
THE EUROPEAN ENERGY MARKET UNDER SEVERE DEPRESSION

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Abstract: Energy transition policy is at the center of European action from 2019 and the implementation of the Green Deal for Europe. The initial challenge was simple: reduce the use of fossil fuels and advocate some form of energy sobriety, in order to achieve the goal of carbon neutrality by 2050. However, the goals of energy policy have evolved and diversified over the past five years: the health crisis has reminded all member states of the need to have European strategic autonomy in many areas, including energy. The war in Ukraine thus reinforced the need for member states to limit their dependence on Russian gas. Thus, the Union is forced to move away from a form of naivety, limiting any dependence on hydrocarbons from unreliable third countries or authoritarian regimes. Russian gas imports to the European Union fell from 40% to 9% of total gas imports during 2022. Finally, the rise in energy prices during the economic recovery after the health crisis, exacerbated by Russian aggression in Ukraine, strongly reminded of the need to have instruments to protect consumers in the face of increased fluctuations and invoices of energy prices. Energy policy must necessarily include social components, to enable the most insecure and vulnerable households and communities to meet their energy needs. The distressing situations of the winter of 2022-2023, with a tripling of energy bills and a sharp increase in unpaid bills, should not be repeated, according to European politicians.

Keywords: Electricity, interconnections, European Union, renewable energy sources, nuclear energy

1. INTRODUCTION

Interconnections are transmission lines that cross borders and connect the national transmission networks of two Member States or of a Member State to a third country. As early as 1955, the Messina resolution mentioned that "all measures must be taken to develop gas and electric current exchanges capable of increasing the profitability of investments and reducing supply costs." Interconnections thus precede the market. As noted by the Energy Regulatory Commission (CRE) during its hearing by political entities, interconnection networks play a major role in economic optimization and solidarity, especially in relation to electricity: - interconnections allow to call, at any time, the cheapest power plant in Europe (renewable energy sources, nuclear), then the more expensive ones (coal and gas) until all demand is covered. Furthermore, the continent's heterogeneous weather conditions ensure minimal renewable energy production in Europe and production variations are more controlled in a system of this size, with large interconnections; - the interconnections are as well an essential instrument for guaranteeing security of supply and thus promoting solidarity between member states, but also with third countries. Thus, Germany, France, Romania, Belgium or Italy benefit from this market, both through imports to meet consumption needs when the conjuncture is not favorable, but also through exports when it produces more electricity than it consumes. On average, France is a net exporter of around 60 TWh of electricity each year. For example, in 2022, given the difficulties in the national nuclear and hydroelectric fleet, France and Germany were for the first time net importers of electricity during the year, up to 16.5 TWh. Therefore, the European interconnection network enabled solidarity between member states, avoiding supply interruptions. At this stage, 2023 represents a positive balance of 27 TWh for France and Germany corresponding to the difference between imports and exports.

2. EUROPEAN MISUNDERSTANDINGS

Several experts have identified several common paths, marking the shape of the political consensus in the EU at a time of major European reforms. To achieve the goal of decarbonizing the energy mix, your rapporteurs encourage the electrification of uses, the development of hydrogen and the adoption of a truly European strategy to reduce energy consumption. To achieve the goal of independence and European strategic autonomy, Europeans call on the Union to take into account the risks of geostrategic dependence on authoritarian regimes within European energy partnerships. The objective of capping prices must ultimately be achieved by de-correlating the selling price of electricity from the prices of fossil fuels, which can be used to produce it during peak consumption. In this direction, the political disagreements between the European states are exposed, which are oriented towards following the EU's main energy options for two main issues. On the one hand, some European experts disagree about the composition of the electricity mix until 2050. (Aznag, M. 2022) Some argue for a balanced mix between renewables, hydro and nuclear, in order to preserve the capacity to control electricity generation. There are also experts who, on the other hand, favor a mix based 100% on renewable energy sources, with a significant effort on storage facilities and hydraulics to compensate for the interruption of production. Europeans are divided over the current European

