

PROBLEMS IN SUSTAINABLE ENERGY TRANSITION – THE FIRST POLISH NUCLEAR POWER PLANT IN THE POMERANIAN REGION

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Purpose: The identification of gaps in the Environmental Impact Assessment (EIA) Report in the investment planning process in the managerial and social dimensions.

Design/methodology/approach: The research is based on the method of the analysis of the subject literature and a critical analysis of the source documentation, i.e., the Environmental Impact Assessment Report on the project to build and operate the first Nuclear Power Plant (NPP) in Poland.

Findings: Gaps identified refer to the issue of coordination of the accompanying investments with the NPP Investment; an identification of the real impact area of the NPP in the scope of the analysis of its impact on residents; the impact of the investment on the functioning of the local government units; the impact of the investment on the local labour market, tourism and the property market.

Research limitations/implications: Although the research implements a cost-benefit analysis, which is a recognised method of analysis, the study is conducted in the reality of local (national) regulations. The issue of environmental impact assessment is not the subject of the analysis. The analysis is limited to the impact on society, i.e., on residents, the functioning of local government units, and selected local markets.

Practical and social implications: The article draws attention to the problem of nuclear plants and sustainability standards including environmental, social and economic dimensions (impact). It shows the necessity of improving the content of the evaluation report, draws attention to the issues neglected in the report and aims to increase the knowledge available to the public.

Originality/value: A nuclear power plant is a strategic, capital-intensive investment, demanding in terms of technology but also of organisation, with a significant impact on society. The first nuclear power plant in Poland is analysed. The article provides knowledge that has not been previously presented.

Keywords: nuclear energy, nuclear power plant, cost-benefit analysis, impact on society.

Category of the paper: Research paper.

1. Introduction

Global climate change, low air quality and the problems related to energy security encourage a search for energy sources alternative to coal, oil and gas. Renewable energy sources (solar, wind and geothermal energy) are considered to be more environmentally friendly than traditional sources. Investments in renewable energy sources are perceived as opportunities for a reduction in the quantities of greenhouse gases and air pollution, which is important for human health and nature conservation. At the same time, energy security based on energy supply irrespective of the weather conditions is important, as renewable energy sources cannot ensure it. The building of an energy system based on many sources, such as coal, natural gas, nuclear energy and renewable energy makes it possible to reduce the risks posed by breakdowns and limitations at one source. However, energy security is an issue which is determined not only by the diversification of energy sources but also by energy policy, political and geopolitical stability and sustainable development.

A consistent and long-term energy policy, including planning, regulations, investments and international cooperation, is of key importance for safeguarding energy security. Over the recent decades, energy has gained in political importance and has been often treated as a key issue of foreign policy. It seems, however, that the vision based on the economy-energy security-sustainable development triangle recently lost some of its importance. Indeed, first it was dominated by its economic domination as a result of an economic crisis, while after the Russian attack on Ukraine the issue of energy security became crucial (Wagner, Grobelski, Harembski, 2015). Two key dimensions of energy security have been indicated: availability (the possession of a sufficient quantity of energy) and the reliability (its possession at any time and place) (Szulecki, Westphal, 2014). In this context, the advantages of nuclear power plants have been noted, as they need smaller quantities of raw materials and can operate for many years. This means that they are more energy efficient than the other sources of conventional and renewable energy.

The question arises, however, about the extent to which nuclear power plants are consistent with the concept of sustainable energy development. Do they really make it possible to take into account the environmental, social and economic aspects and to maintain the balance between energy security and the protection of the environment and society, not only in the several dozen years long process of production and consumption, but also at the investment implementation stage? According to Verbruggen (2008), nuclear energy does not meet sustainability standards and has low public acceptance. Therefore, the discussion on investments in installations of renewable energy sources vs. investments in nuclear power plants does not result only from the commitment to substantially reducing greenhouse gas emissions under the climate treaty signed in 2015 in Paris, the efforts to reach energy independence or the objective advantages and disadvantages of the use of such an energy

source. It also results from different interests and social values, leading to different and often contradictory preferences regarding environmental protection and energy security.

Energy transition can be defined as a change of the character or model of energy use in the system, which can be a change related to the type of fuel, access, supply, delivery, reliability or end-use, as well as the general orientation of the system. This change can take place at any level – from local systems to the global one (Araújo, 2014). The basic directions of changes in Poland's energy policy (Ministerstwo Gospodarki, 2009) are as follows:

- improvement of energy efficiency,
- higher security of fuel and energy supply,
- diversification of the electricity generation structure by introducing nuclear energy,
- development of the use of renewable energy sources, including biofuels,
- development of competitive fuel and energy markets,
- limitation of the environmental impact of the energy sector.

In an overall approach, experts contrast the cost of energy transition (and, in the long term, the savings generated) vs. higher operating costs based on the current model. The latter was mercilessly exposed by the geopolitical situation last year and the related energy price increases. Consideration is seldom given to the addition of the costs of unmeasurable external effects in the form of climate change, its impact on human health and increasingly frequent extreme weather events (Wojewnik-Filipkowska, Filipkowski, Frąckowiak, 2023).

