INVESTMENT PROJECT

“ADDRESSING DISASTER RISK MANAGEMENT DUE TO BELARUSIAN NUCLEAR POWER PLANT POSSIBLE THREATS“

EXECUTIVE SUMMARY

Prepared in accordance with the Purchase of Service Agreement signed between the Fire Protection and Rescue Department under the Ministry of the Interior and Jostra Ltd. On 8 May 2021.

The Investment Project "**Preparedness for a Potential Accident at the Belarusian Nuclear Power Plant**" (hereinafter referred to as the "IP") has been prepared within the framework of the project "Investment Project on Preparedness for a Potential Accident at the Belarusian Nuclear Power Plant" (Contract No ECHO/SUB/2019/TRACK1/807526, hereinafter referred to as the "Project"), funded by the Directorate General for European Civil Protection and Humanitarian Aid (hereinafter referred to as "DG ECHO") of the European Commission. The IP is intended to prepare the ground for future project applications in the relevant field (disaster preparedness, in particular for nuclear or radiological emergencies) for funding from the Lithuanian, European Union or other international funds.

In preparing the IP, the Service Provider has been guided by the provisions of the Technical Specification (TS) annexed to the Tender Conditions, as well as by information received from the Customer and other publicly available sources.

The purpose of the preparation of the IP is to assess and describe the readiness of Lithuanian state institutions and municipalities located within 100 km of the Belarusian Nuclear Power Plant (BNPP) to implement the functions set out in the State Plan for the Protection of the Population in the Event of a Nuclear Accident or Radiological Emergency approved by the Resolution of the Government of the Republic of Lithuania No. 99 of 18 January 2012 "On the Approval of the State Plan for the Protection of the Population in the Event of a Nuclear Accident".

The IP is based on the existing legal framework, an assessment of the capabilities of Lithuanian state and municipal authorities to prepare for and respond to nuclear and/or radiological emergencies, and consultations with national and international partners and experts.

Project context. Population protection is a public service that creates benefits that are guaranteed by the state and municipalities and are equally available to members of society. The Civil Protection System (hereinafter referred to as the CPS), which is organized according to the administrative division of the territory of Lithuania, taking into account the hazardousness and potential impact of emergencies predicted for the territory of those units, operates on the principle of permanent preparedness, and covers the entire population.

The main objectives of the CPS are to prevent or minimize damage in imminent or emerging emergencies, to maintain order, to preserve the life, health, and property of the population, and to protect the environment, by making optimal use of the material resources of state and municipal authorities and bodies, other institutions and economic entities. In order to respond effectively and efficiently to the occurrence and to restore living and working conditions sufficiently quickly, the **early preparedness of the CPS**, ensured by the organizational, legal and financial capacities of the State, is essential. CPS preparedness must be appropriate for all hazards, but if the specific hazard factors require unique response actions and measures, specific planning and resources are required. Radiological and nuclear emergencies, by their very nature, create situations that require a specific response, and therefore require special attention to ensure the safety of the population and the recovery from the consequences.

A specific threat that requires exceptional CPS preparedness is the commissioning of the first power unit of the Belarusian Nuclear Power Plant (Belarusian NPP or BNP) on 7 November 2020 near Mikailishki (Šulniki village), Astravas district, 20 km from the Lithuanian border (2 power units planned, total capacity of 2,400 MW). This nuclear facility was recognized by the Seimas of the Republic of Lithuania on 15 June 2017 as an unsafe nuclear power plant under construction in the Republic of Belarus, in the Astravas district, by the Law "On the Recognition of the Nuclear Power Plant under Construction in the Republic of Belarus, in the Astravas District, as an unsafe nuclear power plant, which poses a threat to national security, the environment and the health of society". The reliability of the Belarusian NPP raises concerns and reasonable doubts as to its continued safe operation, as it was not designed, installed or operated in compliance with environmental, nuclear and radiation safety requirements, in breach of international agreements and international conventions. The most worrying aspect is the extremely short distance between the BNP and the Republic of Lithuania. It is 20 km from the state border and about 40 km from the capital (55 km from the center of Vilnius). In the event of an accident, with prevailing easterly winds and/or transport in the upper atmosphere, harmful ionizing radiation could reach the capital of Lithuania within a few hours, and less than an hour in the event of strong winds (15 m/s) and/or strong easterly transport in the upper atmosphere.

