DECOMMISSIONING – A PROBLEM OR A CHALLENGE?

by

Irena MELE

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With the ageing of nuclear facilities or the reduced interest in their further operation, a new set of problems, related to the decommissioning of these facilities, has come into forefront. In many cases it turns out that the preparations for decommissioning have come too late, and that financial resources for covering decommissioning activities have not been provided. To avoid such problems, future liabilities should be thoroughly estimated in drawing up the decommissioning and waste management programme for each nuclear facility in time, and financial provisions for implementing such programme should be provided.

In this paper a presentation of current decommissioning experience in Slovenia is given. The main problems and difficulties in decommissioning of the Žirovski Vrh Uranium Mine are exposed, and the lesson learned from this case is presented. The preparation of the decommissioning programme for the Nuclear Power Plant Krško is also described, and the situation at the TRIGA research reactor is briefly discussed.

Key words: decommissioning, nuclear power plant, research reactor, uranium mine, waste management programme

INTRODUCTION

The first nuclear facility in Slovenia originates from the sixties, when the small TRIGA research reactor was constructed near Ljubljana. After the successful commissioning of the research reactor in 1966, in the seventies, Slovenia and neighbouring Croatia decided on the construction of a nuclear power plant (NPP). Initially, two NPP were planned – one in Slovenia, another one in Croatia – both to be jointly financed, constructed and exploited by the two republics. The construction of the first NPP, located near Krško in Slovenia, started at the end of 1974. Seven years later, the nuclear power plant was already in trial operation, and January 1, 1983, was regarded as the beginning of the commercial operation of the Nuclear Power Plant Krško (NPP Krško).

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Author's address:
Agency for Radwaste Management
Parmova 53, 1000 Ljubljana, Slovenia

Author's e-mail:
irena.mele@gov.si

The construction of the second NPP in Prevlaka near Zagreb has never been realized. Plans were stopped by the moratorium on further construction of NPP until 2000 , adopted by the former Yugoslavia in 1986. Later, the moratorium was also adopted by Slovenia, which withdrew from further activities on the NPP Prevlaka.

The construction of the NPP in Slovenia was accompanied by the opening of the uranium mine in Žirovski Vrh near Škofja Loka. The mine was intended to provide the raw material for the fabrication of nuclear fuel for the NPP Krško, but also for other nuclear power plants, being planned in former Yugoslavia. The Žirovski Vrh Uranium Mine company was formally established in 1976. The uranium ore excavation started in 1982, and in 1984 the first yellow cake was produced. In 1990, only after few years of operation, the mine was closed and is now being decommissioned [1].

CURRENT STATUS OF NUCLEAR FACILITIES

Nuclear power plant

The NPP is located at Krško near the border with Croatia, the co-owner of the plant (fig. 1). The

Figure 1. The Nuclear Power Plant Krško

plant has been in commercial operation since the beginning of 1983. Its projected lifetime is until 2023. The electricity generated by the plant is shared equally between Slovenia and Croatia.

The NPP Krško has a PWR type reactor. The power station was designed and manufactured by the Westinghouse company. The plant was designed following the USA regulations. All later modifications and improvements of the plant have been performed in accordance with the applicable original vendor regulation.

The initial nominal power of 632 MW_e was upgraded in the year 2000 to 676 MW_e. Until now, the NPP Krško has achieved, in comparison with the international practice, excellent production and safety results. From the standpoint of safety, the production of the NPP Krško has been comparable to the nuclear stations in the European Union and the United States.

The average annual energy production in the NPP Krško is around 4.4 TWh, which represents almost 40% of total energy production in Slovenia [2]. The NPP Krško proves to be a stable and reliable energy source in Slovenia. Although the electricity is equally shared with Croatia, it is still covering 20% of our energy needs. It also produces no greenhouse gas emissions; therefore, it is also being considered that its lifetime might be extended after its expiration in 2023.

