

# Completion of the nuclear units 3 and 4 at Khmelnytsky NPP: *project status and risks*

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## About Khmelnytsky NPP

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Khmelnytsky nuclear power plant (KhNPP) is situated near Netishyn town, approximately 250 km from the border of Poland. It has two nuclear units of VVER-1000 type commissioned in 1987 and 2004 respectively. Construction of units no. 3 and 4 at Khmelnytsky NPP started in 1985-1986 but was never completed, following the Chernobyl accident and subsequent collapse of the USSR. Since 2005 state-owned nuclear operator Energoatom has been trying to revive the project but construction work has yet to begin.

According to Energoatom, at unit 3 up to 75% of building works is already complete, and at unit 4 the figure is 28%. The expected installed capacity of both units is 2094 MW, and technical projected lifetime is 50 years.

## History of the project

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In 2008 Russia's Atomstroyexport won the tender for the construction of the revived project, and it was agreed that Russia would provide a loan to Ukraine to finance the construction. However, works were never started and the loan was not granted by Russia once the Ukrainian parliament [denounced the respective agreement with Russia in 2015](#), after it became clear that further

cooperation with the Russian company was impossible in light of Russia's aggression against Ukraine.

In 2016-2017 Energoatom adjusted the feasibility study for the KhNPP 3,4 completion, envisaging the use of a VVER-1000 reactor by a "European" supplier of reactor technology – Czech company Skoda JS. There was no tender conducted to choose the supplier. The decision to choose Skoda JS was taken ["as a result of negotiations with potential suppliers"](#).

## Project status

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On July 5<sup>th</sup> a Ukrainian governmental committee approved the adjusted feasibility study of the Khmelnytsky NPP units 3 and 4. On July 26 the feasibility study was approved by the Cabinet of Ministers of Ukraine with a warning from Prime Minister Volodymyr Groisman that reactors should not be manufactured in Russia. The text of that governmental decision has not been made public yet.

The next step in project development, according to Khmelnytsky NPP management, [will be the development and adoption by the Parliament of the law "On placing, designing and construction of the units 3 and 4 at Khmelnytsky NPP"](#). No timeline is publicly available for these processes.

## Environmental Impact Assessment

In March 2018, the Ministry of the Environment launched an Environmental Impact Assessment (EIA) in respect of the planned activity of units 3 and 4 of the KhNPP. This is to fulfil the requirements of the new EIA law that came into force in December 2017. The procedures require Energoatom to organize public consultations in Ukraine once the draft EIA report is ready, but currently no timeframe has been announced. In parallel, transboundary consultations with potentially affected countries are on-going. The timeframe has been determined for conducting public consultations and panel discussions in Belarus, Poland and Austria as part of a transboundary impact assessment<sup>1</sup>. Both consultation processes must be finalized and their results taken into account in the process of approval of the law “On placing, designing and construction of units 3 and 4 at Khmelnytsky NPP”.

## Project cost and expected sources of finance

The cost of the project as approved by the Cabinet of Ministers is 72,4 billion UAH in 2017 prices (approx. EUR 2,3 billion). However, previously Energoatom has claimed the cost would be EUR 3,7 billion in 2012 prices<sup>2</sup> (see Pic.1).

To finance the construction Energoatom plans to use its own money (from the electricity tariff) and to implement the [so-called “Energy Bridge” project](#) – to connect Khmelnytsky NPP unit 2 to the EU grid and start selling electricity to Poland. Money from this deal is supposed to finance completion of KhNPP unit 3. Energoatom has also said that it has [launched negotiations with Barclays](#), an international bank based in the UK, on an export contract-backed loan as part of the Ukraine–EU Energy Bridge project. To date, neither Barclays nor Poland has confirmed publicly their participation in the project.



### CONSTRUCTION OF UNIT #3 AND UNIT #4 OF KHMELNITSKY NPP

(Cont'd)

#### 3. Financial and economic provision

The cost of completion of KhNPP Units #3, #4 remains at the level of indicators determined in the construction feasibility study – **EUR 3.7 billion** (based on prices of 2012). This is **50-60%** lower than the cost of NPP green field construction.

