

Simulation of CfDs: the French Case

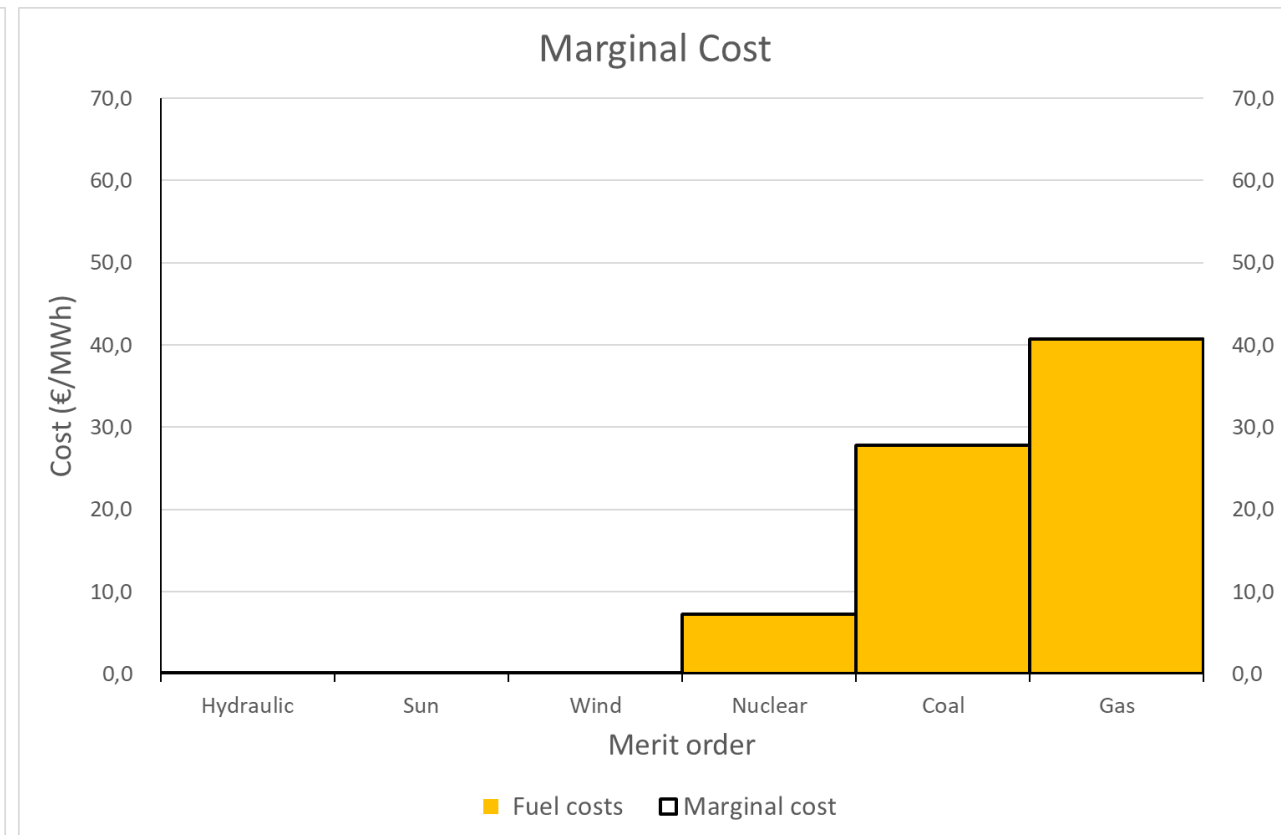
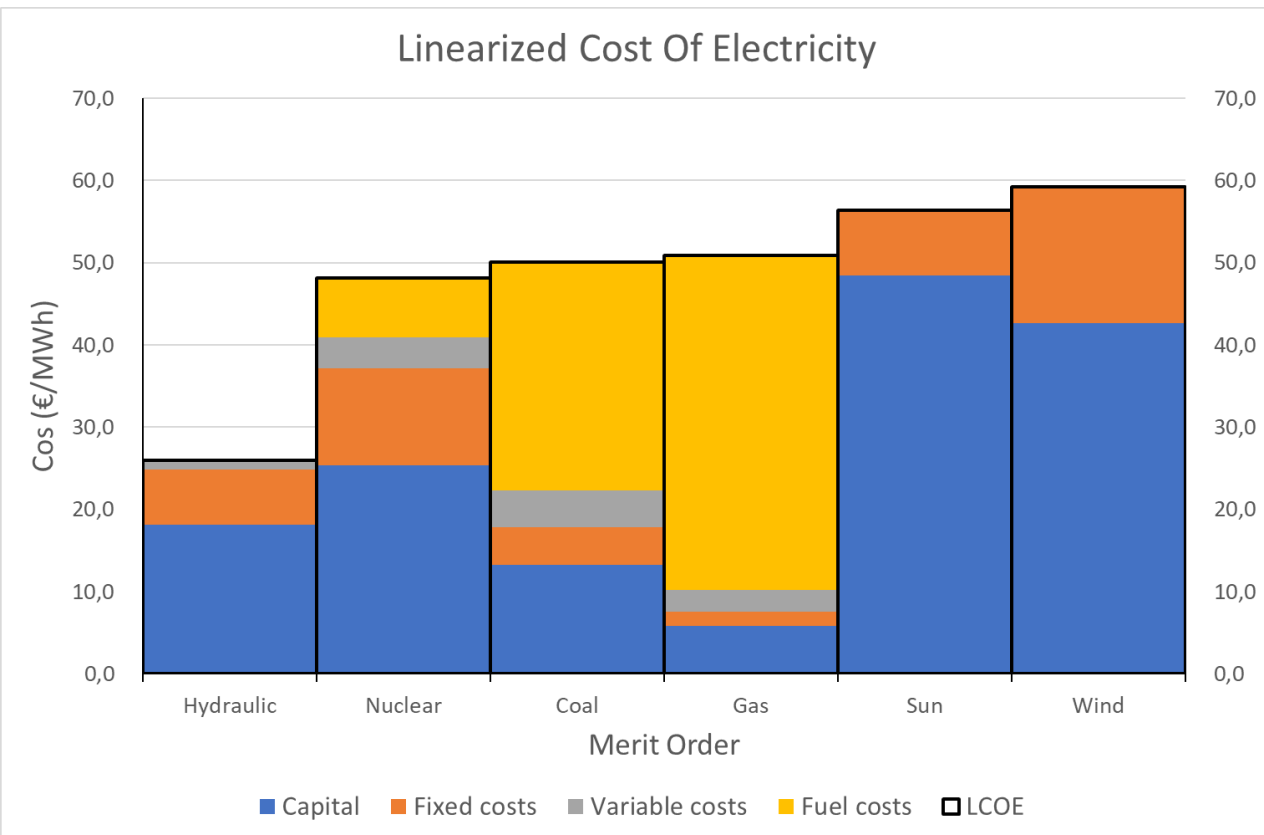
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Introduce safeguards on the wholesale electricity market to enable it to cope with rising wholesale prices.