On 14 July 2021, the European Union published a package of new climate regulations, called 'Fit for 55' and providing for an emission reduction by at least 55% in the EU by 2030. The EU as a whole intends to become climate neutral by 2050. Is this realistic, in the context of the recent geopolitical events and the particular interests of the non-EU states? There are many indications that it is not. Is it needed? Everything indicates that it is. In practice, these actions will include a reform of the present Emissions Trading System, new carbon taxes and more stringent emission standards, as well as new investments in both renewable energy sources and nuclear power plants. The investment in a nuclear power plant is strategic. It is a capital-intensive investment, demanding in economic terms and in terms of technology and organisation, with a significant impact on the natural environment and society. But while some countries are investing heavily in expanding their nuclear energy supplies, others are taking their systems offline. The role of nuclear power in the energy system is therefore very country-specific. There are 440 commercial nuclear power reactors operable in about 30 countries. About 60 more reactors are under construction, notably in China, India and Russia. The nuclear plans are present all over the world – there are 168 nuclear plants in Europe (Statista, 2023). Currently, Poland remains one of the few European countries that does not yet use energy generated by nuclear power plants, and the decision to build a nuclear power plant arouses a lot of controversy and is the basis for a broad discussion about the benefits and risks associated with the implementation of these investments (Kowalski, Cwyl, Piotrowski, 2013).

The purpose of this study is to identify gaps in the Environmental Impact Assessment Report on Poland's first Nuclear Power Plant in Pomerania (hereinafter referred to as the Report and the Investment or NPP Project). The authors focus on gaps in the Report in two ranges. From the managerial point of view, the analysis will address the issues related to the timetable of the investment and its objective range (accompanying investments), while in the scope of the social impact, the analysis covers the impacts on the functioning of local government units, residents and local markets. The issue of the assessment of the impact on the natural environment is not analysed. The formulated research question addresses not only the extent of gaps in the Report, but also their causes.

The research methods include critical analysis of the selected subject literature and the source documentation, i.e., the Environmental Impact Assessment Report on the project to build and operate the first Nuclear Power Plant in Poland with an electrical capacity of up to 3,750 MWe, in the areas of the Municipalities of: Choczewo or Gniewino and Krokowa, Vols. II, IV and VI, including attachments. The method of cost-benefit analysis was used to analyse the Report.

The study consists of 4 Sections. Section 2 presents materials and methods which include information about the first Polish Nuclear Power Plant in the Pomeranian Region, and its administrative determinants relevant for the Environmental Impact Assessment Report. This Section includes a brief explanation of the methods applied. Section 3 presents results and discussion relating to managerial and social gaps identified in the Report. The Conclusions in Section 4 close the study.

2. Materials and methods

On 22 August 2023, the company Polskie Elektrownie Jądrowe (PEJ) submitted to the Pomeranian Voivode an application for the issue of a location decision for the first nuclear power plant in Poland, to be built in Pomerania, in the Municipality of Choczewo (Polskie Elektrownie Jądrowe, 2023). This was not the first attempt to incorporate nuclear energy into Poland's energy system. In the 1970s, taking into account the favourable geological, meteorological and demographic conditions and the large energy demand in the northern regions of the country, a decision was taken to locate the power plant at the village of Kartoszyno on Lake Żarnowieckie. On 12 August 1971, the Polish Government adopted a decision to build a nuclear power plant, while on 10 April 1986 the Parliament adopted the Act on Nuclear Law in Poland, the first act of this rank in Polish law to regulate the activities using nuclear energy (Komunikat IPN, 2023). After the first construction works began on the Żarnowiec Nuclear Power Plant in 1982, fears associating a nuclear power plant with a nuclear bomb intensified. Opposition and environmental organisations strongly joined the protests.

In 1987, when the economy of the People's Republic of Poland plunged into crisis, the construction works were halted, while at the end of 1988 only the existing structures were secured and no new ones were erected. Under the impact of growing public protests, in December 1989 the Government of Tadeusz Mazowiecki took a decision to suspend the construction for a year and on 17 December the new Government adopted a resolution to put the investment 'The Żarnowiec Nuclear Power Plant under Construction' into liquidation. Works began to dismantle and scrap the already purchased equipment of the power plant (Serwis Rzeczpospolitej Polskiej, 2023).

The Polish Nuclear Power Programme – a strategic government document constituting a roadmap for the construction of the first Polish nuclear power plant – was adopted by the Council of Ministers on 28 January 2014 and on 2 October 2020 so was its updated version (Serwis Rzeczpospolitej Polskiej, 2023; Ministerstwo Klimatu, 2021). The construction of the nuclear power plant in Poland is presented as a strategic investment for the sustainable development of the whole country, indicating that nuclear power generation is a stable source of electricity and that, moreover, that the capability to store nuclear fuel for a long time improves the energy independence of the country.

However, the process of implementing an investment with such a wide impact range as a nuclear power plant is long-lasting and multi-stage; it can also cause numerous problems which are not always fully identified by the investor. In formal terms, the administrative procedure consists of specific stages:

1. decision-in-principle,
2. decision on environmental conditions (environmental decision),
3. decision determining the location of an investment to build a nuclear power unit (location decision), a construction consent,
4. construction permit,
5. commissioning permit (after the completion of the construction),
6. operating permit.

This article focuses at the stage of a decision on environmental conditions (the so-called environmental decision) – the Environmental Impact Assessment (EIA), with particular consideration given to the analysis of one of the key elements of this procedure – the Environmental Impact Assessment Report. This decision is an instrument to ensure comprehensive environmental protection (Ustawa o udostępnianiu informacji..., 2008). The performance of the environmental impact assessment of a project is required for the implementation of projects likely to always have a significant effect on the environment, i.e., in accordance with the Act, a proposed project likely to always have a significant effect on the environment or a proposed project likely to potentially have a significant effect on the environment (if the obligation to perform the environmental impact assessment of a project has been determined).