The cost indicators will be achieved by means of use of:

- Equipment located onsite KhNPP
- NPP infrastructure that was assumed for operation of four VVER-1000 units
- Building structures of units #3 and #4 of KhNPP, extensive involvement of local manufacturers



#### Possible sources of funding

- ❖ Skoda JS a.s. holds negotiations with **Czech Export & Import bank** for attraction of investments for the project in the amount of cost of essential equipment of reactor installation VVER-1000 Skoda JS and in the scope of supplies, work and services to be provided by the Czech counterpart.
- ❖ Own funds of SE NNEGC “Energoatom”
- ❖ Attraction of additional foreign investments, in particular of European and Chinese investors concerned
- ❖ The option of implementation of the investment **project “Energy Bridge Ukraine- European Union”**

Financed out of SE NNEGC Energoatom’s funds:

- Since the beginning of implementation (as of October 1, 2015) – **UAH 224.6 million**



58

Pic. 1 Slide from Energoatom’s presentation accessible at IAEA’s website as of June 2018.

Source: [http://bit.ly/iaea\\_presentation](http://bit.ly/iaea_presentation)

1 [http://bit.ly/xaec\\_org](http://bit.ly/xaec_org)

2 In the reply to Ecoaction no.33.4-BIX/134-18 from 13.03.2018 No.33.4-BIX/134-18

The upgrade and extension of an existing transmission line between Khmel'nitsky NPP and Rzeszow (Poland) is among suggested [2018 priority infrastructure projects](#) under the framework of the Energy Community Treaty. In November 2017, Ukrainian press reported that China National Nuclear Corporation (CNNC) and the Industrial and Commercial Bank of China (ICBC) offered Ukraine a loan to fund the completion of construction of unit 3 at KhNPP with a VVER reactor and use Chinese technology – a reactor HPR-1000 – for completion of the construction of unit 4<sup>3</sup>.

### **Project key risks for Ukraine: more dependency and more safety uncertainties**

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#### **1. The project may increase Ukraine's dependency on Russia in the energy sector**

Ukraine has been always heavily dependent on Russia for energy supplies, especially in gas and nuclear fuel. It is among Ukraine's key priorities set in the revised Energy Strategy up until 2035 to decrease the country's dependency on Russia via diversification of energy supplies and increasing efficiency of energy use.

Skoda JS has been part of [OMZ, Russian private heavy engineering corporation](#), since 2004. OMZ is owned by Gazprombank, which [holds 98,622% of company's stocks](#). The head of the Board of Gazprombank is Aleksey Miller, head of the Board at GAZPROM. Gazprom as a [shareholder of Gazprombank](#) holds up to 46% of ordinary shares.

Moreover, Ukraine's cooperation with OMZ and Gazprombank is impossible due to these companies being in the "sanctions" list. According to the Decision of the National Security and Defence Council of Ukraine (NSDC) from May 2<sup>nd</sup>, 2018, OMZ and Gazprombank have been included [in "sanctions" list by the National Security and Defense Council \(NSDC\) of Ukraine](#) for 3 years (no. 19 and 696). No deals (contracts) are allowed with these companies, according to this sanction. Both companies are also under the Russia-Ukraine related sanctions issued by the [U.S. Department of Treasury](#)<sup>4</sup>.

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<sup>3</sup> [http://bit.ly/interfax\\_news](http://bit.ly/interfax_news)

<sup>4</sup> Subject to Directive 1 under Executive order 13662.

Information can be found via OFAC Sanctions List Search: [http://bit.ly/s\\_search](http://bit.ly/s_search)

#### **2. The stability of the existing building structures at the construction site is not confirmed**

The existing building structures at the KhNPP 3 and 4 were built in the mid 1980s and they have been standing open-air for 30 years, partially flooded and corroded. The adjusted feasibility study and project's proposed budget are grounded on the idea of using existing structures for the construction of the units. However, no comprehensive examination of the conditions of those structures has been made in the last 10 years.

In 2006-2007 Energoproekt, a Kyiv-based research and design institute, performed examinations and evaluation of the technical condition of building structures and facilities at unit 3<sup>5</sup>. This evaluation concluded that the condition of the structures was unsatisfactory. The evaluation report on numerous occasions mentions mechanical defects of the structures, corrosion of the reinforcement and metal components of the reinforced concrete structures, cracks in concrete and corrosion. Although the report stated that it will be possible to use the structures and facilities of units 3 and 4 of the KhNPP for 50 years on condition of their renovation, it does not provide any calculations for the cost of such works or any possible risks<sup>6</sup>. The current version of the feasibility study envisages a projected lifetime of 50 years and 7 years for the construction of unit 3. Thus, Energoatom needs to prove that existing structures will be fit for use for a minimum of 57 years from now and that has not yet been done.