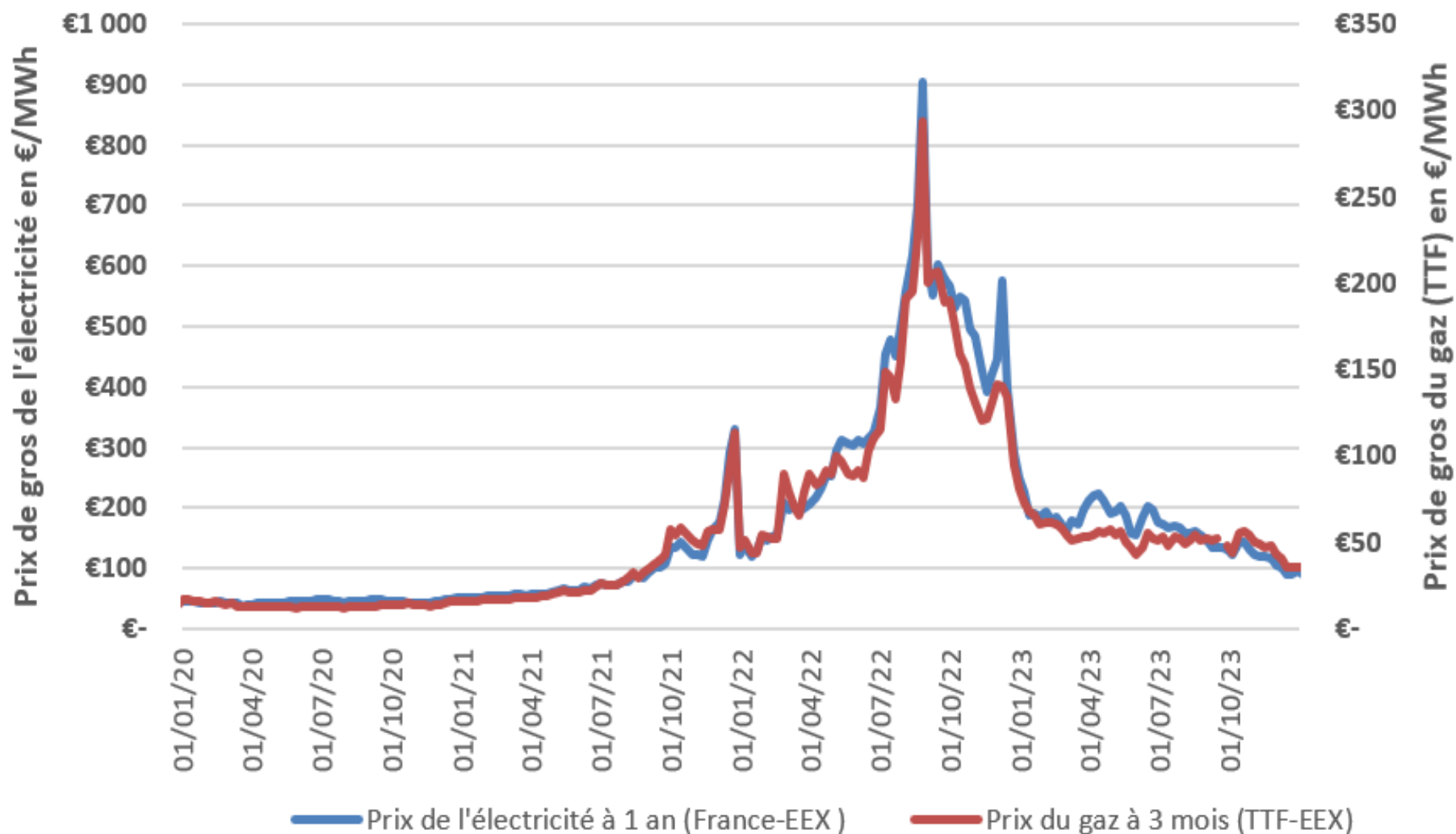
- The rise in wholesale electricity prices in 2022, due to soaring gas prices and the reduced availability of French nuclear power, has prompted the public authorities to consider reforming the European electricity market. The aim is to introduce safeguards on the wholesale market to limit price volatility, which is detrimental to long-term investments.
- Two mechanisms have attracted particular attention: CfDs (*Contracts for Differences*), which set a floor price and a ceiling price for the wholesale price (the two prices can also be confused), and PPAs (*Power Purchase Agreements*), medium- and long-term contracts signed by mutual agreement between producers and suppliers or large electricity consumers.
- With the CfD, the state collects the rent when the wholesale price exceeds the ceiling price, and subsidizes the producer when the wholesale price is below the floor price. This rent can then be redistributed to the end consumer to enable him to cope with rising wholesale prices. It should be noted that this system already exists for renewables, which has led the State to recover part of the infra-marginal rent from which these renewables benefited in 2022.

