Explainer

The Merit Order Model and Marginal Pricing in Electricity Markets

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In electricity markets, "marginal pricing" and the "merit order model" are confusing people all the way up to heads of state. This is Ursula von der Leyen explaining it to the European parliament (11:19 to 11:21). The judgment is pretty clear.

"We still have an electricity market that is designed in a way like it was necessary twenty years ago when we started to bring in the renewables […] Today, the market is completely different and **this market system does not work any more.**" Ursula von der Leyen, 8 June 2022

"People are being charged for their electricity prices on the basis of the top marginal gas price, and that is frankly ludicrous. **We need to get rid of that system.**" Boris Johnson, 25 June 2022

"You have skyrocketing electricity prices that no longer have anything to do with electricity production costs, it follows gas, **it's absurd**" Emmanuel Macron, 28 June 2022

Here is my try.

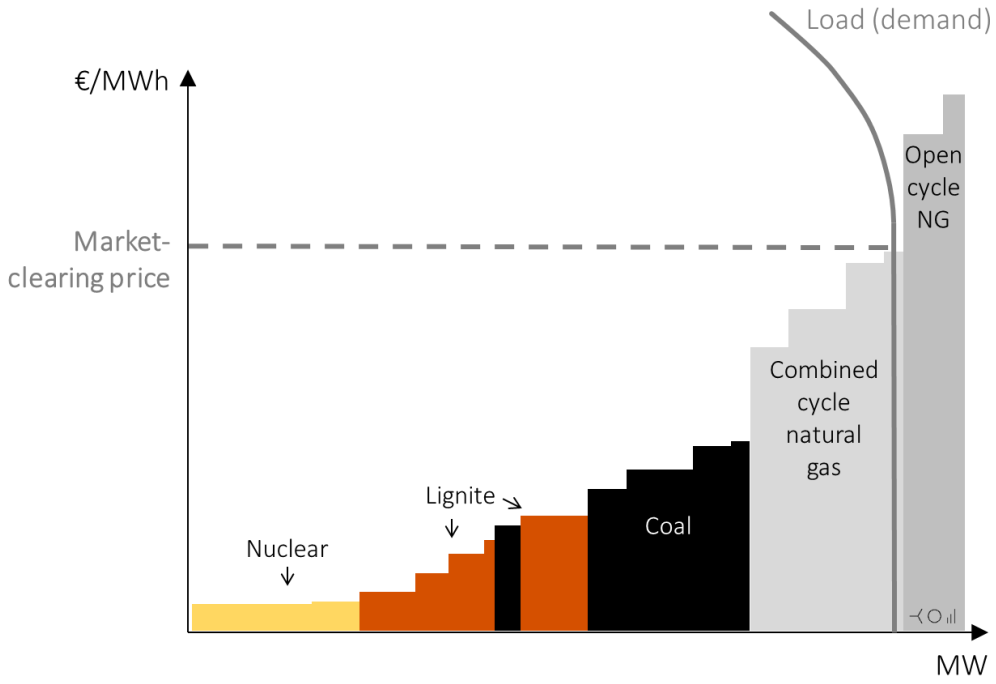
In this short explainer text, I'll try to explain how prices are formed on electricity markets and clarify a number of what seem to be misunderstandings and misconceptions.

What is marginal pricing and the “merit order”?

Marginal pricing refers to electricity prices being set by the variable cost of the marginal plant, i.e. the most expensive plant that is required to serve demand. This is the way electricity prices are determined on short-term wholesale markets, such as the day-ahead market.

This mechanism is often illustrated with the “merit order curve”, a chart depicting the power generation costs of the existing plant fleet.

All generators receive and all consumers pay the same price. A uniform price.



