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Do not be misled on the energy crisis

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Abstract

False narratives cloud our understanding of Europe's energy crisis and its relationship to climate change and climate policy. A clear-eyed understanding, based on factual knowledge and the insights of scientific research can help resolve the seeming contradiction between security of supply, affordability, and environmental sustainability.

Reduced Russian gas supply to Europe coincided with the Covid recovery, nuclear power shut-downs, and drought-affected hydropower to create a severe energy supply shortage in 2022, likely to last well into 2024. As a result, spot market prices for gas and electricity peaked at 15 and 5 times their pre-pandemic levels, respectively, endangering business models and causing a cost-of-living crisis [1]. The crisis triggered a vigorous response from the public, businesses, and policy makers, bringing prices down to still high but more manageable levels. A widely circulating narrative suggests that climate policy contributed to the crisis and Europe needs to invest more in fossil energy supply to avoid a repeat [2]. Another narrative blames the energy market for high prices and resulting economic pain [3]. These false narratives misrepresent what has happened. If they become the basis of public decision making, we endanger both supply security and emissions reductions. The crisis has forced Europe to mobilize substantial resources and acutely face hard decisions it was trying to avoid. To the degree the crisis prompts an appropriate response, it can help Europe achieve a higher degree of energy self-sufficiency as well as faster decarbonization, as the decline in greenhouse gases (GHG) emissions in the fourth quarter of 2022 suggest (figure 1(a)) [4].

1. Fossil fuel dependency is the problem, not the solution

The first narrative suggests that the crisis is somehow the result of the transition away from fossil fuels towards renewables and energy efficiency. Had Europe invested more in fossil fuel supply, the crisis would have been avoided. Ergo, energy security requires more investment in fossil fuels. At least three facts contradict this narrative. (1) Europe is drawing down the last of its natural gas resources and its dependency on fossil fuel imports from regions with a high political risk has increase over the past two decades [5]. Relying more on fossil fuels would invariably increase import dependency and exposure to geopolitical risk. A diversification of gas supply could potentially have helped. However, as the curtailment of oil production by OPEC + illustrates, other suppliers could still have taken advantage of the situation. (2) The fact that Europe is undergoing the energy transition has helped the situation in several ways. One, the rate of new solar and wind power coming online doubled in 2022, reducing the need for fossil-fuelled power generation (figure 1(b)). Two, recent mothballing of coal power plants means that there was a spare capacity available that could be easily brought online when gas became scarce [6]. Finally, if capacity additions of renewables had stayed at the peak value of 35 GW in 2011 instead of falling to half of that in 2013–18 [7], Europe would have been less dependent on fossil fuel from Russia. (3) Climate change itself contributed to the crisis. A drought reduced hydropower production (figure 1(b)). It also led to a curtailment of thermal power because coal barges could not reach power stations and there was a shortage of cooling water. More fossil fuel use is likely to increase the severity of such events.