electricity market reform. It is thought that this reform will allow all member states to secure their supplies through interconnections, while ensuring price stability for the consumer. However, the scope of these agreements must be precisely defined to cover all carbon-free generation capacity, especially existing nuclear power. Some French experts, on the other hand, are in favor of leaving the European electricity market, in order to protect consumers. Without mobilizing the interconnections necessary to supply energy to France, exiting the electricity market would actually allow for a return to a single regulated selling price for all consumers. The restoration of the public system of production, transportation and distribution in the form of a monopoly will also provide guarantees regarding the control and access for all to the public good, which is electricity. Hence, the exit from the European market would be a palliative platform for the wild liberalization of the electricity sector, which deeply destabilized the safe French model for the consumer, embodied by the company EDF. considered by the member states, however some like Nathalie Oziol recognize that, within the reform, the principle of resorting to agreements on the difference. in which the state is involved, may prove useful by allowing a ceiling price to be set for the sale of electricity. (Bureau, D. Glachant.J-M & Schubert, K. 2023, 1-12,pp.)

3. THE IMPACT OF THE 2021 PANDEMIC AND THE UKRAINIAN CRISIS IN 2022

The interconnected network of the Union promotes the energy security of the Member States, the European electricity market and profoundly changed the former energy model. The European energy policy led to the liberalization of the electricity and gas market. The historical basis of the European construction, the internal market implies the opening to competition of the national markets of the member states, in order to make effective the four freedoms of movement provided for by the agreements, i.e. free movement of goods, people, capital. and the freedom to provide services. According to liberal economic theory, the opening of monopolies and international trade should cause prices to fall and stimulate technical progress. (Maillé, P. 2023) The completion of the European internal market implied, starting in 1996, a gradual liberalization of the energy market, in order to remove obstacles to the exchange of electricity and gas between member states. After the first series of texts in 1996, the second energy package from 2003 enabled the opening for competition of the activity of electricity and gas supply, i.e. purchase on the wholesale market for resale at various points of consumption. Thus, consumers have had the freedom to choose their electricity and gas supplier since 2004 for professional companies and since 2007 for households. European law also requires the division of activities for production, transmission, distribution and supply of electricity. Two European directives from 2009 thus required states to set up independent network managers, responsible for guaranteeing equal treatment for all producers and suppliers when accessing the network. The largest German, French, Spanish, Italian companies, which had a monopoly in each of these electricity and gas segments, respectively, had to stop their transportation and distribution activities. If the transport and distribution activities are still quasi-monopoly, the energy production and supply activities are now open to competition in the gas and electricity markets. The different segments of the energy market: from production to supply. (Baldwin, H.,2023)

4. THE EXAMPLE OF FRANCE

The production of electricity is one of the important determinants of the composition of the energy mix in the most energetically powerful countries in the EU. In France, electricity generation is largely decarbonised due to the significant share of nuclear power and the current development of renewable energy sources. Energy transport is the transport of electricity produced on high-voltage networks. In France, electricity transmission is provided by the company RTE (Electricity Transport Network), and managers of the gas transmission network are the company GRTgaz, a subsidiary of Engie. Energy distribution represents the transport of electricity from the high-voltage network to the consumer, on the low-voltage networks. In France, the distribution of electricity is provided by the company Enedis, while GRDF is in charge of gas distribution. Energy supply is the activity of buying electricity in bulk for resale at various points of consumption. Several companies operate in this market segment open to competition, including incumbent operators EDF for electricity and Engie for gas. Thus, liberalization led to the creation of a true internal electricity market. Therefore, the goal was twofold: - encouraging the emergence of different producers and suppliers on the one hand; - to intensify trade between member states by opening national markets to foreign operators in order to harmonize the wholesale price of electricity on the Union market. Therefore, at a given time, suppliers from all Member States buy electricity at the same price on the Union's short-term self-market. Only the risk premium paid by market participants to secure their coverage can vary. This price varies in the same way over time across the Union. (Godelier, M. 2024)

5. FUNCTIONING OF THE EUROPEAN ELECTRICITY MARKET

The European electricity market aims to guarantee a balance between the supply of electricity, determined by producers, and the demand for electricity settled by suppliers at Union level. The European electricity market is divided into an intraday market, a short-term spot market (overnight) and a long-term market (between 1 day and 3 years). The spot market price paid by suppliers, i.e. the wholesale price of electricity determines the last power plant needed to meet demand. Therefore, the last central unit called determines the selling price of all production units. Specifically, the wholesale price of electricity is set according to the marginal cost price principle, theorized in the 1960s by Marcel Boite, which corresponds to the production price of the last megawatt hour produced. Thus, power plants are called upon to meet demand according to an "order of merit," a principle whereby the various sources of electricity generation are called upon in order of increasing marginal cost. Manufacturers first use technologies with the lowest operating costs (renewable energies and nuclear). If the demand increases, then the use of thermal power plants (gas, coal) is necessary, which increases the wholesale price because their production cost is higher. The last plant mobilized is often a gas plant during peak demand, so electricity prices are correlated with gas prices. (Baldwin, H.2023) The futures market allows suppliers to buy a certain amount of electricity several months or years in advance in order to guarantee a fixed price to customers, businesses or households. This price corresponds to the prediction of the marginal costs of electricity production in the given period.

