NUCLEARELECTRICA

Approved
Board of Directors,
Chairperson
Teodor Minodor Chirica

NOTE
regarding the approval by the Extraordinary General Meeting of SNN Shareholders of the Investment Decision on Cernavoda NPP Unit 1 Refurbishment Project, based on the Feasibility Study with the implementation of Scenario 2 Enhanced Safety Scenario, as the optimal option for the refurbishment of Cernavoda NPP Unit 1

I. General aspects /competence

According to the provisions of art. 13 par. (4) let. a) of the Articles of Incorporation of SNN, updated on April 5th, 2021, the Extraordinary General Meeting of Shareholders of SNN decides on "a) concluding, by the Company, any contract, **assuming any obligation or commitment which could involve expenses or assuming any other important obligation by the Company,** according to the competence limits provided for in Annex no. 1 to these Articles of Incorporation", and according to the provisions of the Annex to the Articles of Incorporation of SNN, position 2 – "Investment decisions", **for investments with a value higher than or equal to EUR 50 million, the approval competence belongs to the shareholders of the company.**

At the same time, pursuant to art. 113 let. m) of Law no. 31/1990 on companies, republished, as further amended and supplemented, the extraordinary general meeting congregates whenever it is necessary to make a decision for which the approval of this meeting is required, as provided for in the Articles of Incorporation of SNN.

In this context, as will be shown later in this Note, the choice of the optimal option for SNN, in terms of the scenario that will be implemented within the Refurbishment Project of Cernavoda NPP Unit 1, is a strategic investment decision, exceeding the value of EURO 50 million, indicated in the Articles of Incorporation of SNN. Therefore, such a strategic investment decision rests with the shareholders of the company, according to the Articles of Incorporation of SNN and the applicable legal provisions.

II. Presentation

1. Introduction

Nuclear power plants, like any facility, have a limited lifespan, given mainly by the life of the reactor vessel, respectively, in the case of CANDU power plants, the lifespan is given by the assemblies of fuel channels, Calandria tubes and feeders.

By design, Cernavoda NPP Units have an envisaged lifespan of 30 years.

In the early 2000s, as the first CANDU plants neared the end of their first 30-year operating cycle, the CANDU project licensee developed a refurbishment technology enabling them to operate for another 30-year life cycle. The main element of this technology is the replacement of CANDU reactor components (fuel channel assemblies, calandria tubes, feeders, etc.), an activity referred to as retubing. From the operating experience so far, it appears that the retubing of CANDU reactors is technically and economically feasible, allowing the extension of their operation life by another life cycle, in appropriate conditions of safety and economic efficiency. Up to the present date, the following CANDU nuclear power plants have been refurbished and are operating in the second life cycle: Point Lepreau, Bruce Power 1&2, Embalse and Darlington 2.

The main advantages for the refurbishment of a nuclear unit, after the end of the first life cycle, are the following: the upgraded nuclear unit is able to operate at the design parameters for another operating cycle, with an investment of less than half the value required to build a similar new objective. Also, the estimated time to upgrade a nuclear unit is significantly shorter than the duration of the construction of a new unit. Taking into account these considerations, by Decision no. 27 /December 23rd, 2013 of the Extraordinary General Meeting of SNN Shareholders, the Strategy and Refurbishment Plan of Unit 1 of Cernavoda NPP was approved, in order to extend the lifespan thereof, and by Decision no. 9 /September 28th, 2017 of the Extraordinary General Meeting of SNN Shareholders, the start of Phase I of the Strategy for the Refurbishment Project of Unit 1 of Cernavoda NPP was approved.

Unit 1 of Cernavodă NPP was commercially commissioned on December 2nd, 1996 and its first operating cycle ends in December 2026.

Taking into account these data and the international experience in the refurbishment of other CANDU plants, the Refurbishment Project of Unit 1 was structured in 3 phases:

- Phase 1 - November 2017 - March 2022 - Defining the project and approving the Investment Decision based on the Feasibility Study;
- Phase 2 - April 2022 - December 2026 - Implementation preparation (detailed solutions, component procurements, activity implementation planning, infrastructure construction);
- Phase 3 - 2027 - 2029 - Unit shut down, refurbishment project activities actual execution and commissioning of the unit.

The refurbishment project of Unit 1 of Cernavoda NPP is being carried out as planned, now being in Phase 1 of implementation. All pieces of information necessary to establish the input data for the Feasibility Study have been obtained. Based on this information, Ernst & Young prepared the Feasibility Study for the Refurbishment Project of Unit 1 of Cernavoda NPP. This study was approved by the Technical and Scientific Council (TSC) of SNN and presented to the Board of Directors (BOD) of SNN which approved the Investment Decision for this project.