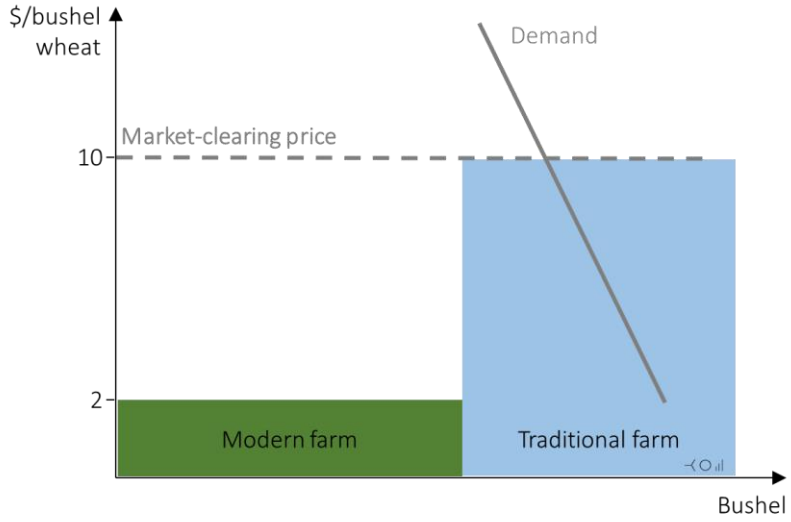
1. Marginal pricing is not unique to power markets

Commodities price on the margin, and so does electricity. Oil, gas, copper, milk, solar panels – they are all subject to marginal pricing.

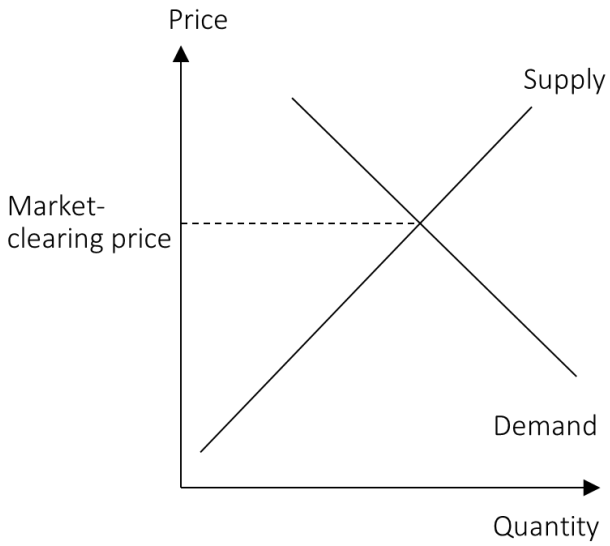
Let's look at a simple example: Two wheat farmers, one very modern and mechanized with low production costs of $2 per bushel. another traditional with loads of expensive manual labor yielding costs of $10. Both farms produce the same quality. Both are required to supply demand.

- The more expensive farm will not sell below $10 – otherwise it would make a loss
- The more efficient farm knows it can sell at $10, because that’s what consumers pay next door. So why should it sell at anything below 10? It won’t.

In other words, there will be a uniform price because the good is uniform, and that price will be determined by the cost of the marginal producer. Same thing for electricity.



In fact “merit order curve” is just a complicated name for what is conventionally called the “supply curve”. The Merit Order Model is just the supply-demand model that most of you have seen many times:



2. Marginal pricing is not an artificial rule

It is not a rule that some institution or person came up with. It’s not an arbitrary choice among alternative “market designs”. It is the natural way prices emerge in free markets.

It follows that if you want to get rid of marginal pricing, you must force people to change their behavior. They won’t do this voluntarily. If you want generators to sell electricity below the marginal price you need taxes, subsidies or bans.

3. The merit order model is descriptive

The merit order model is not an instruction of how markets ought to function, but a description of how individual decisions lead to market outcomes. It tells you how prices emerge from decentralized decision-making. The model is descriptive, not prescriptive.

4. The power prices is not coupled to the gas with by law

The talk of “de-coupling” power prices from gas prices has led people to believe there is a law or a rule that connects those prices. There is not. It is economic mechanisms, not regulation, that makes these prices move hand-in-hand.

