

**To: Ministry of Energy**  
**Directorate General Privatization and Administration of State Energy Participations**  
**In the attention of : Mr. General Director Mihai Liviu Mihalache**

**Reference : Address Directorate General Privatization and Administration of State Participations**  
**in Energy no. 261 858 / 15.06.2017**

**Mr. Director General,**

Regarding your requests from the address referenced above, we make the following clarifications to:

*- Updated Strategy for the Unit 1 Refurbishment Project of Cernavoda CNE .*

We mention that „Note on the approval of the updated Strategy and Action Plan for the Unit 1 Renovation Project Cernavoda CNE ” and The Action Plan, appended to this note, which have been approved by SN Nuclearelectrica S.A. number 86 dated 05/25/2017, refer and include stages of updated strategy compared to the original form approved in the Extraordinary General Meeting of Shareholders dated 12.23.2013 . These documents , in addition to the updated strategy , also include the projected activities and budgets for the period 2017-2021 , as well as the Level 1 Chart for the Cernavoda CNE Unit 1 Rehabilitation Project .

Against the initial form approved by the AGA in 2013, the updated life extension strategy of the Cernavoda CNE envisages two major complementary action lines that ensure , under current conditions and based on the experience and lessons learned from the most recent refurbishment projects internationally optimum solutions for SNN , in terms of technical , financial and nuclear safety .

The two directions are:

♦ Operation of the unit over 30 years of operational life by exceeding the limit of 210.000 hours to a capacity factor of 80%, provided that the actual capacity factor achieved at Cernavoda CNE up to now is about 90%.

Any nuclear unit has a limited lifetime, set by the project. For units with technology CANDU, is the design life of 210.000 hours of operation at nominal power, which a capacity factor of 80%, translates into an economic operating the operational life of about 30 years. The main components and structures that are limiting the life of the fuel channels, and the tire feederii nuclear reactor.

Unit 1 of Cernavoda CNE was put into commercial exploitation on 2 December 1996.

According to the assessments made so far, because it was exploited at a capacity utilization rate of about 90% since commissioning, superior to the project (80%), Unit 1 will reach the threshold of 210,000 hours Operating at nominal power at the end of 2023. The operation at a higher capacity factor of about 10 percentage points was possible due to the project improvements implemented over time at Cernavoda CNE, as well as to the judicious operation and maintenance mode.

The technical arguments for updating the strategy's stages are based on the fact that in recent years, given that several CANDU nuclear units are approaching the limit of 210.000 hours of rated power, the nuclear industry has researched on the behavior of fuel channels over time And the aging mechanisms that affect them to extend their life span beyond the estimated limits at design time.

- The second line of action is the actual preparation of the refurbishment project by completing the studies necessary for the complex project feasibility, contracting of the works (including procurement of materials) and carrying out the preparatory work (mock-up, training building etc.).

*- The opinion of the company CTES approving the measures/ activities proposed to be undertaken and the timetable for their realization ;*

In Appendix 1 we will transmit CTES Opinion No. 4 dated 22.05.2017, which endorses the updated Strategy and Action Plan for the Cernavoda CNE Unit 1 Refurbishment Project .

*- Analysis of the assessment and assumption by the company's management of the potential risks (economic, financial, technical / technological, nuclear safety) that the actions included in the Action Plan with the theme / purpose "Assuring the operation of Unit 1 during the projected 30-year period at a capacity factor of about 90% and refurbishment projects in preparation for a second cycle of life "and rethinking / reconsidering the project schedule deadlines may have on refurbishment projects and the Unit 1.*

### **Analysis of circumstances**

The inspections and technical analyzes carried out at the Cernavoda NPP to date, coupled with the experience of others States operating CANDU reactors, where the extension of the number of hours of operation over the 210.000 allowed by the national regulator, indicate that there are all the prerequisites that allow the extension of the number of hours in the case of Cernavoda Unit 1 CNE .