2. Description

The Feasibility Study of the Refurbishment Project for U1 has two components.

The first component of the study, referring to the determination of the maximum value that SNN can invest in refurbishment of U1, so that this investment is profitable, was performed by Ernst & Young, using, primarily, the following assumptions:

- The shareholders will receive dividends amounting to at least 70% of the profit SNN over the lifespan of Unit 1 of Cernavoda NPP;
- The electricity production of U1 in the second life cycle will be similar to the one in the first life cycle;
- The production costs in the second life cycle will be similar to those in the first life cycle.

The second component of the study refers to the cost of refurbishing Unit 1 of Cernavoda NPP. This cost results from the costs of the activities necessary to be performed for the refurbishment of Unit 1: the retubing activity, activities resulting from Condition Assessment recommendations (assessment of the condition of Systems, Strucutres, Components and Equipment, in order to establish the remaining lifespan and the capacity thereof to operate within the project parameters for another life cycle), activities resulting from the implementation of design modifications (activities necessary to maintain the operation of the unit in conditions of nuclear safety and economic efficiency for a new life cycle), activities required to create the infrastructure necessary for project implementation, and from own SNN and project management expenses.

Based on the classification criteria established for the selection into the refurbishment scope, Condition Assessment recommendations and proposed design modifications were divided into two types, namely “Must/Mandatory” and “Recommended”. This categorization resulted from the analysis performed by the technical departments within Cernavoda NPP, was validated by the experts of Canadian Nuclear Partners, which provide technical advice within the Refurbishment Project of U1, and was approved by the Technical and Economic Council (TEC) of Cernavoda NPP.

The Feasibility Study for the refurbishment of U1 presents 3 implementation scenarios, defined based on different structures of the proposed refurbishment scope, in terms of the Condition Assessment recommendations and design modifications selected to be implemented. The definition of the 3 proposed scenarios was approved within the TEC of Cernavoda NPP.

3. Options on the implementation of the Refurbishment Project of Cernavoda NPP Unit 1

According to the aforementioned, for the implementation of the Refurbishment Project of Unit 1 of Cernavoda NPP, 3 scenarios are possible, depending on the Condition Assessment recommendations and proposed design modifications selected to be implemented, respectively:

- Scenario 1 **Mandatory**;
- Scenario 2 **Enhanced Safety**;
- Scenario 3 **Good to Have**.

3.1 Scenario 1 Mandatory

The scope of Scenario 1, **Mandatory**, covers implementation of those Condition Assessment recommendations and design modifications considered **Must/Mandatory,** which ensure the proper authorization and operation of Unit 1 in the second life cycle in terms of nuclear safety, reliability and economic efficiency, according to the assumptions taken into account by Ernst & Young in drawing up the Feasibility Study.

The current cost for the implementation of the Mandatory Scenario 1 is of about 1.81 billion Euros, without taking into account the financing costs and the update with the inflation rate on the date when the refurbishment contract of Unit 1 of Cernavoda NPP is going to be signed.

3.2 Scenario 2 Enhanced Safety

The scope of Scenario 2, **Enhanced Safety,** contains the scope of Scenario 1, **Mandatory**, plus the implementation of the **Safety Related Recommended** design modifications. These design modifications provide, in addition to Scenario 1, an increase in the nuclear safety margins of the plant and take into account the new trends in increasing the plant nuclear safety robustness, that regulators are considering. In other words, we expect the design modifications added to this scenario to become mandatory during the second operating cycle.

The current cost for the implementation of Scenario 2 Enhanced Safety is of about 1.85 billion Euros, without taking into account the financing costs and the inflation rate update on the date when the refurbishment contract of Unit 1 of Cernavoda NPP is going to be signed.

Table 1 shows a comparison between the cost of U1 refurbishment by implementation of Scenario 2 Enhanced Safety, to costs resulting from refurbishment of other CANDU units. From this comparison, it results that the value of the current estimated cost of 1.85 billion Euros, proposed for the U1 refurbishment by the implementation of Scenario 2 Enhanced Safety, is similar to the costs of the refurbishment projects of the other CANDU units.

3.3 Scenario 3 Good to Have

The purpose of Scenario 3, **Good to Have,** contains the purpose of Scenario 2, **Enhanced Safety,** plus the implementation of the **Non-Safety Related Recommended** design modifications and **Condition Assessment Recommended** recommendations, which, in addition to Scenario 2, ensures the alignment between U1 and U2 and an increased robustness upon the occurrence of malfunctions for U1, in the second life cycle.