Merit Order: average and marginal costs



Percebois, J., & Pommeret, S. (2022). Marché de l'électricité : comment faire face aux épisodes de prix extrêmes ? La Revue de l'Énergie, 662, 63–75.

Correlation between electricity and natural gas prices

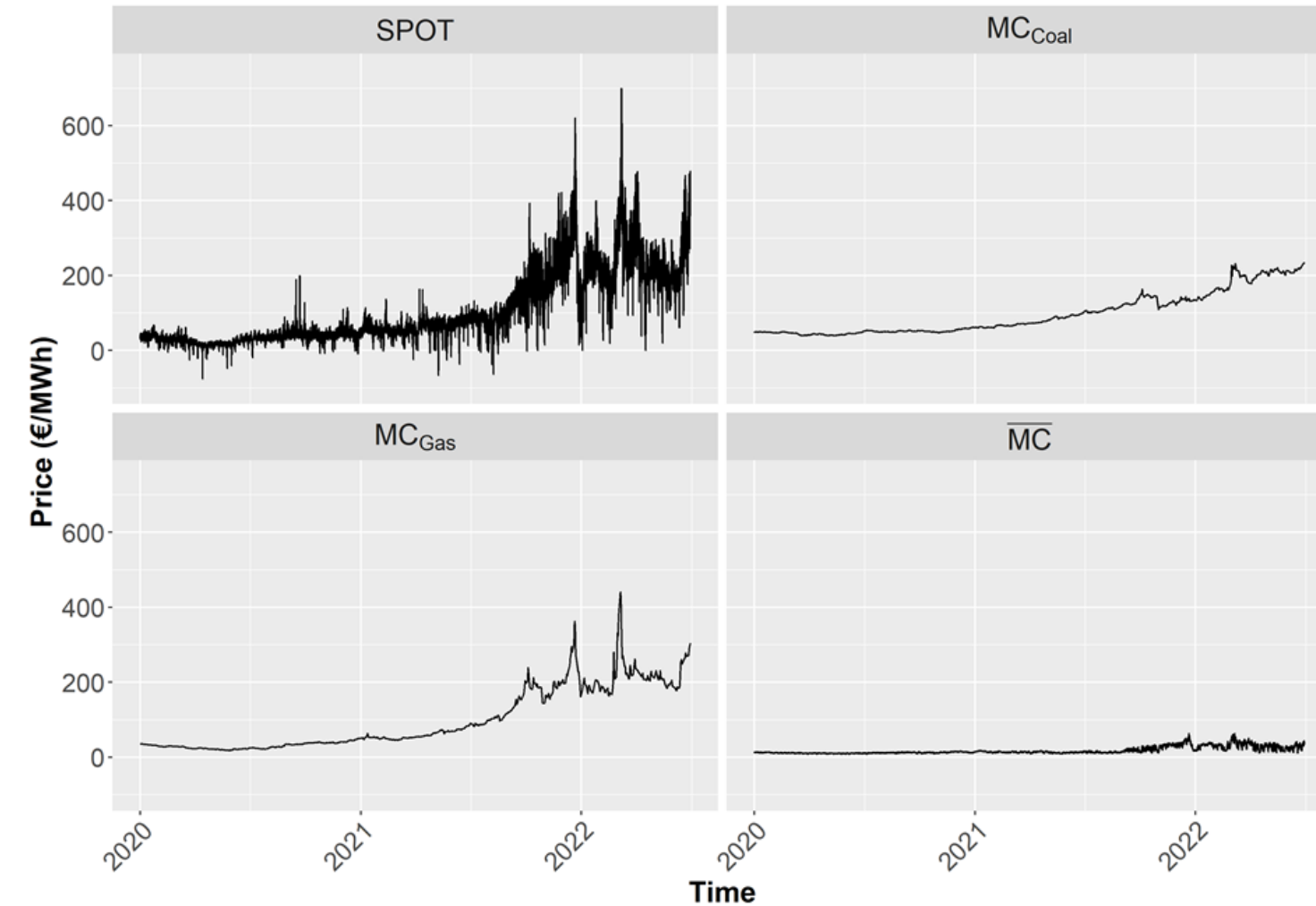


Is there a relationship between wholesale price and marginal cost?

