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**REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND
THE COUNCIL**

**on the implementation of the work under the nuclear decommissioning assistance
programme to Bulgaria, Slovakia and Lithuania and JRC programme in 2021 and
previous years**

1. SUMMARY AND HIGHLIGHTS

The nuclear decommissioning programmes co-funded by the European Union in Bulgaria, Slovakia and Lithuania have accomplished the main objectives which were set in the previous Multiannual Financial Framework (MFF 2014-2020), hence the programmes have moved onto the next stages of the respective decommissioning plans. As the decommissioning activities progressed, the level of radiological hazards were largely reduced at the three sites. Particularly important in this respect was the completion of the removal of spent fuel assemblies from the reactor buildings of the Ignalina nuclear power plant, two large RBMK reactors (same type as in Chernobyl) located in Lithuania.

For the current MFF 2021-2027 new objectives were set and the decommissioning and radioactive waste management programme of the European Commission Joint Research Centre (JRC) was joined under the same funding regulations. The co-funding provided as of 2021 will support the completion of the decommissioning programmes in Slovakia and Bulgaria, while it will assist Lithuania in embarking the actual dismantling of the Ignalina reactors, a first-of-a-kind technological challenge on a global scale. The funding will also ensure steady progress of pre-decommissioning and decommissioning activities mainly at the JRC Ispra site, as well as waste management and removal of obsolete equipment in the other three JRC sites with operating nuclear research infrastructure.

During 2021, preparatory activities of key upcoming projects progressed at a slower rate than planned, in spite of the progress of works on the ground, which was excellent in some particular cases. The funds' absorption rate in Bulgaria and Lithuania was not satisfactory, while, in Slovakia, the programme stakeholders revised the schedule and postponed the end-date by two years until the end of 2027 as a result of past delays for which applied mitigating measures were less effective than desired: nevertheless, the programme budget at completion decreased. At JRC, the programme has mostly progressed as planned, although the COVID-19 pandemic and other unanticipated circumstances impacted the construction of support facilities for the decommissioning in Ispra.

Key highlights of the implementation of the 2021 programmes are:

- Progress of the construction of the near-surface repository for low- and intermediate-level waste in Bulgaria (National Disposal Facility);
- Segmentation and packaging of the two reactor pressure vessels, i.e. main reactor casings, completed in Slovakia;
- Removal of last batch of spent fuel assemblies from the spent fuel pool in Lithuania: hence (fully finalized in April 2022), the two reactors will be prepared for dismantling;
- Recycling of large amounts of materials, in particular metals, at all three sites; for example in Slovakia the rate of release of metals from regulatory control exceeded 95%, and more than 1 800 tonnes were recycled;
- In JRC, pre-decommissioning activities and license-application preparations in Ispra, as well as programme-related activities in the other sites with operating infrastructure.

The decommissioning of nuclear facilities and the management of the arising waste under a common instrument in the 2021-2027 MFF will take advantage of synergies and knowledge sharing with a view to ensure dissemination of knowledge and return of experience. While the decommissioning programmes have produced a first set of knowledge products, the JRC has started the setting up of a dedicated platform for the benefit of EU stakeholders. The synergic approach promoted by the European Commission has come to fruition in Bulgaria, where the decontamination equipment and processes previously used in Slovakia are now being deployed with a substantially higher efficiency and cost savings. This positive experience will be replicated across the sites whenever applicable, under the sponsorship of the European Commission, starting from a stress test of the overall schedule of the Bulgarian programme, in order to draw from lessons learnt in Slovakia and to ensure its completion by the end of 2030, as planned.

2. FRAMEWORK OF THE PROGRAMMES

The current EU long-term budget, i.e. the multiannual financial framework (MFF) 2021-2027, includes funding programmes for decommissioning and radioactive waste management, which are set out in two Regulations¹ (hereinafter ‘the Regulations’) that provide a common framework for the Kozloduy nuclear power plants (units 1 to 4) in Bulgaria, the Bohunice V1 nuclear power plant in Slovakia, the Ignalina nuclear power plant in Lithuania, and the nuclear research installations of the European Commission Joint Research Centre (JRC) in Belgium, Germany, Italy, and the Netherlands.

This report presents the implementation of the work carried out under those programmes as per the Regulations, Article 10.