6. EUROPEAN INTERCONNECTIONS FOR ELECTRICITY AND GAS

The European Union acts to maintain and build new infrastructures to connect energy between member states. The 2018 Regulation 4) thus sets an electricity interconnection target of at least 15% by 2030. To achieve this goal, the Interconnection Mechanism for Europe (IEM) has EUR 5.8 billion for the period 2021-2027, with a specific component dedicated to cross-border projects in the field of renewable energy sources. The Union thus participates in the financing of the "Bay of Biscay project", i.e. the electrical interconnection connecting the Cubnezais substation, near Bordeaux, with the Gatica substation, near Bilbao. This line will increase the electricity exchange capacity between France and Spain to 5,000 MW. As stated in the investigative report of the National Assembly aimed at determining the reasons for the loss of sovereignty and energy independence of France in March 2023, the geographical position of France favors the development of interconnections. France now has 50, with 6 neighboring countries: Belgium, Germany, Switzerland, Italy, Spain and the United Kingdom. RTE aims to double these capacities by 2035, with new infrastructures under development, particularly with Spain, Ireland and Italy. According to security reports published annually by RTE, significant system events (ESS), which reflect the occurrence of incidents on the network whose origins can be multiple, but some of which are directly attributable to the market. (Aznag, M. 2022) In 2019, two significant systemic events are related to the management of market interconnections. Thus, between 2006 and 2016, the average was 37 ESSs per year (except for the years 2009 and 2010 with 63 ESSs), while from 2017, the average number of ESSs increased to 123 per year: part of this increase is attributed to the market. b. However, Union policy weakened the French energy model The Union's liberalization policy led to the establishment in France of regulated access to historic nuclear electricity (ARENH), with the aim of promoting competition in the market segment dedicated to electricity supply. In implementation of the 2009 directive requiring the unbundling of electricity production, transport and distribution activities ([5]), the so-called "NOME" law of 2010 ([6]) provides for an obligation for the incumbent operator EDF to sell the nuclear energy it produces to its competitors, at a specific price, set at €42 per MWh from January 1, 2012. ARENH's ceiling, that is. The amount EDF is forced to sell at this regulated price is 100 TWh in 2023, after a temporary increase to 120 MWh for 2022. The aim sought is then to offer alternative suppliers the opportunity to rely on EDF's nuclear fleet to develop and enable consumers to sustainably benefit from prices that reflect the competitiveness of the national generation assets it owns the incumbent operator, regardless of their choice of supplier. (Bureau, D. Glachant.J-M & Schubert, K. 2023, 1-12,pp.)

7. ARENH ASYMMETRIC FUNCTIONING

The ARENH mechanism is optional for alternative suppliers, which in practice gives it an asymmetric character. When market prices are lower than the reference rate set by ARENH, either suppliers do not buy electricity from EDF, or the company EDF is forced to sell its electricity at a price lower than the fixed rate, which is currently 42 euros per MWh. Conversely, when the market price is high, alternative suppliers buy electricity from EDF, which is thus forced to sell it at a low price. Thus, ARENH sets a ceiling price, but not a floor price. The price of €42/MWh from 2012 also does not take into account the evolution of production and maintenance costs for EDF, nor inflation. In addition to ARENH and nuclear power, liberalization also includes advertising and competition for the award of concession contracts for hydroelectric dams, until now managed by EDF. The European Commission has on several occasions notified France to open its concessions to competition. Uncertainty about the future of operations of these

concessions leads their operators to minimize their investments. The rapporteur of the National Assembly's 2023 commission of inquiry into the causes of the loss of sovereignty and energy independence of France considers that this situation "sustainably weakened the hydroelectric park and its investments over which hung the sword of Damocles, which becomes more pronounced with the passage of time and formal notices from the European Commission. (Revel, D.2019)

