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REMEDIATION OF WISMUT´S URANIUM TAILINGS PONDS –APPROACH AND LESSONS LEARNED OVER TWO DECADES

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In Eastern Germany uranium mining lasted from 1945 until 1990 leaving enormous environmental impacts. From 1951 to 1990 the former Soviet-German WISMUT company produced a total of about 216,000 t of uranium, mainly in two large mills located near Seelingstädt (Thuringia) and Crossen (Saxony). Nearby the former Seelingstädt mill tailings dams were erected in mined-out open pits for separate disposal of uranium mill tailings from soda alkaline and from acid leaching processing schemes. Nearby the Crossen mill only tailings from soda-alkaline leaching were discharged into tailings ponds erected in ancient gravel pits and valleys. The tailings ponds Culmitzsch A and B, Trünzig A and B near Seelingstädt and the tailings ponds Helmsdorf and Dänkritz 1 near Crossen cover a total area of about 580 ha and contain more than 160 million m3 of uranium mill tailings.

Initially after reunification of Germany the federal government funded in 1991 in total 6.4 billion EUR to cover for decommissioning and remediation of the uranium mining sites in Thuringia and Saxony. Based on the federal Wismut act the state-owned Wismut GmbH was established and made responsible for decommissioning and remediation of the uranium mining sites.

First decommissioning activities started in 1991 including defence measures against immediate hazards, environmental investigations and development of initial site-specific remediation concepts. Decommissioning of the uranium tailings ponds has to meet the following most relevant decommissioning aims:

• the radioactive dose to the population caused by the uranium mining sites and by decommissioning works is to be limited to no more than 1 mSv/year.

• water released from the sites into the hydrographic net must comply with regulatory discharge standards for contaminants;

• decommissioning objectives have to be sustained in the long term. This means that sufficient stability and functionality of all relevant constructions, like i.e. soil covers or reshaped dams, shall be ensured for periods of 200 years up to 1,000 years with minimum maintenance and care required in the long term.

Wismut identified dry decommissioning in situ as the preferred remediation option for all of its uranium mill tailings ponds in Thuringia and Saxony. Dry remediation option is costly but the risks are significantly lower compared to wet remediation options. By 1996 this was agreed by the authorities of Saxony and Thuringia for all tailings ponds under responsibility of Wismut. Dry remediation in situ includes the following basic decommissioning steps:

• removal of pond water, catchment of seepage and contaminated runoff including water treatment before release into the receiving streams;

• interim covering of air-exposed tailings surfaces including partial dewatering of soft fine tailings using shallow vertical wick drains;

• re contouring of dams with respect to geotechnical stability and recontouring of ponds including the use of deep vertical wick drains and surcharge loading with respect to speed up fine tailings consolidation during the remediation period

• final covering including different soil cover designs with respect to the results of modelling of contaminant transport

• vegetation of the all surfaces affected by remediation works including balancing of intervention measures and compensatory measures in the accompanying landscape management plan

• continuous monitoring during remediation phase regarding radiological, geotechnical, geochemical/environmental aspects and including geotechnical and ecological on-site monitoring of the implementation of the construction works

At first the paper presents the approach for the development of the remediation design and the legal, technical and societal constraints. The paper outlines the main aspects of the fundamental remediation steps mentioned above. During more than two decades changing legal, technical and societal requirements affected the design and implementation of each remediation step. The paper presents in more detail legal and technical challenges that led to changes in the technical design of specific remediation steps over the last two decades. In the early

remedial stage water management of completely filled ponds were of critical importance. Then the design of interim covering of very soft tailings and dam reshaping with respect to seismic stability had to be solved. During ongoing remediation the recontouring design of pond surfaces changed site-specifically with respect to tailings consolidation and with respect to the experiences made. Different final cover designs have been built or applied for including single layer store-and-release covers, two-layer covers consisting of storage layer and underlying sealing layer and multi-layer type covers. During the last two decades the increasing requirements from environmental law, in particular the law of protection of species and from water law significantly influenced the design, the permitting procedures and the implementation of the works. The paper presents in more detail selected examples that show the particular influence of these changing requirements on the remediation. Finally the paper presents an outlook until the completion of tailings remediation foreseen in 2028 and to the after-care phase.

Country or International Organization

Wismut GmbH, Germany

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