NEW NUCLEAR SOURCE AT THE DUKOVANY SITE

Summary supplementation of explanatory documents relating to the issues of supply of process water to nuclear equipment at the Dukovany site

November 2018

This document summarizes the problems of supply of raw water to the new nuclear source at the Dukovany site as it was presented in the EIA documentation (hereinafter referred to as the "Documentation") and its Annex 4 "Surface Water and Groundwater Impact Assessment of the New Nuclear Source at the Dukovany Site" and further responds to the debate on this issue within the EIA procedure in the period following the publication of the Documentation until the public hearing of the Documentation.

Consumption of raw water for the existing Dukovany NPP (EDU1-4) is, based on the valid water decision, covered by the Mohelno Reservoir, maximum authorized quantity 63 million m3/year, but consumption of the power plant in the last period was virtually up to 55 million m3/year, of which loss due to evaporation from cooling towers (loss of balance of the Jihlava River downstream of the point of consumption - downstream of the Mohelno Reservoir) was up to 33 million m3/year. The rest of the water consumed was drained, after use in the technological process of the power plant, in the form of wastewater back to the Mohelno Reservoir in the quantity up to 22 million m3/year, of which the most important component of wastewater was blowdown from circulating cooling circuits of the EDU1-4.

In the context of the Documentation, consumption of raw water for the needs of the new nuclear source (hereinafter referred to as the "NNS") also by pumping from the Mohelno Reservoir on the Jihlava River, i.e. the same source of raw water as used by the existing nuclear power plant. The water supply for the NNS will by provided by pumping and subsequent transportation through the new discharge water mains to the new water tank and then through the new gravity water mains from the water tank to the NNS.

The work on the Documentation included an assessment of whether there will be a sufficient quantity of water in the water source to supply the NNS or the NNS and EDU1-4 (in the period of time-limited parallel operation).

Balance assessment of the security of supply of raw water was conducted by the T. G. Masaryk Water Research Institute, v. v. i., both for the operation of the NNS, i.e. following the shutdown of current EDU1-4 units up to the total net power of 2,400 MWe, and for the time-limited parallel operation of the NNS and the existing Dukovany NPP (according to the power alternative of the NNS either with the EDU1-4 or with the EDU2-4) up to the total net power of 3,250 MWe, which was considered as the site limit in the model on the basis of the preparatory studies on the previous versions of the Documentation. The assessment was conducted by means of mathematical modelling where the model included in the monthly step the progress of actually observed flow rates on the Jihlava River for the period from 1932 to 2015 (total of 84 years = 1008 months), subsequently corrected to the progress during warming in the basin of the Jihlava River by 2°C compared to the reference period from 1981 to 2010 (i.e. taking into account climate change so as to cover the prospective period critical for impact assessment of the NNS). The existing system of Dalešice-Mohelno reservoirs has been also incorporated in the model. The boundary condition in the model was to comply with the requirement for maintaining the minimum residual flow rate of 1.2 m3/s in the profile of the Jihlava Mohelno downstream of the (dam) with the minimum security of 98.5% in consumption of raw water for the NNS or the parallel operation of the NNS and the existing power plant. Balance calculations were executed assuming that the distribution of volumes in tanks by their purposes will be the same as today, while using only the storage volume of the Dalešice Reservoir for the needs of the NNS and the existing power plant and the mode of re-pumping from the Mohelno Reservoir to the Dalesice Reservoir will be maintained.

The executed calculations show that the consumption of raw water for the nuclear sources at the Dukovany site to the total power of 3,250 MWe is real in terms of balance and the security by duration reaches 99.931%, which corresponds to the security without disruptions in supply.

In the context of discussions of the Documentation, one of the most discussed questions was whether there will be a sufficient quantity of water in the Jihlava River to supply the NNS or its time-limited parallel operation with the existing power plant in the future where, according to some climate scenarios, there should be further temperature increase, in particular with regard to manifestations of climate change in water levels of the Jihlava River upstream of the point of consumption.

On the basis of the above doubts, the notifier completed further information to the problem concerned, the short summary of which is given below.

It was found at assessing the impact of temperature on outflows that they decrease by 20% at warming by +2°C. It corresponds to around 10% decrease per 1°C of warming. Model versus reality also conservatively assumed that the warming will result in increase in evaporation of water from the Jihlava River and from the Dalešice-Mohelno reservoirs without proportional increase in precipitation.

With the conservative scenario of +2°C, the following occurs:

- runoff depths increase in winter months by circa 10% in winter months,
- runoff depths decrease in the order of 30% in the summer period.

Despite this “conservative assumption”, the mathematical modelling demonstrated sufficient security of the supply of raw water. This is due to the fact that a system of Dalešice-Mohelno reservoirs was built on the Jihlava River in the late 1970’, also in connection with the need to cover the consumption of raw water for the existing Dukovany NPP.

Mainly due to significant storage area of the Dalešice Reservoir (volume sufficient to cover several months of consumption of the NNS at full power while maintaining the minimum residual flow rate downstream of the Mohelno Reservoir), it is possible to balance even long-term (multi-year) disproportions between the inflow and the demands for consumption and outflow, i.e. accumulate water in the reservoir for the needs of nuclear sources in more water period for less water period.

Occurrence of the more or less water periods is not historically exceptional in the Jihlava River. The observation in 1931 shows that these periods alternate on a regular basis, with the occurrence of periods of very low average annual flow rates and, conversely, very high average annual flow rates repeating in the long-term average approximately 22 years, which is confirmed by the current final period 2015 – 2018 with very low flow rates. Previous periods of very low flow rates occurred in the pas: 1931 – 1934, 1949 – 1952, 1971 – 1974 and 1989 – 1992.

In conclusion, therefore, on the basis of the model calculations, it can be stated that the capacity of the water management system is, taking into account the current knowledge, sufficient to compensate for the impacts of the expected level of climate change, while respecting currently stipulated minimum residual flow rates in the Jihlava River for all power alternatives considered in the context of the Documentation, with the model balance calculations including the variability of flow rates in the Jihlava River on the basis of practical monitoring of flow rates for the period 1932 – 2015, i.e. for 84 years.

The magnitude of climate change in the Jihlava River in the next decades and its real effect on the behaviour of the flow rate series in the Jihlava River at the inflow into the system of Dalešice-Mohelno reservoirs, whether and how the observed frequency of alternating more and less water periods will change as well as the duration of periods of extreme drought or extreme high flow rates, will be finally determined only on the basis of real long-term measurements of flow rates in the Jihlava River and climate data in next years.

For this reason the problem of sufficient security of the consumption of raw water for the NNS or for the time-limited parallel operation of the NNS and the EDU1-4 continues to be monitored.

After selection of the contractor in the development of design documents for building permit procedure and prior to filing a request for consumption of raw water, it will be necessary to update the results of water balance calculations (or security of consumption) based both on new data to be provided by selected contractor for the NNS and on the basis of time-extended flow rate series for the Jihlava River in the Jihlava - Ptáčov profile, current values of at that time applicable minimum residual flow rate in the Jihlava - Mohelno pod profile downstream and other real data on climate development (temperatures, rainfall).

On the basis of these updated data, it will be possible to re-verify the security of the supply of raw water for long-term operation of the NNS or for time-limited parallel operation of the NNS and the existing Dukovany NPP and possibly define the organizational and technical measures (if necessary), leading to ensure adequate security of the supply of raw water.