2.1. Nuclear Decommissioning Assistance Programmes

The first set of programmes, also known as the Nuclear Decommissioning Assistance Programmes (NDAP), provides financial assistance for the decommissioning of a specific list of eight nuclear reactors located in three sites in Bulgaria, Lithuania, and Slovakia. The programmes originated in the early 2000’s and are based on decommissioning plans containing clear provisions on scope, budget and planning. The disposal of spent fuel and radioactive waste in a deep geological repository is excluded from the programmes and is to be handled by each Member State as required by the Council Directive 2011/70/Euratom².

The European Commission implements these programmes under indirect management and has entrusted their implementation to the European Bank for Reconstruction and Development (EBRD) for all three sites (since 2001); the Central Project Management Agency (CPMA) for the Ignalina programme (since 2003); and the Slovak Innovation and Energy Agency (SIEA) for the Bohunice programme (since 2016).

¹ Council Regulation (Euratom) No 2021/100 of 25 January 2021 establishing a dedicated financial programme for the decommissioning of nuclear facilities and the management of radioactive waste and repealing Regulation (Euratom) No 1368/2013 (OJ L 34, p. 3–17); Council Regulation (EU) 2021/101 of 25 January 2021 establishing the nuclear decommissioning assistance programme of the Ignalina nuclear power plant in Lithuania and repealing Regulation (EU) No 1369/2013 (OJ L 34, 1.2.2021, p. 18–28).

² Council Directive 2011/70/Euratom of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste (OJ L199, 2.8.2011, p. 48).

The EU financial support provided by the Regulations will enable Bulgaria and Slovakia to complete the decommissioning of the concerned reactors and help Lithuania to proceed safely and steadily with the decommissioning of the Ignalina nuclear power plant, a first-of-a-kind process on an unprecedented scale that involves retrieving and packaging a large amount of irradiated graphite.

2.2. JRC Decommissioning and Waste Management Programme

The Decommissioning and Waste Management Programme (D&WM) of JRC entails a complex set of specific activities and projects with related objectives. In Ispra (Italy), where most of the nuclear facilities ceased to operate before 1999 and where there is a well-established organizational structure since the launch of the programme, the objectives include safe conservation, pre-decommissioning, decommissioning and waste management targets covering a variety of obsolete large installations and waste batches. For the other sites (Geel in Belgium, Karlsruhe in Germany, and Petten in the Netherlands) the objectives are, to a large extent, focused on legacy waste management, dismantling of obsolete equipment and relatively small facilities and on the definition of plans and teams to implement future decommissioning and waste management activities.

The D&WM programme is implemented by the JRC under direct management: programme management is performed by JRC staff while activities are outsourced.

3. BUDGETARY IMPLEMENTATION AND CO-FINANCING

The funding of the Kozloduy and Bohunice programmes will be completed within the current MFF 2021-2027. As the Ignalina programme is scheduled to last until 2038, a difference between the budget at completion and total funds still exists.

Bulgaria and Slovakia have established dedicated funds providing financing for decommissioning and radioactive waste management. These are complemented by other national resources, mostly from their national budgets. For the Ignalina programme, the Lithuanian government undertook a political commitment to provide funding from the national budget until the end of the programme for an amount of 14% of the overall budget.

Table 1 displays the shares of funding since the start of the programme in the early 2000's as well as the 'Budget At Completion', including contingencies and risks.

Table 1: NDAP funding contributions, EUR million

NDAP	Member State	Other donors	EU	Total	Budget at completion
Kozloduy	35.7%	0.6%	63.7%	100.0%	1 358
Bohunice	40.5%	0.7%	58.8%	100.0%	1 220
Ignalina	14.0%	0.7%	60.5%	75.2% ³	3 345

Source: Monitoring reports, annual work programmes, EBRD, CPMA, SIEA.

³ The total funding amounts from MFF 2021-27 and previous MFFs do not cover the whole LT programme which is foreseen to continue (unlike for BG and SK) after 2027.

The Regulations introduce maximum co-financing rates which apply to the EU budget under the MFF 2021-27; these rates are 50% for the Kozloduy and Bohunice programmes and 86% for the Ignalina programme. As the programmes are at different stages of implementation, these thresholds will be verified at project level for Bulgaria and Slovakia and at programme level for Lithuania.

The timeframe for the decommissioning of JRC obsolete facilities will extend until the decade of 2040. The programme also covers experimental facilities that are still in operation and the decommissioning of which will need to be planned once the facilities are shut down. The current estimated budget at the completion of the decommissioning activities in Ispra is EUR 926 million.

Table 2 summarises the disbursements made and allocations assigned to D&WM, split by site when such information is available.

