MODERNIZATION OF THE ACCIDENT LOCALIZATION SYSTEM AND RELEVANT DOSE EXPOSURE ON UNIT 4 OF KNPP

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Abstract:
In 2001 a modernization of the Accident Localization System (ALS) on unit 4 was accomplished. The outage duration was longer then usually and special dose budget was elaborated. All ALS work was performed by external organization. An ALARA implementation was recognized priority. The really accumulated collective doses were analyzed and conclusions drawn. A short film on CD was prepared.

1. Preliminary information

According to the modernization Programme' 97 of NPP Kozloduy priority task was the Accident Localization System. Main part of it is the Vortex Jet Condenser.

Due to modernization activities in 2001 including the modernization of Accident Localization System (ALS) the outage of unit 4 was prolonged to 4 months, (22.08.2001-22.12.2001). The projected collective dose was 1610 man.mSv. The projected collective dose (dose budget) just for ALS activities was 300 man.mSv. This dose budget was based on the technology to be used and the expected working time for the main activities. Consideration was given to the gamma dose rate (dose rate mapping) as well.

The gamma dose rate on the working places in the Restricted Control Area (RCA) was 0.005-0.03 mSv/h. For a short- time activities, on some hot spots the dose rate was up to 0.80mSv/h.

Before the work started a group of engineers and worker was delegated to Novovoronezh NPP, where similar system was already erected. The purpose of the visit was to gather information about:

- what instrumentation was used;
- what facilities should be available and applied;
- what was the most crucial task;
- how the work was scheduled;
- what is the optimum number of workers per shift;
- radiation safety measures;
- any experience feedback;

2. ALARA implementation

The project was performed by subcontractor. The modernization activities started from the first days along to the end of the outage.

The existing ALARA approach was implemented:

- Instruction of the personnel about used technology and systems location;
- Gamma dose rate mapping at the entrance of the RCA;
- Pre-briefing of workers;
- All preparatory work was performed outside the RCA;
- Decontamination of the floor;
- Individual dose control by TLD and alarm electronic dosimeters;
- Weekly management meetings;

A short ALARA course was given to each worker group. A very detailed planning of the work sequence of the different tasks and transportation routes were established.

One key aspect was the effective empowerment of the workforce. The work management of this modernization emphasized this aspect and we believe it was successfully applied. On daily and weekly meetings we tried to talk to the workers and third line management, and motivate them to perform job in efficient and effective manner. Good communication with RP personnel and all workers, and everyday dose records reports helped to follow the set goals.

Monitoring of the internal contamination was performed before and at the end of the activities.

3. Dose management.

Dose management was conducted according to the procedures in KNPP and ALARA meetings decisions:

- Dosimetry with TLD badges and electronic alarm dosemeters were used for the dose control of the personnel;
- The highest permissible dose in the Radiation Work Permit was 0.5 mSv;
- The maximum permissible accumulated individual dose for all ALS modernization 5 mSv;
- A daily analysis and comparison of the expected and committed dose;
- Dose rate mapping was performed in any single RWP;
- Continuous monitoring of the levels of air contamination.

Dose reports were accomplished on daily basis and transmitted to all involved persons.

4. Results

4.1. Dose analysis

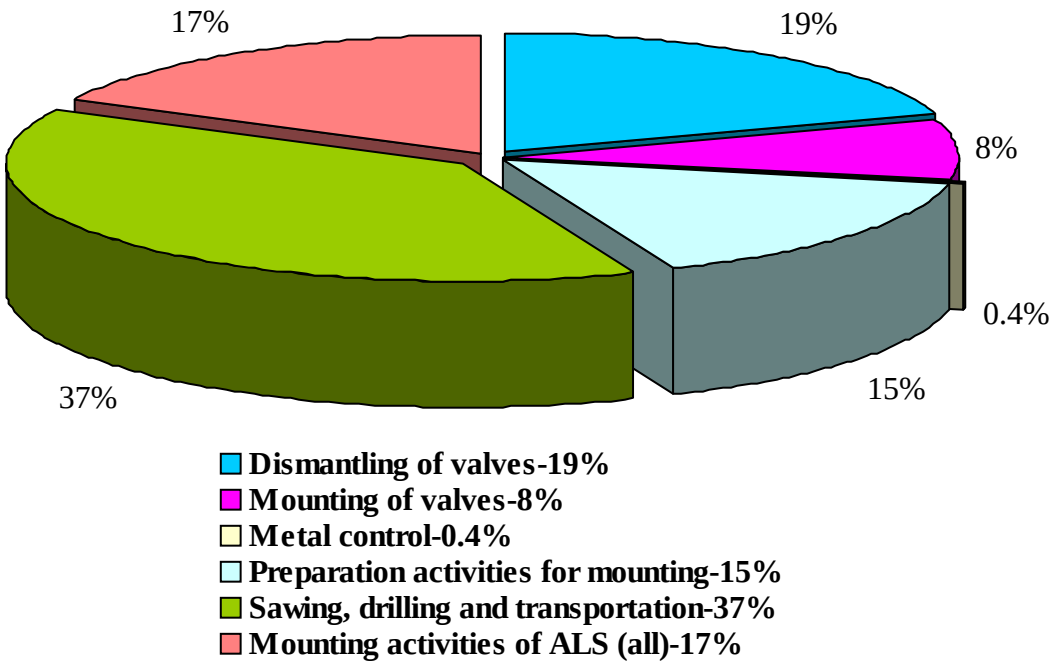
In the end of ALS modernization about 606 Radiation Work Permits were issued. About 210 workers were controlled. No one worker received a dose higher then 0.2mSv/day. The maximum individual dose was 5.8mSv, about 15% higher than the allowable value. The worker was busy with cutting, and dismounting activities. The average individual dose due to ALS modernization was 1.16mSv. The real collective dose for all ALS activities was 243.4 man.mSv, and for the whole outage - 1732.7 man.mSv. About 35 different tasks were observed.

No internal contamination at the end of the ALS modernization was detected.

Based on the requested task in the Radiation Work Permits (RWP), dose distribution analyzes were performed. All RWPs were grouped in 6 main tasks:

- Dismantling of valves –123 RWP with collective dose 47 man.mSv;
- Mounting of valves –31 RWP with collective dose 20.1 man.mSv;
- Metal control –11 RWP with collective dose < 1man.mSv;
- Preparation activities for mounting –67 RWP with collective dose 37.8 man.mSv;
- Sawing, drilling and transportation 254 RWP with collective dose 90.2 man.mSv;
- Mounting activities of ALS (all) –96 RWP with collective dose 42 man.mSv;

The dose distribution is shown on the following chart:



4.2. Radioactive waste generation

During the reconstruction activities a quite big amount of concrete and metal wracks was cut out and removed from the restricted area. Most of it, about 200 m^3, was not contaminated. The radiological limitation was: non fixed beta activity less then 0.4 Bq/cm^2, and gamma-dose rate less than 0.20 μSv/h.

All measurements were performed on previously selected area with low background (15-20 μSv/h). About 5 m^3 were determined as radioactive waste.

5. Conclusion:

5.1. Good work management and a first attempt of effective empowerment of the workers gave satisfactory results.

5.2 Although the work was not typical, and performed for a first time, the ALARA implementation reduced the projected collective dose with 19 %

References:

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