In accordance with the cited Act, the environment includes all the natural and social elements, as well as the one understood to be cultural. The environment affects the condition, quality of life and welfare of humans and other forms of life on Earth. The purpose of the EIA is to identify, describe and assess the effect of a proposed project or action on the environment so as to enable the protection and preservation of the environment and to ensure sustainable development. The EIA analyses not only the effects on air, water, soil, ecosystem, landscape and human health, but also the economic, social and cultural aspects. Thus, the assessment also addresses technical, organisational and economic aspects related to the implementation of a specific project. Ultimately, the purpose of the assessment is to work out solutions to minimise the adverse environmental impacts, to adopt protective measures, to compensate for potential damage and to promote actions to protect the broadly understood environment – not only the natural environment, but also the social and cultural environment. Its purpose is also to ensure transparency of the decision-making process and to take into account the views of the public and stakeholders in the process of taking decisions on projects and actions likely to have an effect on the specific environment (surroundings). The final scope of the report is determined by the Regional Directorate for Environmental Protection (RDOŚ) or the Chief Inspectorate of Environmental Protection (GIOŚ).

On 29 March 2023, the company Polskie Elektrownie submitted the Environmental Impact Assessment Report mentioned above to the General Directorate for Environmental Protection (Polskie Elektrownie Jądrowe, 2023). The Report is one of the elements of the procedure, intended to facilitate the determination of all the potential threats related to the implementation of the proposed project.

The completeness of the Report was analysed using the method of a cost-benefit analysis (CBA). The essence of the CBA is the comparison of all the costs related to an action or project with their possible benefits and the selection of the best option of action on this basis. The main advantages of the CBA include the account taken of the economic value of the natural environment, which is particularly important when decisions affecting the natural environment are taken – but not only. The CBA is a tool to identify, analyse and value the long-term term outcomes of actions related to external effects of environmental, social and economic character which are not reflected the financial account of the investor (project). Thus, the CBA makes it possible to take into account the criteria of sustainable development. At the same time, the CBA has certain limitations. The analysis has a subjective character, since certain benefits and costs are difficult to estimate in monetary categories and various stakeholders can differently value individual benefits and costs. The total cost of energy supply includes three entire categories: capital expenditures at the plant level (including administrative cost, planning and documentation preparation), system costs at the grid level, and external costs (Figure 1). In fact, grid system costs which include the costs that plants impose on the system in terms of extending, reinforcing or connecting to the grid, have also external components (Nuclear Energy Agency, 2018).

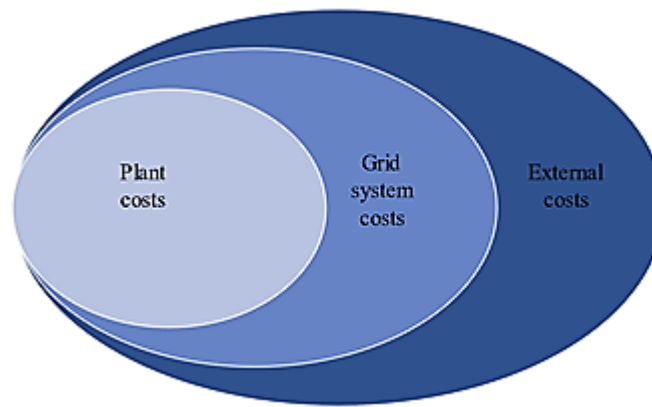


Figure 1. Cost categories composing the full costs of electricity provision.

Source: based on the Nuclear Energy Agency (2018).

3. Results and discussion

The analysis of the Report focuses on gaps in the managerial and social dimensions. From the managerial point of view, the analysis addresses the issues related to the timetable of the investment and its objective range (accompanying investments). In the social scope, the analysis focuses on the impacts on society, i.e., on the functioning of local government units, residents and local markets, e.g., the labour market, tourism and the property market.

The gap analysis should, however, be preceded by the statutory definition of an accompanying investment to which the analysis of managerial and social gaps will refer. The catalogue of such investments is limited and specified (Ustawa o przygotowaniu i realizacji..., 2011). In accordance with the Act, an accompanying investment means:

1. an investment to: build, reconstruct, repair, maintain, use, change the manner of use, operate or dismantle transmission networks, distribution networks needed to connect a nuclear power facility to the power grid or for the evacuation of power from a nuclear power plant, and heating networks or cooling networks needed to evacuate heat or cold from a nuclear power plant,
2. another investment needed to: build, reconstruct, repair, maintain, use, change the manner of use, start up, operate or dismantle a nuclear power facility; particularly in the scope of power stations, temporary built structures, facilities of a gas network; power, water supply, wastewater collection, district heating, telecommunications, tele-information and cooling networks and connections; road, hydro-engineering and railway infrastructure, stacking yards, storage facilities, energy storages, installations for the production, distribution or storage of hydrogen, production buildings, assembly or manufacturing plants, as well as to perform measurements, tests or other works needed to prepare a preliminary location report, a preliminary report or an environmental impact assessment.

Managerial gaps

The Report indicates that the preparation of work timetables will be of crucial importance for coordination and documents will undergo cyclical updates, taking into account progress of works and the changing conditions of their execution. At the same time, the Report fails to address the need to coordinate the NPP Investment and accompanying investments, the timetable itself is not realistic, the Report is not consistent in this respect and has a vague and wishful character. It should be pointed out here that access roads, railway lines and the accommodation base have been excluded from the Project and qualified as accompanying investments, thus failing to include these investments in the analysis of the cumulative impact. The analysis of the cumulative impact itself also assumes that the timetables of external investments will not overlap and that there will be no delays, while the criteria for including external investments in the analysis of the cumulative impacts are not clear.