8. UNMET EXPECTATIONS

The opening of the electricity market did not fulfill all the promises: - consumers did not receive the expected benefit from the liberalization. Prices are slightly reduced for the consumer: according to CLCV Consumption of housing and living conditions, the price competition between operators was disappointing and offers a reduction of 6 to 7% of the final bill. In addition, consumers are exposed to aggressive commercial practices, even if their numbers are sharply decreasing in the context of rising prices; - innovations remained limited in the electricity generation market. According to the CLCV, electricity is actually distributed through a single and centralized network: therefore the supplier cannot offer specific electricity to the consumer who wants it, which represents a significant obstacle to the development of green offers. Furthermore, the investments of alternative suppliers in the capital assets of production are non-existent; - the situation of the companies worsened. In 2022, the company EDF in France recorded a record loss of 17.9 billion euros, a significant part of which must be attributed to ARENH. EDF's debt reached €64.5 billion on December 31, 2022; - Expert Nathalie Oziol - Nathalie Oziol also noted that very few players are really interested in investing in the electricity generation sector. According to the same liberal logic, few actors actually have an interest in making very large investments to finance new installations (or sectors), since income is uncertain due to the very functioning of markets. Oziol highlights the disappointing results of France's participation in the European electricity market. The market mechanism, with the principle of order of merit, has the effect of establishing a European market price excluded from French production costs. The spot price is actually very volatile and uncontrollable, as it depends heavily on the price of gas. In contrast, the French generation assets are essentially nuclear and renewable energies, which allows the production of cheap energy: during consumption peaks, the prices of these so-called "inframarginal" producers are aligned with the prices of the last mobilized power plant, which is the most often a gas-fired power plant. The European market thus deprives French consumers of the competitive advantage of electricity produced at a lower price than other member states. Therefore, producers and consumers are subject to highly volatile prices. On the one hand, these prices, excluded from costs, have led to a series of crises since the formation of markets, the most severe of which is the one that began in 2021. It has shaken the entire economy, fueled inflation, and put communities and households, including the most precarious, in difficulty. On the other hand, producers are exposed to highly uncertain incomes, which hinders long-term investments, making them much more expensive. However, these investments are necessary for the ecological transition. Liberalization finally had the effect of eliminating equal treatment between users for the basic need for electricity, with the possibility of free choice of their supplier. (Achard, P. 2024)

9. TENSIONS ON THE ELECTRICITY MARKET

The electricity market experienced the first series of tensions immediately after the health crisis, exacerbated by the Ukrainian crisis I). The rise in energy prices is explained by the economic recovery in 2021, strengthened by market mechanisms. The crisis begins in 2021, with an economic recovery much stronger than expected. (Gazzane, H. 2022) Between December 2020 and December 2021, the import price of energy in the Eurozone increased by 115%. Domestic producer prices increased by 73%. This development contrasts with the relative stability of import prices between 2010 and 2019 and the relatively small increase in domestic energy production prices of 0.9% between 2010 and 2019. Several factors contributed to the price increase from 2021: - the unprecedented increase in gasoline prices on global markets (170% increase in 2021), with repercussions on the European market (more than 150% increase between July 2021 and July 2022) . The increase in prices particularly applies to liquid natural gas, which is subject to a sharp increase in global demand, especially from China; - extreme weather conditions, including heat waves across the Union, which cause an increase in energy demand for air conditioning and cooling; - the shortage of French nuclear electricity production in 2022 and hydroelectricity, partly related to climate conditions. II). The energy situation of the Union in 2022 became critical with the war in Ukraine. Russia's military aggression in Ukraine, launched on February 25, 2022, contributed to the worsening of tensions on the European market, causing a real energy crisis. During 2022, Russia actually used energy weapons to pressure European Union member states. (Gazzane, H. 2022) By creating significant supply uncertainty, the military context caused an increase in petrol prices, which led to an increase in electricity prices due to the current functioning of the Union's energy market. In 2022, Russian gas supplies fell by 55% compared to their 2021 level, peaking at 80% at the end of the period. In addition to the delivery flow, the difficulty also comes from insufficiently filled storage, as GazProm has acquired or