In the case of Unit 1 CNE Cernavoda, 30 years of operation can reach about 230.000-235.000 hours of operation, also taking into account a gradual decrease of the capacity factor for the rest of the life span up to 30 years, due to aging Unit, and ensuring all aspects of nuclear safety.

Even in this context, SNN will implement a set of measures whose purpose is to demonstrate unequivocally that one unit can operate in conditions of safety beyond the 210.000 hours of operation, according to the initial project.

Extending the number of hours has a significant positive impact on SNNs from consideration :

- Higher electricity production than estimates in the economic model used to initially determine the feasibility of the CANDU project for Romania under nuclear safety and environmental projection;
- Extending the period of internal financial accumulations from the flows generated by SNN by 3-4 years, which means a significant reduction of the borrowing requirement for the project, given the estimated costs of about 1.2-1.5 billion EURO for the entire refurbishment process .

SNN held preliminary discussions with Candu Enegy and CNCAN experts on the extension of hours, discussions that indicated an opening to operational procedures with the extension of hours of operation while fully respecting the requirements of nuclear safety, which is a constant priority of SNN.

### **Risk analysis of life extension**

#### *Economic and Financial Risk*

From the economic and financial point of view it is estimated that the profit obtained from the operation of Unit 1 during the expansion of its operation over the 210,000 EFPH will be significantly higher than the expenses.

Specifically, this strategy reduces the financial risk of the refurbishment project. One of the targets is the accumulation of approximately 100 million EUR , the amount of additional funds accumulated over the three-year extension period needed to finance the investment .

The risk that studies and work done to extend the life span does not confirm the expectations justified by good international practice and the inspections made to date have a very low probability .

#### *Technical / Technological Risk*

Research programs and studies conducted by the Canadian industry have shown that the service life of fuel can be extended beyond the initially estimated design time (210,000 EFPH). The results of these research have been included in the current edition of the standards governing the design of the fuel channel. On the basis of these and after completion of the inspection activities, tests and measurements on the fuel canals, including pressure tubes, the regulatory bodies of Canada and Argentina have approved the extension of the life of some CANDU units as follows :

- ✓ Bruce Units 5 and 6 to EFT 245.000
- ✓ Pickering NGS up to 247.000 EFPHs
- ✓ Embalse up to 225.000 EFPHs

The measurements and assessments made so far on the current state of the fuel channel, feeder and other main equipment of Unit 1 resulting from In Service inspections and preliminary engineering estimates highlight the fact that there are no technical reasons And / or nuclear safety that will cause a negative impact or additional limitation of the number of hours for Unit 1 at Cernavoda CNE . Also, the further development of PlIM programs and the contracting of necessary studies and analyzes with the designer and with engineering consultants in Canada with experience in the field represent measures to minimize the technical / technological risk.

### *Nuclear Security Risk*

The Cernavoda CNE facility management program ensures the maintenance of the existing security level. The operation of the unit will be carried out in compliance with the norms, procedures and instructions at the level of excellence ascertained by the international evaluations, and in this period, the functioning of the fuel channels shall be monitored in the parameters of the CSA N 285.4 and CSA N 285.8 standards.

As far as the impact on the terms of the refurbishment project schedule is concerned, the operation of Unit 1 over the 30-year period gives the opportunity for better organization in preparation for the project. It also provides additional time to provide the necessary funds, conclude and run engineering contracts, purchase equipment and works, prepare staff, etc.

To the extent as repeated inspections carried out during the extended period would reveal accelerated wear, the capacity factor would be reduced accordingly and even, as the case may be, the unit would be stopped in a timely manner.

In this way, the prospect of extending the life span would, of course, be abandoned, either prematurely or partially, possibly with a diminished impact on the proposed budget of 70 million lei. The impact is estimated in the hypothesis that 50% of the 30 million ROL, estimated / budgeted for repeated monitoring / inspection during the extended period, would be spent, combined with the hypothesis of reduced power operation with zero result (without benefits and without Operational losses).

