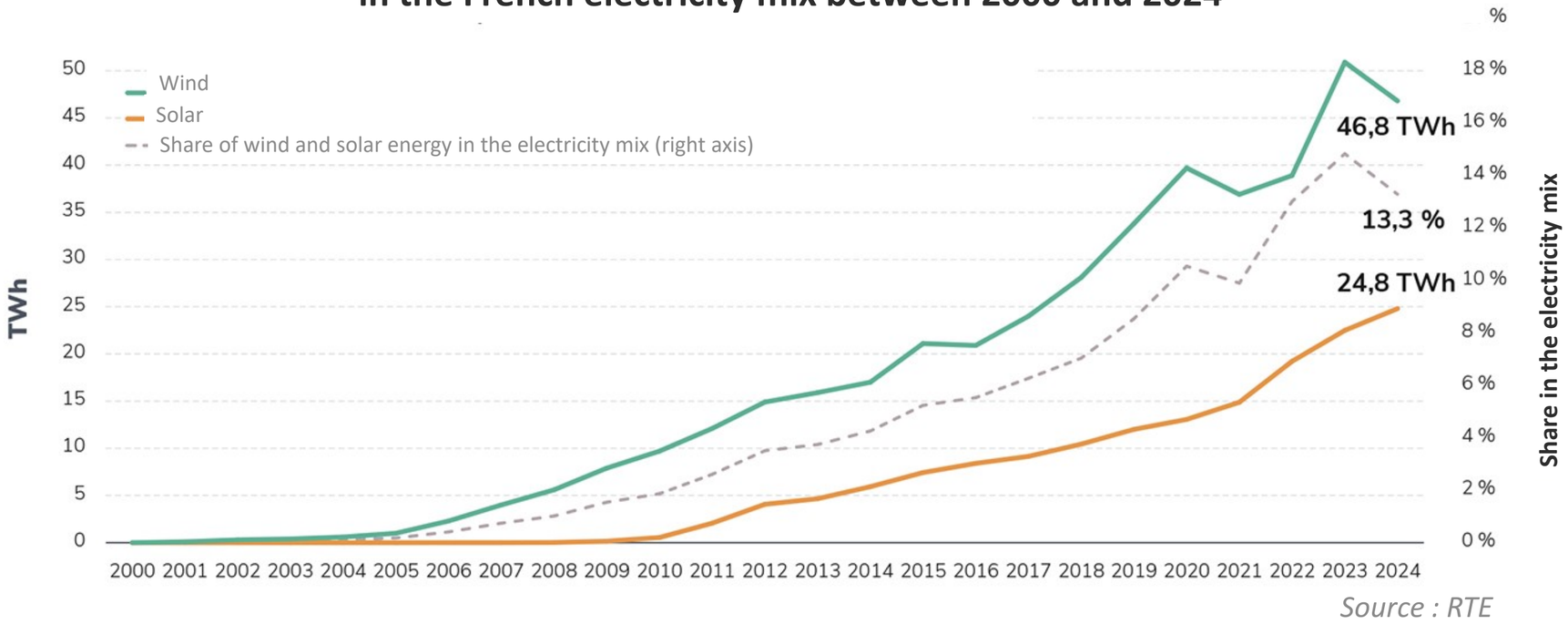
A rising share of non-dispatchable RES

67. 1 % 13.9 % 8.7 % 4.6 % 3.6 % 2 %

The 2024 French electricity mix

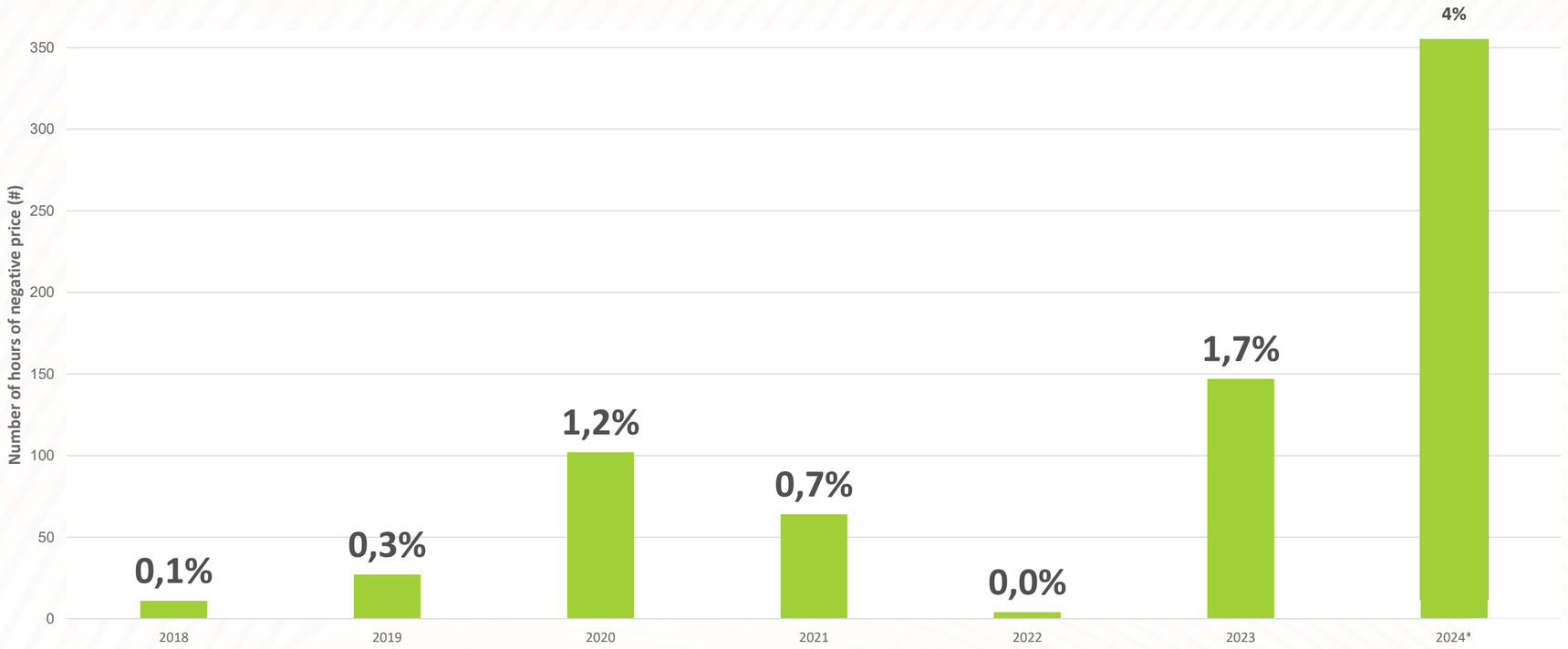
539 TWh

Evolution of wind and solar electricity production in the French and of their share in the French electricity mix between 2000 and 2024



Source : RTE

Since 2023, a sharp increase in negative price instances



In 2024, in France, spot prices were negative 4% of the time (359 hours):

- The first negative price on the French spot market occured in 2010.
- But, until 2023, there had only been a maximum of a *102 hours* of negative spot price in a year, which was hit in 2020 in the midst of COVID.
- **From 2023 to 2024, negative price occurrences doubled,** going from 147 to 359 hours.

The design of RES support schemes can amplify the phenomenon of negative prices

Negative prices are a market signal, they do not necessarily reflect a market dysfunction :

- In theory, an increase of negative prices creates a natural incentive for producers to modulate their electricity generation.

- **Furthermore, *near zero* prices do not reflect a suboptimal use of the production fleet.** If the last asset that is called is a wind/solar asset with a 0€/MWh marginal cost, spot price is supposed to approach 0€/MWh.

However, the design of administered schemes, especially Feed in Tariffs contracts, can lead to the suboptimal use of the production fleet and collective economic loss.

French stats *(2023 – mid 2024) :*

- Half of negative prices had a level of - 0,1 €/MWh or higher.
- On average, the other half was - 15€/MWh in 2023 and - 16€/MWh in S1 2024.

Thus, CRE identified improvements for the French RES support schemes

- **Older and smaller supported renewable assets receive no incentive to stop producing during negative price hours.**

→ **CRE recommended a major adaptation of Feed-in-Tariff (FiT) contracts, especially existing ones** for the biggest assets, like offshore wind parks. During negative hours, they would receive their remuneration only if they don't produce.

