

Chapter 10

Energy transition in France: towards green development

Tomasz MŁYNARSKI²⁵⁰

Energy transition in France involves different directions of reform, such as improving energy efficiency, reducing the emission of greenhouse gases and fossil fuels consumption, and the growth of renewable energy sources in the energy basket. The goal of energy transition is to gradually change from energy generated from hydrocarbons (oil, natural gas, coal) and centralized energy sources (nuclear energy) to low emission, dispersed energy sources (RES). The scope of the works included three main areas of reform: to decentralize the energy system (gradual reduction of the share of nuclear energy), to enhance energy saving and reduce energy consumption (energy efficiency and performance), and to ensure environmental protection and development of “green” and energy-saving economy sectors.

Energy balance structure of France

The programme of nuclear energy introduced over political divisions has led to a significant lowering of energy dependency of the country, compensated for the lack of its own fossil resources, and allowed a departure from coal. Thanks to nuclear energy, France has developed a unique model of energy security. In 2014, nuclear energy covered 42% of total energy consumption. France’s energy independ-

²⁵⁰ Tomasz Młynarski, PhD, Associate Professor in Jagiellonian University, Faculty of International and Political Studies, Institute of Political Studies and International Relations, Jagiellonian University, Kraków, e-mail: tomasz.mlynarski@uj.edu.pl

ence is relative and mainly refers to the electricity sector, where almost 75% of energy production comes from nuclear power. Nuclear energy has priority economic and strategic importance for France: it balances over 1/3 of the costs of fossil fuels import. Nuclear energy meets three fundamental goals: it enhances the energy self-sufficiency and security of supply in the country, ensures low and stable prices of electricity (which increases the competitiveness of the French economy, especially in sectors with high demand for electricity), and is an instrument in the fight against global warming. The nuclear power industry is an important asset and link in the country's economy, and export of electricity is an important source of extra income. Additional economic benefits come from low emissions in the French sector of electricity in the face of tightening the European system of quoting the emission of greenhouse gases (*EU Emissions Trading System*). Thanks to nuclear energy, France has not only reduced the import of fossil fuels, but has even become the main supplier of products and services for the nuclear industry.

The share of fossil fuels (oil: – 30%, natural gas – 14%, and coal – 4%) in the total amount of primary energy consumed in France does not exceed 50%; it is the lowest rate in all EU member states.²⁵¹ Thanks to the common use of nuclear energy, France's import dependency rate is 48%.²⁵² However, the dominance of nuclear energy has caused significant backwardness and the lack of a consistent political and economic strategy concerning the development of RES.²⁵³ France has a rich potential of renewable energy sources, but apart from water energy, they are rather poorly used. Renewable energy with a share of 9.5% is developing, in 2015 employing about 170 thousand people (in Germany, 355 thousand).²⁵⁴

New directions for France's energy policy were determined by the process "*Grenelle de l'environnement*" initiated in 2007 (with the partici-

²⁵¹ Commissariat Général Au Développement Durable, *Chiffres clés de l'énergie*, Édition 2015, Commissariat Général Au Développement Durable, Février 2016, <http://www.developpement-durable.gouv.fr/IMG/pdf/reperes-chiffres-cles-energie-2015.pdf> (accessed: 15.12.2016).

²⁵² *EU Energy in Figures*, European Commission, Statistical Pocket Book, 2015, p. 194.

²⁵³ The basic drawback is the low diversification of new renewable energy sources, because the share of wind and solar energy in energy production is still very low.

²⁵⁴ *Renewable Energy and Jobs Annual Review 2016*, IRENA, p. 5, p. 11.

pation of representatives of regional authorities, trade unions, employers, and non-governmental organizations) in order to establish plans of action concerning sustainable development. It was a special form of consultation and inclusion of the community in the process of political debate on the future of the energy sector in France. Public consultations involved five parties (trade unions, entrepreneurs, NGOs, members of parliament, and the administration). The programme “*Grenelle de l’environnement*”, created a future framework for policies and measures, setting ambitious goals for individual sectors and sources of energy and guidelines to improve research and development for clean energy technologies. Priority areas were the reduction of emissions in the construction and transport sectors, as well as the production industry. Grenelle also introduced support for heating based on RES.