### **Conclusion**

The updated strategy for the Unit 1 Refurbishment Project, which provides for a prior measure in the project preparation plan, the extension of the life span, a measure economically and financially beneficial, implies reduced and controllable risks from the point of view Technical, operational and financial conditions under well -controlled nuclear safety conditions, in comparison with the strategy's objective of setting up additional own funds for the upgrading project up to EUR 100 million over the extended period, subject to the retention of those benefits and their non-distribution to shareholders .

The analysis concludes on extending the life circumstances, to acquire additional resources to finance the refurbishment project is that it can bring significant benefits to the financial situation of SNN .

*Situation of endorsements / agreements by the institutions responsible for the project refurbishment (CNCAN environmental authority, etc.) and whether there were / any consultation between the company management and the institutions .*

Until now, the licensing authorities (CNCAN, Environmental Authority, etc.) have not issued authorization requirements for the Unit 1 Re-Technology Project. However, the international experience in long-term refurbishment and operation projects From Canada, Europe, USA, shows that the documentation needed to extend the lifetime of the NPI over the lifetime established by the project and the operating authorization, generally includes two main packages: "Periodic Review of Nuclear Safety" and Integrated Assessment Environmental impact, to obtain the environmental agreement. In addition to these core documentation packages, an updated Nuclear Safety Final Report will be required which will contain a brief description of aging effects programs and activities and the evaluation of aging analyzes for the extended period of operation and LBD documentation (Base Licensing Project). Regarding the consultations with the competent authorities, we mention that there is always a constructive dialogue between SN Nuclearelectrica S.A. And their counterparts from the competent authorities since July 2014 to ensure good preparation and deployment of the Unit 1 Renewable Energy Project. Currently, SNN is conducting a study with the plant designer to establish together with CNCAN the authorization strategy and implicitly The requirements for obtaining it .

**With consideration ,**

**Chairman of the Board of Directors**

**Iulian-Robert Tudorache**

*Chairman of the Board of Directors*

**General Director ,**

**Daniela Lulache**

Approved  
Director General  
Daniela Luîache  
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Technical-Economic and Scientific Council  
Nr. 6158 / 22.05.2017

**Advice CTES nr. 04/22.05.2017**

Documentation analyzed :	Updated Action Plan and Action Plan for UNE Cernavoda Unit 1 Retechnology Project
Elaborated by :	SNN
Beneficiary :	SNN
Date of meeting :	22.05.2017

**FINDINGS**

Compared to the previous version of the Strategy and Action Plan for the Retrofitting Project, approved by the Extraordinary General Meeting of Shareholders by Decision No. 27 / 23.12.2013, the version analyzed in the CTES brings some new elements, such as:

- <sup>1</sup> The possibility of extending the hours of operation at nominal rot over at 210,000 hours provided for in the original design to achieve an operational lifetime of 30 years.
- information resulting from international experience in projects aimed at expanding the number of operating hours at nominal rot in countries such as Canada (Bruce, Pickering, Darlington) and Argentina (Embalse)
- \* Modify the Preliminary Level 1 chart by introducing the step of expanding the number of hours of exploitation at nominal rotation and by updating the duration and period of activities.

Extending the number of hours of operation:

The recent international experience regarding the possibility of extending the number of hours of operation to nominal power: Bruce - Canada (+37.000 hours), Pickering - Canada (+37.000 hours), Darlington - Canada (+25.000 hours), Embalse - Argentina +15.000 hours) reveals that the possibility of extending the number of hours of operation to nominal power is feasible .

Studies and periodic inspections on behavior while components Unit 1 and monitor degradation mechanisms associated components "time - limiting" and pressure tube reactor, allowed at the end of 2015, to estimate by Candu Energy that hope Life for them at Unit 1 CNE Cernavoda could reach at least 220.000 – 230.000 hours of nominal power .

