



Electricity market design in a time of crisis: the case for geothermal and renewable flexibility resources

The electricity price crisis, (see GEOSMART factsheet on its origins¹), has created a rift in the consensus that the European electricity market is the best framework to govern the remuneration of electricity producers. The price spikes of 2021 already led some European Member States to call for a suspension or an adaptation of some of the rules of the electricity market.

Spain, the country where the electricity price crisis first materialised in the summer of 2021, was among the first European countries to call for a change of rules. Spain has a different electricity system to the rest of the EU.

Firstly, compared to other Member States, renewable energies play a much greater role in Spain's energy mix (43%), although the marginal source of energy generally comes from combined cycle plants. Secondly, the transmission of wholesale prices to end consumers depends on the structure of the retail market. In Spain, 40% of customers are on regulated market tariffs and, the regulated price, which is known as the voluntary price for small consumers, fluctuates daily depending on the wholesale price. As a result, the transmission of wholesale-market prices to end consumers, and consequently to inflation, is much more instant in Spain than in other Member States.

Initial calls from Spain were quickly followed by other Member States whose economies found it hardest to cope with the winter 2021 crisis. This included Greece, Italy and France.

The energy price crisis was further exacerbated in 2022 following the Russian invasion of Ukraine. Energy prices are expected to remain high for the rest of 2022 and until 2024/25.

In conclusion of the late March 2022 European Council meeting, the European Council invited the Commission to "swiftly pursue work on the optimisation of the functioning of the European electricity market - including the effect of gas prices on it - so that it is better prepared to withstand future excessive price volatility, delivers affordable electricity and fully fits a decarbonised energy system, while preserving the integrity of the Single Market, maintaining

¹ https://www.egec.org/wp-content/uploads/position_papers/Energy-Prices-the-geothermal-answer.pdf

incentives for the green transition, preserving the security of supply and avoiding disproportionate budgetary costs.”²

A consequence of the electricity price crisis therefore is the realisation that the current electricity market no longer functions optimally, opening a new policy discussion on the shape the electricity market should take in Europe.

The main positions in the debate

The Czech Republic, which holds the EU’s rotating presidency to January 2023, has sought to build support for an EU-wide solution from the different vantage points.³ The main cause of the problem is the use of fossil gas in power generation, the overcapacity and the stagnation of the electricity demand for 10 years. Because fossil fuel is the most expensive means of power generation, it sets the market price in “*merit order pricing*” systems.

The only short-to-medium term solution must include a massive scale-up of all renewable power and heat generation technologies. Combined with effective energy savings measures, which reduce the demand of electricity, heating, cooling and energy in the transport sector, is the only feasible course of action in the short to medium term. Moreover, the pricing should go beyond the LCoE of the electricity generation technologies to show the value of each source. The policy solutions, thus far, have strayed away from these solutions to a:

- **‘Nothing is broken’ position:** For many actors, the current electricity market is adequately designed and functions well, to the extent that ACER – the European grouping of electricity market regulators – has lauded the electricity market’s benefits in mitigating the current crisis⁴. However, the current electricity market does give natural gas a prominent role in the formation of electricity prices, which led to the current crisis since natural gas currently is the only major component of the European electricity mix in a situation of scarcity whose price have ballooned⁵. ACER’s report does indeed point to the important role interconnection has played in maximising the European capacity and reducing the need for dispatching ever more expensive capacity generation. The organisation is emphasising the many benefits that come from nearly three decades of electricity market building, notably in providing more

² [2022-05-30-31-euco-conclusions.pdf \(europa.eu\)](https://ec.europa.eu/euipo/euco/2022-05-30-31-euco-conclusions.pdf)

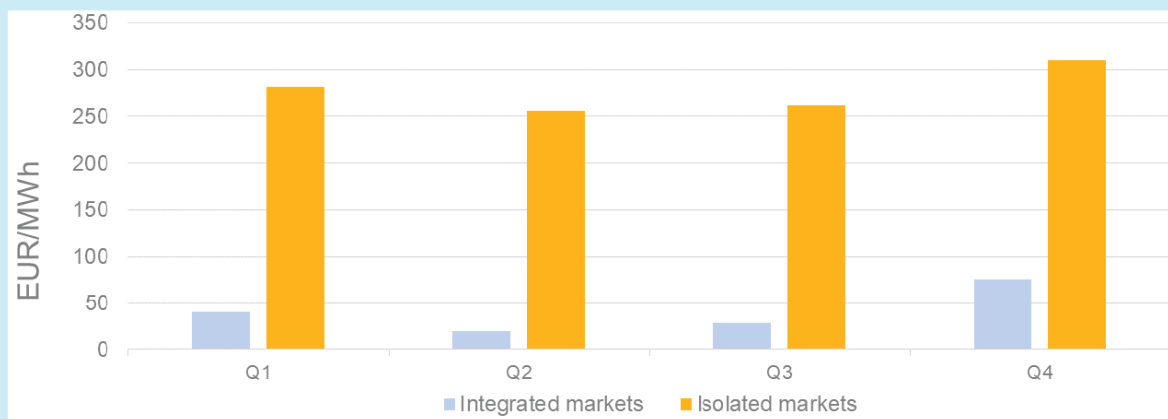
³ [EU plans ‘emergency intervention’ to halt energy price rise – EURACTIV.com](https://euractiv.com/en/energy/eu-plans-emergency-intervention-to-halt-energy-price-rise)