Irrespective of the above, the implementation timetables of the Investment and the accompanying investments have been presented without including the time needed for design and the issuing of permits and decisions. However, the project management practice indicates that taking into account the time needed for administrative activities is an element of a correctly designed investment timetable. As regards the scope of the activities included in the timetable, the Report indicates the possibility of expanding the scope of works and a time reserve is foreseen, e.g., for the activities related to an area check for unexploded ordnance and a preliminary archaeological survey, but these time reserves are short (2 months in this case), while the risk in this scope is assessed as high. The reduction of the operating time of machinery is indicated as part of measures to minimise the external impacts, but there is no information if these measures are included in the timetable. In this scope, the Report contains phrases with the character of proposals the implementation of which is uncertain.

On the one hand, taking into account the scope of the Investment and the related investments, the indication that the Investor does not possess full information in specific areas is understandable. At the same time, the Report adopts without any problem the assumptions which result from the timetables of external investments over which the Investor has no control. It is only in the case of the Local Information Centre and partly in the case of the accommodation base that the Investor is responsible for the implementation of the investment, thus exerting an actual influence on the management of these investments. In the case of both accompanying and other investments, the Report even fails to take into account possible delays and their consequences which may follow and thus the effects of these delays on the Investment itself. There is no information, either, on the communication between the Investor and the investors/contractors of the accompanying and other investments. The accompanying investments are presented synthetically, although they are indispensable for the construction and the later operation of the NPP, while the main analyses are limited to only the site of the construction/implementation of the Investment.

For example, the transmission networks, which have not been prepared and adapted to support the Investment, pose a problem. According to Polskie Sieci Elektroenergetyczne (2022), the transmission networks are expected to be ready for the commissioning date of the investment, but the timeliness of this investment cannot be ensured. Possible delays which have not been included in the Report may result from the expropriation processes and the landowners' complaints to the courts. Moreover, in 2020 on average almost 50% of high and medium voltage networks in Poland were more than 40 years old (Tomczykowski, 2011).

In the scope of transport infrastructure, railways as well as roads, gaps include failure to take into account repairs of the existing roads which will be intensively used at the stage of preparatory works when the railway line is not in operation yet and, in consequence, the whole transport will be carried out by lorries (the Report provides for 600 lorries in a day in both directions on the road between the Port of Gdańsk/Gdynia and the Strzebielino Junction). In addition, the timetable of new investments is unrealistic, when taking into account the experiences from other investments carried out by PKP Polskie Linie Kolejowe S.A., where delays were as long as several to a dozen or so months (Madrjas, 2019).

Indeed, the effects of delays in the implementation of investments in the transport (roads and railways), transmission, water supply and wastewater infrastructures (related not only to the Investment, but also to the accommodation base) will be felt by the entities which are directly involved in the preparation and implementation of the Investment and the other stakeholders, including the NPP employees and the residents of the municipalities where the Investment and the accompanying investments are located; the same is the case with the residents of the neighbouring municipalities. In particular, the consequences of delays of the investments in the transport infrastructure mean a longer duration of the inconveniences related to the implementation of the Investment itself and the actual accompanying investments, including detours, further delays, lesser throughput capacity and the need to arrange for the cost of substitute transport. On the basis of studies carried out on transport projects, it can be indicated that a cost overrun depends to a large extent on the duration of project implementation, but does not depend on the type of a project in the scope of the transport infrastructure; with each passing year from the decision to build to the start of operation, the mean annual cost overrun is 4.64% (without financial costs); in the case of railway projects, the average cost increase is 45%; while in the case of roads, the average cost increase is 20% (Flyvbjerg et al., 2018). As indicated by the experiences from the construction of other new nuclear power plants, this technology is also prone to the risks of an overrun of the construction timetable and an increase in the investment costs. The main factors include an optimistic plan related to a new technology, administrative regulations and safety requirements (Alsharif, Karatas, 2016; Badyda, Kuźniewski, 2015).

In light of the possible difficulties caused by delays in the implementation of the abovementioned capital- and time-intensive investments in roads, transmission, water supply and wastewater collection networks, the absence of details on the investments in the

communications infrastructure seems to be insignificant. However, communications are a key element of security systems. The Report laconically indicates the need to expand the telecommunications infrastructure at the cost of an unspecified operator.

According to the Polish Nuclear Power Programme (PEJ 2020), there is already a delay of one year. In 2022, the environmental and location decisions were expected to be issued for the NPP and the agreement with the technology provider and the main contractor was expected to be signed. In turn, in 2023 the preliminary and preparatory works were expected to be started at the NPP location, including the conclusion of the connection agreement. In the meantime, a decision-in-principle was issued, formally confirming that the investment in the first nuclear power plant in Poland was consistent with the public interest and the policies pursued by the state, including energy policy (11.07.2023), and a decision was issued to indicate the location in the Municipality of Choczewo (19.09.2023) for the purposes of an in-depth geological survey to be carried out by the Investor and the issue of a construction permit by the President of the National Atomic Energy Agency. However, the issue of a decision indicating the location does not predetermine the final siting (Pomorski Urząd Wojewódzki, Aktualności, 2023). The environmental decision has been just issued (19.09.2022) and the engineering service contract has been signed (27.09.2023) (Polskie Elektrownie Jądrowe, Aktualności, 2023).

Social gaps – the impact on inhabitants and local administration

The Report fails to address many aspects by referring to the arising accompanying investments. However, as indicated above, the catalogue of such investments is limited and specified by statute. Therefore, any investments which are indirectly related to the construction of the power plant, such as those intended to ensure good quality and comfort of life for the residents, healthcare or education for the construction workers and their families, may not qualify as accompanying investments.