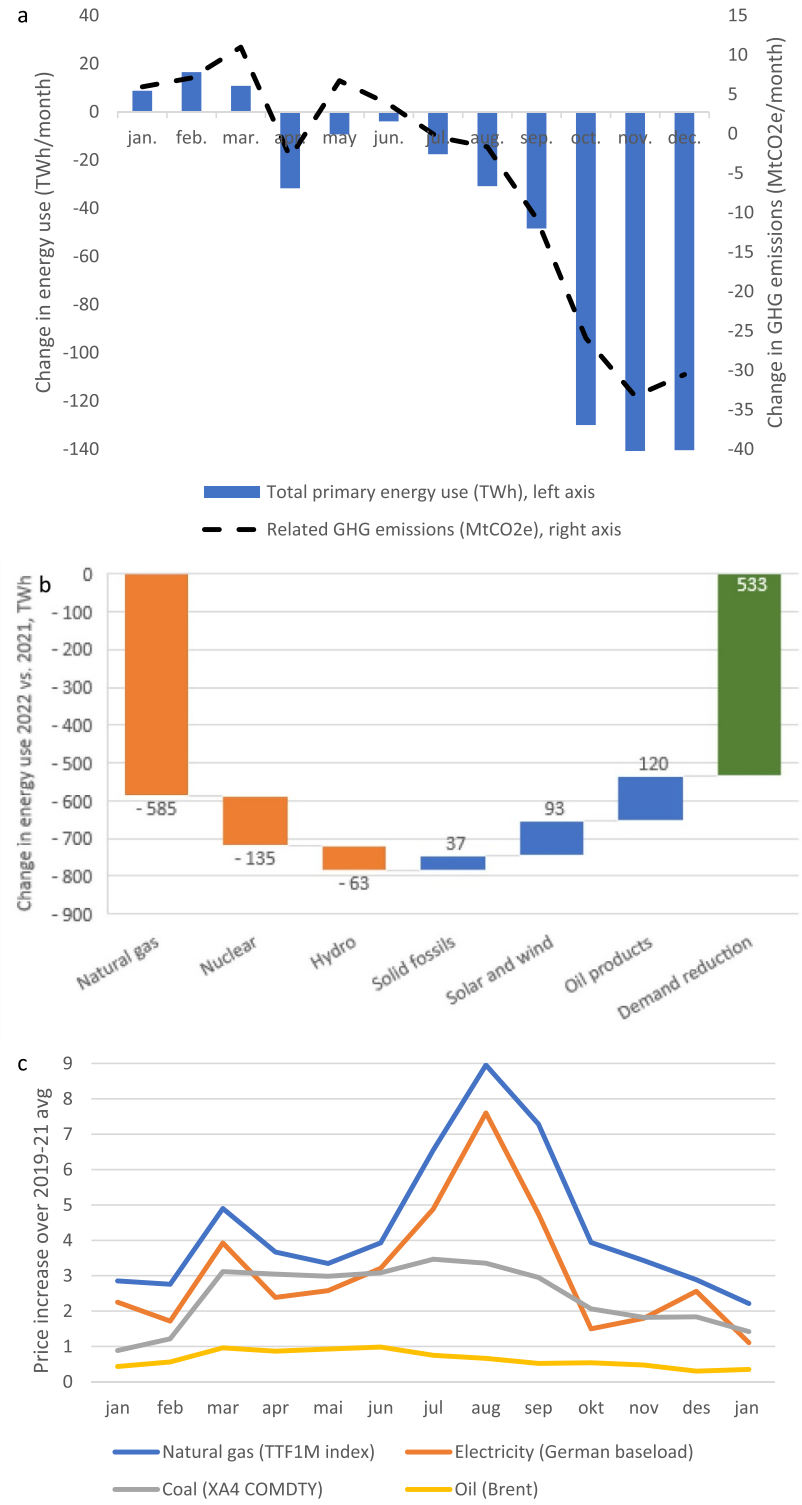

Figure 1. (a) Change in EU energy use and emissions in 2022 compared to 2021. An initial rise in energy use reverted to a decline after Russia's aggression. (b) Change in EU energy supply and demand by source, 2022 compared to 2021. (c) Increase in energy prices in 2022 and January 2023 over the monthly average in 2019–2021, normalized by the average price of 2019–2021. Source (a) + (b): Eurostat datasets nrg_cb_pem, nrg_cb_sffm, nrg_cb_gasm, nrg_cb_oilm. Figure design: Pieter Lemmons.[4]. Data source (c): ESABCC [4].

2. High prices strained the system, but did not break it

The second narrative is that energy markets have failed, and alternative systems could have resulted in a better outcome for energy consumers. The first part of the narrative, markets failing, is usually well-articulated, citing cases of hardship, and pointing to the fantastic windfall profits of both domestic producers and foreign suppliers. For the second part,

past systems such as government monopolies are sometimes suggested but a description of alternatives is vague. Indeed, some national policy makers have interfered heavily in the markets [8]. Some of these interventions have been measured. For example, Austria subsidizes electricity use by residential customers up to a limit that lies well below the average household consumption. In Germany the support for gas is proportional to past rather than current use. Other examples are egregious. France, for example, forced the main electricity generator to sell electricity to below-market prices at a time when almost 60% of France's fleet of nuclear power plants were shut for scheduled maintenance or emergency repairs [8].

The functioning of energy markets is well understood in terms of microeconomics. In a situation of constrained supply, high prices are the principal mechanism by which demand is reduced to match the available supply [4]. If utilities are forced to sell energy below input costs, two things happen. First, utilities are driven to bankruptcy and require bailout. Electricité de France, that country's main generator, had to be nationalized and the French government now covers the losses of its electricity sales [8]. Second, as demand exceeds available supply, rationing would be the only orderly alternative to high prices. In Norway, where a drought brought the prospect of having to curtail demand in the spring of 2023, the systems operator had to admit that they were unprepared [9]. There is no evidence that monopoly utilities would have responded better than the market to a shortage of fuel as Europe experiences today. The cap on electricity prices in France drove up prices in neighboring countries which made up for France's shortfall [6]. It was hence not the renationalized system in France, but the markets in neighboring countries which were able to handle the French power shortage.

The European energy market has proven to be resilient, despite harmful interventions by some governments (figure 1(c)). A combination of reduced demand and increased supply has brought gas and electricity prices down from their peaks, although the prices of futures remain far above historic costs, reflecting a continued supply shortage [10]. The real test could be next winter if East Asian liquified natural gas (LNG) demand experiences a strong rebound [10, 11]. More freak weather events or aggression may bring more unforeseeable interruption. However, Europe has a fair chance of making it through this crisis with only a few bruises.