Table 2: JRC decommissioning and waste management programme (disbursements + allocations), EUR million

	1999-2020 (actual values)	2021-2027 (planned value)	Total funds
Ispra	376	260	636
Geel	12	88	247
Petten	18		
Karlsruhe	129		
Total	535	348	883

Source: JRC direct management

4. PROGRESS AND PERFORMANCE

The European Commission measures progress and performance against the objectives set out in the Regulations. To support the monitoring process, the Commission uses performance indicators, including those set out in the earned value management (EVM) system⁴. By tracking progress against the performance measurement baseline, EVM is used to check the schedule and costs. In parallel, the programmes' critical path⁵ is monitored with the utmost attention and, where risks are identified, mitigating actions are proposed.

In 2021 risks threatening the respect of the end-dates were identified for all three programmes. In particular, the Bohunice programme end-date was re-scheduled from 2025 to 2027 (see below).

⁴ ISO 21508:2018 Earned value management in project and programme management.

⁵ In project planning, the critical path is the longest sequence of tasks that must be done to successfully complete the project. Tasks that are in the critical path, if delayed, will delay the whole project.

4.1. Bulgaria — Kozloduy programme

Units 1-4 at the Kozloduy plant are VVER⁶ 440/230 reactors. Units 1 and 2 were shut down in 2002 and Units 3 and 4 in 2006.

Under the supervision of the Ministry of Energy, the State Enterprise for Radioactive Waste (SERAW) is the licensed operator in charge of the decommissioning, as well as the construction and operation of the national disposal facility for low- and intermediate-level radioactive waste.

Having completed the dismantling in buildings other than the reactor buildings in the previous years, SERAW has intensified their decontamination and dismantling activities within the reactor buildings in accordance with the design approved by the national safety authority (BNRA).

The similar designs of the Bohunice and Kozloduy reactors provided an excellent opportunity to share experience, methods and equipment, thus reducing risks and cost. In 2021, the used decontamination equipment from Bohunice for the decontamination of the primary circuits was delivered to Kozloduy (Figure 1): estimated savings are about EUR 8 million and several months timewise.

As of end 2021, SERAW had processed 539 tons of metal (as planned) and released for recycling 3585 tons of diverse materials (more than the yearly targets). The retrieval, treatment and conditioning of historical and decommissioning radioactive waste are progressing in accordance with planned annual quantities.

Figure 1: Equipment for decontamination of the primary circuits received at Kozloduy
photos SERAW



The construction of the near-surface repository for low- and intermediate-level waste (National Disposal Facility) started in 2017 and is planned for completion in October 2023. This milestone will have to be met on time to ensure completion of the programme by the end of 2030.

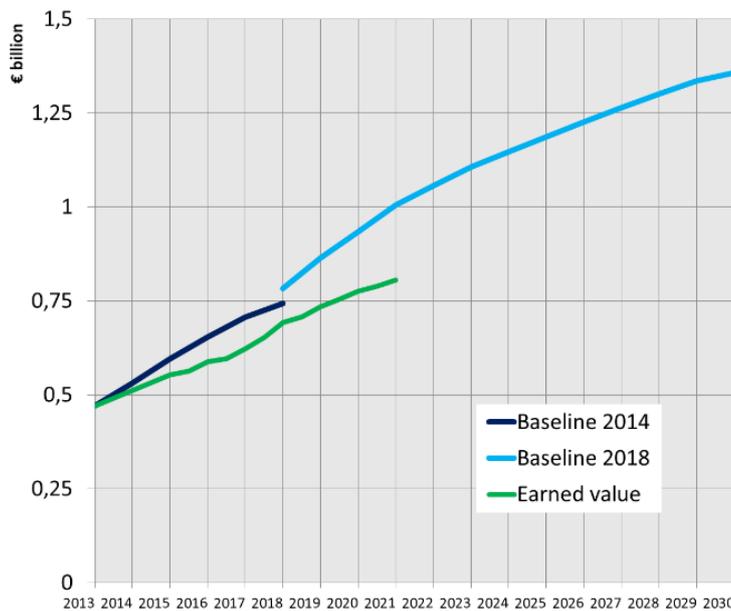
The plasma melting facility (PMF) is a first-of-its-kind installation for reducing the volume of radioactive waste. It employs a very-high-temperature thermal treatment that

⁶ Вводо-водяной энергетический реактор / vodo-vodyanoi energetichesky reaktor (VVER — water-water power reactor) is a series of pressurised water reactors.

produces a solid waste form which is particularly stable and safe. The project was launched in 2009 and reached the operational stage in 2019, for a total investment cost of EUR 8.2 million. In 2019-2021, SERAW carried out four operational campaigns reducing the volume of input waste by 50 times on average.