Thus, there is an information gap here relating to the entity responsible for providing such services. On the basis of experiences related, e.g., to education, it can be assumed that this task will be imposed directly on local government units, mainly municipalities. Taking into account the social impact of the project and the necessary investments (not only the so-called accompanying investments) on the quality of life and the living conditions of the population, the labour market and the property market, in the scope of the abovementioned issues the submitted Report is hardly exact and only provides an outline of problems which arise in the context of the implementation of such a large investment.

The Report does not address many problems that the local government units will face. Predominantly, the potential problems are caused by an influx of many employees, who will become the temporary residents of the municipalities where the Investment will be implemented. These problems will also affect the neighbouring municipalities. It follows from the Report that the estimated number of hired employees exceeds 1,000 employees in the course of preparatory works, while almost 8,000 persons will work at the peak period of the

Investment. For comparison, the Municipality of Choczewo, where the investment is to be implemented, as of this writing has a population of 5,010 persons, while the neighbouring Municipalities have the following populations: Gniewino – 7,448, Łęczyce – 12, 023, Krokowa – 10,545 and Wicko – 5,561 (data as of December 2022, Bank Danych Lokalnych, 2023).

The experiences from other investments in the energy sector, including nuclear power, e.g., in the United Kingdom, raise the concern that the projected number of employees may be substantially underestimated (Thomas-Aleksander, 2022). Therefore, the increase in the number of persons inhabiting the Municipalities mentioned above could well be significant. The multi-nationality of the human resources could also be a problem; e.g., 75% of the persons working on the construction of Olkiluoto 3 in Finland represented 60 different nationalities (Muinonen, 2012). In light of this, it is justified to assume that, although the investors intend to hire local labour, many employees will be brought from outside Poland's borders. This is confirmed by the fact that State Treasury companies also bring employees from abroad to implement other investments, e.g., the workers building the Olefin III Complex near Płock include: Koreans, Indians, Malaysians, Pakistanis, Filipinos, Turks and citizens of Turkmenistan (Rowicka, 2023). A substantial number of the newcomers will significantly affect the local population and its functioning. The problems which may arise can be divided into 3 groups:

1. everyday problems of the construction workers,
2. conflicts between the residents and the construction workers,
3. burdens on the functioning of the local government units.

Everyday problems of the construction workers

Basic doubts as to the manner in which the needs of the construction workers are to be met are raised by the estimates given in the Report in relation to the provision of accommodation, water supply and domestic wastewater collection.

The Report reads that 'about 1,000 employees will stay in the container accommodation base at the construction site (in the Project Implementation Area), while about 4,000 will reside in the accommodation base at Choczewo, which will be built as part of the accompanying infrastructure'. At the peak employee influx, there will be 8,000 of them; hence it is doubtful whether the accommodation base will be sufficient to house so many persons at the same time. Even when taking into account the investors' assumptions that 15% of employees will come from the local market (as a result, they will not need medium- and long-term accommodation), it should be borne in mind that the Report indicates that a part of human resources will move to the areas around the Investment with their families, who will also need an accommodation base; this has not been considered in the estimates of the necessary number of accommodations.

The quantities of water also seem to be underestimated, as during the implementation of the Investment they will have to be larger by a multiple factor than at present; especially given that the Report indicates that: 'The basic factors conditioning the occurrence of impacts on the social and economic conditions include the number of employees and the place and duration of their

stay.’ The projection of the water consumption and wastewater collection as a result of the influx of employees needed to implement the NPP does not take into account the issues related to the functioning of the accommodation base at Choczewo and the container base at the construction site. As an element of the accompanying infrastructure in accordance with the Report, the accommodation base does not fall in the scope of the Project and can be considered only as a cumulative impact, i.e., the one caused by a given type of activity in combination with other past, present and real future activities. Moreover, the section of the Report concerned with cumulative impacts fails to give numerical data on the water demand, wastewater collection or the quantities of waste generated at the newly-built accommodation bases. Therefore, it is mistaken to adopt an approach where the estimates of the water demand, the quantities of wastewater collected and the waste generated are limited to those for the site of the construction/implementation of the Project only, since all the employees who will also significantly affect these issues ‘after work’ are an element of its implementation.

In addition to the issues of basic needs, consideration should be given to such needs as trade, catering, financial services, education or primary and specialised medical care. Trade, catering and financial services do not cause such large concerns as the other two sectors, since it can be assumed that demand will shape supply, although here and there formal problems may arise, e.g., when setting up bank accounts. In turn, healthcare services are essentially expected to be provided using the existing facilities and establishments. According to the Report, the Project will additionally generate about 3,300 visits annually. The Report also indicates the need to add the members of employees’ families who decide to stay with their families (this has not been taken into account in estimating the demand for accommodation – see above). The question is whether the now-existing facilities and the personnel working in them will be able to cope with such a significant increase in the demand for their services. As an additional problem, the Report indicates the language barrier which will appear in the doctor-patient relationship. In contrast, the Report does not address other sensitive issues which may arise, e.g., the issue of financing medical care or hiring medical personnel, which even today are the problems facing many medical establishments, or the issue of incurring the costs of setting up and managing an additional health care service. The Report also fails to indicate possible formal/legal problems related to treatment, e.g., the mandatory vaccinations of the children of newcomer employees, pre-employment examinations or other requirements under Polish law.

The Report also fails to address the issue of the adaptation of both the employees themselves and their families to Polish society. It can be expected that in the case of families, especially children, the feelings of alienation and loneliness and problems with social integration may arise and they, in turn, can cause conflicts.

Conflicts between the residents and the construction workers

The Report identifies the sources of potential conflicts, mainly focusing on the relationship between the Investor and the local community and engaging in reflections on nuclear energy generation seen as a threat to the residents’ security. Almost entirely, it fails to address the

conflicts which may be caused by the presence of a large group of employees in the Municipalities surrounding the Investment and resulting, e.g., from cultural differences or just the language barrier already referred to above.