The current cost for the implementation of Scenario 3 Good to Have is of about 2.01 billion Euros, without taking into account the financing costs and the update with the inflation rate on the date when the refurbishment contract of Unit 1 of Cernavoda NPP is going to be signed.

Table 1 shows a comparison between the cost of U1 refurbishment by implementation of Scenario 3 Good to Have, to the costs resulting from the refurbishment of other CANDU units. This comparison shows that the value of the current cost of 2.01 billion Euros proposed for the refurbishment of U1 by implementing Scenario 3 Good to Have is higher than the value of the refurbishment projects of other CANDU units, except for Darlington 2.

3.4 Personnel Strategy and Organizational Model proposed for the Refurbishment Project of Unit 1 of Cernavoda NPP

By Note no. 1767 /February 11th, 2021, the approval of the SNN Board of Directors was requested for supplementing the total number of positions in the Organizational Chart of the Cernavoda NPP Branch with 101 positions wich are ment to be assigned to Unit 1 Refurbishment Project, in order to properly train the personnel for the next project phases.

The SNN Board of Directors approved this request, and the organizational structure of the Refurbishment Department of Unit 1 was extended by 101 positions, after the approval by CNCAN of the updated organizational structure of Cernavoda NPP Branch.

In order to fill in these positions, a selection contract was concluded with a personnel recruitment company. As a result of this contract, 78 people have been hired so far. This staff is enroled in a general training program, that will be followed by a specific training within Cernavoda NPP. After the completion of the training period, this staff will be used for the implementation activities of Phases 2 and 3 of the Refurbishment Project of U1.

The organizational model envisaged for the implementation of Phases 2 and 3 of the Refurbishment Project of U1 also includes a number of about 15-20 positions of foreign experts with experience in refurbishment projects, as part of «Owner Engineering».

In order to always have an effective control over the development of the project, 3-4 staff positions were provided, owning significant experience resulted from having occupied senior management positions in other refurbishment projects, that will represent an Oversight group at the disposal of the Chief Executive Officer.

As the implementation of the project approaches Phase 3, the transfer of the personnel from the Unit 1 operating organization towards the refurbishment organization will start, depending on the project execution needs, while giving priority to U1 operation under proper conditions.

At the beginning of Phase 3 of the project, the entire satff that ensured Unit 1 operation will be transferred to the refurbishment organization and will work for it until the end of the project, therefrom will be transferred to the operating organization of the refurbished Unit 1.

The transfer of the personnel within the operating organization of Unit 1 will be made entirely for the groups that are dedicated exclusively to the operation of Unit 1, in general the groups providing shift personnel (operation, radiation protection, chemical, etc.), as well as the dedicated technical personnel of U1 (system engineers) and in a proportion of 30-40% for the groups in which the personnel is integrated for the operation of Unit 1 and Unit 2, ensuring priority to Unit 2 operation under proper conditions .

This personnel strategy will ensure the retaining and the transfer of that knowledge required for the implementation of the refurbishment project of Unit 1 in good conditions, as well as for the unit operation following the refurbishment.

The personnel expenses provided for in the Feasibility Study of the Refurbishment Project of Unit 1 of Cernavoda NPP are estimated based upon the previously presented personnel strategy.

4. Assessing options

From the assessment of the aforementioned, it results that the scenarios to be considered for the implementation of the Refurbishment Project of Unit 1 of Cernavoda NPP are **Scenario 1, Mandatory**, and **Scenario 2, Enhanced Safety**, having costs similar to the costs recorded upon the refurbishment of the other CANDU units.

The implementation of these scenarios provides the proper authorization and operation of Unit 1 in the second life cycle in terms of reliability, economic efficiency and nuclear safety, according to the assumptions taken into account by Ernst & Young in drawing up the Feasibility Study.

5. Recommendations

The recommendation of the authors of the Feasibility Study, Ernst & Young, agreed upon by the Refurbishment Department, approved by the SNN Technical and Scientific Council and the SNN Board of Directors, is that the implementation of Scenario 2, **Enhanced Safety,** is the best option to implement the Refurbishment Project of Unit of Cernavoda NPP, as it provides the fulfillment of the requirements of nuclear safety with high margins and an optimal balance between the operational/financial performances of the power plant and the risks of refurbishment/operation following the refurbishment, in the second life cycle.

Likewise, the implementation of the Enhanced Safety Scenario responds to the principle according to which nuclear safety prevails over any other considerations.

