RISK MANAGEMENT SOLUTIONS FOR CERNAVODA UNIT #2 NPP COMPLETION

Teodor Chirica, Stefan Pall
Societatea Nationala “Nuclearelectrica” S.A.
33, boulevard Gheorghe Magheru, 5-6th floor, sector 1
P.O.BOX 22-102, R-70164 Bucharest, Romania
E-mail: dchirica@snn.rdsnet.ro, spall@snn.rdsnet.ro

ABSTRACT

The greatest risk facing today’s electric utilities is change. Utility risk managers are being challenged to address the changes of deregulation, new technologies and changing work force. The utilities must be more aware of where all its costs are located to face with the challenge of competition, forcing them to respond with lower prices and innovative services.

For completion of large projects, like Cernavoda NPP – Unit 2, the utilities are facing also with certain specific risks: politic, economic, social. The natural perils or machinery breakdown are common risks for operation as well as for construction-commissioning projects. Beyond the explicit challenges associated with the completion of a nuclear power plant in a transition economy environment, the utilities are facing with new risk factors such as professional liability, political risk, product warranty and liability, international exposure, etc. Changes in other governmental policies are also affecting large projects, mentioning healthcare, workplace safety, workers’ compensation, environmental clean up, etc.

1 INTRODUCTION

The intention of this paper is to present some specific risks associated to the completion of Cernavoda NPP-Unit 2 Project. Their potential impact and some solutions to reduce the exposure for Societatea Nationala Nuclearelectrica (SNN) SA, the utility in charge with finalization of the project are also presented.

2 STATUS OF THE CERNAVODA NPP-UNIT 2

Today, Cernavoda NPP - Unit 2 is in an advanced state of equipment installation and is more than 50% complete. Once Unit 1 was completed at the end of 1996, SNN turned its attention to Unit 2 and proceeded with the installation of much of the equipment already procured. When Unit 2 enters commercial operation, Cernavoda will be supplying close to 16% of Romania’s electricity needs, considering the expected increase of the national demand.

In addition to the purchase of certain specialized nuclear equipment from Canada, Italy, France and United States, approximately US$ 350 million will be spent with Romanian industry to complete Unit 2 and thousands of jobs will be created. Needless to say, the project will have a significant impact on Romania’s economy over the next few years and is viewed as a priority by the Romanian government.
The Cernavoda Project benefits from a sound industrial support network, made of by the Fabrica de Combustibil Nuclear (Nuclear Fuel Plant) in Pitesti, operated by SNN SA and the Fabrica de Apa Grea (Heavy Water Plant) - ROMAG, located in the south-west of Romania, near Drobeta-Turnu Severin. The “brain” support for the Romanian Nuclear Program is provided by the Institutul de Cercetari Nucleare (Nuclear Research Institute) - ICN for specific Research and Development (R&D) activities and by the Centrul de Inginerie Tehnologica pentru Obiective Nucleare (Center for Nuclear Projects Engineering and Technologies) - CITON for design-engineering activities. ROMAG, ICN and CITON are subsidiaries of the Regia Autonoma pentru Activitati Nucleare from Drobeta-Turnu Severin. Specialized industries such as uranium mining, milling and concentrating in Compania Nationala a Uraniului were also developed.

Romania has also developed a network of dedicated nuclear infrastructure, beginning with an educational system to industry and research-engineering capabilities. We may mention from the industrial and services sector the following: General Turbo, Heavy Component Plant for NPP- FECNE Kvaerner, Vulcan, Aversa, Titan Echipamente Nucleare, Automatica, Retrom, Electricom, etc., from construction-erection sector: Nuclear Montaj, Trustul de Montaj Utilaj Chimic, General Concrete, etc., from engineering and research sector: Institutul de Studii si Proiectari Energetice (ISPE), EUROTEST, Institutul de Cercetari pentru Metale Rare, CEPROAR, Institutul de Cercetare si Proiectare pentru Echipamente Termoenergetice - ICPET and the Institutul de Fizica Atomica - IFA. We can further mention actors operating in nuclear insurance being provided through the Romanian Atomic Pool.

