

New Approach for Safeguarding Spent Fuel Transfer to Dry Storage at OLR

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1. Introduction

Four Wolsong units are designated by the IAEA as an On-Load reactor. On-power fueling in a CANDU 600 MW reactor is normally performed by inserting eight fresh fuels on the end of a fuel channel while eight irradiated fuels are discharged at the other end. Since Wolsong unit 1 started its commercial operation in 1983, now four OLRs have been operating in ROK.

2. New Approach

The Korea Hydro & Nuclear Power Co., Ltd. (KHNP) adopted the dry storage policy, which transfers long cooled spent fuel from the wet storage to the dry storage. Since the first Spent Fuel Transfer (SFT) began at Wolsong unit 1 in 1992, SFT has been carried out every year except of 2004. Accordingly, in order to make wet storage space available to cool fresh spent fuels discharging everyday, SFT should be carried out at all sites. As they transfer about 5,000 fuels for one campaign, each campaign requires approximately three months every year at each unit. Therefore, it plays as a big burden on inspection activities of the IAEA and the NNCA. Table 1 shows the inspection efforts used to inspect the SFT carried out at Wolsong unit 1 for last few years. Because of that, the IAEA proposed a new safeguards approach and is performing its feasibility test on site to achieve a greater efficiency of safeguards inspection.

Table 1 Status of inspection efforts

Facility		2000	2001	2002	2003	2004
PWR	IAEA	102(12)	103(13)	76(14)	61(15)	68(16)
	TCNC	204(12)	202(13)	212(14)	205(15)	218(16)
OLR	IAEA	115(4)	109(4)	78(4)	97(4)	114(4)
	TCNC	88(4)	72(4)	69(4)	104(4)	101(4)
SFT	IAEA	53(1)	91(1)	73(1)	72(1)	-
	TCNC	54(1)	85(1)	75(1)	89(1)	-
Total	IAEA	351	39	310	313	263
	TCNC	459	476	477	509	424

2.1 Transfer of Spent Fuel to Dry Storage at Wolsong

All spent fuel ponds of Wolsong NPPs were designed to store about 38,000 fuels at the maximum. Figure 1

shows the diagram of SFT campaign at Wolsong. The facility operator transfers spent fuels from wet storage to dry storage according to the procedures as follows.

- Place the tray of spent fuels on the working table and turn them up vertically to be lifted.
- Load 60 bundles into the basket, place a lid onto it and move it to the welding station.
- Dry and weld the covered basket inside the transfer flask and load the flask with a basket onto the truck.
- Move the truck with the flask to the dry storage and unload the basket into the canister
- Insert the permanent plug onto the canister and weld plug & lid.

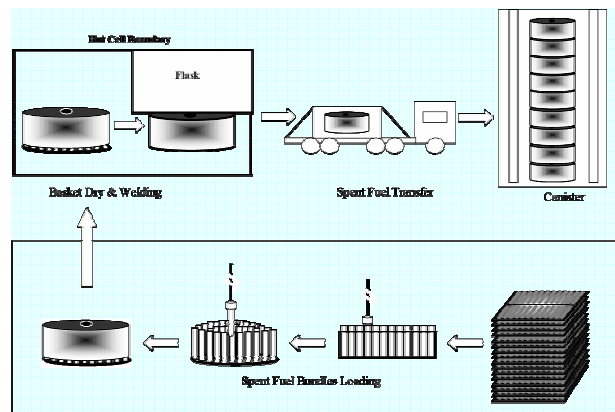


Figure 1 Diagram of spent fuel transfer campaign at Wolsong

In order to meet the inspection goal attainments mentioned in Safeguards criteria, both the IAEA and the NNCA inspectors perform the inspection activities as follows.