After the presidential election in spring 2012, public consultations continued as a form of national debate on energy transition. The debate started on November 29, 2012, under the auspices of the Ministry of Ecology, included extensive regional consultations focused on reducing dependence on fossil fuels and nuclear energy.²⁵⁵ As part of the national energy debate there were hundreds of meetings with the participation of local communities, non-governmental organizations, companies, and universities. Recommendations for the future energy law pertained, to the following issues: simplification of administrative procedures necessary for the development of wind, solar, and geothermal energy, and increased support for renewable energy. The National Debate on Energy Transition (DNTE) provided the basis for a governmental draft of the law concerning changes in the energy sector. France adopted the assumptions of deep energy transition in order to reduce emissions and promote energy efficiency. The French act on energy transition (*Act on energy transition for green growth/ Transition énergétique pour la croissance verte* after Senate amendments of July 15, 2015²⁵⁶) finally adopted on July 22, 2015, includes

²⁵⁵ *Ouverture du débat sur la transition énergétique*, http://www.lepoint.fr/societe/ouverture-du-debat-sur-la-transition-energetique-29-11-2012-1535085_23.php (accessed: 15.12.2016).

²⁵⁶ *Loi n° 2015-992 du 17 août 2015 relative à la transition énergétique pour la croissance verte* (1), JORF n°0189 du 18 août 2015, <https://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000031044385&categorieLien=id> (accessed: 15.05.2016).

a change of the energy model based on fossil fuels through promoting “green growth” and energy efficiency with gradual lowering of nuclear energy. The key goals of French energy transition assume the reduction of CO₂ emission, in part through the development and integration of renewable energy sources with the energy system, with a gradual reduction of nuclear energy. GHG emissions are to be reduced by 40% before 2030, and by 75% before 2050 (as compared to 1990). The French act on energy transition introduced a high tax on CO₂ emission (“climate-energy tax” / “contribution climat énergie”, CCE) from fossil fuels, depending on the generated emission.²⁵⁷ France has also chosen to tax high emission sectors (heavy industry, energy sector, aluminum, etc.), and even to introduce an international carbon tax. Its goal is to effectively encourage industry to reduce emissions and invest in low emission energy sources.

Competitiveness on global and European energy markets in light of the assumptions of energy reform in France

France is one of the most industrialized countries, and at the same time emits one of the lowest amounts of greenhouse gases. Its ratio of CO₂ emission/GDP is one of the lowest in the world. As a result, contemporary France is trying to build its leadership capacities, not only in traditional spheres of international relations (e.g., opposition to the attack on Iraq in 2002 or its active role in the military intervention in Libya in 2011), but also in new areas, such as counteracting climate change. Just like the EU, France displays strong ambitions to be a leader in counteracting climate change, which is confirmed by its role as a key player in international negotiations (see the role of France in the negotiations before the COP21 summit). This is so because France has ambitions to be a climate leader, which in practice means support for tightening the objectives of GHG emission reductions, both regionally (EU ETS) and globally. The nuclear programme developed on a scale unique in Europe has not only ensured the competitiveness of the French economy, but also enabled its exceptional

²⁵⁷ The CCE mechanism also occurs independently of the fuel tax (TICPE, *la taxe intérieure de consommation sur les produits énergétiques*).

success in activities aimed at preventing climate change, i.e., separating economic growth from pollution emissions. Therefore, France is attempting to achieve global climate leadership by influencing international institutions, which suits the Gaullist ambitions of building a multipolar world where it would play the role of a leader. Thanks to the significant role of nuclear energy, France is one of the few highly industrialized economies with the lowest ratio of CO₂ emissions per capita and in the sector of energy production, so it is pursuing the role of leader in the fight against climate change, promoting the development of nuclear technology as a zero emission source of energy. As a nuclear world power, France strives to popularize civil nuclear technologies at the regional and global level. This provides an opportunity to develop the industry sector, where it has had the know-how advantage for several decades. In this way, climate policy may be an instrument for improving the competitiveness of the French economy on the global market. In this sense climate policy is becoming first of all an instrument of economic strategy.

