Chernobyl NPP Nuclear Liability and Risk Management Solutions

Description

1) Background
The Ukrainian government shut down Chernobyl station operations in December 2000. Due to the closure, the President and the government of Ukraine decided to separate the power plant from Energoatom and establish a new operator to carry out specific tasks on the station decommissioning, shelter transformation, and waste management. A new operator was an entity established on the basis of Chernobyl NPP.

The result of this structural change was, among others, the transfer of the risk management function from Energoatom to a new Chernobyl NPP operator. A new enterprise was likely to face an array of risks, particularly in the area of nuclear liability, while risk management activities would be new to the company and its staff. A new operator required assistance from experienced risk managers to identify research, quantify, and mitigate these risks.

Furthermore, Energoatom insurance of nuclear liability excluded Chernobyl NPP and the necessity to cover this risk was quite acute as well as the need to identify the sources of financing this risk mitigation.

2) Objectives
The objective of the project was to develop the risk transfer and retention programme for the Ukrainian government and Chernobyl NPP operator. The programme focused on financial coverage of nuclear liability and other risks of a newly created nuclear facilities operator so that it meets international risk mitigation requirements.

In fact, the transfer of the European nuclear risk management experience was one of the key factors to ensure safety and efficiency of the decommissioning and waste management process that would be performed in the context of the Ukrainian legal system.

In order to achieve the above mentioned objectives and to develop the relevant recommendations, it was necessary to split the project into the following tasks:

- Risk assessment at the site
- Research on local and international nuclear legal environment
- Comparative study of nuclear and non-nuclear decommissioning risks and their mitigation
- Development of insurance and non-insurance solutions and identification of the potential financing sources
- Development of a programme for risk transfer and retention for clear liability and other priority risks

3) Project results-achievements (with reference to the TORs)
Risk Assessment
Chernobyl NPP station, which had a significant accident to Unit 4 in 1986, can be considered as two separate entities. Units 1,2 and 3 will be decommissioned in accordance with the
international guidelines and Unit 4 Shelter will be stabilised, reinforced, monitored. A new shelter will be provided and future decommissioning plan determined. New facilities for waste treatment in course of the decommissioning process will be built onsite or within the 30 km exclusion zone.

The site is not exposed to any significant risk from any climatic/geological scenario. Flood risk is remote, the site level being +114m above msl, cooling lake +110.9m above msl and the river maximum level is 105m above msl. No flooding has been experienced previously at the site. Aircraft damage risk is low, the nearest airport being approximately 160 Km away and there are no commercial aircraft flight paths over (a permit to over fly is required). Moreover, the reactor ventilation stacks and other stacks (four in total) are fitted with aircraft warning lights.

Earthquake does not represent a credible risk, this part of the continent not being a seismically active area. The plant is designed for earthquake intensity of 5 on the Richter scale although most likely withstand 6. In the Romanian earthquakes of 1986 and 1990 an intensity level of approximately 4 was experienced at site. This had no discernible adverse effect on the Shelter.

During the next 5 to 10 years the main risk is related to the structural collapse of the shelter, which could cause dispersion of radioactive dust outside the exclusion zone.

High standards of site security are provided; therefore sabotage or malicious damage is unlikely. There is security guard manning at the three exclusion zone boundary 30 km entry points and the single Chernobyl industrial zone boundary 5 km entry point, and the Unit 4 site boundary 100 m-entry point. Site security is excellent with continually manned (Ukrainian Army) access points.

Fixed fire protection system comprises a dependable on site water supply the cooling lake and independent underground water wells (about 26 units with 6 in permanent operation), external/internal hydrants, hose reels, water spray protection to main transformers, over the electrical fire pump set, and electronic equipment rooms.

Fire protection is reliant on the presence of the trained site fire brigade specialists (6), the operational response teams and the army. There are six fire emergency training exercises per year.

CHNPP has a suite of emergency preparedness procedures and incorporates regular emergency action plan training exercises for fire prevention. We understand that full-scale action plans for dealing with nuclear emergencies specific for decommissioning do not exist although the existing emergency procedures fully cover all situations, including emergency situations during decommissioning (about 80 emergency situations). The new emergency procedure was simplified (will contain only 10 emergency situations) and all operation emergency situations were excluded: only decommissioning emergency situations were considered. The new emergency procedure document was completed in 2002.

Approximately 5000 staff members are on site. They will be required to operate the new process and waste plants as they come on stream.