⁴ <https://www.acer.europa.eu/events-and-engagement/news/press-release-acer-publishes-its-final-assessment-eu-wholesale>

⁵ A caveat to this could be the situation specifically in France where the low availability of nuclear power plants is greatly worsening the ongoing crisis with future markets estimating prices above 540 euros for the year 2023, nearly 5 times average seasonal prices. <https://www.bloomberg.com/news/articles/2022-08-08/german-power-rises-to-record-as-heat-wave-scorches-europe>

flexibility and maximising technologies such as renewable sources and their low marginal costs.

Figure 12: Price volatility (EUR/MWh) in integrated and isolated electricity markets in the EU in 2021



Source: ACER based on NEMOs simulations.

Volatility was estimated by using the standard deviation of day-ahead wholesale prices. The standard deviation was calculated per bidding zone for the whole year, then averaged out across the EU.

Figure 1: ACER on price volatility in EU power markets across 2021

Source: ACER (Figure 12)

- Price caps and windfall profits:** For some stakeholders and Member States, the structure of the electricity market is one of the factors responsible for the surge in electricity prices, and solutions must be found to reduce the cost of electricity for households and businesses and ensure the current crisis does not exclusively benefit electricity producers. The value of a renewable, base load and flexible electricity generation source such as geothermal must be better remunerated.

Spain has called for a better use of windfall profit taxation and implemented measures to that effect, and the establishment of a price cap with a mechanism that guarantees cost recovery to fossil gas plants as a short-term solution. This call is now heeded by stakeholders in Germany domestically and was echoed by the Belgian energy minister.

France and Spain were the first to call for a radical overhaul of the current marginal pricing system for electricity, with Spain asking for “[structural solutions](#)” at the European level to decouple gas and electricity markets. They were backed by the leaders of Italy, Portugal and Greece, who urged the EU executive to [address the “contagion effect”](#) of high gas prices on electricity markets.⁶

Germany, Belgium and Austria joined the call for the decoupling of gas and electricity pricing.

⁶ [Berlin, Brussels join calls for ‘fundamental reform’ of EU power market – EURACTIV.com](#)

- **Split of the electricity market:** Greece came forwards with a position paper asking for the split of the electricity market between a market with zero carbon sources remunerated based on CFD and a market with bidding-based price formation for other generators, especially fossil fuels⁷. At the heart of both proposals, the objective is to put natural gas on the margin of the electricity market, and no longer the core price formation factor. Instead, the proposals are looking at the establishment of an electricity market with smaller overall volatility which would benefit from the cost structure of renewable investments (low OPEX), adding a layer of remuneration for providers of flexibility – summarised to fossil generators in a short-term perspective. The Greek proposal was positively received by Italy, Cyprus and France but met with scepticism from Denmark and Luxembourg who defended the current market structure.

European Commission proposals

On the 9th September, the Czech Presidency hosted an Extraordinary TTE (Energy) Council meeting to discuss several options for short-term measures that could bring relief to the energy situation. The European Commission also presented non-papers to delegations providing a preliminary assessment of options for emergency measures to reign in soaring electricity and gas prices including exceptional electricity demand reduction measures, which will help reduce the cost of electricity for consumers, and measures to redistribute the energy sector's surplus revenues to final customers.⁷

The discussion conveyed the following areas which the Commission is expected to act:

1. Coordinated Demand Reduction

- To target the most expensive hours of electricity consumption, when prices are determined by gas-fired power generation, the Commission proposes an obligation to reduce electricity consumption by at least 5% during selected peak price hours. Member States will be required to identify the 10% of hours with the highest expected price and reduce demand during those peak hours.
- The Commission also proposes that Member States aim to reduce overall electricity demand by at least 10% until 31 March 2023. Member States can choose the appropriate measures to achieve this demand reduction, which may include financial compensation.⁷

