

Chernobyl Cooling Pond Remediation Strategy

Review of the ongoing activities (IAEA-CN-211/7PR)

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Review prepared as a part of
IAEA TC project UKR 3/003

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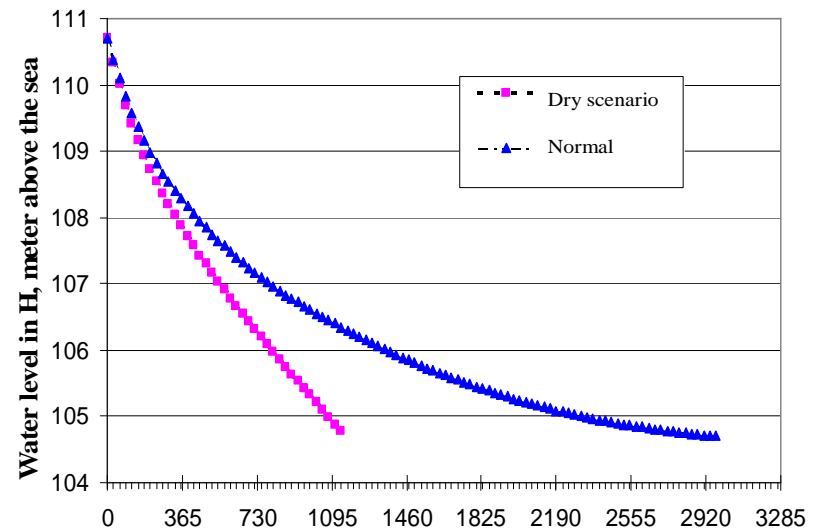
Problem

- The Chernobyl cooling pond is an artificial water reservoir that was created to cool down the heat exchangers of four nuclear reactor units at the Chernobyl Nuclear Power Plant.
- The CP is situated on the right-bank flood plain of Prypiat River and protecting dike of 25 km in length. The water elevation of the CP is near 7 m over the Prypiat river level.
- To maintain the current water level in the CP, i.e., to compensate for water losses due to leakage (filtration) and evaporation, water is continuously pumped from the Prypiat River.
- Chernobyl NPP was shutting down in 2000, and CP currently lost its functionality as water reservoir used for heat exchange. The existing area of the CP significantly exceeds the current needs.
- The economic cost of maintaining and operating the pumps, dams and surrounding areas is high (up to 0,5 mln. US dollars).
- Therefore in accordance to the Government decision, ChNPP is going to provide the decommissioning of the CP by means to stop pumping of water, which compensating the filtration losses.
- To provide economically reasonable, radiologically safe and ecologically friendly decommissioning of the CP and long-term remediation of the site in a future is a grate challenge for ChNPP

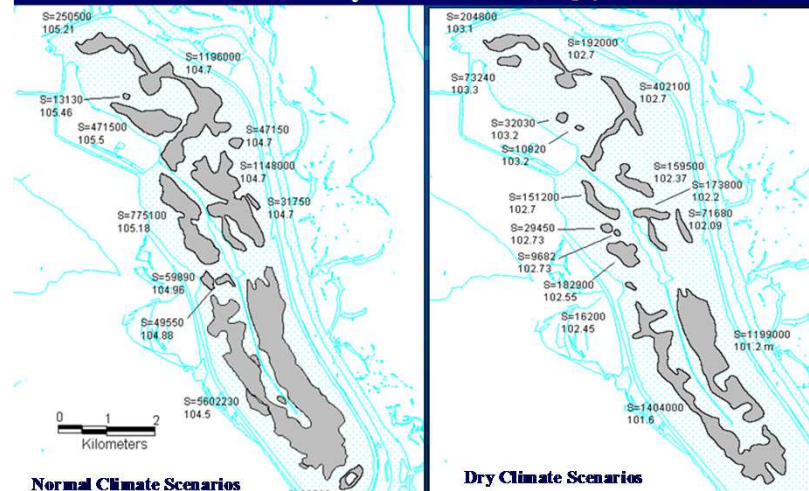
Decommissioning Strategy

- If terminate water pumping and no action to regulate water compensation the water level will be reduced to the hydraulically equilibrium conditions with the Pripyat River reached with in 5-7 years.
- A new wetland system, with specifically high radioactive contamination and new ecosystem, will be created.
- The monitored natural attenuation seems a most reasonable strategy to be selected

- **What are a potential radiological and ecological impacts ?**
- **What time for water level declining can to be optimal for implementation of the strategy ?**



The forecasts of eventual water levels in the water bodies created in place of dried-up Cooling Pond for the «normal» and «dry» scenarios (Bugay et al. 2004)



Impact assessment

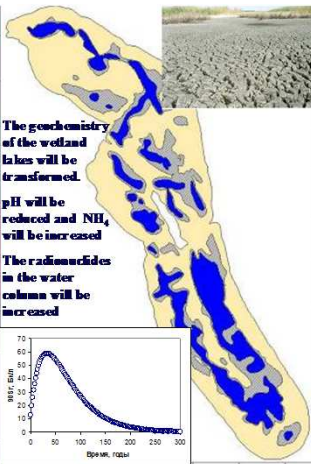
Bottom landscape transformation

As the result of the water level decline the area covered about 60-70% of the bottom sediment territory may be dried and exposed for wind human access.