According to the Lithuanian and international normative regulation (Part 7 of the IAEA GSR and recommendations EPR-METHOD (2003), EPR-NPP-PPA (2013)), the preparedness for emergency response in case of a nuclear or radiological accident at the Belarusian NPP must be proportional to the emergency preparedness category V. This means that on-site events and accidents may result in severe radiation effects for the off-site population and that emergency and early protective actions, and emergency response actions should be applied in the designated emergency preparedness areas to protect the population. In the Urgent Protective Action Planning Zone (UPAPZ), which is located within a radius of 15 to 30 km from the nuclear energy object (NEO), the following actions should be planned: sheltering, evacuation(s), iodine lockdown, decontamination, and restriction of the consumption of food and drinking water contaminated by radioactive materials. Within the Extended Planning Area (EPA) up to 100 km from the NEO, radiological monitoring shall be prepared, and an area shall be designated for emergency response, if necessary, with optional emergency and/or early protective actions such as relocation of the population, restriction of the consumption of food products contaminated with radioactive substances on a long-term basis.

In 2020, the Radiation Protection Centre (RPC) carried out a worst-case scenario assessment of a general accident at the Belarusian NPP, the results of which suggest that a significant proportion of the Lithuanian population could receive an effective dose of more than 100 mSv over a period of one month or more, and that, given the trajectory of the dispersion of the radionuclides, some of the radionuclides would be likely to be deposited in the areas over which the radioactive cloud would pass i.e. contamination of the environment, including buildings, vehicles, etc. The assessment concludes that it is necessary to plan for the temporary relocation of the population out of the UPAPZ and the EPA (including the city of Vilnius) and to plan for the application of restrictions on the consumption of foodstuffs, animal feed and water contaminated with potentially radioactive substances throughout the territory of Lithuania for a period of at least one year, and to make preparations for their laboratory control.

According to the National Risk Analysis, the risk of a large-scale nuclear or radiological accident at the Belarusian NPP is very high. Although the probability is assessed as very low, the potential impact is assessed as catastrophic in various aspects. Two Lithuanian municipalities - Vilnius and Švenčionys districts
- fall within the UPAPZ of the Belarusian NPP. They have a population of 123,075 inhabitants, of which 22,364 live within the UPZ. The EPA zone of the Belarusian NPP covers 17 municipalities. They have a population of 1,014,631 inhabitants. In the event of an accident at the Belarusian NPP, according to the worst-case scenario modelled (Figure 1), 472,528 inhabitants in the contaminated zone of the UPAPZ and the EPA area would have to be temporarily relocated within 7 days, 118,132 of whom would have to be evacuated or relocated in an organized manner using the resources of the municipalities and 23,626 of whom may need sanitary cleaning (decontamination). This would require a very high level of state capacity and public mobilization.

Figure 1: Radioactive contamination dispersion model for the worst-case scenario of a BNP accident (48 hours after the event).

Source: Fire and Rescue Department (FARD), ArcGIS platform

Within the EPA area, Vilnius City is home to important national landmarks and state administration institutions. Their activities may be disrupted until staff is relocated to alternative workplaces established in safe non-contaminated areas for this purpose. The EPA zone includes the part of the Republic of Lithuania where the waters of the River Neris flow. In the event of an accident, 230 km of the River Neris and 210 km of the River Nemunas would be contaminated. The Curonian Lagoon and the Baltic Sea would also be contaminated. The valleys of the Neris River and its tributaries are home to 11 of the country's 20 largest waterworks, which provide more than 70% of the total drinking water supply to Vilnius City. As some of the water points are open-type, in a worst-case scenario more than 50% of the drinking water resources in Vilnius water points would be unfit for consumption. The accident would affect the operation of the transport and healthcare systems, cause severe damage to the environment, the mental health of the population, disrupt the operation of virtually all sectors of the economy and have a severe impact on the national economy.