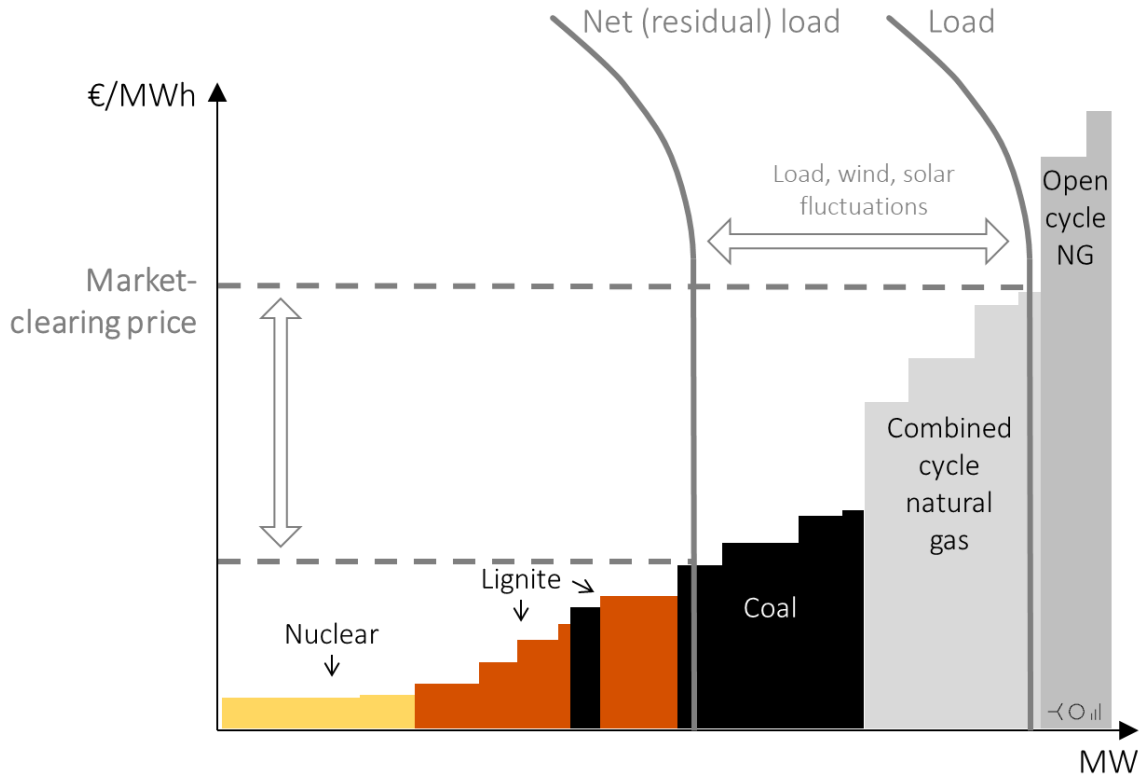
By the way: that’s only the case under certain market conditions, not necessarily and not always.

5. There isn’t “the one” power price. There is a different price in every quarter-hour

The one crucial difference between electricity and other commodities is that power, unlike wheat, cannot be stored. So the market-clearing price on spot markets varies on time scales of minutes, and widely so. Take the example of Germany:

- Last Sunday noon, the price was 13 €/MWh
- Monday morning, the price was 800 €/MWh

Why? There was little demand and loads of solar energy on Sunday. So prices fluctuate, but the principles according to which they are formed in each moment are the same.