SNN operates, by means of the branch thereof - Cernavoda NPP, two high-power nuclear power reactors. In this context, providing nuclear safety and operational safety is the absolute responsibility and priority for SNN/ Cernavoda NPP Branch, as the operator and owner of Cernavoda NPP. This fundamental principle ("nuclear safety first") is also enshrined in law, primarily in Law no. 111/1996 on the safe conduct, regulation, authorization and control of nuclear activities, republished, the CNCAN regulations and the Convention on nuclear safety adopted in Vienna on June 17th, 1994, ratified by Law no. 43/1995.

The implementation of the proposed personnel strategy represents the optimal option for maintaining and transferring knowledge for the accomplishment of the Refurbishment Project of Unit 1 in good conditions and providing the operation of the refurbished Unit 1 in good conditions in the second life cycle.

6. Conclusions

According to the recommendation resulted from the previous chapter, the approval of the **Investment Decision on Refurbishment Project of Unit 1 of Cernavoda NPP i**s proposed, based on the Feasibility Study with the implementation of **Scenario 2 Enhanced Safety,** as the optimal option for the refurbishment of Unit 1 of Cernavoda NPP. The estimated/indicative cost is of EUR 1.85 billion, without taking into account the financing costs and the update with the inflation rate on the date when the refurbishment contract of Unit 1 of Cernavoda NPP is going to be signed.

III. Proposals subject to the approval of the Extraordinary General Meeting of Shareholders of SNN

Considering the aforementioned, **we submit to the approval of the Extraordinary General Meeting of SNN Shareholders the Investment Decision on the Refurbishment Project of Unit 1 of Cernavoda NPP**, with a total estimated cost of 1.85 billion Euros, without taking into account financing costs and inflation rate update on the signing date of the refurbishment contract for Unit 1 of Cernavoda NPP , based on the Feasibility Study with the implementation of **Scenario 2 Enhanced Safety**, as the optimal option for refurbishing Unit 1 of Cernavoda NPP.

We would like to mention that this proposal has also been approved by the Board of Directors of SNN, in the meeting thereof held on January 18th, 2022, according to the provisions of art. 20 par. (4) in the Articles of Incorporation of SNN, updated on January 27th, 2021, corroborated with the provisions of the Annex to the Articles of Incorporation of SNN, position 2 - "Investment Decisions".

Annex: Executive Summary of the Feasibility Study for the Refurbishment Project of Unit 1 of Cernavoda NPP

Chief Executive Officer,
Cosmin Ghita

Chief Financial Officer,
Paul Ichim

Deputy Chief Executive Officer,
Dan Laurentiu Tudor

Cernavoda NPP Manager
Ovidiu Valentin Nae

Refurbishment Manager
Sorin Ghelbereu

Refurbishment Chief Engineer U1
Viorel Vasilache

Manager of the Legal Division
Laura Constantin

Table 1 - Comparison between the refurbishment costs of U1 of Cernavoda NPP and the refurbishment costs of the other CANDU plants

NPP and Unit	Installed Capacity (MW)	Actual cost	Outage timeframe	Actual cost	Inflated actual cost
Cernavodă NPP Unit 1 Scenario 1 Mandatory	706.5	n/a	2027 - 2029	**1.81 bln.EUR**	**1.89 bln. EUR**
Cernavodă NPP Unit 1 Scenario 2 Enhanced Safety	706.5	n/a	2027 - 2029	**1.85 bln.EUR**	**1.93 bln. EUR**
Cernavodă NPP Unit 1 Scenario 3 Good to Have	706.5	n/a	2027 - 2029	**2.01 bln.EUR**	**2.09 bln. EUR**
Bruce Power Units 1&2	805 (each)	4.8 bln. CAD	2005 - 2012	**3.56 bln.EUR**	**3.70 bln. EUR**
Point Lepreau	705	2.4 bln. CAD	2008 - 2012	**1.8 bln.EUR**	**1.87 bln. EUR**
Embalse NPP	683	2.149 bln. USD	2016 - 2019	**1.9 bln.EUR**	**1.97 bln. EUR**
Darlington Unit 2	878	3.152 bln. CAD	2016 - 2020	**2.11 bln.EUR**	**2.19 bln. EUR**

* Actual cost - the current value is the one based on the estimates received/performed in terms of 2020/2021

*Inflated actual cost – the current inflated value up to the presumed signing date of the refurbishment contract for U1, less for SNN Own Expences which were inflated pro rata to the assignment thereof per years until 2029