In May 2001, SNN SA and AECL-ANSALDO concluded a new contract specific for Cernavoda NPP – Unit 2 completion, with the aim to start the commissioning tests in 2004. The partners are now focused on securing financing to complete the project by 2005-2006. The financing resources for Cernavoda NPP-Unit 2 include foreign loans from Canada, USA and Europe, as well as the Romanian State contribution and SNN own resources.

The Canadian and European loans will be used to finance the imports, such as equipment and materials, technical assistance etc. from Canada, Italy and France. Also, for financing the General Electric – USA contribution to the turbo-generator completion, a credit coming from USA could be obtained.

3 ASSOCIATED RISKS FOR CERNAVODA NPP-UNIT 2 COMPLETION

3.1 Pre-contractual risks

Under this category are identified risks that could affect the effectiveness of the Completion contract for Cernavoda 2. Some examples are the following:

a) political risk
b) reglementation risk
c) financing – guarantees risk
d) insurance risk
e) human expertise risk

a) Political risk - is not considered a real one, the position of the decidents being favorable to the development of the nuclear power in Romania, independent from their political orientation. An example represents the Ordinance No. 126/2000, issued by the
former Government in August 2000 and later on adopted as Law No. 335/2002 by the new Parliament of Romania, resulted after the elections from Autumn 2000. However, the existent Government paid much more attention to Cernavoda 2 Project implementation, having the strong support of the Parliament and the Presidency. There is not an opposition for this Project from any other political force represented in the Parliament.

b) **Reglementation risk** - considers the possible changes of the existing legislation, mainly dealing with nuclear and environmental regulations. The Romanian legislation and regulations in force are consistent with the international conventions, norms and directives, and this risk is not perceived to be a real one. However, the decision of the European Union to set-up a common set of enhanced safety standards, higher than the IAEA safety guides, has to be correctly approached by the Romanian authorities in charge, considering the specificity of the only CANDU reactor in operation/construction in Europe, at Cernavoda NPP, Romania. Preliminary evaluations consider that the existing CANDU are fulfilling the new European Light Water Reactor Requirements, but detailed analyses have to be performed.

c) **Financing-guarantee risk** - is an important aspect, but the commitment of some important international banks to provide long term credits for Unit 2 completion, as well as the transparency from the Export Credit Agencies (ECA) to provide guarantee for these loans is reducing very much the financing-guarantee risk. An attention has to be paid to the environmental aspects and environmental planning program for the upcoming years on the Cernavoda Unit 2 project, today ECAs are focusing very strong on this aspect. On the Romanian side, the Romanian Government Sovereign Guarantee, requested by the proposed loans, represents also a factor of risk, considering that the Government has to negotiate the debt ceiling with International Monetary Fund.

d) **Insurance risk** – after the events from September 11, 2001 the Insurance market become much more reluctant in covering large projects and an increase of costs correlated with strengthening of the conditions. However, Cernavoda 2 Project is “insurable”, the insurance is available and the major insurers with expertise in large projects construction-erection all risk coverage are present. The only real matter represents the cost, higher than compared with previous years. As risk point of view, also as a result of last September events, the terrorism risk is not covered by the insurance.

e) **Human expertise risk** – the long gap between the commissioning of Unit 1 and restart of Unit 2 activities induced some draining of expertise from the Utility side, as well as for the local sub-contractors. SNN maintained a core team, with experience from Unit 1 completion. Also, the main local sub-contractors maintained at site core teams with expertise from Unit 1 Project. In order to increase the expertise and to balance the “brain drain” from Cernavoda site to foreign countries, specially to Canada, SNN started program to attract young students at Cernavoda site, offering scholarships and jobs after graduating the universities. This risk is continuously, and a proper management of human resources could reduce it.