As already mentioned, the implementation of the Project will cause an increase in the population in its area, characterised by substantial variations at the different stages of the implementation of the NPP. The Report indicates that 80% of employees in the sector are aged up to 55 and are mostly men. It can be assumed, therefore, that there will be a considerable gender imbalance. Employees can come from countries with different cultures and profess different religions; in the conservative Polish society, this can spark conflicts. It must also be borne in mind that the influx of several thousand young men from different cultures and nationalities will cause social fears. On the one hand, it is due to the lesser cultural differentiation in our country, the lesser familiarity with national 'otherness' and the hostility of certain communities towards any manifestations of 'otherness', and, on the other hand, due to the reports in media about immigrants' attacks on the local communities. The language barrier will additionally strengthen these conflicts. In light of this, it seems justified to deploy additional law enforcement personnel, as in the case of the Olefin investment for Orlen, where police officers are expected to be present on the site on a 24-hour basis (Serwos Policji, Aktualności, 2023).

When analysing the statements in the Report about the burdens on medical establishments, it can be concluded that the primary medical care will take over the burden related to the provision of healthcare services; this can potentially have an adverse effect not only on the everyday conditions of the Investment employees, but also on the quality of life of the present residents and can be a cause of the residents' greater frustration. The excessive stress to the system may produce such effects as: patient referrals to other establishments and reduced access to diagnostics and treatment opportunities, as a result of a greater demand for medical personnel or delays in diagnosis and treatment. Such situations can potentially increase hostility and spark a conflict.

The residents may disapprove of the NPP construction itself and the accompanying investments; especially when they affect their everyday life, e.g., traffic jams that are caused by the deliveries of raw and other materials to the construction site, the tourist traffic declines and the road infrastructure is damaged by the movement of heavy equipment on it.

Burdens on the functioning of the local government units

In its biased analysis of the impacts on the socioeconomic aspects, the Report points out the opportunities for improving the socioeconomic status of the localities. In the longer term, the construction can translate into the development of the localities where the Investment is located, especially as a result of a better availability of services, which may be expected to be set up in response to a greater demand generated by the Investment employees and the development of the necessary technical and social infrastructure. In turn, it is doubtful whether, given such a large influx of non-local employees, the availability of public services and

customer service will really improve as early as at the construction stage. On the contrary, given the burden on the offices, the implementation time of the services rendered is likely to be longer. The local government units will also face the challenges of having to serve customers in a language other than Polish and to finance the current translations of document templates, guides and instructions.

These burdens can arise both due to the need to serve a larger number of residents and due to the fact that it will be necessary to improve the availability of certain services which are managed by the Municipality. In accordance with the Act on the Municipal Government, its own tasks include, among others, the matters of healthcare, water supply pipelines and water supply, wastewater collection systems, municipal wastewater collection and treatment, keeping cleanliness and order, as well as sanitary facilities, waste landfills, municipal waste disposal, electricity, heat and gas supply, local collective transport, and public education. It is more difficult to carry out the tasks related to water supply, wastewater collection or waste collection, since the estimates of their quantities are not only very general and inaccurate, but also there is no indication of the levels of demand generated by the accompanying investments. In light of this, the Municipalities will find it difficult to prepare earlier tenders, e.g., for waste collection. The Report also assumes that a wastewater treatment plant and a wastewater collection system will be built as part of the accompanying infrastructure. These activities are the own tasks of the Municipalities; therefore, the costs of these investments can be imposed on them. Moreover, the office work related to these aspects may require the creation of additional full-time jobs equivalents at the Municipal Offices for persons handling a larger number of declarations of the number of persons living at given properties or the adoption of new rules for calculating the waste collection costs or the performance of inspections; the Report fails to address it.

The source of another additional burden on the functioning of the Municipality will be the need to organise school and pre-school sections in its area for the children of employees which come together with their families. Under the Polish law, a child coming from abroad is admitted to a public pre-school, a pre-school section of a public primary school or another public form of pre-school upbringing on the conditions and in the recruitment procedure applicable to Polish citizens; the same rules apply to the admission to forms in a primary school. Moreover, pursuant Education Law Act (Prawo oświatowe, 2016) the network of public primary schools should be so organised as to enable all the children to fulfil the school obligation. This means the need to arrange for free transport of all the children to primary schools. Therefore, in the case where the number of children in the Municipalities grows, the local government units have to open new school and pre-school sections; this will not only require the employment of additional teachers, but can also cause problems with finding premises and even make it necessary to build new facilities. In addition, teachers will have to be trained in the scope of the cultures of the children's countries of origin and the development of intercultural competences (Jaworska, 2019).

All the persons who reside in Poland's territory have the right to healthcare services and examinations which are related to the control of diseases, infections and infectious diseases. These rules also apply to persons who do not have Polish citizenship and even have no rights under health insurance. Assuming that the employees at the power plant construction site will be insured and, even skipping the abovementioned problems related to the need to hire the medical personnel who will be able to communicate with non-local patients, it can be assumed that the demand for medical services will grow significantly. According to the content of the Report, in this case, too, the need to ensure health services of adequate quality and availability will be the Municipalities' problem.

The need to ensure additional law enforcement personnel will also be the Municipalities' problem. However, among the accompanying investments, there is no indication of those related to ensuring security. Thus, the local authorities are responsible for infrastructure in the form of police stations/units (mainly during the construction) or fire service bases/units (during the operation, too).