Research reactor

The TRIGA Mark II research reactor is located near Ljubljana and operated by the Jožef Stefan Institute (figs. 2 and 3). It is a General Atomics design. Its nominal power is 250 kW in the steady state mode of operation and it is intended for research, training and isotope production. In 1991, it was refurbished and reconstructed to enable the peak power of 1000 MW in the pulse mode, in addition to the earlier steady-state mode of operation [3, 4].

Uranium mine

The third facility, linked to the nuclear fuel cycle, is the Žirovski Vrh Uranium Mine. It is located 20 km south west of Škofja Loka in the valley of the Brebovščica stream (figs. 4 and 5).

Preliminary geological exploration in the Žirovski Vrh deposit area started in the sixties, and was intensified in the late seventies after the construction of the NPP Krško had started. Next to the mine, a modern processing plant for extraction of uranium concentrate from the ore was erected. The processing technology was based on domestic research and development. At the time, the technology was regarded as very advanced and environmentally clean [1].

Nevertheless, the operation of the uranium mine was of short duration. Due to the changed situation on the uranium ore market, in the combination

Figure 2. TRIGA research reactor centre in Brinje near Ljubljana

Figure 3. The TRIGA Mark II research reactor

Figure 4. The headquarters and the processing plant of the Žirovski Vrh Uranium Mine

Figure 5. In the uranium mine

with political changes and growing opposition to nuclear energy, in 1990 the Slovenian Government took the decision on temporary cessation of the mine operations. In 1992, the Law on Permanent Close-out of Uranium Ore Exploitation and Prevention of Mining Consequences at the Žirovski Vrh Uranium Mine was adopted by the Parliament, by which the mine was permanently closed-out and the decision on its decommissioning was taken.

DECOMMISSIONING PLANS AND ACTIVITIES

Activities related to the decommissioning of the uranium mine are the only practical experience in decommissioning facilities, related to nuclear fuel cycle in Slovenia. The other two nuclear facilities – the NPP and the research reactor – are still in operation.

The decommissioning of the uranium mine cannot be regarded as a model project. Lessons learnt from this painful experience initiated early decommissioning planning for the NPP. The decommissioning plan for the NPP Krško was already prepared in 1996. Just recently the new revision has been drafted and is waiting for adoption, while for the research reactor no such activities have yet been initiated.

Legal requirements for decommissioning

Since October 2002, the new Act on Radiation Protection and Nuclear Safety (Act; Official Gazette of the RS, No. 67/02) has been effective in Slovenia; it is harmonized with the EU legislation and all relevant international conventions, being ratified by the Slovenian Parliament. With the adoption of this Act, the Act on Radiation Protection and the Safe Use of Nuclear Energy from Former Yugoslavia (Official Gazette of the SFRY, No. 62/84) ceased to apply. However, the regulations issued on the basis of this law remain in use until new regulations are issued. Some of them have already been replaced, but many of them are still valid.

While in the previous act the decommissioning aspect was only modestly covered, and the decommissioning plan was not required before the end of operation of the nuclear facility, the new Act from 2002 imposes more stringent rules. The Act clearly requires the operator of a nuclear or radiation facility to provide the financial resources for covering future liabilities, including the management of radioactive waste as well as the decommissioning of the facility. Adequate provisions for raising the money and an adequate level of financial resources for covering future liabilities need to be proved in the process of licencing a nuclear or radiation facility. Although more detailed rules are still expected to be defined in new regulations, the requirements of the new Act are already proving to have a strong impact on the future operation of nuclear facilities. The operating licence is, according to the new Act, issued for a maximum of 10 years. In the process of renewal, the licence holder will have to show that he fulfills all the requirements from the Act, including the financial provisions for future liabilities.