### 3.2 Risks to be considered during Project completion

During Cernavoda Unit 2 Project completion there are specific associated risks, concerning many aspects, such as:

- **Managerial risk**
- **Late financing risk**
c) social risk
d) natural perils
e) fire risk
f) hot testing and commissioning risks
g) nuclear risk
h) liability risk

a) Managerial risk – could affect mainly the Budget and the Schedule of the project. The evaluation of such risks consider the economical impact over the tariff and sensitivity analysis are requested to evaluate their impact.

The Investment cost for NPP Cernavoda Unit 2 completion works is about US$ 700 millions, and the levelized Unit Energy Cost evolution vs. Investment cost evolution is the following:

![Figure 1: Levelized Unit Energy Cost vs. Investment Cost](image)

From the timing point of view, a longer schedule could affect SNN SA twice, once from supplementary cost of the project, involving increased funds from credits, state budget and company own funds as well as the loss of non-delivered power at the agreed time with the distributors, including penalties. Also, penalties for late payments or cost of the renegotiation of credits have to be considered. The evaluations indicate that the impact over tariff is not very important.

As protection for such risk, the utility could buy from the insurance market specific coverage for Delayed Start Up (DSU), also called Advance Loss of Profits (ALOP). There are also contractual methods to mitigate such loss, such as the performance bonds.

b) Late Financing risk – is more addressed to local financing, and the experience from Unit 1 show that some delays in project completion resulted from delays in receiving financing from the State Budget at the right time. The result is the same as the above, increasing schedule and budget, affecting the efficiency of the Project and the economicity of the Utility. This risk could not be allocated to the Contractors, the Utility caring entire liability.
One method to reduce this risk is to obtain proper financing to cover the local portion from multilateral institutions like the European Bank of Reconstruction and Development or EURATOM.

c) Social risk – is considering mainly social convulsions that may affect the Project, starting with protests, strike and finishing with riots. This risk could be also associated with managerial skills of the Management Team and sub-contractors, in proper motivation of the participants to the Project. Of course that not only site activities could influence this risk, sometimes impact may come from the outside of the project.

d) Natural perils – such earthquake, flood, severe storm, ice storm, etc represents risk that may affect the Project progress. The mitigation of those risks started with Cernavoda site selection process and continued during design and construction process. However, they cannot be fully neutralized, so the protection against them could be enhanced using proper insurance coverage, such as a Construction Erection All Risk (CEAR) policy.

e) Fire risk – seems to be the most frightening one, the statistics mentioning it as one major cause of loss during construction as well as during commissioning and after that in operation. The nuclear companies are making successful efforts to minimize potential for fires and resulting consequential damages caused by fires. A CEAR policy is including also the fire risk, but before to subscribe such coverage, the Insurers are proceeding to detailed inspection of the fire risk presented by the site during construction and later on in commissioning and operation.

f) Machinery (mechanical and electrical) breakdown – represents a risk associated with hot testing and commissioning phases of the Project. This risk is the main cause of loss during operation, and one of the most important during commissioning, after the main pumps start to operate for the first time in the history of the Project or the first steam is introduced in the Turbine. Supplementary to the technical and administrative measures to reduce this risk, CEAR coverage includes it too. The Insurers are reluctant also with this risk, usually from the inception of Hot tests and commissioning they are increasing dramatically the deductibles associated, with 5 to 10 times compared with the construction-erection time.

g) Nuclear risk or core damage – is specific to nuclear projects, and its potential occurrence is associated with the first introduction of the nuclear fuel into the reactor, when so-called High Radioactive Zone appears. The probability to have a loss resulted from the nuclear risk is considered to be very small; in fact there is no evidence for such occurrence during commissioning and initial operation. The only losses registered during the history of nuclear energy are those associated with Three Mile Island and Chernobyl. This risk is excluded from CEAR policies and is considered only by specialized insurers – nuclear pools.