Social gaps – the impact on local markets

Labour market

An important aspect of the construction and operation of the first nuclear power plant in Poland is its impact on the labour market. In this scope, the analysis should address not only the number of full-time jobs by which the local labour market will change, but also the co-existing factors which will gain importance with an influx of new hires.

A basic gap identified after the analysis of the Report is its approach to the labour market at the regional scale, failing as it does to consider the direct impact of the NPP construction on the local market. Emphasis is placed on the number of new full-time jobs on the construction and operation of the NPP, while the Report does not estimate the number of jobs liquidated as a result of the exclusion from use of the extensive area where the NPP will be located and the site and sea waters around the facilities of the power plant. This includes employees in the tourism sector, broadly understood services and fisheries whose activity is strictly related to the area to be affected by the expected significant impact of the NPP and whose skills may not be sufficient for work on the construction and operation of the NPP.

In the Report, the number of full-time jobs at the level of 860 employees at the operating stage of the power plant may be an underestimation. On the basis of similar investments, it was estimated that the operation of a 1,000 MW nuclear power plant would need on average about 600 full-time jobs (Kancelaria Senatu, *Opinie i ekspertyzy OE-401*, 2022). The planned capacity of the NPP is up to 3,750 MW; therefore, the number of 860 employees in the operating period is too low.

Given the high landscape values, the area of the planned location of the NPP in the Municipality of Choczewo is now used for tourism and resting purposes. It is an area of pristine nature, right next to the Sarbska Spit Reserve. It is difficult to find a similar investment in the

studies on the siting of nuclear power plants in the world. The difficulty with estimating the impact of the construction and operation on tourism in the Municipality of Choczewo results from the long timeframe (estimated at 70 years) and the fact that NPPs are usually not sited in an attractive area in terms of tourism. For this reason, the Report does not contain an exhaustive analysis of the impact on the tourism in the region. Another gap in the Report is its failure to verify the conformity of the project to build and operate the NPP with the European Union Strategy for the Baltic Sea Region in the scope of tourism and clean waters (EU Strategy for Baltic Sea Region, 2017).

The Report presents contradictory information on fisheries. It indicates a possible decrease in the demand for fish from catches near the power plant as a result of the view that the NPP has an adverse effect on water quality. At the same time, it mentions a possible increase in the demand for fish as personal foodstuffs caused by an influx of employees into the areas on the seacoast from those where fish are less available.

In addition, the Report completely fails to consider the need to support fish processing companies by the implementation of an information campaign among consumers. The companies which operate at a short distance from the proposed location of the NPP mark their products with the fishing symbol of FAO27 (the North-eastern part of the Atlantic Ocean), which includes, among others, the Baltic Sea, the Norwegian, the North Sea, the Irish Sea, the Portuguese Waters, Azores and the Greenland Waters. The Report fails to give the information that these are the locations of several dozen nuclear power plants using seawater for cooling purposes. To date, the operation of nuclear power plants in other countries has not changed the demand for fish products in Poland and is not a contraindication against the use of fish caught in the fisheries within the FAO27 area.

The Report also fails to address the impact of the NPP on the operations of the local fishermen and the fried fish shops which they supply. The Report indicates that the seawaters extending from the shore over a distance of 1.2 to 6 km into the sea, depending on the final choice of the investment option, will be completely excluded from general use. The shoreline of the area in question is about 3 km long. To fish, the local fishermen rarely sail more than 4 km into the sea; therefore, such a substantial exclusion from the use of seawaters will significantly limit their ability to fish and supply local catering outlets.

Property market

The problem which has not been sufficiently explored in the Report is the level of employment in terms of the skills required from employees. In other words, the percentage of persons with high skills among employees at each implementation stage of the investment is not known. This factor is of essential importance for the property market, particularly the property resource. Scientific research has confirmed that ‘the higher the education level is, the higher remuneration a given individual obtains and this affects his/her total income and increases his/her consumer potential’ (Wałęga, 2010). Hence, affluent persons will expect better conditions of accommodation; this is not been considered in the Report. The Report fails

to present an analysis of the existing accommodation base, but gives an approximate number of accommodations required. The Authors of the Report fail to include additional accommodations for the families of the newcomer employees. Given the long-term character of the project, it is natural that some of the newcomer employees will want to settle down near their place of work, together with the accompanying persons.

In addition to the residential properties, road properties are an important element of the resource of the property market. In order to increase the transport availability during the construction of the NPP, there is a plan to expand the network of roads, railways and sea routes. The Report indicates the location of the NPP facilities and an approximate range of the area to be excluded from use. In contrast, the road properties are cursorily mentioned. There is also a need to fill in an information gap relating to the exact location of roads and to take into account the amounts of compensations for the properties to be taken over for this purpose. The Report contains the information that the existing roads will be used at the stage of preparatory works and then a new road will be built to connect the NPP and regional road 213. In the Report, there is an information gap relating to the quality of regional road 213. It is assumed that transport will be active 250 days in a year and it is estimated that there will be 600 lorry trips to the NPP each of the 250 days. Hence, there is the concern that the factor of the quality of the access road to the NPP has not been sufficiently examined.

An important aspect of the property resource are also the historic properties and archaeological sites situated in the area of the proposed location of the NPP and the accompanying infrastructure. In the Report, there is a gap relating to the determination of the extent of the impact on historic sites generated by vibrations from transportation and industrial activity, although it has been noted that the sites which have already been identified in a given area can be damaged due to the vibrations of heavy construction machinery and other factors. The Report allows for the possibility that other, as yet unidentified sites can be found during the execution of the construction works. It has been assumed optimistically that the time needed for an archaeological excavation and a site description will be one to two months, depending on the investment variant. This assumption may turn out to be too optimistic and could cause significant shifts in the timetable of the implementation of the NPP.