Energy efficiency.

French law supports investments in the sustainable development of energy sources e.g., by interest-free loans for those who buy a house for the first time (if the building meets standards higher than those set in construction law, i.e., is characterized by energy saving or low energy consumption, the so-called BBC – *bâtiments basse consommation*) and BEPOS – *bâtiments à énergiepositive*).²⁵⁸ The act also supports the conversion of already existing houses, including a system of tax deductions. In January 2011, a new system of tariffs was introduced for electricity produced from biomass, and in March the same year, for electricity produced using solar panels.²⁵⁹ EDF is obliged to purchase all the power produced from solar and wind energy. France is

²⁵⁸ T. Młynarski, *Uwarunkowania transformacji polityki energetycznej Francji. Między ekologiczną modernizacją a ekonomiczną kalkulacją [Determinants of French energy transition policy: Between ecological modernization and economic calculation]*, Rocznik Integracji Europejskiej, no. 9/2015, Wydział Nauk Politycznych i Dziennikarstwa Uniwersytetu im. Adama Mickiewicza, p. 372.

²⁵⁹ T. Młynarski, *Francja w procesie uwspólnotowienia bezpieczeństwa energetycznego i polityki klimatycznej Unii Europejskiej [France in the process of communitizing energy security and climate policy of the European Union]*, Kraków 2013, pp. 70-71.

making up for delays in the development of renewable energy sources and supports investment in RES or energy saving technologies.

Energy saving and the growth of the eco-work sector One of the main ways of reducing energy consumption by 20% in 2030 and by 50% in 2050 in comparison to 2012 is to be energy efficient in the sectors of construction and transport. In the housing sector (which accounts for almost half of energy consumption in the country), activities will include e.g., mandatory thermomodernization of public and private buildings, so that they can achieve the standard of “low emission” buildings by 2050. For this purpose, subsidizing loans is assumed to support the energy efficiency of buildings (interest-free loans, lower VAT), especially in the case of households with low incomes.²⁶⁰ A 30% tax deduction for labor costs connected with improving efficiency is also planned. The development of the energy saving sector is expected to create tens of thousands of extra jobs (in construction, biosectors, or projects of reducing energy consumption, e.g., the installation of smart meters.

Another issue is the support for innovative energy-saving projects and the policy of reducing waste by 50% (e.g., banning the use of disposable plastic bags or dishes). In that country, the age of disposable plastic items has finished upon the decree of 31 March 2016: as of July 1, 2016, all disposable plastic bags were banned and replaced by reusable bags. One anticipated effect of energy transition is the creation of 100 thousand jobs.

The development of “green energy”.

Ségolène Royal, Minister of Ecology, Sustainable Development and Energy, discussing the draft of the act on energy transition in April 2016 said: *“The development of renewable energy is at the heart of the transition to our energy model of the 21st century, more efficient and more sober, more diversified...”*²⁶¹. The transition assumes

²⁶⁰ Establishment of a National Guarantee Fund, offering subsidies for less affluent families or people who buy a house for the first time (if the building meets the standards higher than those set in construction law, i.e., is characterized by energy saving or low energy consumption, so-called BBC – *bâtiments basse consommation*) and BEPOS – *bâtiments à énergie positive*). Other instruments of support are e.g., tax deductions for the conversion of already existing houses.

²⁶¹ *Les objectifs pour le développement des énergies renouvelables. Programmes pluriannuels des*

dynamic development and integration of renewable sources with the energy system: their role is to fill the gap in reducing the share of nuclear energy in electricity production. Dynamic development of renewable installations is to be stimulated by administrative incentives for local governments, which will receive preferential state loans for the achievement of the goals of energy transition. Instruments stimulating the development of RES include financial support for small-scale energy generation for communes and local communities, as well as facilitation of laws and simplification of issuing permits for innovative local government projects, such as wind energy, water energy, and biogas (1,500 new installations are planned), as well as special tariffs for electricity produced from RES. As a result, the government assumes an increase in the share of renewable energy in gross final energy consumption from 14% in 2012 to 23% in 2020 and 32% by 2030. 40% of the consumed electricity is to come from RES.²⁶² Besides, roofs of all new commercial buildings with a surface area over 1,000 m² will have to be equipped with renewable energy sources or vegetation that will ensure thermal insulation and will help maintain biodiversity.