$$\overline{MC}(t) = \frac{\sum_i (MC_i \times Prod_i(t))}{\sum_i Prod_i(t)}$$

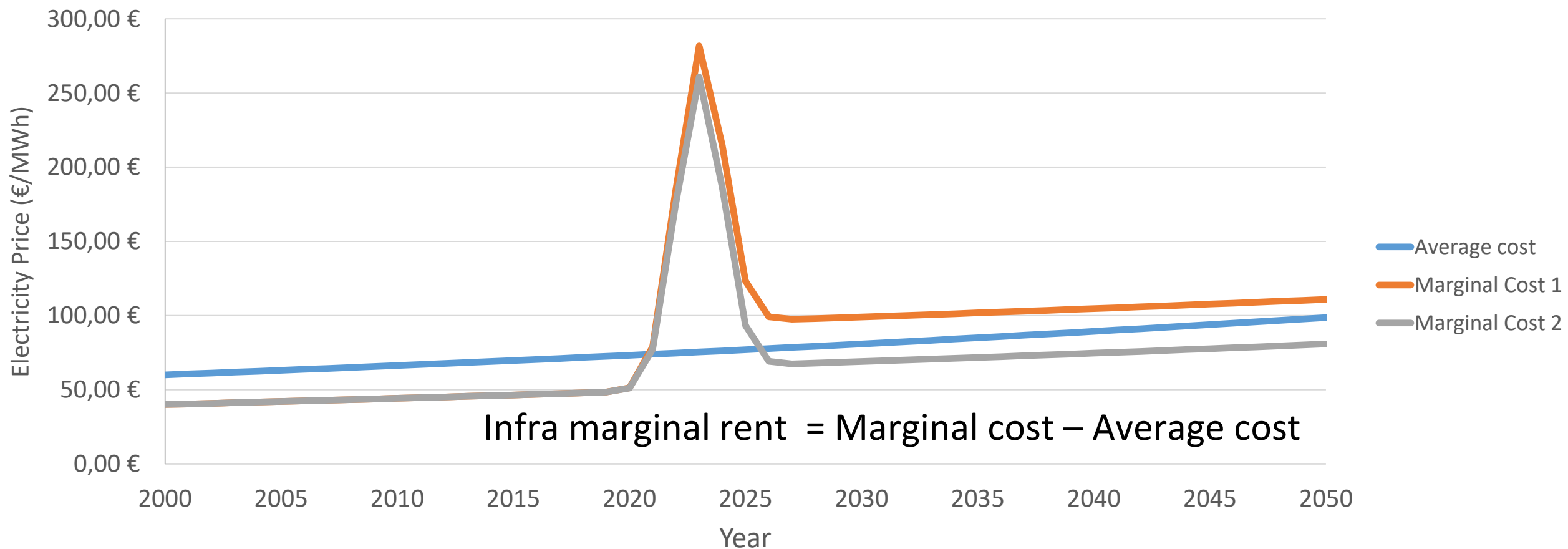
The 2 main reasons for the surge in wholesale prices are:

- 1) the rise in the price of gas, which, via the marginal cost of gas-fired power plants (marginal on the wholesale market), drives up the wholesale price of electricity
- 2) the lack of controllable power generation capacity in Europe due to the numerous closures of gas, coal and nuclear power plants.