For the NPP Krško, the financial mechanisms for covering future liabilities are more specifically defined in a separate Act on Fund for Financing the Decommissioning of the NPP Krško and Radioactive Waste Disposal from the NPP Krško (Decommissioning Act, Official Gazette of the RS, No. 75/1994), prepared and adopted by the Slovenian Parliament already in 1994. Two basic requirements have been set by this law: the establishment of the fund for decommissioning, which collects the financial resources for these activities, and the preparation of the decommissioning plan. Based on the requirements of this act, the decommissioning plan for the NPP Krško as well as provisions for its funding are already in place.

Decommissioning of the uranium mine

The operation of the Žirovski Vrh Uranium Mine was stopped in 1990 without previous notification and without any plan for decommissioning. After two years of uncertainties, in 1992 the permanent closure of the mine became a find fact. In the same year, the former operator of the uranium mine was transformed into an enterprise responsible for the decommissioning of the mine and processing plant [5].

It was only in 1994 that the Programme on the uranium ore exploitation, close-out and prevention of mining consequences in the Žirovski Vrh Uranium Mine, covering all aspects of decommissioning, was prepared and approved by the Government.

In general, there are three different areas at the Žirovski Vrh to be remediated: the mine, the mill and two waste disposal sites [6]. Those areas were separately evaluated as sub-projects:

– a project for permanent closure of the uranium ore exploitation facilities (mine),

– a project for cessation of the yellow cake production plant (mill) with permanent environmental protection against the consequences of the yellow cake production, and

– a project for restoration of the waste disposal sites (mine waste piles and mill tailing pile). An additional project was prepared for permanent environmental protection against the consequences of disposal and storage with long term environmental monitoring and health control after the restoration of the site.

The implementation of these projects strongly depends on available funds. These have been short during all these years; therefore, the progress was much slower than expected and the decommissioning has still not been concluded.

Of all the above mentioned projects, the most demanding one is the restoration of the waste disposal sites on the slope in the vicinity of the mine: the mine waste disposal site Jazbec (fig. 6), and the disposal of mill tailing at Boršt (fig. 7). Especially the remediation of the Boršt tailings disposal is accompanied by great difficulties. Several possible alternatives were considered: tailings close-out in situ, relocation of the mill tailings to a new site, relocation of the mill tailings into the underground mine, and dumping of the milling tails in the bulk of the Jazbec disposal. The option of in situ close-out with leaving tailings on place and covered with a multilayer cover was selected as the best solution. Unfortunately, the landslide of tailings, discovered during the works, caused many additional problems. Earth sliding was stopped only after the construction of an underground water drainage tunnel at the Boršt disposal site.

Figure 6. Jazbec mining waste disposal site

More successful was the decommissioning of the production line. This has already been completed, and just recently the land complex of the former processing plant has been given over to the local community of Škofja Loka for unrestricted use. In the decommissioning process several buildings, process equipment and installations have been dismantled (fig. 8). Some other buildings, intended for unrestricted use, have been cleaned and decontaminated. The decontamination was performed mainly by water washing (pressure of 7-150 bar). Demolishing of the buildings generated about 4300 m^3 of solid radioactive waste and, together with the ruins, it was dumped at the Jazbec mining waste disposal.

For successful completion of the decommissioning of the uranium mine, the following activities still need to be concluded:

– permanent close-out of the mine, including the sanation of different sectors of mine infrastructure to provide stability and safe access during the close-out works and backfilling the shafts and adits in order to prevent the future impact on the surface,

Figure 7. Mill tailings disposal site at Boršt

Figure 8. Dismantling of the processing plant

– mill tailings permanent close-out with permanent protection of the environment by covering the mill tailings with a protection cover composed of radon barrier, drainage layer, biological barrier, frost protection layer and erosion protection grass-seeded layer, and

– mine waste pile permanent close-out with permanent protection of the environment by a newly shaped surface covered with similar layers as in the case of mill tailings.

The latest plan foresees that the decommissioning will be accomplished by 2007, assuming that sufficient financial resources are available. The works are estimated at the cost of 37 million EUR, half of which represents the loan from the European Investment Bank.