reserved significant gas storage capacities in Europe (especially Germany, the Netherlands, Austria) without filling them. However, in 2021 energy accounted for 62 percent of the Union's total imports from Russia, at a cost of €99 billion. Before the war, Russia accounted for 45% of gas imports, 27% of oil imports and 46% of coal imports into the European Union. Dependence on Russian fossil fuels, however, varies between member states. France, for example, is less dependent on Russian gas than Germany or Finland, where gas imports were 98% of Russian origin in 2021 (Eurostat-2022) The consequence of these market tensions is the record rise in energy prices that the European Union faced at the beginning of 2022. The wholesale electricity price has risen from a low of €150/MWh in August 2021 to a level oscillating between €400 and €800/MWh in August 2022. The price of gas also increased sharply, by €29/MWh in June 2021 to €300/MWh in August 2022, before gradually decreasing from the end of September 2022. In France, in 2022, the average price of MWh in industry increased by 45% compared to 2021 and that of MWh of gas by 107%. This results in the potential loss of 117,000 jobs in France due to the permanent doubling of energy prices. Additional tensions in the electricity market related to stress corrosion problems in the French nuclear fleet and weak hydroelectric power production EDF's French nuclear fleet had lower availability, particularly as a result of preventive research related to stress corrosion. Thus, 27 reactors out of 56 were closed in October 2022. Therefore, electricity production from nuclear sources reached a historically low ceiling in 2022, with 279 TWh produced, compared to 361 TWh in 2021. As of September 25, 2023, 37 reactors are available, 18 are shut down to perform maintenance operations, and only one reactor (Belleville 1) is shut down for repairs related to a stress corrosion problem, scheduled to restart on November 30. As of December 1, 2023, it is expected that 47 reactors will be available, 9 must be shut down as part of planned maintenance or refueling. During its hearing by your reporters, the EDF company however indicated that its strategy for the control of nuclear installations, in consultation with the Nuclear Safety Authority (NAS). This strategy consists of a preventive repair program, supplemented by a plan for targeted control of certain welds, especially those repaired during reactor construction. Furthermore, French hydroelectricity production also fell in 2022 to 49.6 TWh, after a first drop in 2021, due to poor rainfall. Production in 2023, however, appears to be on the rise again. These two phenomena contributed to tensions in the French electricity market: instead of largely exporting its carbon-free electricity production, France was forced to import electricity en masse.

10. CONCLUSION

The adoption of the texts of the "Fit for 55" package and the urgent measures to deal with the crisis in the fall of 2022 make it possible to lay the foundations of a new "Energy Europe", without solving the issue of ELECTRICITY prices A. The "Fit for" package 55" helps to adapt the European Union to the new context of ENERGY As part of the environment and climate program of the Von der Leyen Commission, the European Green Deal, The European Parliament and the Council adopted in 2021 the "European Climate Law", the goal was to achieve carbon neutrality by 2050. A milestone has been set that is planned for 2030, with the goal of reducing net greenhouse gas emissions by 55% in compared to their 1990 levels. On 14 July 2021, the Commission presented the "Fit for 55" package, which sets out the means to be implemented to achieve the target to be reached by 2030. The package consists of thirteen regulations and directives, several of which aim to regulate the energy sector: - The Renewable Energy Directive (RED III) was definitively adopted in July 2023 by the Council and in September 2023 by the European Parliament. Its publication in the Official Journal of the European Union must take place by the end of 2023 . This text plans to increase the share of renewable energy sources in the Union's total energy consumption to 42.5% by 2030. The previous target, set by the RED II directive of 2018, envisaged a share of 32% of renewable energy sources by 2030; - The Energy Efficiency Directive, which was definitively adopted by the European Parliament and the Council in July 2023, sets the European energy reduction target of 11.7% by 2030. energy consumption; - overhaul of the European Union's carbon quota trading system (EU ETS), which particularly applies to electricity producers. The EU ETS reform adopted in May 2023, which applies from 1 January 2024, envisages a 62% reduction in emissions by 2030 in the sectors covered by the ETS by 2030 compared to their 2005 levels; - The Energy Taxation Directive ([20]), which is currently being examined by the Council, also proposes several measures such as the taxation of fuels according to their energy content and their environmental performance: according to this classification, conventional fossil fuels will be taxed at the highest rate and lowest rate electricity; - the proposal for a directive on the energy performance of buildings stipulates, in its initial version, that all new buildings in the Union must be zero-emission buildings from 2030, and from 2027 for public buildings. The directive also complements the renovation provisions by introducing minimum standards to increase the renovation rate of the least energy efficient buildings. Trilogies between the European Parliament, the Council and the Commission are underway for this text.

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