- Confirm that operator is loading bundles into an assigned basket, and verify two bundles among 60 bundles of the basket by using method A and H.
- Confirm that the verified basket is covered with a lid, moved into the welding station and welded.
- Confirm that the truck with a basket moves to dry storage and the basket is unloaded into an assigned canister.
- Attach dual permanent seals on the canister full with nine baskets after operator welded the plug & lid, and verify the canister by taking the NDA profile along the verification tube of the canister.

2.2 Background

The IAEA thought the OLRs operating in Canada and ROK have been requiring too many inspection efforts to meet current safeguards criteria due to their SFT campaigns. And also, the IAEA estimates that the PDIs forecast at all CANDU facilities based on current safeguards criteria will show a steady increase in PDIs ranging from 1000 PDI in 2002 to 2000 PDI in 2008. Accordingly, considering the concept of the Integrated Safeguards (IS) to achieve a greater effectiveness and efficiency, the IAEA is trying to develop the State Level Approach (SLA) instead of current facility level approach. However, the IAEA's conclusion of non-diversion of declared nuclear materials in a state has to be drawn as required under a comprehensive safeguards agreement. This conclusion is based on the evaluation of results of inspection activities performed at nuclear facilities in the State and a qualitative assessment of all other information available to the IAEA.

2.3 Cooperation Approach

All transfers of spent CANDU fuel from wet storage to dry storage have been verified by the IAEA and NNCA inspectors as appropriate. The IAEA suggested a cooperation approach to the ROK to achieve a greater efficiency of safeguards and prepare the new IS approach for SFT campaign. This approach involves the mailbox concepts for declaration of operational activities, the application of unattended monitoring sensors and the use of unannounced inspections during SFT campaign. The mailbox concept requires the SSAC to declare the long term plan, one week advance notice and 24 hours advance notice, and 24 hours post notice according to the schedule and operational status of SFT campaign. For collecting the near real time data on all activities, the surveillance cameras are installed at the working area and the radiation sensors are installed at the bundle loading station, moving flask and canisters described as a strategic point. And also, it requires the IAEA to perform unannounced inspections during SFT period. Then inspectors have to confirm whether all activities declared by the SSAC are going well or not and that a diversion of nuclear material doesn't occur. But, this one is just the cooperation approach suggested by the IAEA under the current safeguards criteria. So, the IAEA is going to develop the new IS approaches for SFT campaign.

3. Proposal

Since the nuclear issues happened in the ROK at the last year, our government has been trying to strengthen the SSAC (State System of Accounting for and Control of

Nuclear Material) for the nuclear transparency. The new IS approaches described that announced inspections, Short Notice Random Inspections (SNRI) and unannounced inspections are available depending on the current surveillance system operating in a State. In our case, all data of surveillances operating at facilities are able to be remotely transmitted to the IAEA and the NNCA has an ability to do the enhanced cooperation with the IAEA for achieving a greater effectiveness and efficiency of safeguards. Based on our these conditions, we would like to propose that accepting announced inspections at nuclear reactors instead of unannounced inspections and SNRI at fuel fabrication plants is a good option for both government and facilities. Then, facilities and government can get a notice of inspection and our national inspector can implement national inspections simultaneously with the IAEA inspector. In a case of Japan, they accepted announced inspections and short notice inspections except of unannounced inspections because officers have to accompany IAEA inspectors as required by their law.

4. Conclusion

In order to increase effectiveness and efficiency of safeguards, the IAEA is trying to develop the new IS inspection approaches. The cooperation approach will work well as a reference for the IAEA to develop the new IS approaches for SFT campaign at OLR. When the field trial is finished successfully, both sides will reflect all current issues occurring in the field trial on the development of the IS approaches. And this cooperation will work as our transparency factors when the IAEA considers the state level under the IS in the near future. Finally A proposal is to reflect our considerations when which kinds of inspection are decided to be the best option for us to strengthen our SSAC as appropriate.

REFERENCES

- [1] CSSP, Draft Report of the Field Trial in Canada of an Integrated Safeguards Approach for Transfers to Dry Storage at Multi-unit CANDU Stations in Canada, CSSP-2004-10, 2004
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