Because of the low uranium contents and low levels of soluble contaminates in the mine and waste, the mine operations have had a relatively low radiological impact. The critical group dose equivalent (for 1994) was calculated to be 0.33 mSv, 80% of this dose being from the exposure to radon-222 progeny. The background equivalent dose is 5.5 mSv, with 73% of this being from the exposure to radon-222 progeny. Remediation would bring the critical group dose equivalent down to 0.11 mSv.

The decommissioning plan for the NPP Krško

The first decommissioning plan for the NPP Krško was prepared in 1996 by NIS Ingenieurgesellschaft mbH consulting company from Germany [7]. The plan was aimed at investigating possible decommissioning methods with cost estimations for different decommissioning strategies and time schedules for their implementation. Although the decommissioning usually does not include the disposal of radioactive waste, it was required that the decommissioning plan for the NPP Krško should also cover the disposal of spent nuclear fuel and low and intermediate level radioactive waste (LILW).

This is a site specific plan. Three alternative scenarios were analysed: immediate dismantling, later dismantling, and entombment. In the immediate dismantling scenario, the facility is immediately dismantled and the complete radioactive inventory removed. When completed, the site (and the remaining facilities, if any) is available for unrestricted use. In later dismantling, as well as in the entombment scenario, a certain period of safe storage or entombment of radioactive inventory is included in order to take the advantage of radioactive decay. The main advantage of the first scenario is the relatively short duration of the whole decommissioning project and early release of the site for further use. In the other two scenarios, the dismantling is simpler and occupational exposure lower due to the lower radioactivity level.

In selecting the optimal scenario, the deciding factor was the availability of an experienced and skilled working team at the time when the decommissioning started. More weight was placed on this factor than any other, including the financial aspect. Therefore, the immediate dismantling model was selected as the best option. The total duration of the decommissioning by this model takes 96 years. Only 14 years out of these are needed for the dismantling activities; the remaining 82 years are planned as the decay period for the reactor vessel and some other components.

Spent fuel management considers direct disposal of 1500-1600 spent fuel (SF) assemblies. The repository concept follows the Swedish model: the repository is constructed 500 m deep, and SF is packed in copper/steel canisters. Packaging is performed at the site of the NPP. If the repository is not available in time, dry storage of SF in Castor casks for a period of 20 years is foreseen.

For LILW disposal, the plan assumes that the operational waste will be disposed of in 200 l drums or in tube-type containers. For LILW from the decommissioning, quadrangular canisters will be used. The waste will be immobilised with concrete. The amount of waste will be reduced by storing larger components on site for a period of 60 to 100 years, later cutting it into pieces. In case of late availability of a repository, a storage facility on site is assumed.

The results are summarized in tab. 1. Beside the cost estimation for all three scenarios, data for the total duration of decommissioning, the amount of decommissioning waste and the expected occupational radiation exposure of the working team are also given.

Due to the long-term nature of the decommissioning project, the plan was supplemented by the sensitivity analysis to assess the impact of

Table 1. Comparison of different decommissioning scenarios from NIS study [7]

Strategy	Cost [10^6 DEM]	Duration [year]	Decommissioning waste [m^3]	Exposure [man-Sv]
Immediate dismantling	740.8	96	13132	8.2
Later dismantling	784.8	96	735	2.4
Entombment	690.3	164	1258	2.7

some highly sensitive parameters. Because of the dual ownership of the NPP Krško, the sensitivity analysis took into account the possible construction of two repositories for SF and LILW, extension of safe storage period, delays in some other activities and rise in wages. With the results of sensitivity analysis, the cost estimation for the immediate dismantling scenario increased to 1113 million DEM, which was taken as the basis for calculating the decommissioning tariff of 0.462 SIT/kWh to be collected by the decommissioning fund.

That fee was accepted in Slovenia and successfully collected by the decommissioning fund from our share of produced energy. Unfortunately, the fee was unacceptable for the Croatian owner, mainly due to unresolved ownership problems.