The programme performance baseline remains unchanged, with the completion date set in 2030. However, the lower-than-planned rate of implementation and the complex interdependency of activities on the critical path both signal an increasing risk of delay. The European Commission has requested the execution of a stress test on the overall schedule in order to confirm whether the completion date of the programme can be met, and to assess risks and mitigation measures. Figure 2 shows the amount of work carried out (earned value) against the plan (baseline). The baseline includes contingencies and this explains part of the gap compared with the actual progress.

Figure 2: Kozloduy programme — progress and performance



4.2. Slovakia — Bohunice programme

The Bohunice V1 plant consists of two VVER 440/230 reactors. Unit 1 was shut down in 2006 and Unit 2 in 2008. The Bohunice programme is the most advanced of the three NDAP. It may well become the first completed decommissioning programme for a VVER-type reactor world-wide.

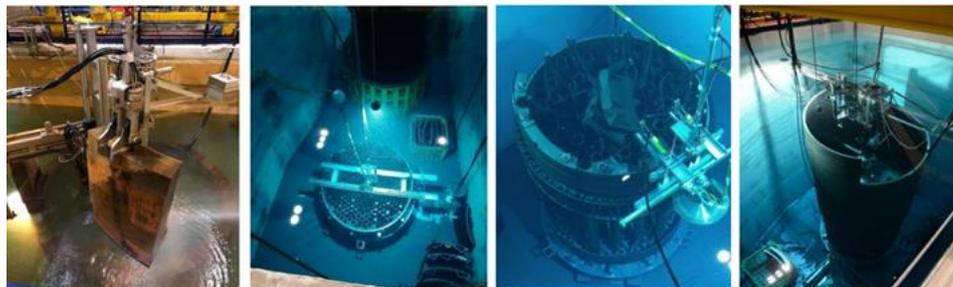
Under the administrative supervision of the Ministry of Economy, *Jadrová a vyrad'ovacia spoločnosť* (JAVYS) is the operator in charge of decommissioning Bohunice V1. Its mission includes the safe decommissioning of the nuclear facilities, spent nuclear fuel and radioactive waste management on Slovak territory.

During 2021, JAVYS and their contractors carried out very substantial work in decontamination and dismantling of the reactors. The reactor components and the pressure vessels were fragmented, decontaminated and packaged. The 12 steam generators, each made of 145 tonnes of steel, were also dismantled; at the end of the year, 8 steam generators had been fully fragmented, decontaminated and packaged. Most prominently, the decontamination processes were optimised to such an extent to enable

the release of more than 95% of metals as non-radioactive material, so that more than 1 800 tonnes of metallic waste were sent to recycling.

Figure 3: Cutting of Reactor Pressure Vessels at Bohunice

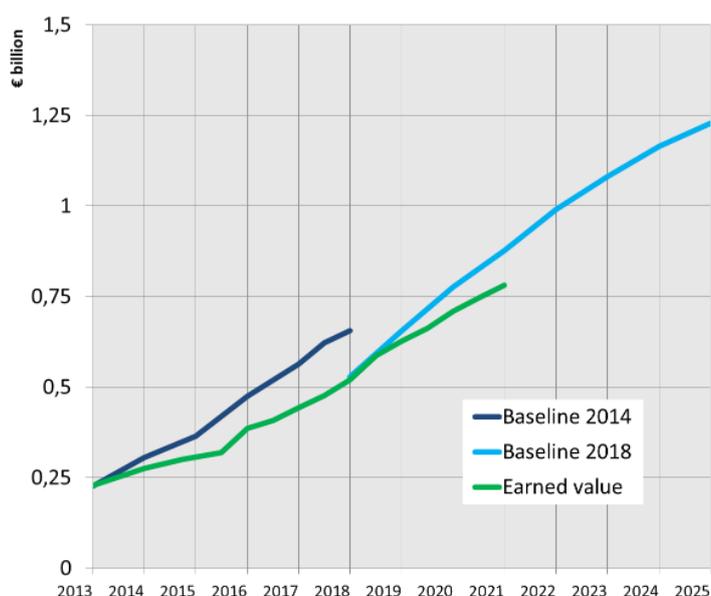
photos from JAVYS



While field work progressed at a rather satisfactory pace, JAVYS had to revise the overall programme schedule and postpone the end date until 2027. This two-year extension has been caused by the fact that previously set mitigation measures to recover a delay of a former project on the critical path were not as effective as initially expected. JAVYS presented several scenarios which were critically reviewed by all stakeholders, including the European Commission. Eventually, the accepted scenario set a target end-date in 2027 at no extra costs; rather, the budget at completion of the Bohunice programme was reduced from EUR 1237 million to EUR 1220 million as several projects had been completed and related contingencies could be reduced. Completing the programme in 2027 is feasible but very challenging too; strategic level risks have been identified and assessed to control projects delivery on time.