Lithuanian state and municipal authorities are preparing for these challenges. Since 2012, the country has had in force the State Plan for the Protection of the Population in the Event of a Nuclear or Radiological Emergency (hereinafter referred to as the "Population Protection Plan"), which sets out civil protection measures at the national level for the organization and implementation of protective actions to protect and/or minimize the potential impact on the population of accidental and/or induced effects of ionizing radiation, and to protect the population's assets and the environment against radioactive contamination, regulates the organisation of the management of an imminent or occurring state-level emergency, the functions of state and municipal authorities and economic entities in this area, and is the main document governing the actions of state and municipal authorities and institutions, other institutions and economic entities in the event of a nuclear or radiological emergency. In 2018, following an assessment of the progress of the construction of the Belarus NPP, it was revised to include additional measures for emergency preparedness for a potential nuclear accident at the Belarus NPP, to define emergency preparedness directions, and to provide for the roles of state and municipal authorities in emergency preparedness planning and the implementation of protective measures.

The Population Protection Plan provides 19 public authorities and 17 municipal administrations with critical functions to ensure the safety of the population. However, due to insufficient funding, they are not adequately prepared for a large-scale accident at the Belarusian NPP. The surveys carried out between 2020 and 2021 on the need for material resources of the state and municipal authorities to adequately prepare for the functions foreseen in the Population Protection Plan have identified a huge need for funds for evacuation of the population, for sanitary cleaning, for the provision of collective protection structures, for the personal protection of workers and for dosimetry control measures, etc. Inadequate provision of radiation protection for civil protection personnel involved in emergency response (all authorities lack personal protective equipment and personal exposure monitoring devices) risks that the necessary functions may not be performed at all. Early warning and radiological monitoring measures are insufficient, the data transmission format supported by the RADIS network is old and does not guarantee data security, the technical condition of some important existing instruments is unsatisfactory, and in case of failure or loss of internet connection there is a risk that no information on radionuclide contamination of the air and the water of the Neris River will be available. Another problem is that the uncertainty of the possible consequences of the accident at the Belarusian NPP and the uncertainty of the scale of the response mean that the real need for material resources (classification and quantities) is unclear. Even if funding is available for the purchase of specific equipment, the authorities face problems in organizing public procurement as the technical characteristics of the specific material resources required are not always known to the contracting authorities.

Insufficient funding is not the only reason why it is difficult to ensure adequate emergency preparedness in case of accident at the Belarusian NPP. The range of problems to be solved is wide and the problems themselves are deep. The complex legal framework, unclear responsible authority, unclear responsibilities of the authorities and the procedures for coordinating decisions in carrying out the functions of the Population Protection Plan hinder preparedness and would make it more difficult to respond promptly and take decisions in the event of a state-level emergency. Civil protection functions in state and municipal authorities are assigned to civil servants as additional functions. This leads to a fragmented approach to civil protection and does not ensure adequate preparedness of the civil protection system. The following additional studies have been carried out during the preparation of the IP in order to develop an optimal solution:

1. **An analysis of the level of preparedness of European countries for nuclear and radiological emergencies, with the following** main conclusions:

a. The analysis of the level of nuclear emergency preparedness in the EU countries has shown that in most EU countries emergency preparedness plans are prepared and implemented in accordance with the requirements and recommendations set out in international normative documents. However, in practice, the application of these normative documents varies considerably from country to country. These differences are particularly evident when comparing the definition of Emergency Planning Zones (EPZs) and the assumptions used to define the boundaries of the EPZ. The criteria for protective actions and their levels of application are closely linked to the definition of emergency planning zones. They vary considerably between European countries due to significant differences in assumptions depending on the magnitude of the accident, weather conditions and level of intervention. Most European countries rely on generic dose planning criteria for protective action planning.

b. The strategy for protective action in the event of an emergency is also different. Most European countries consider that sheltering and evacuation of the population is recommended before the release of radioisotopes. However, some EU countries (mainly non-nuclear countries) take the view that these protective measures should be taken after the release of radioactive material.

c. European countries also have very different views on decontamination activities. Many European countries do not have a practical decontamination strategy for a nuclear accident. In those countries where such a strategy has been prepared, it focuses more on the decontamination of radioactively contaminated population and work tools. Lithuania differs positively from other European countries in this respect, as it has decontamination plans and some measures for cleaning the population and decontaminating the environment (work tools, vehicles, soil, roads, building structures, etc.).