Joint decommissioning and waste management programme for the NPP Krško

The agreement between Slovenia and Croatia on the ownership and exploitation of the NPP Krško has been a hot issue between the two countries for more than a decade. The real progress in negotiations was achieved only in 2002, when the agreement was drafted. It has been effective since March 2003 (Official Gazette of the RS, No. 5/03).

By the agreement, the decommissioning and the disposal of SF and LILW from the NPP Krško is the responsibility of both parties. More details on these two aspects are not given in the agreement. Instead, the agreement refers to the joint final solution for the decommissioning of the facility as well as for the disposal of radioactive waste and spent fuel, which needs to be elaborated in the programme of the decommissioning and disposal of radioactive waste from the NPP.

The programme was required to be prepared jointly by the waste management organizations from both countries within one year after the agreement was signed. The decommissioning plan from 1996 was accepted as a basis for this new programme. In March this year ARAO – Agency for Radwaste Management from Slovenia – and APO – Agency for Hazardous Waste from Croatia – in a short period of only 9 months finalized the Joint decommissioning and waste management programme [8] and submitted the document to the Intergovernmental Commission for adoption.

The Joint Programme is primarily aimed at providing a good estimation of future liabilities of the NPP Krško [9]. A cost estimate for the NPP Krško decommissioning, for disposal of LILW and for management of SF is a necessary input to the two national funds, which, according to the agreement, take the responsibility of collecting the funds for implementing the programme.

The Joint Programme assumes that the operation of the NPP Krško will end in 2023. It also assumes that all LILW will be disposed of in a single near surface repository, which will be available before the decommissioning is due to start. One deep geological repository is also assumed for the disposal of spent fuel [10]. Regarding the timing, two options are analysed: the repository being available in 2030 and the repository being available in 2050. In the first case, no interim storage of SF is needed. After a few years of cooling, the spent fuel is relocated directly into the repository. In the second case, a 30-year storage period (dry or wet) is foreseen before the SF will be finally disposed. As an alternative scenario, an export of spent fuel to Russia is also considered. The decommissioning analysis follows the approach from the previous decommissioning plan. The immediate dismantling strategy (SID) has been adopted, but several variations of this strategy are being investigated: besides original dismantling in 96 years, the options of immediate dismantling in 30 years and in 15 years are also being analysed.

By combining different technical solutions for dismantling the NPP, for transport and storage of SF, for disposal of LILW and for disposal or export of SF, and by applying different time schedules for these activities, a series of possible decommissioning and waste management scenarios has been prepared. The unacceptable ones were immediately eliminated, while the following seven scenarios have been recognized as feasible.

SID-96 disposal

This is a scenario of immediate dismantling over 96 years. The major dismantling activities are completed in 14 years. This period is followed by a relatively long decay period in which the radioactivity level of larger components (*e. g.* reactor vessel) is reduced. The LILW repository is already available by 2013, but its operation is extended over the whole dismantling period to accommodate the decommissioning waste. SF repository is available in

2030. The disposal of SF starts in 2031 and is completed in 6 years. The main disadvantage of this scenario is the very long operational period of the LILW repository, which significantly raises the cost of LILW disposal.

SID-96 export

This is a similar scenario to the one above. The difference is in SF management. Instead of construction of a repository, the SF is exported. The export takes place immediately after the permanent shut-down of NPP. It is completed in four years.

SID-15 export

In this scenario the decommissioning takes only 15 years. The main problem of this scenario lies in the management of SF. Since the repository of SF is not available before 2030, and the dismantling cannot start as long as the SF is in the spent fuel pit, the scenario is feasible only if SF is exported. Export is planned immediately after permanent closure of the NPP and completed in four years. All LILW is accommodated in a LILW repository, which is available in 2013 and operates until 2037, when the decommissioning is completed.

SID-15MS disposal

This is a slightly modified *SID-15 export* scenario. By decoupling the spent fuel pit from other systems of NPP, it enables the immediate dismantling activities while the spent fuel is stored in a separated spent fuel pit, where it is waiting for the disposal starting in 2030. Management of LILW is the same as in the *SID-15 export* scenario.