France has set ambitious operational goals to meet by 2023²⁶³:

- growth of generating capacity in electricity production from renewable sources by more than 50% as compared to 2015 (from 43 GW to 71-78 GW),
- double the power from land wind power plants,
- triple the power from new photovoltaic parks,
- double the generating capacity to produce electricity from timber,
- developing France's potential in sea renewable energy (including 3,000 MW from offshore wind installations, 100 MW from sea liquid energy, and then expanding the capacities to 6,000 MW and 2,000 MW respectively).
- increase by more than 50% of heat production from renewable sources in comparison to 2014 (including more than 20% of heat

investissements de production – PPI, Ministère de l'Environnement, de l'Énergie et de la Mer, 25 avril 2016, http://www.developpement-durable.gouv.fr/IMG/pdf/2016-04-25_Obj-_Dvp-_Energies_Renouvelables.pdf.

²⁶² Others: 38% of heat consumption, 10% of gas consumption, and 15% of engine fuel consumption.

²⁶³ *Les objectifs pour le développement des énergies renouvelables...*, *op.cit.*

- production from biomass, seven-fold increase of heat production from biogas (methanization), four-fold increase of heat production from geothermal energy, increase by over 75% of heat production from heat pumps, and increase by over 80% of heat production from solar collectors),
- improvement of effectiveness and energy recovery from the grid,
 - introducing to the gas network 8 TWh of biogas from anaerobic fermentation and support for the development of the sector of powering cars with natural gas (bioNGV) up to 20% in transport consumption in 2023.

Reducing the share of nuclear energy and conventional fuels.

The act provides for lowering the share of nuclear energy in electricity production from 75% to 50% by 2050 as compared to the year 2012 (unlike Germany, France is not going to give up on it completely) under the condition of maintaining a competitive price for electricity and a guarantee of no increase in GHG emissions. Electricity production will remain at the previous stable level. For this purpose, extending the life cycle of reactors is planned, and the reactors will be shut down gradually as new renewable sources are launched.²⁶⁴ Thanks to retaining a stable share of nuclear energy, an uninterrupted and evolutionary transition in French energy balance will be possible. Simultaneously, the government assumes a reduction in fossil fuels (oil, gas, coal) consumption by 30% (as compared to 2012), so as to achieve 40% of electricity in France coming from renewable sources by 2030 (besides 50% from nuclear energy).

The transport sector.

The sector in which a considerable reduction of CO₂ emission is possible is the sector of transport, being the main source of GHG emissions apart from the heating sector. This goal is to be achieved by popularizing electric cars and extending the infrastructure of electric car charging stations.²⁶⁵ Another instrument is financial incentives for the purchase of an electric car or tax deductions for the construc-

²⁶⁴ It must be emphasized that the French nuclear fleet is obsolete, because as many as 22 out of 58 reactors will have operated for 40 years in 2022, so EDF intends to extend the life cycle of reactors from 40 to 50 or 60 years.

²⁶⁵ By 2020, 2-3 million electric cars are planned to be going on French roads, powered at home or from public grids.

tion of an electric power station (approximately 7 million of them are planned, compared to 10 thousand now functioning).²⁶⁶ Extension of battery technologies is planned in order to store energy. The act on energy transition introduced subsidies for the replacement of an old car with a new, ecologically powered one. The development of the electric car sector is intended to support the system of “electric bonuses” applying when replacing an old Diesel car (older than 13 years) with a new, electric one (emissions up to 20 g CO₂/km) or purchase or lease of a new hybrid vehicle (emissions from 21 to 60 g CO₂/km).²⁶⁷ Both individuals and public entities (enterprises, local governments, offices etc.) may use the assistance. The reform of the sector is to be supported by promoting bicycles and public transport or car sharing.