Figure 4 shows the amount of work carried out (earned value) against the plan (baseline). A revised Detailed Decommissioning Plan (DDP 2021) to be used as the new baseline is being finalised to reflect the new end date.

Figure 4: Bohunice programme — progress and performance



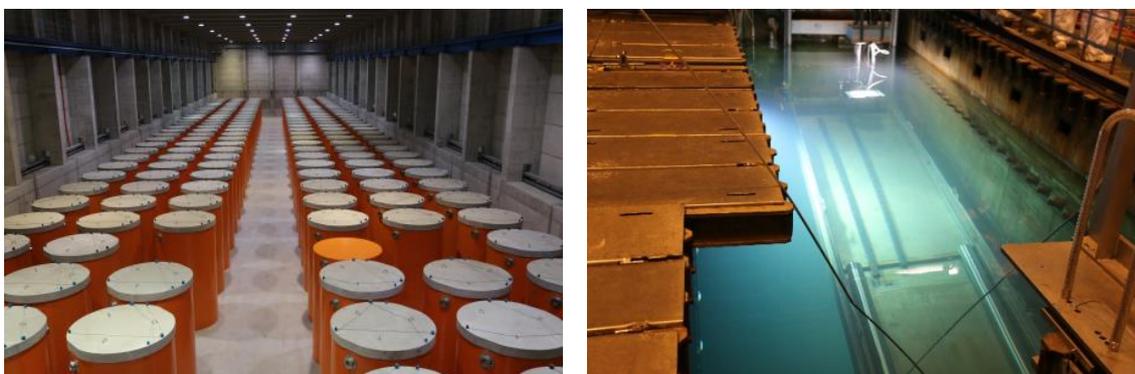
4.3. Lithuania — Ignalina programme

The Ignalina plant consists of two RBMK⁷ 1500 reactors. Unit 1 was shut down in 2004 and Unit 2 in 2009. Lithuania does not operate other nuclear reactors.

Under the administrative supervision of the Ministry of Energy, the state enterprise Ignalina Nuclear Power Plant (INPP) is the operator in charge of the facilities under decommissioning and, since 2019, the waste disposal facilities.

As of end 2021, the programme had substantially progressed in removing the spent fuel from the reactor buildings and its transfer to the interim dry-storage facility whose loading was almost completed (Figure 5, one cask to go out of 191). This is a major milestone in terms of nuclear safety and reduction of the radiological risk, opening the way to the dismantling of the reactor core systems. Meanwhile, INPP has started cleaning-up, emptying and decontaminating the spent-fuel pools.

Figure 5: Interim storage facility and underwater cutting of damaged fuel elements at Ignalina
photos INPP



The dismantling of the Ignalina reactors is a technological challenge, because never before has a large reactor graphite core been dismantled. In a first phase, started in 2020 and running up to 2027, INPP will remove all peripheral components from the reactor shafts. The design of the subsequent removal of the content of the shafts – the graphite, metal structures and filling material and of the facility for the temporary storage of the irradiated waste – is being preceded by optioneering⁸ studies. In 2021 calls for tenders for the optioneering study were launched and contracts should be placed in the current year. This slow process has caused further delay in the overall schedule, due to complex procurement preparations between the programme stakeholders. The delay in starting the design and the first-of-a-kind nature of the project will require a reassessment of the programme end-date at the end of the optioneering stage.

While the projects managed by EBRD were coming to an end, Lithuania's Energy Minister expressed in March 2021 the view that the Ignalina programme should continue to be supported by two entrusted entities: i.e. EBRD and CPMA. Accordingly, the Minister also indicated Lithuania's preference that EBRD take over specifically the project for the dismantling of eight steam drum-separators from the two reactor units.

⁷ Реактор Большой Мощности Канальный / reactor bolshoy moshchnosti kanalnyy (RBMK — high-power channel-type reactor) is a class of graphite-moderated nuclear power reactor (also installed in Chernobyl).