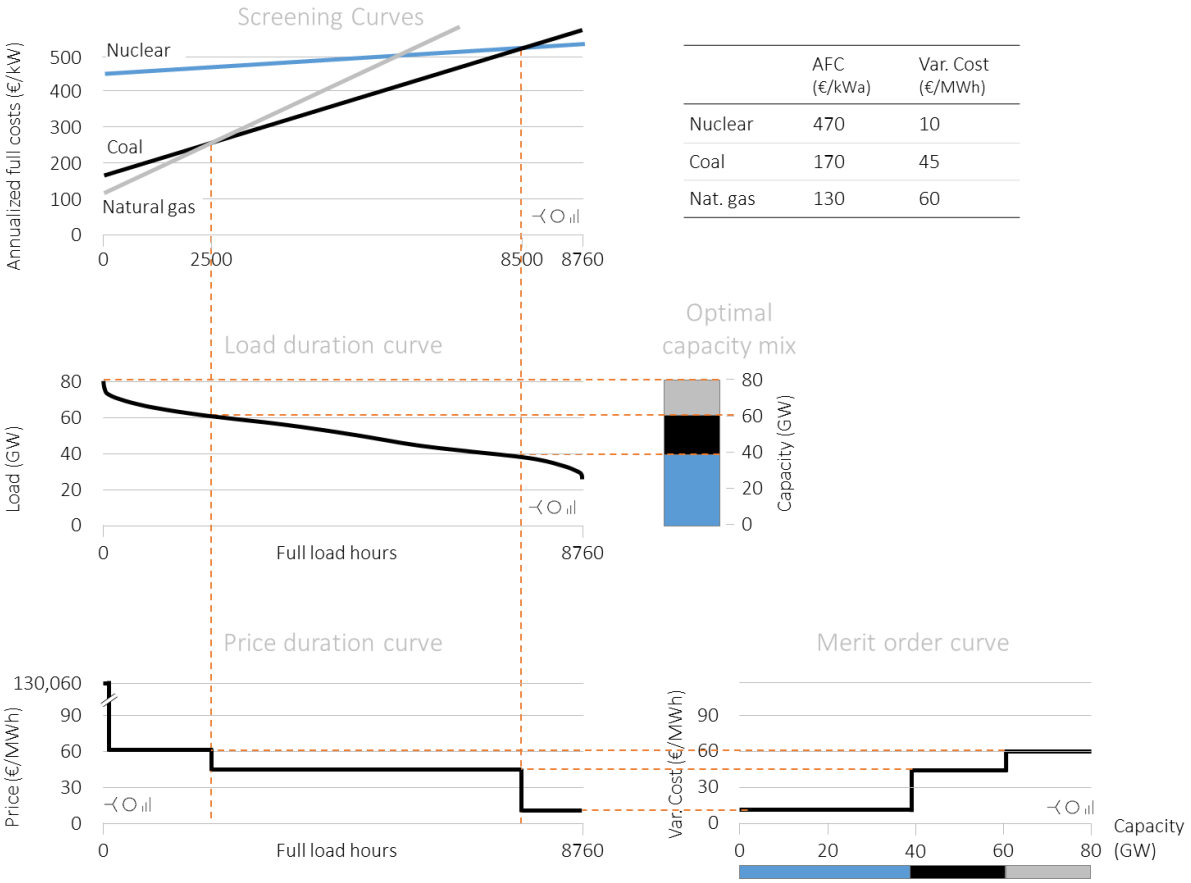
6. Margins pay for investments

Power stations left of the marginal plant will earn a “contribution margin”. These margins are necessary to finance investments. Economically, profits arise if contribution margins exceed what’s necessary to recover investment costs.

7. Profits disappear in the long run

There is an extension to the Merit Order Model called the "Screening Curve Model" that shows how new investments reduces margins. In equilibrium, all power generators earn margins that are, over the course of the lifetime of the plant, just sufficient to pay for the investment. Magic!

In the current crisis, the stratospheric prices are the incentive mechanism through which new investments are attracted, at scale and speed.



	AFC (€/kWa)	Var. Cost (€/MWh)
Nuclear	470	10
Coal	170	45
Nat. gas	130	60

8. Forward markets exist and they matter

All the above discusses short-term spot markets. Wholesale electricity markets are much broader and include forward contracts, power purchasing agreements and other long-term contracts.

This matters for policy interventions like the ones currently discussed. When thinking about policy interventions, we must account for long-term markets. If, say, a plant owner sold this year's production long time ago during the Covid pandemic at rock-bottom low prices, there is no profits to be taxed away, sorry.

The current crisis also underlines the need for more long-term contracting to hedge consumers against price spikes.

9. The electricity market works perfectly fine

The power market, the mechanism that clears demand and supply, works smooth and fine. It's not dysfunctional or broken. It works exactly as you would expect it to work, given sky-high gas prices.

What's wrong is not the market, but the outcome it produces. That's a hell of a difference. High prices are an existential threat to many households and firms.

Bottom line

None of the above implies electricity markets produce outcomes that are desirable. Currently, I think they do not. I've been advocating for cushioning policies for those affected since March. But claiming that "this market system does not work anymore" is, in my view, simply not true.