SID-15MS export

This is another variation of the *SID-15 export* scenario. The difference is only in the decoupled spent fuel pit, which permits the export to be performed after a period of storage. To be comparable with the *SID-15MS disposal* scenario, the storage period is 8 years. Beside the financial impact of later export, the scenario has an additional advantage: the interim storage period can easily be extended, if needed.

SID-30 disposal

More flexibility in SF management can be achieved only if interim dry storage is included. In such a case the storage period can be extended, if necessary, and the casks in which the SF is stored can be used also for its transport. This flexibility is provided in the *SID-30 scenario*. The dismantling is completed in 30 years, all LILW is accommodated in the LILW repository, which is available in 2013 and operates until the decommissioning is completed. The SF, after 30 years of dry storage, is disposed of in a repository, which is available in 2050.

SID-30 export

The same scenario as above, but instead of SF disposal, SF is exported after a period of dry storage.

For all these scenarios the cost estimates have been prepared, based on costs of different activities, equipment, processes and facilities attributed to each scenario [11, 12]. The total fixed cost of each scenario is finally calculated. Due to large uncertainties in these cost estimates, relatively high contingency factors have been used for each scenario. From the time-distribution of costs the discounted total cost is estimated as well.

The total fixed costs of these scenarios varies from 1.8 billion EUR to 1.1 billion EUR. The most expensive is the *SID-96 export* scenario and the most favourable the *SID-15MS disposal* scenario. From the results, it is seen that the new cost estimates for the decommissioning and waste disposal are much higher that the previous estimates from 1996. However, the time spans of these scenarios vary quite significantly. By discounting the time-distributed costs, a completely different situation can emerge. Although from fixed total cost estimates, the financially most favourable scenario is *SID-15MS disposal,* the discounted cost estimates give preference to the scenarios *SID-30 disposal* and *SID-30 export*. The discounted cost (end of 2002) of the former is 389 million EUR and 424 million EUR of the latter.

Both scenarios were further investigated for possible optimization. Since they include dry storage of spent fuel, the period of storage can be easily extended, thus giving more time for implementing the required solutions and making both scenarios financially more favourable. By extending the dry storage to 45 years, the disposal or export of SF can be shifted to 2066. Further optimization can be made on the disposal of LILW. Since the operation of this repository is quite expensive, the operational period is reduced by shifting the beginning of its operation to 2018.

With these optimizations the total discounted cost (end of 2002) of the *SID-45 disposal* scenario drops to 339 million EUR and for *SID-45 export* to 345 million EUR. The scenario *SID-45 disposal* was recommended by the expert team preparing the Joint Programme as the most reasonable scenario for the decommissioning and waste disposal from the NPP Krško. The programme has already been

adopted by the Intergovernmental Commission and is waiting for adoption of both Governments. It is hoped that this process will soon be finished, which will enable the full implementation of the provisions on the decommissioning funds from the agreement.

No decommissioning plan for TRIGA Research Reactor

The final decision on the operating lifetime of our research reactor has not yet been taken. The operating licence, which was issued under the Act on Radiation Protection and the Safe Use of Nuclear Energy from 1984, does not require any particular actions from the operator, regarding future decommissioning prior to the decision on permanent closure of the reactor. However, this has been changed by the new Act. For renewal of the operating licence, which is required by the new Act, the operator needs to prove that provisions for future liabilities are established. It is expected that within these activities the decommissioning and waste management plan will be prepared for the research reactor as well.