d. Bilateral cooperation in the event of an accident in one of our neighboring countries is a major focus in the EU. There are many good examples of such cooperation in Europe. One such example is the Austria-Czech Republic exchange of information in the event of an accident at one of the Czech Republic's nuclear power plants.

e. In the area of medical assistance and specialized radiological treatment, most EU countries have the necessary means and capacity to carry out the medical support functions foreseen in their emergency management plans. However, there are some European countries where the means and capacity for medical assistance may be insufficient.

f. In assessing the needs of various Lithuanian institutions and municipalities to effectively prepare for a potential accident at the Belarusian nuclear power plant, the experience of European countries in various areas of emergency planning and response was taken into account. It was particularly relevant to take into account the approach of European countries to human, material and financial resources in emergency preparedness planning - what is appropriate to plan in detail, allocating pre-planned resources for this purpose, and where it is possible to develop an appropriate strategy to mobilize the necessary resources only in the event of need. In the light of the experience of European countries, the boundaries of the emergency planning zones should be based on the predicted threat so that the planning of material and human resources is optimized according to the magnitude of the predicted threat and the assumptions that are made in the prediction of the spread of releases within the boundaries of the emergency response zone in the event of an accident. It would be appropriate to carry out a detailed analysis of the validation of the boundaries of these zones in the Republic of Lithuania, based on the design data of the specific reactor (ВВЭР-1200 (АЭС-2006)), the prevailing meteorological conditions in the region, and the existing emergency preparedness capabilities in the country.

g. In assessing the needs of the various Lithuanian institutions to efficiently carry out the emergency preparedness functions envisaged in the State Plan, the priorities of European countries in emergency preparedness planning were taken into account. In this context, the needs related to early warning and radiation monitoring and medical care in the event of an emergency were given the highest priority.

2. **The analysis of other projects implemented in Lithuania and abroad allowed to** facilitate the process of preparation of the IP, to avoid duplication of works (while ensuring continuity of works of previous projects), to reduce the uncertainty of the situation with the Belarusian NPP as much as possible, to optimize the planned technical, organizational and financial needs of the preparation of the possible accident at the Belarusian NPP. The analysis was very useful for the formulation of the list of IP priority problems, hypothetical accident scenarios, specifically identifying the existing gaps in the needs for radiological research instruments and software, evaluating whether the national capabilities are in line with international requirements, assessing the alerting and response systems, identifying the weaknesses of the CPS in the development of a unified algorithm of response to a nuclear accident in BNP.

3. **The analysis of the organization of civil protection systems in the EU Member States**, which compared the civil protection systems of the EU countries, showed that the functioning and effectiveness of each system must be measured by clear indicators: firstly, by looking at the threats faced by society, the impacts it needs to be protected from, and the ways in which these needs are being met. Given the specifics of the IP, the preparedness of Member States to respond to chemical, biological, radiological and nuclear events is additionally examined (the chosen method of assessment, looking at past events, the effectiveness of the CPS in responding to them, what changes countries have made to ensure the effectiveness of the system). The analysis has shown how to ensure the effective functioning of the Civil Protection System and has been useful in the development of criteria for assessing the effectiveness of IP implementation.

4. Once the investment decisions and the equipment needs for the acquisitions have been identified, **draft technical specifications for the material resources have been drawn up** in accordance with clear principles, setting out all the main characteristics of the items to be procured. These specifications can be used to organize the procurement process. The technical specifications have been drawn up on the basis of an analysis of the TED database, using the specifications found therein. They also take into account the legislation in force in Lithuania and its requirements, as well as the recommendations of the competent authorities (Public Procurement Service, State Audit Office). Some of the technical specifications are composite, combining several separate tools, but in the view of the drafters of the IP, only by combining them can fully functioning tools be purchased, avoiding incompatibilities. The technical specifications for the equipment have taken into account storage and maintenance conditions, as well as the possibility of multifunctional use.

The analysis of the Lithuanian situation and the experience of foreign countries allowed us to clarify the Project's problems, goals and objectives.