Trends of the electricity market

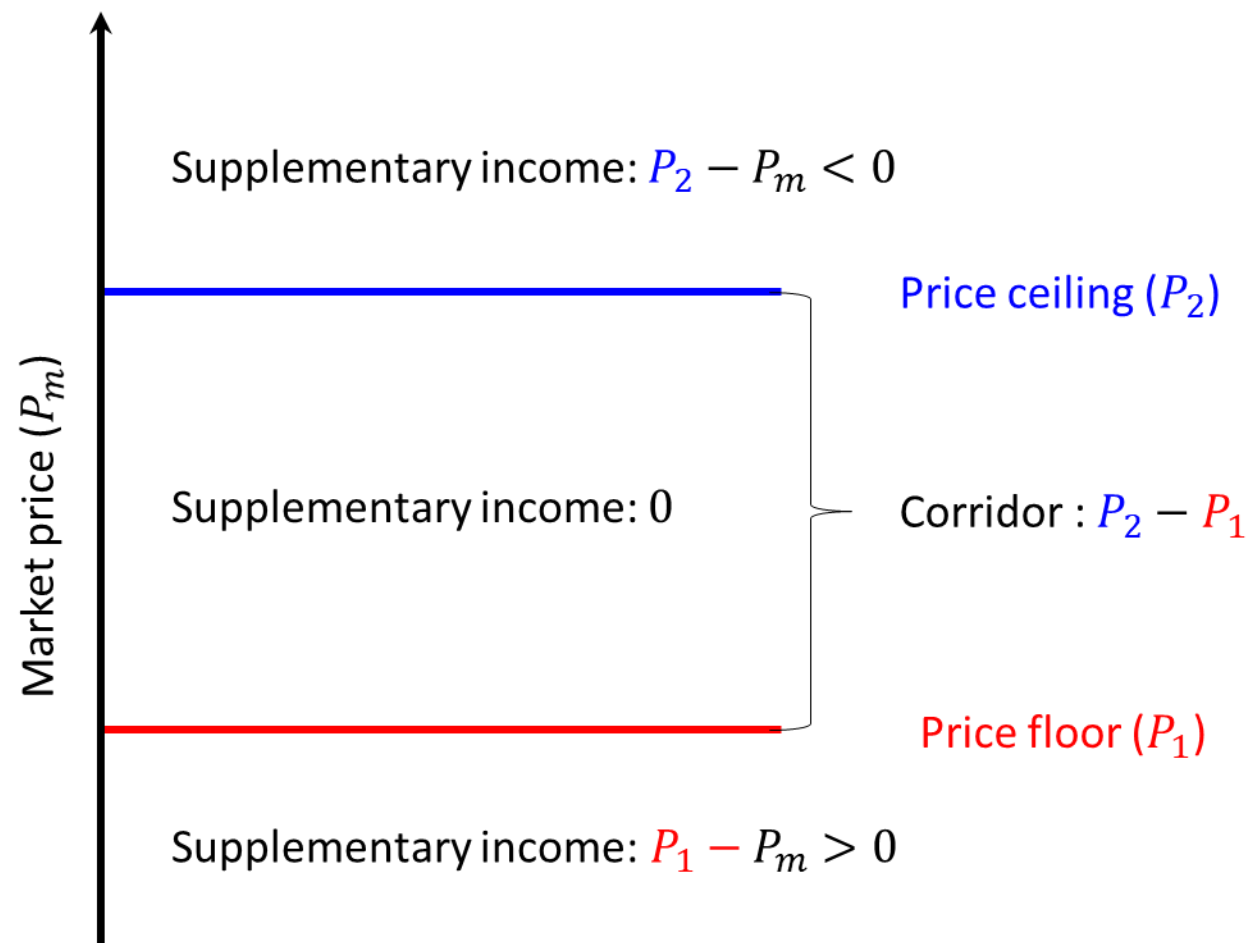
Evolution of the Spot market price = marginal cost



Average or marginal cost pricing?

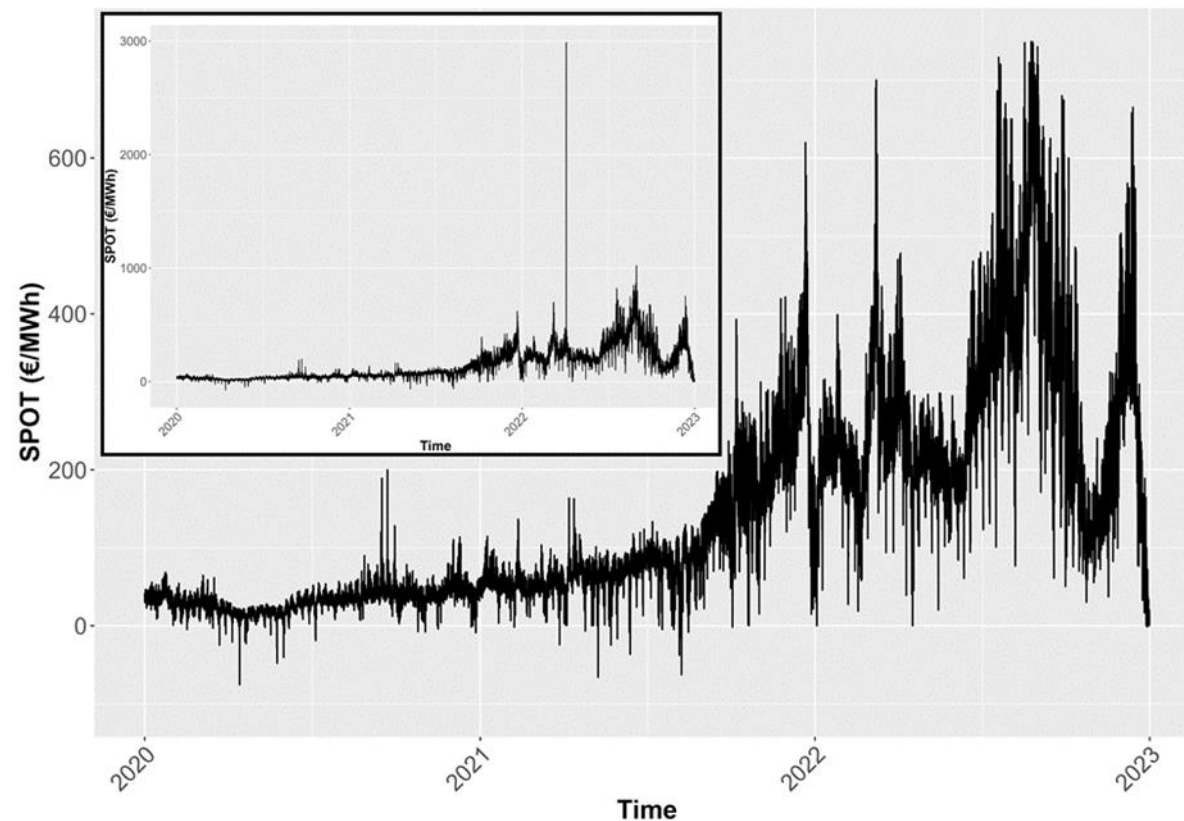
- The debate is open between those who, like the Cour des Comptes, insist that the price of electricity should be set in line with the long-term average cost of the power plants, and those who, like the Commission de Régulation de l'Energie (CRE), explain that in a market economy (in particular with an hourly spot market), the price of electricity should logically follow the short-term marginal cost of the power plants.
- During the decade 2010-2020, the marginal cost, and therefore the wholesale price of electricity, tended to be lower than the average cost of the fleet, hence the closure of certain gas-fired power plants and the introduction of a capacity market designed to remunerate power.
- By 2022, it has become well above this average cost. The future will tell whether or not this marginal cost, based on the fuel costs of gas-fired power plants, will remain higher than the average cost of the fleet. In the long term, when fossil-fired power plants have disappeared, the price will necessarily be based on the average cost of power plants with a high proportion of fixed costs (nuclear and renewable power plants), since the marginal cost will either be zero (in the case of renewable energies) or low (in the case of nuclear). A wholesale market based on marginal cost is therefore not sustainable