h) Liability risk – representing the potential of third parties to request indemnities for losses, injuries or deaths caused by the project during construction or commissioning-operation. For the last case, specific legislation is set-up at international level (Vienna Convention on Civil Liability for Nuclear Damage of 21 May 1963 as Amended by the Protocol of 12 September 1997) and at national level (Law No. 703/03.12.2001 on civil liability for nuclear damages). Proper coverage are available for construction-erection period as well as for commissioning-operation, the last provided by the specialized nuclear insurance pools.
It is important to note that the nuclear pools can cover only a limit of risk, in terms of money and prescription period (10 years instead of 30 years). Any losses exceeding the capability of nuclear insurance have to be covered by the State.

3.3 Risks during plant operation

It is not in the intention of this paper to detail the risks associated to the operation of Cernavoda Unit 2, but we can only indicate some categories:

- political, regulation, insurance, human expertise, managerial, lack of revenue, social, fuel costs fluctuation, operation and maintenance variable cost fluctuation, etc., generally not easy to insure
- natural perils, fire, nuclear, liability, etc. generally covered by nuclear and non-nuclear all risk insurance and nuclear and non-nuclear liability policies

Other risk to be considered during operation is the managerial risk and the insurance marked developed instruments to protect the companies against mismanagement, like Directors and Officers (D&O) liability insurance and Company Indemnification.

4 RISK MANAGEMENT AND RISK MITIGATION

The pre-contractual risks are usually out of utilities control. For some of them utilities could make nuclear lobby activity, informing the decidents about the benefits of the nuclear power, but the main condition of success is represented by a real political will to develop a nuclear program. Of course, this program should be part of a realistic power sector development strategy.

For the case of Romania, the political commitment to develop nuclear power is real and fully demonstrated. This commitment is supported by the National Strategy for the Development of Romanian Energy Sector on Medium Term, demonstrating the necessity to complete Unit 2 project within the next future. For Romania there is no indication that a political change involving a government opposed to use of nuclear power is probable or possible in the foreseeable future.

The Romanian experts have to play an important role in setting-up the new set of European safety standards for nuclear power plant, in order to consider correctly the safety features of our Cernavoda NPP, CANDU type.

Proper human resources management and motivation of personnel working for Cernavoda NPP can mitigate the risk of loosing the human expertise.

During project completion, the Management Team has to develop proper risk management activity, correlated with a Construction Erection All Risk and Third party liability insurances in force. Such coverage is considering the construction-erection period, hot testing and commissioning, as well as a maintenance period. However, the high level of deductibles provided today by the Insurance market increase the retention of risk at the Utility level. For Cernavoda Unit 2, the deductibles during hot testing and commissioning of one million USD for any item, except Steam Turbo-generator were a deductible of two million USD is applicable, are giving a certain level of risk to SNN.

Once the nuclear fuel is first time introduced into the reactor, the existing Nuclear and non-nuclear all risk, as well as the Nuclear and non-nuclear liability insurances, in force for
Unit 1 and Nuclear Fuel Plant have to be extended in order to cover also Unit 2. Until the completion of Unit 2, for a period of time, the ‘conventional’ and the “nuclear” insurances will coexist, and the SNN has to manage their interfaces in order to prevent any gap of coverage among them.

During operation there are some other insurance tools to protect a nuclear Utility like Business interruption/Extra expense/Replacement power insurances.

5 CONCLUSIONS

SNN is confident that the level of risk at Cernavoda Unit 2 site is quite low. A recent independent site evaluation stated that, in overall terms and in a world wide context, with regard to property damage, the Cernavoda Unit 2 completion project is an average to better than average risk. This evaluation is for a scale of Risk rating from poor to worse than average, average, better than average and finally good. For the insurers world this evaluation recognize that from the risk point of view, Unit 2 completion is ranked above the average. The result is reflected by the highest level of defects exclusion (LEG3), good terms and condition of the policy and reasonable premium level, considering the today trends of the insurance market.

REFERENCES