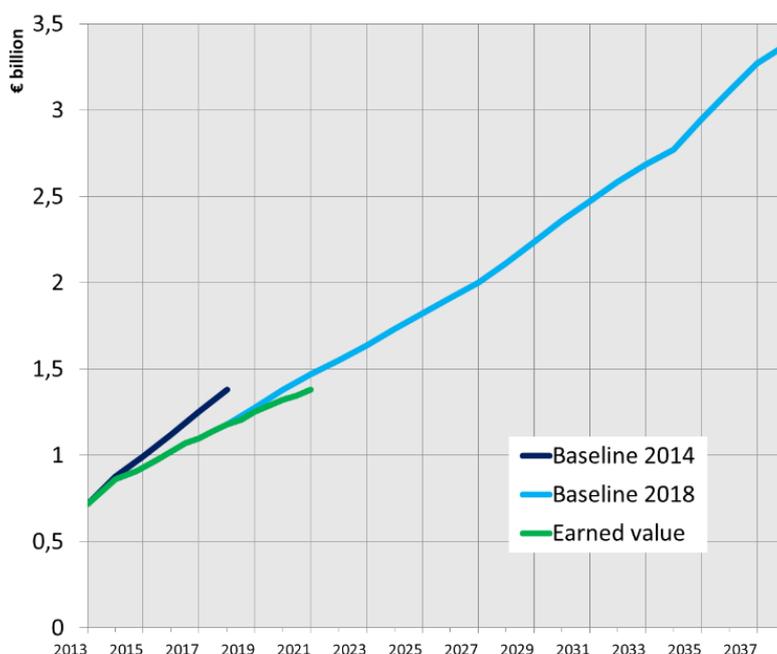
⁸ Optioneering is an iterative process between options identification, assessment and definition.

These preferences were taken into account in the work-programme 2021-2022 and are supported by a strategy based on an assessment of different scenarios of the involvement of one or two entrusted entities provided by the Lithuanian authorities. This strategic change has initially slowed down preparatory works for the dismantling of other equipment located around the reactor zones; however an acceleration is envisaged in the next period. The Commission will closely monitor, and report on, the impact of the new strategy.

INPP could not complete as planned the procurement procedure for the construction of the near-surface repository for low- and intermediate-level due to the legal action of an excluded tenderer. However, INPP completed the construction of the landfill facility for very-low-level short-lived waste; the first loading campaign is planned in the current year. Upon the successful completion of these facilities, INPP will have all the tools needed for disposal of the short-lived radioactive waste under the decommissioning plan. A blueprint is under development for the conversion of the bituminised-waste storage vaults into a repository, under the surveillance of the relevant regulatory bodies.

The programme performance baseline remains unchanged and sets the programme completion date for 2038. Figure 6 shows the amount of work carried out (earned value) against the plan (baseline).

Figure 6: Ignalina programme — progress and performance



4.4. JRC - D&WM programmes

Pandemic and contractual issues delayed the construction of the on-going waste management facilities in Ispra, more precisely the retrieval facility for the bituminised drums and the grouting station to immobilize solid Low Level Radioactive Waste.

In Ispra, the construction of the grouting station was significantly delayed by the poor performance of the selected contractor, which is still working on the completion of the executive design, that was due by April 2021, according to a schedule issued by the same contractor at the beginning of 2021. The contract will be terminated and a new call for tender launched, covering the remaining parts of design and the construction of the

facility. This will cause an overall delay of 3-4 years in the commissioning of the facility, with a consequent impact on waste management and, eventually, on dismantling activities.

Retrieval facility works started in February 2021 with excavation and work-yard preparation. Loose and bagged waste was found in the facility's excavation yard, despite extensive preliminary characterisation not having found hints of contamination, which imposed suspension of the works. The remaining part of 2021 was devoted to the planning of remediation activities, including information and discussion with the competent authorities, retrieval and characterisation of all the waste and soil characterization. The work-yard will restart in Mid-2022, to complete the facility in Mid-2023.

Figure 7: Retrieval facility for bituminised drums construction and decontamination in Laboratorio Caldo Studi e Ricerche (LCSR – hot laboratory)



Ispra-Retrieval facility excavation work yard



Ispra-Decontamination of hot cells in LCSR

The interim storage facility's license was modified, with approval received in 2021, to host unconditioned very low level waste. After the completion of a set of tests, operation is expected to start in the beginning of 2022.

Contracts have been signed to evaluate the possibility for long-term storage of irradiated nuclear material outside the Ispra site, thus avoiding the construction of an onerous dry-storage facility on site. These studies will be completed in Mid-2022. The transit safe area (TSA) for temporary safe storage of irradiated nuclear material in INE has entered operation in May 2021.