- **More recent supported renewable assets with significant capacity are incentived.** They receive

  (1) no remuneration for production during negative hours ;

  (2) a bonus for not producing during negative hours (after hitting an annual treshold).

→ **CRE only recommended some fine-tuning to Feed-in-Premium (FiP) contracts / Contracts for Difference (CfD)**

- **Participation of RES to balancing mechanisms should also be improved.**

NB : Most recommendations have now been adopted by the Parliament

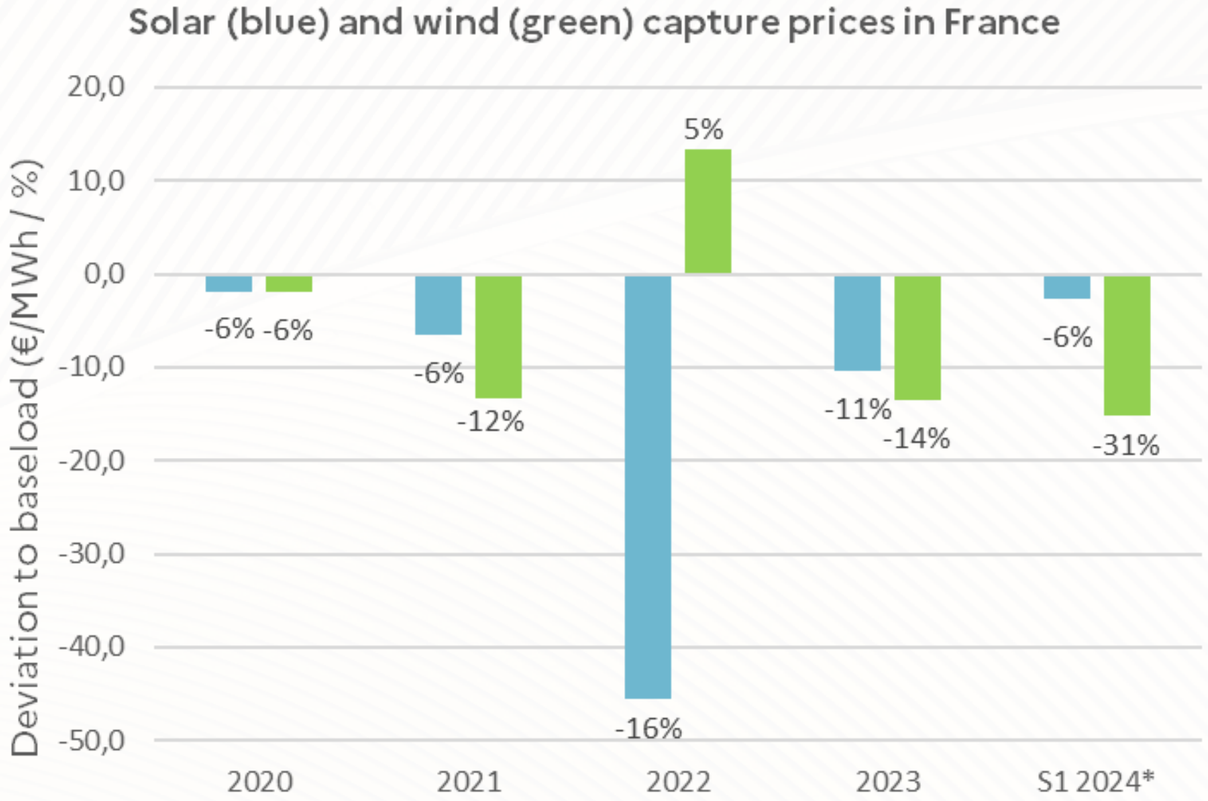
French stats *(2023):*
- Installations with FiT : 40 % of the RES production
- Installations with FiP / CfD : 14 % of the RES production
- Non-supported installations : 46 % of the RES production

Still, near-zero prices will remain likelier and could affect the net-zero transition

Ultra low-prices are likely to :

- **degrade the profitability of support-free installations**
- **reduce the price captured by supported RES**, a financial risk borne, in France, by the **state budget.**

For consumers, lower prices are good (spot and potentially forward) **but risk being offset by other mechanisms** (such as capacity mechanisms…)



Context :

Increasing the cost of capital by 1% (from 4% to 5%) significantly affects the full cost of decarbonized electricity of around : + 5 €/MWh for offshore wind ; + 8 €/MWh for PV ; +13 €/MWh for new nuclear

However, negative prices are also a matter of demand

Between 2023 to mid-2024, French negative spot prices have typically occurred:

- **During the week-end**, *nearly 2/3 of the time*
- **Between 12pm and 4pm**, *nearly 1/2 of the time*
- **Between March and August**

- **In a cluster of around 5 hours**
- *Only 3% of single hours*

- **When France is exporting**
- Still, in most cases, interconnections enable the French excess production to be exported

Why ?