Intensive development of clean public transport is a separate branch of energy modernization. In addition, public institutions (in 50%) and local governments (in 20%) were obliged to renew their transport fleets based on low emission technologies (for vehicles up to 3.5 tons) before 2025. The replacement will apply to public transportation (buses) – 50% from 2020 and 100% after 2025. Energy transition has also introduced the requirement of ecologically clean vehicles for car rental companies and taxis (at least 10% of the fleet will have to have low emission engines by 2020).²⁶⁸

Plans for competitive advantage / new branches of economy.

In February 2014, France and Germany announced the development and adoption of a common industrial and technological strategy, and in the future, the establishment of a common consortium producing components for renewable energy devices (photovoltaic panels, wind turbines, etc.), oriented toward the export of low emission technolo-

²⁶⁶ T. Młynarski, *Uwarunkowania transformacji... [Determinants of energy transition ...]*, op. cit., p. 372.

²⁶⁷ *Voitures électriques et hybrides : Comment obtenir le nouveau bonus de 10 000 € ?*, http://www.developpement-durable.gouv.fr/Voitures-electriques-et-hybrides.html?var_mode=calcul (accessed: 15.12.2016).

²⁶⁸ *Loi no 2015-992 du 17 août 2015 relative à la transition énergétique pour la croissance verte* (1), Chapitre II Efficacité énergétique et énergies renouvelables dans les transports, article 37, http://www.developpement-durable.gouv.fr/IMG/pdf/joe_20150818_0189_0001_1_-2.pdf (accessed: 15.12.2016).

gies and the extension of smart grids.²⁶⁹ France hopes that as a result of the agreement it will become (together with Germany) the center of the world's industry of advanced technologies in the "green energy" and energy saving sectors.

Planes of competitive advantage and new branches of economy

Energy transition fosters the creation of new jobs and may become a stimulus to technological innovation. Energy eco-modernization is an opportunity for re-industrialization in the industry sector. It is connected with the need to patent and implement technological ideas on a large scale, and at the same time, develop new, advanced, energy saving technologies, not only for the internal market but also for export.

Socio-economic benefits of energy transition that may occur in France are:

- domestic energy and improvement of energy security due to reducing the importation of energy sources,
- economic development and industrialization in the modern industry sector,
- new eco jobs,
- energy saving,
- socio-ecological benefits connected with the improvement of environment and air condition,
- technological leadership and the opportunity to profit from low-emission and energy consumption-reducing technologies.

Thus, France counts on the development of the biomass and biogas sectors, sea renewable energy, small hydropower plants, the development of electromobility, projects for heat production from renewable sources, and the development of innovation and research support. As a result, 40 thousand jobs are to be created in the sector of onshore wind energy and photovoltaics (plus 8 thousand in the thermomodernization industry) by 2023. Besides, the construction of 250 PV stations, doubling the number of electric cars, and building 59 start-ups for green energy are assumed.

²⁶⁹ *Conseil des Ministres Franco-Allemand du 19 Fevrier 2014*, 16ème Conseil des ministres franco-allemand à Paris, <https://de.ambafrance.org/16eme-Conseil-des-ministres-franco> (accessed: 15.12.2016).

The impact of energy transition on the energy security of France and recommendations for other countries

The French transformation of the energy sector involves the development of RES, improvement of energy efficiency and energy saving, the transition from hydrocarbons to electric cars in the transport sector, and ecologization of the public domain. All these initiatives are to enhance the competitiveness of the country's economy, to create new jobs, and to improve the security of energy supply in the country. So energy transition is an expression of France's pragmatism, and if stable energy supplies can be ensured, it will be a strong stimulus for technological modernization and the country's economic growth.

French action on energy transition may be a source of inspiration for innovative solutions in designing the "ecological and economic modernization" of the energy industry in other countries that want to achieve: 1) intensive development of renewable energy sources supplemented with governmental support, 2) creating a national programme supporting energy efficiency growth, especially connected with the construction industry (low-energy construction), 3) development of modern forms of light eco industry which offers new jobs, 4) innovation in public transport (systems of municipal electric vehicles and charging stations) supported by the creation of special no-traffic eco zones in town centers, combined with popularization of *park & ride mobility*, 5) promoting cogeneration and modernization of waste management, including the use of post-industrial (mining) areas.