The IP addresses these concerns in relation to a potential accident at BNP:

- The need to acquire the necessary material resources/means shall be assessed, taking into account the functions envisaged in the National Population Protection Plan for State and municipal authorities and the experience of foreign countries;
- Updating, assessing and revising the need for funds to acquire the necessary material resources;
- Determine the technical characteristics of the specific material resources required (by drawing up Technical Specifications).

The target group of the Project (hereinafter referred to as "TG" or "target group") consists of:

- 19 public authorities with critical functions for the safety of the population in the event of a radiological or nuclear emergency, as set out in the National Population Protection Plan;
- 17 municipalities for which the National Population Protection Plan includes critical functions for the protection of the population in the event of a radiological or nuclear emergency;
- Residents of 17 municipalities within 100 km of the Belarusian NPP. The socio-economic impact of the Project also takes into account the consequences of a potential accident for the population of other regions of Lithuania.

The aim of the Project is to ensure the preparedness of state and municipal authorities to respond to and protect the population in the event of a nuclear accident at the Belarusian NPP by implementing a comprehensive system of preparedness for a possible nuclear and/or radiological accident at the Belarusian NPP, including the technical readiness of all institutions involved in the accident management process to adequately carry out the functions assigned to them.

The Project is based on an assessment of the lack of capacity of Lithuanian state and municipal authorities to prepare for and respond to nuclear and/or radiological emergencies and provides a framework for emergency preparedness. **To achieve the Project's objective, the following tasks have been developed:**

1. Acquire and install the measures needed to carry out the functions set out in the National Population Protection Plan.
2. Ensure the security of state and municipal authorities' personnel carrying out protective actions by building up a reserve of necessary protective equipment and providing them with the necessary competences.
3. Implement measures to ensure the prompt receipt and dissemination of information about an accident.
4. Propose other additional steps necessary to implement legal and organizational measures to address the identified problems of the Belarusian NPP accident preparedness (training, information dissemination, exercises).

The readiness of state and municipal authorities to meet the identified challenges in a timely and high-quality manner depends directly on the strategies, systems and resources available. To address the challenges, a long list of activities has been developed to ensure that state and municipal authorities are adequately prepared to respond to and protect the population in the event of a nuclear or radiological emergency and to deal with its consequences, taking into account:

- the initial "Needs plan for the preparedness of state authorities and municipalities for a possible radiological or nuclear accident at the Belarusian nuclear power plant", submitted by the FARD (Fire and Rescue Department) at the beginning of the preparation of the IP,
- the revised needs for measures provided by the institutions and municipalities in the course of the survey and discussions,
- Insights from experts preparing the IP.

Six criteria were identified for evaluating potential long-list investments, which allowed less efficient investments to be excluded.

In order to ensure that the Project best meets the needs of the target groups, two shortlisted options have been identified as two Project alternatives:

- Option 1 - Acquisition of equipment and tools needed to achieve the objectives of the Project,
- Option 2 - Quantitative and qualitative optimization of equipment.

Project investments, million Eur

Investment groups	Option 1	Option 2
1. Technological structures (RADIS, Automatic Aerosol Radiological Measurement Station, VATESI ESOC Centre)	4.7	1.7
2. Software, communication tools, mobile meteorological equipment, PWIS (Population warning and information system)	3.2	3.2
3. Short-term spare equipment (respirators, masks, disposable clothing, etc.)	2.6	2.6
4. Cleaning equipment for people, premises, machinery, environment	29.1	7.0
5. Mobile sanitation, population collection points	9.1	7.7
6. Iodine thyroid blockers	0.3	0.3
7. Dosimetric control measures	1.9	1.9
8. Public order measures	0.6	0.6
9. Patient transport equipment	0.4	0.4
10. Environmental decontamination measures	0.05	0.05
11. Contingencies	5.2	2.5
Total investments in fixed assets	57.1	28.0

Both alternatives include costs for public information and exercises and training.

Costs of public information and exercises and training, thousand Eur

Costs of public information and exercises and training	2022	2023	2024	2025	2026	2027-2036
Public information program	300	100	50	50	0	0 annually
Exercises and training	100	200	100	200	100	50 annually
Total	400	300	150	250	100	50 annually

Operating costs, estimated at 1-2.5% of the investment value, contingency costs at 10% of the estimated costs. It is important to note that a significant part of the costs will only be incurred in the event of an accident. They will be one-off and only incurred in the year of the potential accident. The direct costs of operating all stations and cleaning equipment for the rescue, cleaning and evacuation of the population during the most critical period (the first 14 days after the accident) will be:

- 5.44 million Eur for Option 1,
- 4.13 million Eur for Option 2.