In summary, the decommissioning of units 1, 2 & 3 was regarded as following established western decommissioning practice. Together with the advanced technology design for waste treatment, which has good operational experience elsewhere, it was confidently anticipated that the operator training programme in force should ensure high operational standards.

**Study of local and international legal field of nuclear energy issues**

The Consultant studied the legal possibilities of the following methods of financial security for civil liability of the operating organisation of the nuclear installation "Chernobyl NPP" for
nuclear damage:

- The possibilities of insurance of security of nuclear and other major risks

  The legislation foresees the following kinds of mandatory insurance:
  - mandatory insurance of the operating organisation's civil liability for nuclear damage which may be caused by nuclear incident;
  - mandatory insurance of civil liability for other kinds of damage which may be caused by the incident at Chernobyl NPP.
  Despite the absence of legal determination of many important provisions concerning implementation of such kinds of insurance their implementation will not contradict Ukrainian legislation and is admissible.
  The implementation of other kinds of insurance of the nuclear installation's "Chernobyl NPP" operating organisation's risks is a fortiori admissable and lawful, though they are not mandatory.

- The possibility of securing the risks of the operating Organisation of the nuclear installation "Chernobyl NPP" by the State.

  Though the station does not establish any requirements concerning the possibility of securing for the risks of the nuclear installation's "Chernobyl NPP" operating organization by the State, the particular cases of securing for such risks by the State, especially the securing for the liability of the nuclear installation "Chernobyl NPP", were legally established.
  It seems that such securing is quite possible in the future too. With reference to the publicly owned property of the operating Organisation the State absolutely bears the risk if its damage, waste or loss.

- Conclusion of Stand-by Agreement (credit line) with bank institutions

  Using the method of securing the major risks of the nuclear installation's "Chernobyl NPP" operating Organisation by conclusion of stand-by agreement is actually forbidden by credit legislation of Ukraine.

Comparative Study of nuclear and Non-Nuclear Decommissioning Risks and their Mitigation

In principle, risks in course of decommissioning of nuclear power plants do not deviate much from those of a nuclear power plant in operation. This is especially valid for stage 1. Nuclear risks which depend heavily on the radioactive inventory of the plant and decrease running through the different phases of decommissioning.

As long as the fuel remains in the reactor core or in the spent fuel pond, the risk of uncontrolled criticality as well as the loss of residual heat removal has to be taken into consideration. In this phase damage to irradiated fuel elements can lead to a major contamination inside the plant or of the environment. In connection with a fire, the contamination can spread over a wide area around the plant. That is the reason why authorities require all safety systems being in full operation as long as fuel is onsite and that the operating personnel is staffed as it was during operation. Regarding the financial guarantee for third party liability claims there is no change compared to the operation phase. Liability for third party losses is still channelled to the operator of the plant.

When the irradiated fuel left the site or is stored in safe intermediary storage facilities, more than 99% of the radioactive inventory are in a safe condition. That is the time when -
depending on the national legislation - authorities may reduce the amount of financial
guarantee for third party losses. This reflects the reduced risk for nuclear damage to workers
and environment. Main concern is a fire in the waste treatment plant where low and medium
active waste is treated.

Mechanical, abrasive methods are often used for decontamination of buildings and
equipment and for dismantling of radioactive items. These bear the risk of generating
airborne aerosol contamination. Advanced techniques can reduce the risk. Adequate
radiation protection methods have to be applied to protect the workers against external
radiation and inhalation of airborne activity. Exchange of experience about decontamination
methods, dismantling techniques and demolishing methods from plants, which ran already
through decommissioning, will improve the handling of these risks.

Apart from any contamination of plant on the surface of buildings and inside or on the side of
piping, pumps, and containers, the remaining radioactivity comes from components, which
have long been exposed to neutron irradiation. These are generally the reactor vessel itself
with internals and the biological shield. The half-life of most of the different isotopes is such
that after 50 years from closedown their radioactivity is so much diminished that mechanical
demolition of this highly irradiated equipment is not necessary to be done on a remotely
basis.

Property insurance is generally taken by Western Nuclear Power Plant operators. Except for
the United States, property insurance is not compulsory. The insured value is generally the
new replacement value. Reimbursement is also granted for decontamination costs and some
additional costs as for fire fighting or removal of debris, for example.