↳ Lower consumption and higher RES production, especially solar,
↳ Low modulation capabilities for some assets (nuclear/small hydro)
↳ Simultaneity of high generation or low demand in the different European countries.

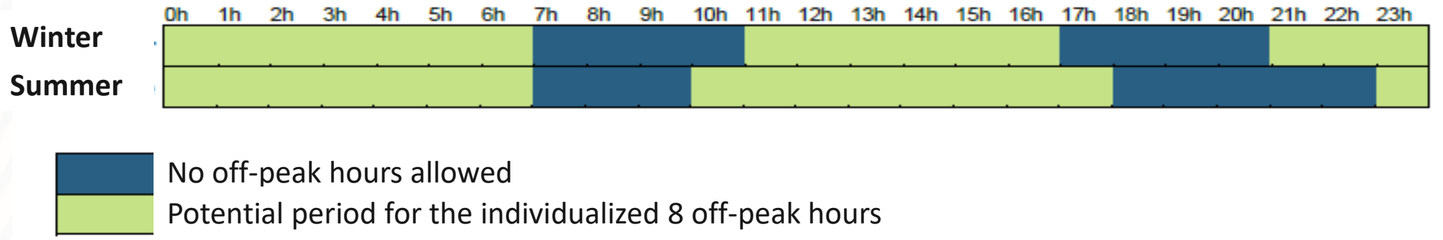
More details in Annex

Improving demand side flexibility is crucial as well

Reform of the peak and off-peak hours for end consumers

CRE modified **network tariffs** in 2025 : off-peak hours will include afternoons (except in winter) **to better reflect the solar production pattern**

Starting in Autumn 2025 :
→ End-consumers might have **different hour schemes depending on the season**
→ A majority of them will have **offpeak hours during the afternoon**, at least during summer.



Leveraging regulated supply tariffs

≥ 9kvA Gradually, regulated supply tariffs will only be available in a Time-of-Use design for the biggest eligible consumers

3-6kvA CRE suggested carrying out an experiment to determine new Time-of-Use designs that are enticing to small consumers who favors fixed regulated tariffs.

Batteries will be pivotal to improve capture prices for non-dispatchable assets

To prompt investments in batteries, CRE successfully relies on markets and grid accessibility:

- **For the last 5 years, batteries development has been market-based, without public support.**
- **The opening up of balancing markets to batteries has been the main driver.**
- **On transmission grids, flexible connection agreements (FCA) are popular with project developers to improve connection time.** Indeed, the restrictions on the power injected/withdrawn do not affect the access to balancing markets.
- **CRE has incentivized the DSO to develop FCA for distributed battery projects by the 1st of january 2026**
- **On CRE's request, the TSO recently published a map and datas of available connection capacities for batteries.**

French stats :

- Over 1 GW of batteries are connected to the grid. 9GW in the queue.
- Balancing markets: 640 MW of batteries are certified for the FCR and 140 MW for the aFRR
- FCA made up half of batteries' connection requests to the transmission grid in 2024

Takeaways

Reviewing RES support contracts offers a significant and rapid leverage:

- Most impactful changes involve changing current contracts
- But correcting such bias can be a win-win situation

To address the need for flexibility, regulators can look into :

- meeting the **bulk** by building up suitable **recuring demand modulation** and
- meeting **finer needs** closer to real time with additional **dynamic flexibilities.**
- facilitating **battery** storage connexions and access to market

The underlying fundamental challenge is to trigger the investments necessary for the energy transition (whether on the production or the demand side).

- Spot prices will not be enough: **developing long-term markets and reshaping their products is essential.**

THANK YOU

ivan.faucheux@cre.fr
amelie.Redortier@cre.fr

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