For the financial and economic analysis of the IP, a Project reference period of 15 years is chosen. The financial discount rate used in the calculations is 4% as recommended by the European Commission. The investments of the Project are expected to be made over the period 2022-2025. The financial analysis of the Project shows that the investments for both alternatives are financially unviable and financially unprofitable for the applicant. This confirms the need for support or public funding for the implementation of the Project. Option 2 is the more financially viable (less financially costly) option. For both alternatives, the viability of the Project will be ensured by the public budget.

The socio-economic analysis (SEA) assesses the benefits (costs) of the externalities, taking into account the nature, aims and objectives of this Project. The socio-economic benefits of the Project are evaluated in terms of two components of externalities: the value of life-years saved and the value of the reduction in working days lost. Estimates of these components are derived from the methodology developed by the CPMA (Central project management agency). Probabilistic calculations and a number of assumptions are used to forecast the quantities of the benefit/cost components of the Project and the value of externalities. The following data and sources have been used to perform the SEA and to formulate its assumptions: Demographic data and projections for Lithuania, population protection and evacuation plans in force in the Republic of Lithuania, the ranking and effectiveness of the Project measures, the effective radiation dose predicted by the VATESI, the accident probabilities predicted by the nuclear safety authorities and authors of empirical studies, the nominal cancer risk factors recommended by the ICRP (International Commission on Radiological Protection), studies of the effects of mental disorders on the labor market, and the consequences of the Chernobyl and Fukushima Daiichi accidents and their countermeasures.

Project externalities (incremental reduction in expected costs compared to the BAU scenario), nominal values, EUR million

Impact	Option 1	Option 2
Reduction of life-years due to the radiation effects of an accident: those leaving within 12> months	16.41	16.61
Reduction of life-years due to the radiation effects of an accident: those leaving within 12< months	9.20	9.31
Reduction of life-years due to radiation effects of an accident: those leaving within 1< month	11.06	11.20
Impact on mental health: direct	10.01	10.14
Impact on mental health: indirect	9.83	9.96
Total	56.50	57.22

Both Project alternatives generate the socio-economic benefits of approximately 56-57 million Eur (expected, nominal) over the period 2022-2036. 65% (approximately 37 million Eur) of these benefits are attributable to the reduction of the radiation impact of the accident as a result of the measures implemented under the Project. The remaining 35% (about 20 million Eur) of the expected benefits are generated by the reduction of mental health disorders caused by the Project measures, which are roughly equally split between the Lithuanian population directly and indirectly affected by the accident.

The socio-economic analysis of the Project alternatives shows that:

- Both Option 1 and Option 2 generate socio-economic benefits of similar value,
- However, Option 2 is much more attractive due to its more than 2 times lower planned financial investment.

Indicators of the financial and economic analysis of the Project alternatives

Financial indicators for the Project

Indicator	Unit	Option 1	Option 2
FRR(C)	%	-	-
FNPV(C)	Million Eur	-70.3	-35.9
FRR(K)	%	-	-

FNPV(K)	Million Eur	-49.0	-19.6
Financial viability	Yes/No	Yes	Yes
ENPV	Million Eur	-23.5	6.1
ERR	%	-	8.4%
B/C ratio	Ratio	0.61	1.20

The Project is financially unviable under both alternatives, but this is typical of CPS investment projects, which are not financially viable but generate socio-economic benefits. For this reason, the indicators of the economic analysis are considered as the main criteria for comparing the alternatives.

The economic analysis shows that the **optimal alternative for the implementation of the Project is Option 2**. This alternative would generate the highest economic net present value. Its highest ENIS indicator confirms that this alternative will generate more economic benefits than economic costs. In summary, the optimal alternative would achieve the Project objective and generate the highest socio-economic benefits.

