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BULGARIA

INTRODUCTION

1. Nuclear facilities in Bulgaria

At the time being there is only one site with operating nuclear energy reactors, near the town of Kozloduy at the Danube river. There are six units in operation, four of them are WWER-440 type and two WWER-1000. No plans for construction of other units at the same site are foreseen. Construction of two WWER-1000s of the second bulgarian NPP-Belene started a couple of years ago. Due to a number of technical, financial, political and ecological reasons the Government took a decision to suspend the plant construction till the future nuclear energy policy is defined.

The only IRT-2000 research reactor-in Sofia was shut-down in 1989 for reconstruction.

2. Storage capacities

Kozloduy's spent fuel is to be stored for a three year period in water pools at reactors and after that to be transfered to AFRS or back to the supplier. Lately the supplier requires that spent fuel is stowed for a period of five years before it can be transferred back. This new requirement causes certain difficulties on the spent fuel management at Kozloduy. The storage capacity of WWER-440s is 360 FAs if fuel is stowed in one rack. It could be approximately doubled if second /upper/ rack is used. The design storage capacity of WWER-1000s is 440 FAs stowed in one rack only.

The AFRS/Away From Reactor Storage/is at the Kozloduy site as well. Transfer of spent fuel from at reactor ponds to it started three yers ago, but the operator has not yet obtained an official licence for comercial operation. 33 baskets containing totally 990 FAs WWER-440 type were transfered there and some functional tests of cooling, ventilation and transportatin systems have been performed. Due to commissioning of WWER-1000s at Kozloduy the AFRS design has been slghtly changed to receive and store this type of FAs as well. Thus the total number of assemblies of both types

stowed in it will be less than the designed-4900.in the Storage the FAs are stowed in baskets containing 30 items each.It is not clear yet which type of baskets for WWER-1000 fuel will be used.

The reason for the delay in granting licence for AFRS operation is that the operator must fulfill some extra requirements enforsed by the regulatory authorities in compliance with the latest more stringent safety criteria.

Nowadays it is not foreseen to increase the AFRS capacity by using new type of baskets or racks.

SPENT FUEL ARISING

The annual theoretical WWER-440 spent fuel arising is 115 FAs per unit or 460 totaly.About 164FAs per year from the two WWER-1000s are expected to be included in the balance of the spent fuel at Kozloduy NPP.

TRANSPORTATIONS

According to the agreements the spent fuel is to be sent back to the supplier after a certain period of interim storage.Due to a number of new financial,technical and political circumstances in our relationships with the country-supplier no shipments took place over the last 3 years.This causes certain difficulties for our nuclear energy strategy and it is a problem to be solved with priority.

SAFETY

The main problem nowadays is the enforced storage of the spent fuel in two layers in reactor pools N°2,3,4.The increased water level in the pools in that case leads to increased water leakage through the pools lining. Obviously the pools design and its performance are not up to the mark.

Another problem is lack of technology and equipment for spent fuel transfer out of the WWER-1000s containemets. This problem schould be solved till the end of 1992.

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STORAGE

It is not planned at present to increase the WWER-440 ponds capacity by "rod consolidation" or reracking. There are no reprocesing plants or plans to construct such facilities for uranium and plutonium reprocessing as well.

CANADA

1.0 INTRODUCTION

The quantity of spent fuel being stored in Canada in water pools and in concrete, dry-storage canisters is approaching 800 000 CANDU fuel bundles (16 000 Mg U). Additional storage will be required at some sites in the 1990s, and will be provided by either additional water pools, dry storage in concrete containers, or some combination of these methods. The following is an update on spent-fuel management in Canada since IAEA Newsletter No. 1.

2.0 WATER POOL STORAGE

In Canada, all spent fuel from CANDU reactors is discharged directly into water pools at the reactor sites. A description of the pools and the movement of spent fuel between pools was provided in Newsletter No. 1. By the end of 1991, Canada will have a water-pool fuel-storage capacity for about 33 000 Mg U. At the present time Canada has 20 commercial CANDU pressurized heavy-water reactors in service, with a net capacity output of about 13 000 MWe. Two additional units, each having a net capacity output of 881 MWe, are either under construction or being commissioned. The typical annual fuel arisings from all of the above reactors is about 1 700 Mg U. The inventory of spent fuel bundles in water pools at the above reactor sites as of 1990 December 31 was about 14 000 Mg U.

2.1 Long-Term Fuel Integrity in Wet Storage

Ontario Hydro and Atomic Energy of Canada Limited (AECL) have a long-term program, initiated in 1977, to examine spent fuel stored in water for possible deterioration. The oldest bundles selected for the program have been in wet storage since 1962. The first examination under this program was performed in 1978/79, and a second ten years later. Results from the 1988/89 examination indicated no change in the condition of undefected CANDU fuel stored underwater for 27 years. The surfaces of UO_2 fuel fragments from intentionally defected spent fuel stored underwater for 21 years were highly oxidized and hydrated; however, the oxidation had no apparent effect on fuel element integrity. On the basis of the results from the most recent examination, it was concluded that spent CANDU fuel can be stored safely underwater for at least 50 years, provided that the rate of UO_2 oxidation does not increase significantly.