Corridor or bilateral CfDs?



CfD impact on public finances

Floor (€/MWh)	Ceilling (€/MWh)	Energy	2022	2021	2020	
40	40	Decarbonized	85,5	31,9	-3,3	
		Renewable	22,5	6,6	-1,0	
		Nuclear	63,0	25,3	-2,3	
	60	60	Decarbonized	78,1	24,3	-4,5
			Renewable	20,5	4,9	-1,2
			Nuclear	57,6	19,4	-3,3
	80	80	Decarbonized	70,8	19,0	-4,6
			Renewable	18,6	3,8	-1,3
			Nuclear	52,2	15,2	-3,4
60	60	Decarbonized	78,0	22,5	-12,2	
		Renewable	20,5	4,5	-3,2	
		Nuclear	57,5	18,1	-9,0	
	90	90	Decarbonized	67,0	15,2	-12,4
			Renewable	17,5	2,9	-3,3
			Nuclear	49,4	12,3	-9,2
	120	120	Decarbonized	56,4	10,7	-12,4
			Renewable	14,8	2,0	-3,3
			Nuclear	41,7	8,7	-9,2
80	80	Decarbonized	70,4	13,2	-21,2	
		Renewable	18,4	2,3	-5,5	
		Nuclear	52,0	10,9	-15,7	
	120	120	Decarbonized	56,2	6,7	-21,2
			Renewable	14,7	1,0	-5,5
			Nuclear	41,5	5,7	-15,7
	160	160	Decarbonized	43,1	2,2	-21,2
			Renewable	11,3	0,1	-5,5
			Nuclear	31,8	2,1	-15,7