Current estimates indicate that there are all positive premises to allow Unit 1 to extend the number of hours of operation over 210.000 hours to reach the 30-year operational lifetime at nominal power .

The impact of such an extension has a strong positive effect on SN Nuclearelectrica S.A. (SNN) for the following main considerations:

- “ Ensures the operation of Unit 1 for the initial projected 30-year period in the conditions of higher electricity production compared to estimates in the economic model used for the initial (historical) determination of the feasibility of the CANDU project for Romania under nuclear safety and the observance of all Environmental requirements.
- Extend the period of internal financial accumulations from the flows generated by SNN by about 3-4 years, with relatively low costs, leading to a significant reduction in the financing needs of re-financing (loans)

We mention that the informative preliminary discussions, which SNN and Candu Energy experts had with CNCAN, indicate that the Regulatory Authority has shown openness regarding the actions aimed at the operation of Unit 1 beyond the number of hours initially projected At rated power, before re-activating the active area, under conditions of full compliance with the nuclear safety requirements .

In addition to the aforementioned positive aspects, the extension of the number of hours of operation to rated power over the initially estimated 210.000 hours has an important contribution and a positive impact on the refurbishment program, and represents an important milestone in the Rehabilitation Project of Unit 1, In order to obtain an additional period of approximately 3-4 years, available for the optimal organization and preparation of the actual refurbishment works .

### **The strategy and the plan for the retrofitting of the Unit 1**

The refurbishment project will be carried out in stages, as follows:

- i. Ensure the operation of Unit 1 for a period of 30 years
- ii. Preparing for the organization of the refurbishment project
- iii. Preparing the necessary documentation and approving the project
- iv. Developing pre-project activities
- v. Implementation of the refurbishment project

As far as Stage i) is concerned, it is intended to ensure the operation of Unit 1 for a period of 30 years. in this context, we mention that SNN has signed a contract with CANDU Energy, as Design Authority, and that by the end of 2017, the report will indicate the number of operating hours at nominal power, additional the estimated 210.000 hours of the project , and a plan of measures

and activities necessary to achieve this goal. The report will then be forwarded to CNCAN for analysis and evaluation in order to obtain the agreement of principle .

Stage ii) To prepare the organization of the refurbishment project, scheduled for March 2017 - 2018, aims mainly to elaborate the study on the organization of the project as well as the implementation of the resulting organizational and logistic changes. To this end, in May 2017, a contract was signed with the Association consisting of the companies AMEC Poster Wheeler Nuclear RO SRL and AMEC NSS Limited, for a study on the optimal way of organizing the refurbishment project \* The value of the contract being 660,950 lei.

In the period 2018-2021, corresponding to Stage iii), the supporting documentation necessary for the preparation of the Feasibility Study will be prepared, and at the end of this stage, considered to be the year 2021, the study will be subject to the approval of the General Meeting of Shareholders .

Stage IV (2021-2026), following the approval of the Feasibility Study of the project, will mainly focus on :

<sup>8</sup> Development of engineering packages related to project changes

<sup>8</sup> Procurement of long-cycle manufacturing equipment and components

“ The award of the engineering, procurement and construction contract (EPC)

<sup>8</sup> Obtaining from CNCAN the authorization to start upgrading works.

The last stage, Stage v) represents the stage of effective implementation of the retechnologization project and it is expected to take place between December 2026 and December 2028, under the conditions in which the project is being implemented in the minimum duration currently estimated at 24 months .

On the basis of what is documented and the views expressed ,

THE TECHNICAL - ECONOMIC AND SCIENTIFIC COUNCIL  
OF THE NATIONAL SOCIETY NUCLEARELECTRICA S.A.  
DECIDES APPROVAL

Documentation  
analysed

Updated Strategy and Action Plan for the Rehabilitation Project of  
Unit 1 CNE Cernavoda

**President meeting :**

**Daniela Lulache**

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**Referent : Adrian Cojacu**

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**Secretary : Alexandru Marciulescu**

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