Potential impact of an accident at BNP on the national economy. A separate scenario has been assessed - the consequences of a hypothetical accident in 2026 and its macroeconomic costs. This indicative assessment is primarily based on the Fukushima accident and its macroeconomic impact case study, and separately identifies the three economic sectors most affected by the accident: agriculture, industry and tourism. If Lithuania were to apply similar countermeasures as those used in Fukushima accident case, the negative impact of the accident on the Lithuanian economy could be felt for about 10 years, and the total damage across three economic sectors could exceed 13 billion Eur. These indicative parameters are the illustration of the magnitude of the potential costs only. The detailed assessment of such costs to Lithuanian economy should be performed additionally and should be a subject of a separate economic study.

Sensitivities and risks. SEA results depend on a wide range of assumptions, the values of which can vary over a wide range. In addition to the fact that the results are subject to assumptions that are difficult to determine, the Project indicators are particularly sensitive to these assumptions. This means that minimal changes in hard-to-determine Project assumptions can lead to drastic changes in the Project performance. One such assumption is the probability of a major accident at BNP (as defined by VATESI) occurring per reactor year.

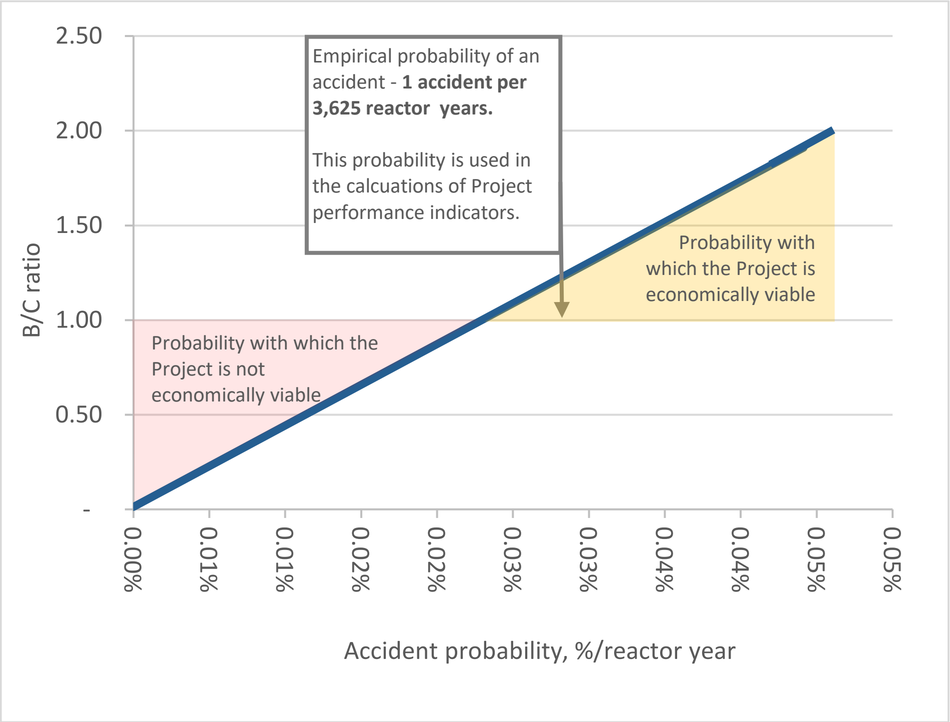

Figure 2. Relationship between the probability of an accident and the Project's economic viability.

The ultimate probability of an accident depends on a number of factors - the probability of a reactor accident (reactor core meltdown), the probability of containment failure, the probability of unfavorable meteorological conditions (wind direction, temperature inversion in the atmosphere) and the probability of human error. A large-scale accident would be caused by the conditional probability of these events, which means that all the events would have to occur together, and their probabilities would be multiplied. It is very complicated to objectively and reliably determine all the above probabilities. Therefore, the probability values are not well known, and the results of the Project are rather ambiguous and very sensitive to the assumptions used in the calculations.

Some of the assumptions applied in the calculations lack reliable sources and/or detailed justifying data. The wide variation in the values of the assumptions used in the SEA and the results of the sensitivity analysis show that the actual accident costs may differ significantly from those probabilistically estimated in this IP. However, the results of the SEA can be useful for a consistent assessment of the consequences of a hypothetical accident, its potential costs and for the planning of the necessary protective measures.