3. Grow supply, lower demand to lower prices

The public dissatisfaction evidenced by demonstrations and credence given to alternative explanations is understandable given the financial squeeze experienced by many. At the prices seen this summer, Europe's energy bill would be 17% of GDP, up from 5% before the crisis. Even before the crisis, over 30 million EU citizens were unable to afford energy services at socially and materially necessary levels [12]. Poorer citizens, and those in Eastern and Southern Europe where energy poverty is concentrated, experienced higher levels of inflation in 2022, because energy constitutes a larger share of household budgets [1]. High energy expenditures are an urgent social, economic, and political problem for European governments. Wealth transfers associated with high energy bills are not needed to cover the cost of producing the energy that is available. Therefore, several European governments have introduced taxes on windfall profits. EU institutions fought throughout the autumn about a price cap for gas. Both, however, is tricky as it interferes with existing contracts and rights and often has unintended consequences.

Europe's governments would do well to work with the markets rather than against them. In the short run, the main function of high prices is to constrain demand. In the long run, businesses and consumers require predictable conditions to make required investments in energy efficiency and energy supply. Given that markets are so tight, any small change of supply and demand will have an outsize impact on prices. This also means, however, that Europe can achieve the desired lower prices through demand reduction and supply investments [4].

A wide range of temporary and permanent demand reductions have been promoted, from reduced heating set-points to LED lights and home insulation [13–15]. Indeed, the renewed attention to energy savings can only be welcome. Improved maintenance, building refurbishments, structural changes in how people work and live, and changes in habit, for example to use public transport or bikes instead of driving, can all contribute to substantial reductions in energy use but require sustained effort to make a significant impact. An analysis suggests, however, that several governments have yet to put in place any new policies for voluntary or mandatory demand reduction [16].

4. Clean and secure supply

As European countries reduce demand, they should also preserve rather than prematurely shut down electricity supply from nuclear plants and speed up the deployment of renewables. Indeed, a third false narrative, that nuclear power is more dangerous that fossil fuels took hold after the severe accident in the Fukushima nuclear power plant in 2011. Risk modeling suggests that expected human health impacts are modest, with at most a few 100 cancer cases resulting from the released radioactive material [17]. This is a small casualty compared to the many deaths

that result from air pollution and mine accidents associated with the operation of coal power plants. The estimate depends on the assumption of a linear no-threshold dose-response relationship which is increasingly being called in question by molecular and cell-biological research, suggesting that low doses of radiation are harmless and may even be beneficial [18, 19]. An ultrasound-based screening for thyroid cancer of a quarter-million residents of the surroundings of Fukushima failed to detect a relationship of incidence with radiation dose [20, 21]. The public has changed its attitude towards nuclear power, and governments should revise their policies to keep nuclear power plants running at least until they have phased out more harmful fossil power. Such a policy would be a valuable complement to the important acceleration of renewable energy deployment already planned by the EU.

5. False narratives, false solutions

The problem with false narratives is that they suggest actions that are ineffectual and impede the implementation of those solutions that are necessary but likely to cause some opposition. The emphasis on increasing fossil fuel supply has led to significant investment in LNG terminals. Europe will soon have an overcapacity for gas imports [22]. Excessive investment in gas infrastructure will create a lock-in to a fuel that Europe seeks to phase-out as part of its climate policy [4, 23].

The alleged failure of energy markets led member countries to implement countless subsidy schemes and the European Council to demand a price cap for gas. EU institutions spent a lot of attention to the price cap, which in the end was so watered down and delayed that it is irrelevant.

In Germany, a continued concern about radiation caused the government to go ahead with its misguided phase-out of nuclear power in spite of the supply crisis and the increasing recognition just how harmful the country's reliance on coal power is for the climate.

Europe must not let its policy be stirred by false narratives. Shifting investments from energy efficiency and renewables to fossil fuels, as one narrative suggests, would increase rather than reduce import dependence. Breaking energy markets, as the other narrative suggests, would rob Europe of the tool that allowed it to respond to a severe supply shock. Energy markets can be reformed, however, to spread the benefits and risks of low-cost renewable generation [24]. Energy poverty is a persistent problem that must be addressed through the targeted social policies.

Europe's energy system was not built to withstand a curtailment of 40% of its gas supply, the shutdown of more than half of France's nuclear power plants, and a severe drought at the same time. Things could have gone much worse. The crisis has shown the value of energy efficiency, renewables, nuclear power, and energy markets. Policy makers now need to create conditions to accelerate the energy transition and eliminate Europe's dependence on imported fossil fuels.

Data availability statement

The data that support the findings of this study are openly available at the following URL/DOI: 10.5281/zenodo.7896737. Data will be available from 4 May 2023.

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