The new artificially forming bottom sediment relief will be created by the 3 types

- always dry
- always covered by water
- intermediate wetland (dried or wet) depend of water mode and climate conditions)

The geochemistry of the wetland lakes will be transformed. pH will be reduced and NH_4 will be increased. The radionuclides in the water column will be increased.



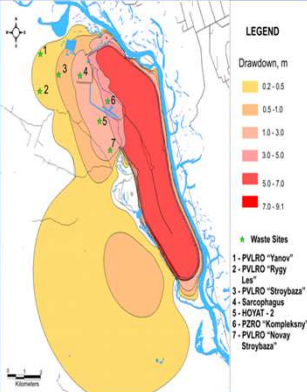
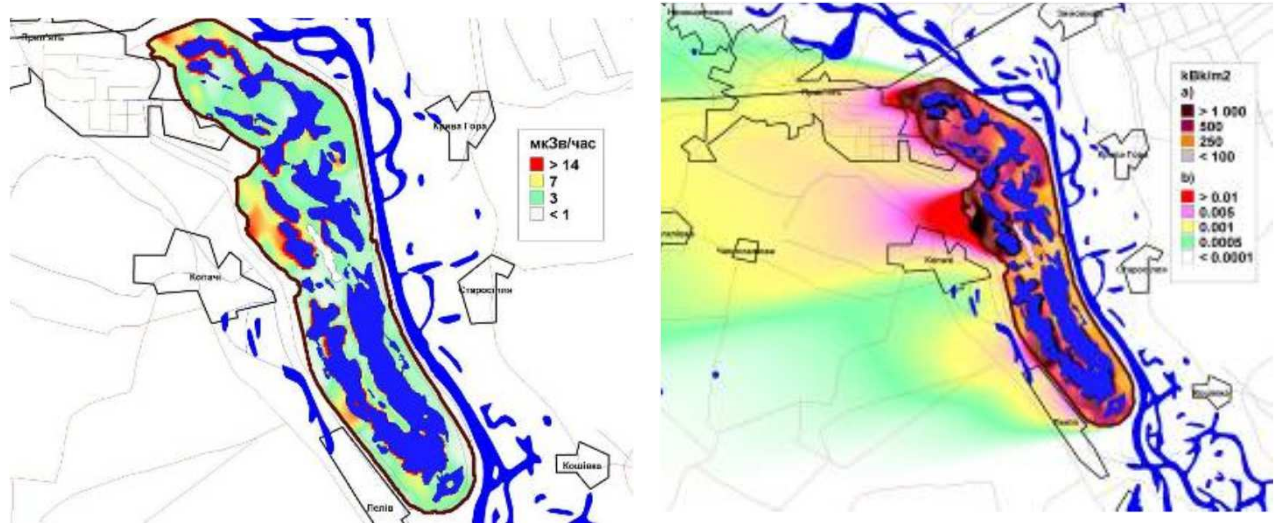
Depth range, m	Bottom area in the given range		^{137}Cs		^{90}Sr	
	km ²	%	TBq	%	TBq	%
0-3,5	2.1	9,6	10	4	2	4
3,5-7,5	13.7	62,6	43	16	10	18
7,5-10,0	2.1	9,6	65	25	13	24
10,0-12,0	1.7	7,8	61	24	13	25
>12,0	2.3	10,5	81	31	16	29
CyMa	21.9	100	260	100	54	100

Effects of the Groundwater drawdown

The groundwater water table will be reduced at many places around the cooling pond from 1 to 7 m of present.

The ground water flow directions will be also changed.

The effects of the groundwater level declining in the CP will create positive effects in regarding of the number of temporary waste disposal sites situated around and also is beneficial for Chernobyl NPP New Safe Confinement.

After water level declining about 80% of Sr-90, Cs-137 activities in the CP will be accumulated in a lakes to be created in a new wetland at the place of former CP.

Dust atmospheric dispersion and fire may increase contamination of the surrounding areas no more than 5 % of existing contamination level.

No significant dose expose effects for personnel, working at the Chernobyl NPP site due to effect of wind re-suspension or grass fire at the CP (1-3 μSv)

Challenges

New Environment monitoring network has to be developed and re-constructed before water level declining will start.

Extended Environment Monitoring and Surveillance Program to be enhanced for Compliance with Remediation Criteria.

The future development of the CP ecosystem are still not clear (degradation, adapting to the new conditions, eutropication, succession)

Hydrochemical mode will be changed and will affect on transformation of the hot particles and radionuclide availability, and remobilization.

Comprehensive Research Program for International Studies for Physical and Chemical transformation of the Radioactive contamination Fate, Ecosystem Restoration, Radioecology and Remediation Techniques have to be elaborated. Radiobilological effects have to be studied

CP is a unique site for international research and remediation technique testing

Welcome for your questions for the poster and cooperation