In 2012, the State Building Structure Research Institute conducted an evaluation of certain structures of units 3 and 4 of the KhNPP. The major conclusion was that no structures are fit for use unless they are renovated. However, 'outer and inner monolithic walls' of the substructure of pump station 3 of the KhNPP were found to be 'unfit for normal operation,' while the condition of certain metal components (stairs and pipes) is critical and requires dismantling<sup>6</sup>.

In 2017 the State Nuclear Regulatory Inspectorate (SNRIU) approved the adjusted feasibility study but with the condition that at the 'project' stage the following mandatory studies should be made

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<sup>5</sup> [http://bit.ly/stan\\_byd\\_aes](http://bit.ly/stan_byd_aes)

<sup>6</sup> Letter from KhNPP to Ecoaction dated 22.03.2018

and justifications provided in the preliminary safety analysis report on:

- the use of new systems, including the external cooling system of the reactor, and modernized systems and equipment;

**- the use of the existing building structures of the units 3 and 4;**

- technological solutions for modernization of infrastructure for radioactive waste management;

- maneuvering mode of operation.

### **3. The possibility of integrating the existing structures into the new project is not confirmed; neither is its compliance with current safety requirements**

The structures of Khmelnytsky units 3 and 4 as built in 1985-1986 were designed for the installation of VVER 100/B-320 reactors.

In the thirty years that has since passed there have been changes in the safety standards and regulations applicable to the development of nuclear power plants, including those that allow taking into account the consequences of the Fukushima Daiichi nuclear disaster in March 2011. More new safety systems that were not contemplated by the original project are required to be put in place, while the structures' strength was calculated without taking them into account. According to Energoatom, Kh3,4 will be equipped with "additional safety systems", including an external cooling system for the reactor, to meet current safety standards. But it is still unclear how these systems will fit into the old building structures.

*"According to data provided by Energoatom, detailed justification of the possibility to integrate existing building structures into the new project is not possible at the "feasibility stage", and will be conducted at the "project" stage".*

[Letter from the Ministry of Fuel and Energy to NGO Ecoaction, 13.03.2018]

## **Conclusions**

The completion of units 3 and 4 at Khmelnytsky NPP raises a number of safety and energy security risks for Ukraine, and should be dropped.

It is an old project from Soviet times, featuring VVER-1000 reactors, and to date there is no

confirmation that it would be possible or safe to use the existing 30 year old building structures at the construction site. There is also no confirmation of whether it will be possible to integrate a new project with additional safety systems into the old building structures, or how these additional safety systems will be implemented in practice in old VVER-1000 units.

The adjusted feasibility study for the completion of the units 3 and 4 at Khmelnytsky NPP provides for the use of VVER-1000 Skoda JS reactors. Cooperation between Ukraine's nuclear units operator Energoatom and Skoda JS, owned by Russian holding OMZ, is not possible due to the fact that OMZ is under economic sanctions imposed by National Security and Defence Council of Ukraine, and by the U.S Department of Treasury.

The project's price tag is currently at the level of UAH 72,4 billion which is roughly EUR 2,3 billion in 2017 prices. There are no confirmed sources of financing for this project, apart from the company's own resources.

## **Observations and recommendations**

Construction of the new nuclear units in Ukraine by a company with close economic ties to Russia goes against Ukraine's strategic goals of decreasing dependency on Russia and diversification of its energy supplies.

The chance of involving a non-Russian supplier in the project is very unlikely and poses additional risks, as only two companies in the world have a proven record of being able to construct VVER-1000 reactors – Skoda JS and Atomstroyexport. In order to involve Chinese or other potential suppliers, the project has to be changed to allow for other types of reactor to be considered. The latter would imply that old constructions must be demolished fully or partially, which subsequently would dramatically increase the cost of the project and time of the construction, making the whole project too costly and time consuming. Ukrainian authorities should focus on developing cheaper, faster and more realistic solutions for providing electricity in the years to come, such as renewable energy sources.