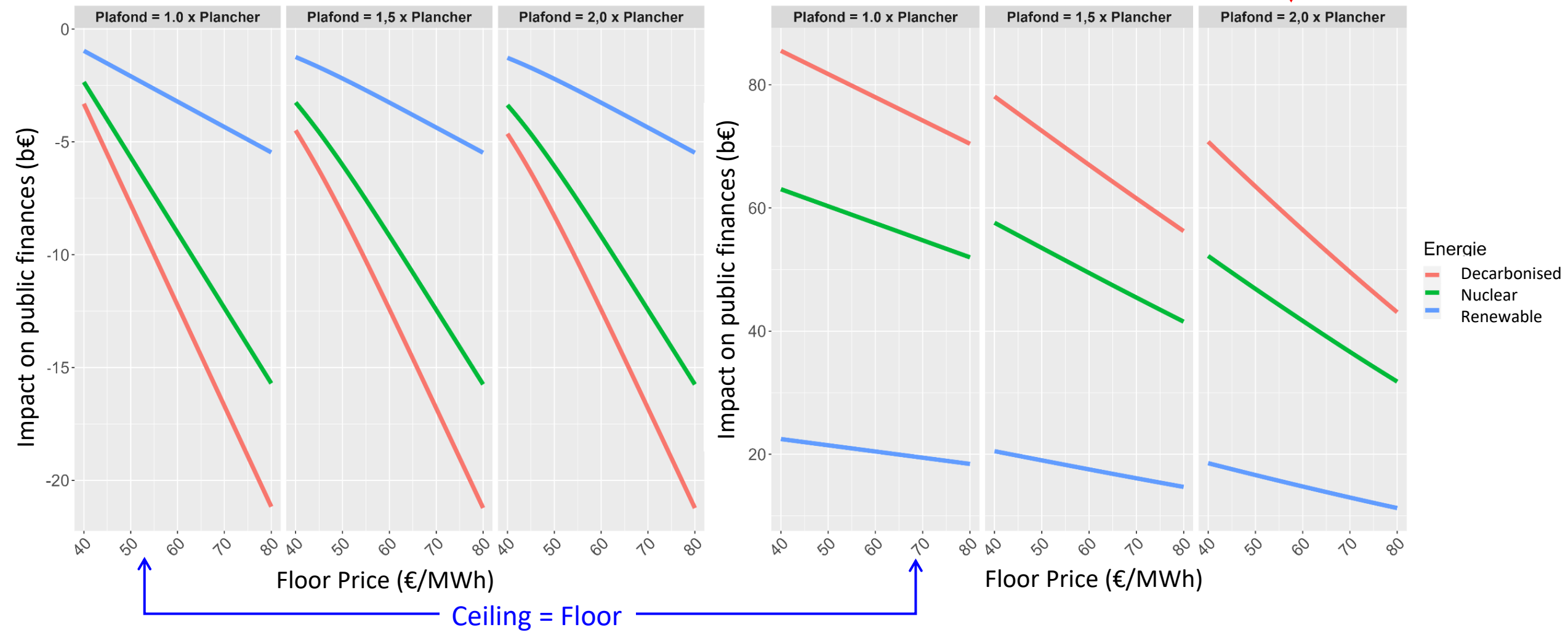


CfD impact on public finances

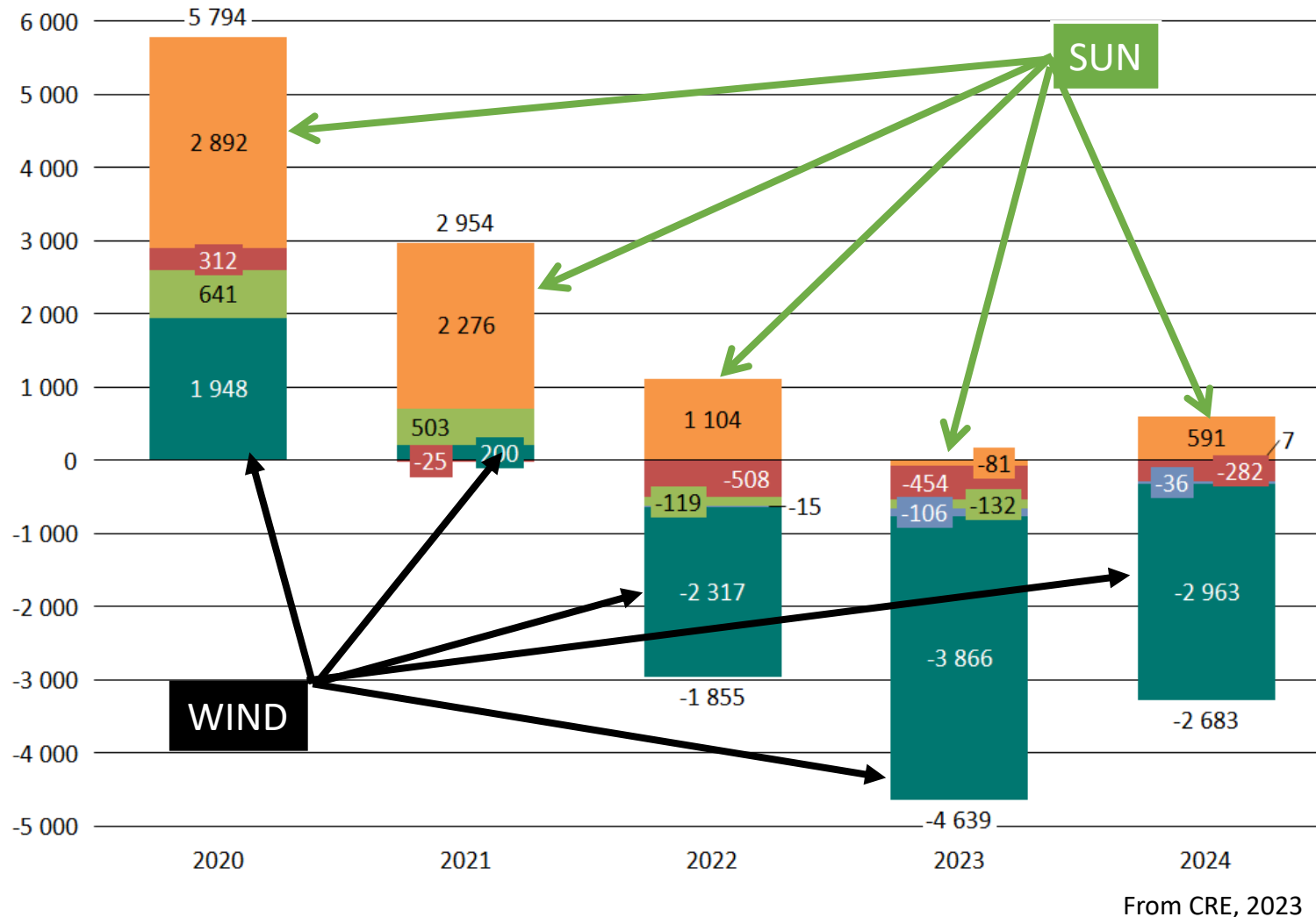
2020

Ceiling = 2.0 x Floor

2022



The CfD mechanism already exists with the renewables.



CSPE : Charge pour Service Public de l'Énergie, Energy public service charges.

A negative amount indicates that the renewables have benefited from a negative income supplement (i.e. have returned to the State).

The 2024 figures are probably overestimated.