In first step, the decision on further operation or closure of the reactor needs to be taken. The following two options are now discussed:

(1) *Permanent shut-down of TRIGA research reactor.* Preparation of the decommissioning plan and return of the remaining spent fuel elements to the USA according to their Research Reactor Spent Nuclear Fuel Acceptance Program. The programme was started in 1996. It is based on a policy that authorizes the receipt and management of foreign research reactor spent nuclear fuel in order to reduce, and eventually eliminate, highly enriched uranium from worldwide commerce. Within this policy, in the period from 1996 to 2006, research reactor spent nuclear fuel containing uranium enriched in the USA will be accepted and managed in the United States. An additional three years for cooling down are given for the acceptance of fuel irradiated during the 10-year window. In 1999, part of the fuel inventory from TRIGA reactor (219 spent fuel rods out of 313) was already sent to the US Department of Energy (DOE). The contract allows the operator to return the remaining fuel inventory to the States as well, but the shipment should be made before the end of the foreign fuel acceptance programme.

(2) *Decision on continuation of reactor operation*. Temporary shut-down of the reactor for complete refurbishment of the facility. Preparation of the application for renewal of operating licence for the next ten years.

Both scenarios are now investigated and analysed. By sending the fuel inventory to the USA, the problem of its future disposal is eliminated, but in this case the research reactor needs to be permanently shut down already in 2006. If the decision will be in favour of further operation of the research reactor, its full refurbishment will be necessary. But in both cases, the decommissioning plan will have to be prepared to obtain a licence either for its closure or for reconstruction and continuation of operation.

CONCLUSIONS

The only practical experience in the decommissioning of nuclear or radiation facilities in Slovenia is limited to the decommissioning activities at the Žirovski Vrh Uranium Mine. The operation of this facility was stopped in 1990 without previous notification and without any plan for the decommissioning. The first programme on mine close-out, prevention and remediation of the mining consequences was prepared only two years later. Unfortunately, the programme was not supported by sufficient financial resources; therefore, the progress of the decommissioning and remediation has been much slower than expected. According to the latest plan, the decommissioning of the mine should be completed in 2007.

The lesson learned from this experience is now applied to other nuclear facilities. The new Act on Radiation Protection and Nuclear Safety is more stringent upon the operator regarding future liabilities of nuclear or radiation facilities. The operator is liable to provide the financial resources for future decommissioning as well as management of spent fuel and radioactive waste. The decommissioning and waste management plan is a tool to estimate future liabilities, and also a prerequisite for adequate funding of these liabilities; therefore, it is essential that the decommissioning plan for each nuclear facility be prepared in time.

For the NPP Krško, the first decommissioning plan was prepared already in 1996. After the agreement on the ownership and exploitation of the NPP Krško between Slovenia and Croatia the plan was revised, and the Joint decommissioning and waste management programme was prepared in 2004 by waste management organizations from both countries. The Joint Programme is primarily aimed at providing a good estimate of future liabilities of the NPP Krško. A cost estimate for the NPP Krško decommissioning, for disposal of LILW and for management of SF is a necessary input to the two national funds, which, according to the agreement, take the responsibility of collecting the funds for implementing the programme.

For the TRIGA research reactor, a decommissioning plan still needs to be prepared. According to the requirements of the new Act, it is expected that the preparation of such a plan will start soon.

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Ирена МЕЛЕ

ДЕКОМИСИЈА – ПРОБЛЕМ ИЛИ ИЗАЗОВ?

Са старењем нуклеарних постројења, или смањеним интересовањем за њихов даљи рад, у први план избијају нови проблеми повезани са њиховом декомисијом. У многим случајевима показало се да су припреме за декомисију закасниле и да нису обезбеђени финансијски извори декомисионих активности. Да се избегну ове тешкоће потребно је будуће обавезе на време и у потпуности проценити у току припреме програма за декомисију и руковање отпадом сваког нуклеарног постројења, као што треба обезбедити финансијска средства за примену таквог програма.

У овом раду приказано је садашње искуство са декомисијом у Словенији. Изложена су основна питања и тешкоће при декомисији рудника уранијума Жировски врх, и показана стечена сазнања на овом случају. Такође је описана припрема програма декомисије нуклеарне електране Кршко, док је стање истраживачког реактора ТРИГА укратко размотрено.