11. CONCLUSIONS

This report provides a summary of the results of an environmental assessment of completing and modernising a VVER-1000 Model 320 reactor at the Khmelnitsky NPP. It also provides an outline Environmental Action Plan (EAP). All outstanding requirements listed below can be solved during implementation of the K2 project through the EAP.

11.1 Basis and alternatives

The main basis for the project is the need to replace power generation capacity that will be lost by the proposed closure of the Chornobyl NPP. In many cases it has proved impossible to consider the K2 project in isolation from the existing NPP complex since the K2 project formed part of the original design for the Khmelnitsky NPP. Given the project background, a detailed comparison of alternatives has not been undertaken.

11.2 Legislative framework

The Ukraine Government has taken considerable steps towards implementation of a sound and comprehensive legal regulatory framework for the nuclear industry. Most important in this is the change to a system that renders operators of NPPs responsible for the safety of their installations, and the national safety authorities responsible for setting objectives and verifying that procedures are developed during design, construction and operation of NPPs.

11.3 Nuclear safety

The proposed project is based on a reactor type which is already tried and tested in Ukraine. The proposed modernisation programme takes into account all major safety issues and international requirements since it has been demonstrated that, if implemented, the safety of the plant would be comparable to that achieved in the European Union for NPPs of similar vintage recently re-approved by national safety authorities.

11.4 Occupational safety

In conjunction with the safety modernisation programme, there is clear demonstration of a significant improvement in safety culture and in related protection of the workforce. Individual and collective exposures of the workforce of reactors similar to that proposed here are consistent with those that apply to PWRs in Western Europe. Nevertheless, it should be a requirement of the project that a detailed ALARA practice be implemented on the operational procedures for the proposed units so as to reduce occupational doses.

11.5 Radiological impacts

While the proposed project will slightly modify the radiological background, assessments of impacts on the surrounding population from routine operation, design basis accidents and beyond design basis accidents, indicate that such impacts would be very small and well within international standards and levels of acceptability. Nevertheless, all such assessments are very sensitive to assumptions concerning the source term. In the case of operational discharges to atmosphere, it appears that actual discharges are well below calculated discharges at similar plants. In the case of design basis accidents and beyond design basis accidents, the source terms will be refined by project detailed calculations to ensure that they do not understate specified conditions. Once the source terms have been refined, it is recommended that additional calculations should be undertaken to confirm that potential impacts remain well below standards imposed for members of the public. Such studies may need to take into account seasonality i.e. the time of year at which projected discharges may occur.

For discharges to aquatic systems, the situation is less clear although all indications are that any doses would be below the existing and very stringent limits applied for members of the public in Ukraine. A further assessment of potential radiological impacts of aquatic discharges will form part of the EAP. This assessment will take into account the presence of a commercial fish farm on the cooling reservoir with respect to the potential for accumulation and transfer of radionuclides such as Sr-90 and Cs-137.

11.6 Emergency planning and management

Careful consideration has been given to emergency planning aspects both with respect to the workforce and the surrounding population. The relevant emergency plans will be further developed with particular attention to factors such as the time scale for completion of the proposed second on-site shelter, mechanisms for communication at different stages, and subsequent monitoring and assessment activities.

11.7 Radiological monitoring and control

The existing system of radiological monitoring at the Khmelnitsky NPP provides an adequate baseline against which the operation of K2 can be compared. In accordance with NRA requirements, further development of monitoring systems in the 30 km zone will be realised in advance of K2 being put into operation. Particular attention will be given to further monitoring of discharges and impacts of low-energy beta-emitters. For emergency management there is a need to demonstrate the manner and timing by which other local and national systems will be completed and co-ordinated with those at Khmelnitsky. In all cases particular attention will be given to quality control in sampling, analysis and reporting of results

11.8 Radioactive waste management

A package of regulatory documents dealing with radioactive waste management is currently in preparation, as is a national policy on radioactive waste management. The systems at the Khmelnitsky NPP appear to be well developed and recent installations will allow for increased storage capacity as wastes are further processed and arisings are minimised.

Long-term plans for waste disposal need to be developed in the context of the national policy; such plans are required irrespective of the present project.

11.9 Spent fuel storage

Spent fuel will continue to be stored on site for significant periods following the initial three year decay period which is customary prior to fuel reprocessing. Assuming that current proposals for the capacity of the spent fuel pond are realised, no significant environmental or radiological impacts are anticipated as a consequence of this practice.

11.10 Decommissioning and dismantling

A package of regulatory documents dealing with decommissioning is currently in preparation. These define the general requirements for decommissioning and the general strategy and solutions to be taken to decommissioning. It is a requirement that, prior to commissioning of VVER reactors, the operator shall have compiled during design an assessment of the different strategies for decommissioning. The State programme on radioactive waste management takes into account radioactive wastes likely to arise from decommissioning and dismantling and the requirements for a national radioactive waste disposal system.

11.11 Environmental impacts during construction

Environmental impacts during the completion of construction include the effects of noise, dust, transportation, disposal of redundant equipment etc. Such effects can be controlled and limited by the introduction of good working practices, for example by introduction of an environmental management plan at an early stage. Their main zone of impact will be close to the NPP where, because of the present 3 km sanitary zone, receptors will generally be limited to members of the workforce rather than members of the public. Additionally, the construction period will be limited to three years.

11.12 Environmental impacts during operation

Environmental impacts during operation of the NPP include the consequences of abstraction of water from the Goryn river, the discharge of heat to atmosphere through the cooling reservoir, and the impacts of discharges of hazardous effluents having an effect on either air or water quality.

The project envisages an increase in water requirements for the NPP site. The exact requirements and the extent to which they can be met from surface or artesian sources require substantiation. At this stage there is a requirement for an assessment of the effects of further abstraction from the Goryn river, especially during the summer period, on the surface hydrology, and on hydrobiology and water use downstream.

The system for evaluating, authorising, monitoring and controlling discharges of thermal and other effluents to the Goryn river requires more detailed definition, as does that for water abstraction.

An assessment is required of the ways in which increased heat output changes (both temporally and spatially) will add to the existing atmospheric effects. This assessment may need to take into account the ways in which local atmospheric effects e.g. formation of cloud or fog, affect the dispersion and deposition of aerosols and gaseous materials released to atmosphere.

Storage, utilisation and disposal of hazardous materials require further consideration with respect to potential environmental impacts. Any such impacts and the risk associated with their occurrence, will be mitigated by the introduction of good design and working practices within the general framework of an Environmental Management Plan.

11.13 Socio-economic impacts

A further assessment of socio-economic impacts will be completed as part of the EAP. Nevertheless, given the current links between the NPP and the local community, it is clear that such effects would be positive at the local level.

11.14 Environmental Action Plan

An outline for an Environmental Action Plan (EAP) has been prepared (Appendix D). The details will be agreed in consultation with the NPP management and regulatory authorities taking into account the results of the EIA presented here. The agreed EAP will form part of any agreement for funding the project. It will therefore provide a mechanism for ensuring that any mitigation measures identified during the EIA or during preparation of the EAP are incorporated into the project at the appropriate stage and time.

11.15 Public consultation

Steps have been taken to ensure public consultation, both during the scoping of the EIA and during the development of the EIA. Relevant comments received from the public consultation process have been taken into account in preparing and publishing this version of the EIA.