Mechanism adopted in November 2023 in France to replace ARENH

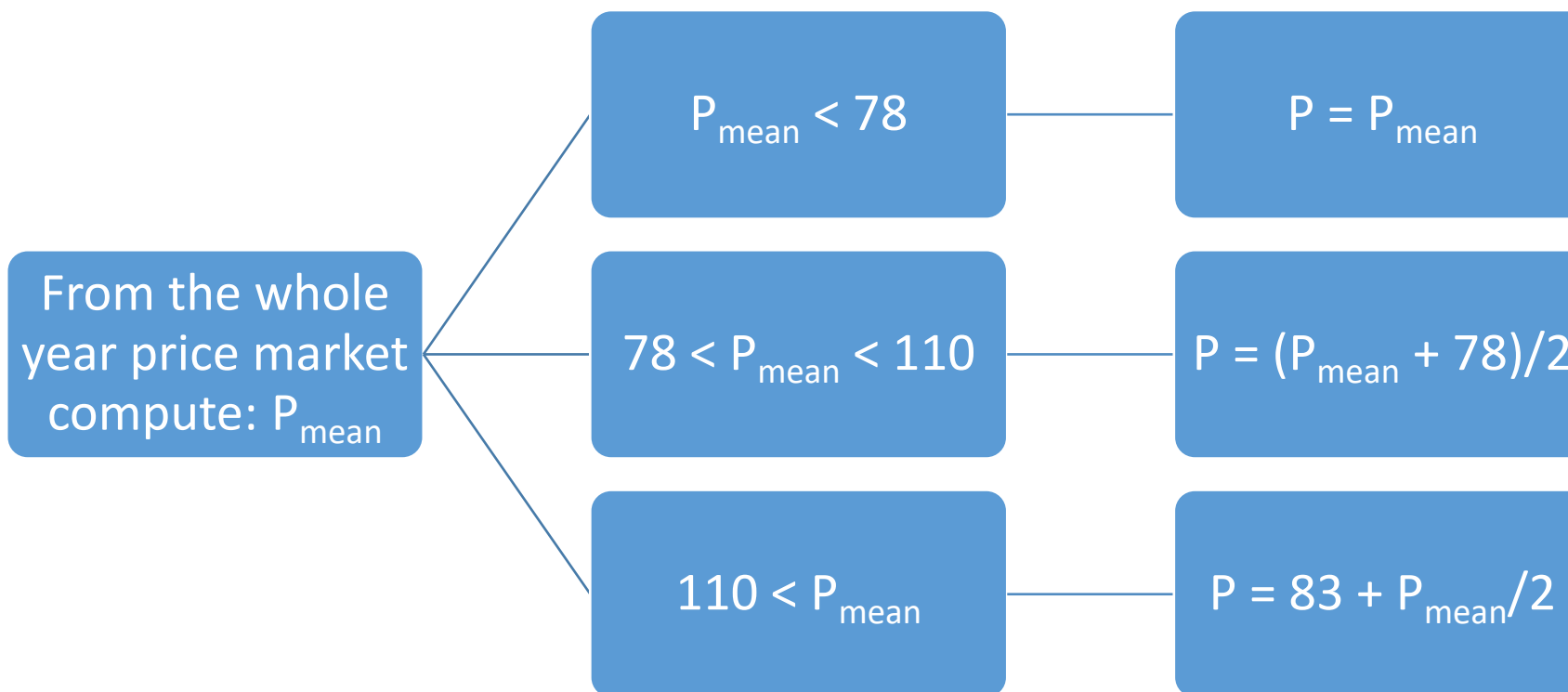
1. No CfD but a double levy on nuclear revenue
2 thresholds: 50% "tax" between 78 and 110 euros/MWh and 90% "tax" above 110euros/MWh); the base will be the average revenue from nuclear sales.
2. The levy will be reimbursed in full to the consumer (via suppliers) the following year, but advances on redistribution are planned for the current year.
3. EDF is encouraged to sign Power Purchase Agreements (PPAs) with industrial customers, particularly with electro-intensives.
 - Medium-term contracts in MWh (2 to 5 years)
 - Long-term capacity contracts in MW (10 to 15 years); industrial partnership with risk sharing (reserved for electro-intensives)

Practical computation of the double levy

Price market

Double levy

Producer revenue



Contributions on Inframarginal Rents (CRI or CRIM)

- The State planned also to tax part of the inframarginal rents recovered by electricity suppliers (law of 2023), but the rents were much lower than expected (4.3 billion euro over 2022-2023 instead of 8.8 expected)
- This is due to the sharp fall in wholesale prices from 2023 onwards.
- It is the proof that the CRIM doesn't pay.

Financing options

Solutions	classic scheme, borrowing or public subsidy	P.P.A or NPAC (nuclear production access contract)	CfD (contract for differences)	RAB (regulated access base)
Risk for the operator	the operator advances the funds and bears the risk in the event of cost overruns (risk shared with the taxpayer in the case of state aid)	The operators advance the funds and bear the risks if additional costs	the operator advances the funds but is guaranteed to recover his investment (provided that the cost does not exceed the guaranteed price)	the operator borrows as it goes along, and recovers the funds as it goes along via the electricity tariff. The operator is remunerated from the start of construction
Risk for the consumer or the taxpayer	consumers only pay once the plant is in operation	consumers only pay once the plant is in operation	the consumer knows the price in advance, but the taxpayer is at risk if the market price is lower than the guaranteed price	risk is transferred from the operator to the consumer, whose tariff follows costs

Conclusion

Why wholesale market reform is ultimately necessary in all cases

1. Setting the equilibrium price on the marginal cost of the marginal power plant does not allow for the financing of fixed costs in a fleet made up mostly of renewables and/or nuclear power (*low marginal cost or even zero, except in periods of shortage, as is the case today for gas*)
2. By nature, a price set by the short-term variable cost of a power plant cannot send a good signal for a capital investment with a life span of several decades