2. Price cap for inframarginal technologies

⁷ [Energy prices \(europa.eu\)](https://europa.eu/energy-prices)

- The Commission have proposed a temporary revenue cap of €180 EUR/MWh on 'inframarginal' electricity producers, namely technologies with lower costs, such as renewables, nuclear and lignite, which are providing electricity to the grid at a cost below the price level set by the more expensive 'marginal' producers.
- Revenues above the cap will be collected by Member State governments and used to help energy consumers reduce their bills.⁷

3. A solidarity tax on fossil fuel companies

- The Commission has proposed a temporary solidarity contribution on excess profits generated from activities in the oil, gas, coal and refinery sectors which are not covered by the inframarginal revenue cap.
- This time-limited contribution would maintain investment incentives for the green transition. It would be collected by Member States on 2022 profits which are above a 20% increase on the average profits of the previous three years.
- The revenues would then be redirected to energy consumers in particular vulnerable households, hard-hit companies, and energy-intensive industries.
- Member States can also finance cross-border projects in line with the REPowerEU objectives or use part of the revenues for the common financing of measures protecting employment or promoting investments in renewables and energy efficiency.⁷

4. Expansion of Energy Prices Toolbox

- This would allow below cost regulated electricity prices for the first time and expand regulated prices to also cover small and medium-sized enterprises.⁷

The Council agreed on a task for the European Commission to issue legal emergency proposals within days, and EU energy ministers will meet on 30th September to discuss these proposals.

The Commission is also continuing its work to improve liquidity for market operators, bring down the price of gas, and reform the electricity market design for the longer term.⁷

Beyond the issue of dealing with the affordability of electricity in the short term, this debate touches on a much more central question: how to design an electricity market that puts renewable electricity sources at the centre of price formation?

Ultimately, fossil gas must be replaced as the current price setting fuel by massively upscaling and accelerating deployment of flexible renewable energy. This will require adequate tools for investments in flexibility resources that are based on renewable energy. This includes renewable electricity storage such as Underground Thermal Energy Storage (UTES), but also flexible and available renewable electricity generation from geothermal power plants.

Key considerations for geothermal power and heat plants in the context of an electricity market reform:

- **Rewarding reliable renewable power generation capacity:** The true value of a geothermal power plants rests on their high availability with capacity factors routinely exceeding 90%, as high as 100% on given years. Permitting and licensing processes must include this significant benefit when considering an application. The timescale for permitting and licensing, as well as the need for a single contact point or a ‘geothermal authority’, as is used in mature markets such as Iceland, will significantly replace the marginal pricing impacts of fossil gas.
- **Adequate reward for grid balancing services:** In the current electricity market rules, geothermal plant developers already had to adapt some of their technologies to demonstrate their capacity to respond to increasingly strict balancing requirements. Turboden’s plants in Germany have demonstrated their ability to ramp up and down 70% of their load in a matter of seconds, at the grid operator’s request⁸. As the electricity market rules expose renewables generators to balancing responsibility and balancing markets are playing an increasingly important role, geothermal operators must be given adequate recognition of their vital grid balancing services they provide.
- **An EU framework for Underground Thermal Energy Storage (UTES):** UTES is critical to meeting seasonal demand. However, there is no commercial-scale demonstration programme to aid the design of appropriate regulatory and support mechanisms.
- **Pooling financial risk mitigation across the EU:** Risk mitigation schemes are essential to addressing the CAPEX aspects of geothermal development⁹.
- **Achieving the Internal market for heat:** the security of heat supply and the price affordability for heating and cooling of households and for the industry urge to establish the internal market for heat. This requires legislating open and fair retail markets for heat; institutionalising a European Network Transmission System Operators for Heat charged with managing infrastructure for renewable energy sources; fostering cross-border cooperation.

Geothermal energy is a source of baseload or flexible electricity and heating and cooling for buildings or industrial processes. Geothermal technologies, ranging from large-scale district heating systems to geothermal heat pumps are competitive today but face numerous regulatory obstacles limiting their rapid and widescale deployment. For example, geothermal district heating can be as affordable as €15/MWh compared to at least €51/MWh for gas in normal conditions, as highlighted by the French energy and environment agency – ADEME Coût des énergies renouvelables et de récupération, 2019.

⁸ http://www.etip-dg.eu/front/wp-content/uploads/2_Geothermal-Electricity-A-balancing-force.pdf

⁹ CAPEX represent up to 90% of a geothermal power plant’s total costs