Pre-decommissioning activities have progressed well in many facilities. A significant amount of donated cyclotron (which is one of those facilities) components was transported to Prague University in November 2021, with the finalization of the components' removal in early 2022; in the meantime, preparation of the licensing documentation for license revocation was ongoing.

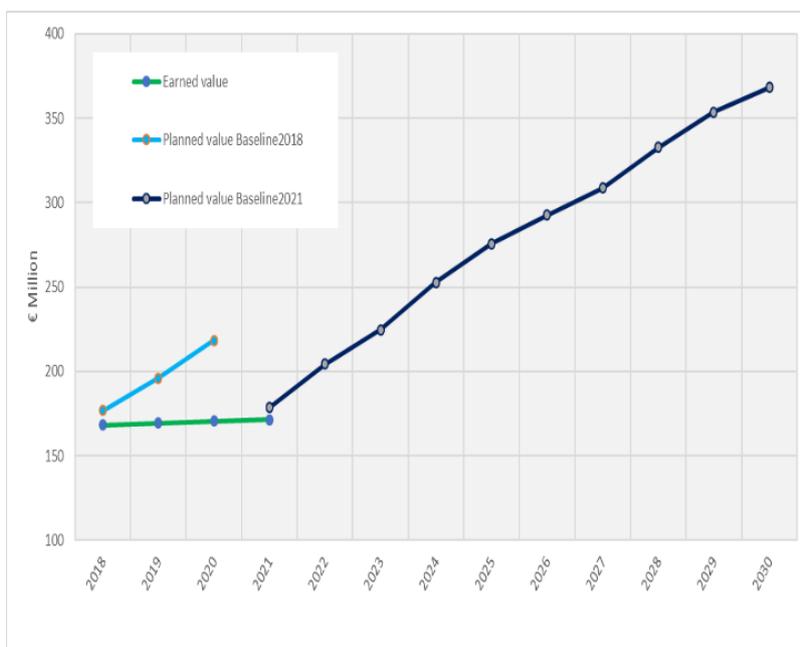
Important pre-decommissioning clean-up work was performed in LCSR (hot laboratory), with clean-up and gamma scanning characterisation of all the hot-cells, now decontaminated to a level allowing operator's direct operation and will continue in 2022 with the decontamination of active tanks in the facility. In the meantime, the preparation of documentation for license revocation is ongoing.

INE global decommissioning, submitted at the end of 2019, is still pending approval and is being updated to take into account entry into operation of TSA and the 2020 change in law (see below), but significant interaction with the competent authorities has been ongoing with the Environmental Impact Assessment. Significant pre-decommissioning actions are planned for 2022.

Due to the issuance of new legislation governing nuclear activities implemented in Italy in 2020, all present nuclear licenses on the Ispra’s site must be updated with a significant licensing and documental effort. The deadline for the submission of all documentation is August 2022, already applicable for the cyclotron license. Another important file is waiting for approval, which is the operational plan for the treatment of metallic waste by melting; the expected date for approval, according to discussion with the competent authorities, is Mid-2022.

Figure 8 shows the amount of work performed (earned value) against the plan (baselines of 2018 and 2021) at JRC Ispra. The progress of implementation at the other sites is achieved by completing specific projects of a lesser scope that are carried out while the nuclear research facilities are still in operation.

Figure 8: Ispra - Progress and performance



In JRC Petten a framework contract to dispose of legacy radioactive waste from past experiments has been concluded with Dutch company NRG. JRC maintains regular contacts with Dutch stakeholders regarding the future decommissioning of the High Flux Reactor.

At JRC Karlsruhe a feasibility study on the characterisation of backlog drums was commissioned and a new contract for dismantling gloveboxes was concluded.

5. KNOWLEDGE DISSEMINATION

As of 2021, knowledge dissemination has become an explicit objective under the Regulations, with a requirement that experience and lessons learnt from the programmes are shared among EU stakeholders. The Joint Research Centre (JRC) has been mandated to facilitate the dissemination. To this end, the JRC planned to establish a digital platform for knowledge exchange and dissemination suitable to meet the relevant objectives of the Regulations.

The platform will be developed in three phases. A preparatory phase will set the basis of the platform, by defining the knowledge products addressing the needs of the EU stakeholders and putting in place the structure and tools to manage them. In a pilot phase (2022-2023) some knowledge products will be developed and shared. Based on the outcome of the pilot phase, the operational phase will be launched (2024) for regularly exchanging and sharing of the knowledge products developed with all interested stakeholders. Progress will be reported in the JRC Annual Activity Reports.