Another impact on properties is a change in their value. Vibrations and noise are effects accompanying the construction of the NPP facilities. They are so-called annoyances. People try to avoid places exposed to high sound intensity levels (Senetra, Szczepańska, 2011). In turn, vibrations damage the structure of existing buildings. Landscape changes are an additional outcome of the implementation of the investment. This factor is irreversible and it is extremely important in an area with high landscape values (Senetra, 2010). The Report does not give the rate of a decrease in the value of properties. It contains the information about an adverse impact on the value of properties, presenting the following argument: 'Examples of nuclear power plants abroad indicate that the drops in prices to be seen in the markets analysed predominantly took place very close to the power plants, as presented in the 2011 study on the

U.S. market from which it follows that prices grew as the distance from a nuclear facility increased.’ The article indicates the percentage-based decreases in the property prices and rents at the level of 4-7% within a radius of 2 miles from a nuclear facility (Davis, 2011), but this fact is not included in the Report. The Davis article cited in the Report is not included in the References. Another study on a case in Finland also indicates drops in prices, especially those of residential properties situated in the direct vicinity of the nuclear power plant Olkiluoto 3, where the prices are lower by about 36% than those of properties not far away. After the construction stage is completed, there will be an outflow of persons working on the construction. A reduced demand for properties causes their prices to fall and thus affects their market value. In the Report, manifestations of the impact of the proposed construction of the NPP on the value of properties are not fully described and the information is presented in a manner designed to mitigate a possible conflict with the local community.

4. Conclusions

Fit 55 is ambitious. In Poland’s case, it is difficult to achieve and absolutely too costly to be incurred at the assumed pace of changes, as it requires a change of both the model of the economy and the lifestyle. The Olefin III petrochemical complex was expected to cost PLN 13.5 billion, but will cost PLN 25 billion. It was planned to be put into operation in the 1st quarter of 2024, but this will probably take place in the 1st half of 2027 at the earliest (Furman, 2023). The Supreme Audit Office negatively assessed the implementation of the investment in the power unit with an electrical capacity of 1,000 MW in Ostrołęka, where the losses suffered from the construction of the unit were estimated at 1,348,904,500 and the auditors indicated the inability to ensure funding sources as the main cause of the failure (Najwyższa Izba Kontroli, 2021). These facts call into question not only the ability to finance this investment, but also its timeliness and its success. Indeed, the building of public trust in the long term is certainly unlikely to be developed by the documentation in which the analyses of the impacts of the Investment on the residents, the functioning of the Municipality, the labour market, tourism and the property market are incorrectly designed. It is exactly in this scope that gaps have been identified in the Environmental Impact Assessment Report on the project to build and operate the first Nuclear Power Plant in Poland with an electrical capacity of up to 3,750 MWe, in the areas of the Municipalities of: Choczewo or Gniewino and Krokowa.

Key managerial gaps include:

- the duration of the particular stages of the Project is too optimistic;
- failure to take into account probable delays, budget overruns and a change in the scope of the Project;

- failure to address the coordination of the accompanying investments with the NPP Investment;
- failure to indicate the persons/entities responsible in specific cases for the implementation and execution of measures to minimise impacts;
- the wishful qualification of an impact as low/insignificant on the condition of minimising measures, where it is not known who is responsible for them or who can/should implement them;
- investments which are necessary for the operation of the NPP (access roads, railway lines and the accommodation base) have been excluded from the scope of the Project and qualified as accompanying investments; as a result, the subject matter of the analysis of the cumulative impact is not the impact between the abovementioned accompanying investments (although they are necessary for the operation of the NPP) and the external projects.

The most important gaps in the scope of the analysis of the impact on the residents and functioning of the Municipality relate to:

- an indication of the real area of the impact of the Project;
- the application of minimising measures and their effect on the strength of impacts;
- the qualification of the construction period of a dozen years or so as a temporary impact, thus belittling its significance;
- failure to analyse the impact of the construction workers staying at the accommodation bases on the residents' everyday life;
- failure to take into account the need to create new full-time jobs in offices and public services related to transport, waste collection, education, health service and the police;
- failure to take into account the need to prepare new local land use plans or change the existing ones and the costs of this process.

The key gaps in the scope of the impacts on the labour market, tourism and the property market include:

- the absence of grounds for making the assumptions on the projected number of employees, especially at the operation stage;
- therefore, the projections based on a vaguely assumed number of employees (the required number of accommodations, the expected level of employment for the local community) can entail a significant error;
- failure to analyse the existing hotel and accommodation base;
- failure to determine the impacts of vibrations, noise and the loss of landscape values on historic sites and the value of properties or their imprecise determination;
- incomplete analyses of changes in the local labour market and projections of lost jobs.

Given the restrictions on the length of the text, the article indicates and discusses only selected problems, which the Report fails to acknowledge, or it only addresses them cursorily; however, the importance of these issues indicates how large a challenge this investment will pose for the residents and authorities of the local municipalities. At the same time, it can be inferred that the underestimation of the impact on society is a deliberate action. It diverts attention from the actual problems and risks of a social character, distorts the concept of sustainable development, incorrectly focuses on the environmental aspects only and fails to address the economic and social ones.

The Authors of the Report belittle many problems, assuming the situation to be a temporary one – including transitional burdens on the life of the local community and the burdens with which the local government units will have to cope. However, taking into account the duration of the Investment in the context of both the social relations, the work of the local government units and organisations or other environmental elements (in the context of both the natural environment and the surroundings) affected by this Investment – it is difficult to consider that the prospects of changes over almost 20 years represent a temporary or transitional situation.

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