In case of plants in a decommissioning stage, only those parts are insured on a replacement
value basis, which are necessary for the safe licensed operation. Decontamination costs are
still included as well additional costs for fire fighting and removal of debris. Property
insurance is granted by Nuclear Pools or Mutual insurance companies belonging to NPP
operators.

Nuclear Power Plants in countries who signed the Vienna or Paris convention are requested
to proof a minimum financial guarantee. The local authorities may increase the amount of
guarantees. Most Western Nuclear Power Plants have therefore nuclear third party liability
(TPL) insurance with limits as requested by the authorities.

Nuclear TPL insurance is granted mainly by the international Nuclear Pools, but there is also
some capacity available outside the pools from independent insurers or mutual insurance
companies. In addition to the capacity bought at the Pools, operators may deliver other
securitised capacity.

As long as fuel is on the site, authorities request the same financial guarantee as for plants in
operation. The request for nuclear third party liability insurance expires only when all
radioactive material is removed from the site. That is the time when the operator does not
need a license any longer.

**Comparative analysis of three possible solutions is as follows**
The following solutions have been analysed by the Consultant:

- Non-traditional insurance solution (Alternative Risk Transfer), which could be placed on capital
  markets and or international insurance markets. In this type of solution an operator self-finances
  the entire risk amount through payment of equal instalments (which are considered as parts of
  quasi-insurance premium) during an agreed period, for example 10 years. At the end of such
  agreed period (which is considered as quasi-insurance period) client will receive a rebate in the
amount equal to 80-85% of the total settled amount less the indemnity for the occurred losses.

- Insurance solution on the local insurance market with reinsurance in Russia. This solution exists now and has been implemented for another Ukrainian nuclear operator Energoatom for the Limit of Indemnity of 50 million SDR. The Consultant could not assess how international institutions and suppliers judge the security of these local and Russian insurance companies. It is these institutions and suppliers who insist on a nuclear third party liability insurance where risks are transferred to a financial secure Organisation.

- Non-insurance solution in the form of a State Guarantee provided by the government of Ukraine as a financial cover against Nuclear Liability of Chernobyl NPP. In countries which are not signatories to the Vienna or Paris Conventions and which do not have experienced insurance markets sometimes the provision of a State Guarantee is in place in order to satisfy the request of international suppliers and contractors for strict channelling of Nuclear Third Party Liability onto the operator and securitisation of TPL capacity.

**Conclusions and Recommendations to the Cabinet of ministers of Ukraine regarding Financial Cover for Nuclear Liability of Chernobyl NPP**

All three Possible Solutions described above meet international and Ukrainian legal provisions, and, theoretically could be implemented by the Ukrainian government.

The comparative analysis performed by the Consultant identified a non-traditional Insurance Solution (Alternative Risk Transfer) as the most effective and appropriate solution for Nuclear Liability financial cover of Chernobyl NPP as a newly created operator of nuclear installation. Such decision has the best financial security and meets the requirements of international contractors and financial institutions.

Another option is to implement an insurance solution on the local Ukrainian and Russian insurance markets. A principal proposal of Ukrainian and Russian insurance markets was provided by the Consultant to provide an insurance cover against Nuclear Liability risks of Chernobyl NPP. A Draft of the Insurance Slip was also developed by the Consultant to be used in this case. However, due to the low financial security of these insurance markets, Ukrainian government was recommended to pay special attention to the existing risks of non-payment of insurance indemnity in this case. Moreover, if this solution will be selected and implemented by the Ukrainian government, there is also the risk of non-acceptance of this solution by international contractors which are performing works and providing services on Chernobyl site or financial institutions for the same security reasons.

The worst solution for the Ukrainian government from the three reviewed ones is provision of a State Guarantee to Chernobyl NPP as a financial cover against Nuclear Liability risks. This solution would meet the requirements of international contractors and financial institutions involved on Chernobyl site and would not result in any direct financial expenses to get such financial cover. However, if the loss occurs as a result of nuclear event and the third parties claims are legally approved, the financial impacts for Ukrainian state and Ukrainian budget would be dramatic.

4) **Comments (quality of the results, lesson learnt, recommendations for follow-up)**

The project met the objectives stated in the TORs.

This management of the project and the technical conclusions were well appreciated by the Contracting Party and the Beneficiary at the final meeting of the project.

**Further information**

Further information on the project results could be sought from the beneficiary organizations.
The Project Final report is available at the EC/JRC-IE-TSSTP archive.

## General Information

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