In parallel to the establishment of the platform, JRC will follow the development of other knowledge sharing initiatives via existing networks led by international organisations such as IAEA and OECD-NEA.

The NDAP decommissioning operators committed to develop a specific knowledge product each year, so making available the knowledge matured in the past years. Each knowledge product is a tangible output (document, service, event, etc.) of prepared knowledge that enables action of selected users.

In 2021 the Bohunice programme developed a knowledge sharing product entitled ‘V1 NPP Conceptual Decommissioning Plan and what was next’. It shares in the form of a detailed presentation JAVYS’ experience with initial projects of set-up/planning/costing/licensing of nuclear facility decommissioning and can be used at all levels of management of decommissioning projects.

The Kozloduy programme developed a knowledge sharing product using a three-dimensional model and Uniform Information Model (UIM) of the controlled areas allowing a hands-on experience and providing detailed information on the planning, design and implementation of the dismantling activities and material management works.

The knowledge product developed by the Ignalina programme is a technical report analysing different technologies for handling liquid radioactive waste, comparing bituminisation and cementation.

JRC will disseminate these three knowledge products in 2022 for the benefit of EU operators of the nuclear decommissioning industry.

6. ACTIVITIES RESULTING FROM CALLS FOR TENDERS

The Regulations (Article 10.3) require the European Commission to report annually on the rate of activities resulting from calls for tenders.

Table 4 displays the total EU funding that has been committed by the entrusted entities, following contracts or grants signed in the period between 2014 and December 2021. The table differentiates the activities resulting from call for tenders and those not open to competition, such as amendments to existing contracts and direct grants to the decommissioning operators for salaries, small procurements and radioactive waste management.

Table 3: Breakdown of NDAP activities – 2014-2021 (EUR)

	Competitive procedures	Not open to competition		Total (EUR)
	Contracts [Amendments thereof]	Contracts	Grants	
Kozloduy programme	87% [24%]	4%	9%	389 446 866
Bohunice programme	91% [33%]	9%	-	379 109 791
Ignalina programme	33% [29%]	3%	64%	377 098 468

Source: Information submitted by the NDAP entrusted entities (CPMA, EBRD, SIEA)

In 2021, the JRC has fully implemented EUR 32,4 million of commitment appropriations. The pandemic has impacted the implementation of the ongoing projects. Payments have been postponed, and projects have been extended.

7. CONCLUSIONS

The NDAP continued to make effective progress in 2021, progressively reducing the radiological risks for the EU citizens. However, delays are accumulating and a reassessment of the schedule has already been necessary for the Bohunice programme. Mitigation measures may be required after the stress test of the Kozloduy programme schedule. In Ignalina, the selection of the technical solution for the dismantling of the reactors will be decisive for the confirmation of the programme end-date and overall funding needs after 2027. Despite those setbacks, the adequateness of the EU financial support to the programmes during the 2021-2027 MFF is not in question.

The JRC programme has been impacted by the delay in the construction and commissioning of auxiliary facilities needed to progress in the decommissioning works, the unanticipated discovery of legacy waste in the retrieval facility excavation yard and the difficulties to access the sites during the COVID-19 pandemic.

The delays reported above and in previous sections have been appearing in a lower-than-planned funding absorption ratio. Should this trend continue, the European Commission may consider adjustments in the financial programming of those programmes, in the context of the annual budgetary procedure.

The outlook for 2022 promises further major developments:

Kozloduy programme

- the plasma melting facility will enter full operations and will create relevant know-how;
- decontamination and dismantling of major components in the reactor building;

Bohunice programme

- reactors fully dismantled, fragmented and packaged;
- start of the last stage of decommissioning, including the demolition of buildings and site restoration;

Ignalina programme

- completion of the transfer of spent-fuel from the reactors to the storage facility;
- first operations of the very-low-level waste disposal facility;
- start of construction of the low-level waste disposal facility;
- kick-off of the optioneering studies for the dismantling of the graphite cores.

JRC

In JRC-Ispra progress on the three main work streams (nuclear material, waste management and decommissioning) are envisaged in 2022: this will include the relocation of fresh nuclear material, further advancement in decommissioning of some facilities (i.e. Ispra cyclotron), and design, licensing and in-field work for waste treatment and characterisation facilities; some waste treatment off-site services will also produce significant outputs. Progress in JRC Karlsruhe will accelerate in 2022 as the pandemic situation allows the return of the staff to the site.