HEADING 1A: Competitiveness for growth and jobs

Nuclear decommissioning assistance programmes in Bulgaria and Slovakia

Lead DG: ENER

I. Overview

What the programme is about?

When Bulgaria and Slovakia were candidate countries to join the European Union (EU), the closure and subsequent decommissioning of six Soviet-designed, first generation nuclear reactors at two nuclear power plant sites was made a condition for their accession. As part of the agreements the Union declared its willingness to provide financial aid and the Nuclear Decommissioning Assistance Programmes were established to assist the Member States concerned in implementing the decommissioning of Kozloduy units 1 to 4 and Bohunice V1 units 1 and 2 in accordance with their respective decommissioning plans, whilst maintaining the highest level of safety.

EU added value of the programme

Being confronted to early closure of their plants, it was not possible for Bulgaria and Slovakia to accumulate sufficient funds from operation of the plants.

It is therefore in the interests of the Union to provide financial support for the seamless continuation of decommissioning in order to progress towards the so called decommissioning end state, in accordance with approved plans, while keeping the highest level of safety. This will contribute to provide substantial and durable support for the health of workers and the general public, preventing environmental degradation and providing for real progress in nuclear safety and security.

Implementation mode

Directorate-General for Energy (DG ENER) is the lead DG for the programme implementation. The programme is managed under the indirect management mode through the European Bank for Reconstruction and Development and the Slovak Innovation and Energy Agency, a public law body in Slovakia.

II. Programme Implementation Update

Implementation Status (2017-2019)

The Commission adopted the 2019 work programmes and associated financing decisions, allocating EUR 77,0 million for the implementation of the actions in Bulgaria and Slovakia. These funds sum up to EUR 364,4 million allocated from 2014 to 2019.

The Kozloduy programme made significant progress on dismantling in the auxiliary buildings. The plasma melting facility, a first-of-its-kind facility for the high-performance volume reduction of radioactive waste, is now in industrial operation. In parallel, construction works continued for the National Disposal Facility, i.e. the low and intermediate level waste surface repository, which will receive large quantities of the decommissioned materials. In accordance with the updated performance baseline, the programme completion date remains the end of 2030.

The Bohunice programme made substantial progress in 2019. The dismantling of the turbine hall equipment and the auxiliary buildings were completed, including the demolition of the four cooling towers. The dismantling of the large components in the reactor building started in earnest. In accordance with the updated performance baseline, the completion date for the programme remains the end of 2025.

Key achievements

As the nuclear decommissioning assistance programmes (NDAP) progress, knowledge-sharing and synergies are becoming more concrete, resulting in time and cost savings in decommissioning projects. The similar design of the Bohunice and Kozloduy reactors provides an excellent opportunity to share experiences, methods and tools. This knowledge-sharing reduces risks and cost. For example, in 2019 the feasibility of decontaminating the primary circuits at Kozloduy was confirmed on the basis of experience from Bohunice. The transportation of decontamination equipment used at Bohunice to Kozloduy was then prepared with a view to decontaminating the primary circuits in 2020.

<u>Kozloduy programme (BG)</u>

The dismantling of equipment in the turbine hall was completed in August 2019, a year earlier than scheduled. The plasma melting facility, a first-of-its-kind facility for the high-performance volume reduction of radioactive waste, started operations in November 2018 and continued with the support of the system provider until the end of 2019. It is now in industrial operation and the technical and financial evaluation of the first operational campaign will be finalised in 2020. The operational and financial feedback will be of the highest interest to several radioactive waste organisations in the EU as they are confronted to similar challenges.

Bohunice programme (SK)

By July 2019, all 12 steam generators, each made up of 145 tonnes of steel, had been removed from the reactor building and transported to the former turbine hall, where construction of the dry-cutting workshop was finalised and the cutting equipment for breaking up the generators was installed. In the second half of 2019, the pressurisers were cut up and the construction started of two wet-cutting workshops in which the reactor internals will be segmented under water. In 2019, disposal capacity for low-level waste, representing over 90% of total radioactive waste by volume, was extended by around 30% at the Mochovce repository.

Evaluation/studies conducted

The key findings of the latest (mid-term) evaluation (SWD(2018)344 final) have been presented in the Programme Statements 2020.

Internal audit (IAS)

The Commission's Internal Audit Service completed its audit on the implementation of DG ENER's control strategy for the delegated bodies implementing the NDAP in November 2019 (audit report IAS.C2-2018-ENER-003). It concluded that the strategy is implemented effectively, thus providing overall reasonable assurance on the effective implementation of decommissioning work financed by the programmes.

Ex post evaluation of energy projects

Until 2013, the assistance programmes allocated funds to energy-sector projects in line with the respective Member States' accession treaties and national energy policies. The impact assessment prepared in advance of the current (2014-2020) programmes concluded that those measures would achieve their objectives with the existing funding and should then be discontinued. Therefore, the current programme is limited to implementation of the decommissioning plans, so that it is the focus of the resources and governance structures.

In 2019, the Commission finalised an *ex post* evaluation of the energy-sector projects financed in 2007-2013. Over €947 million had been committed in support of 58 projects seeking to achieve:

- environmental upgrading (including energy efficiency);
- modernisation of conventional energy production;
- restructuring and modernisation of electricity transmission and distribution;
- enhanced security of supply; and
- enhanced use of renewable energy sources (Bulgaria only).

The *ex post* evaluation concluded that action under the programme was both instrumental and timely in the three countries (Bulgaria, Slovakia and Lithuania), as no other programmes could match the scope and number of projects covered. The programme gave effective support to mitigation measures along the energy value chain, according to national needs. It contributed to the building and modernisation of energy networks, facilitating connections and diversifying the energy mix. On the consumption side, it supported the refurbishment of hundreds of public and private buildings and thousands of households, the modernisation of district heating networks, greater energy efficiency in industry and better street lighting in 35 cities.

Forthcoming implementation

The forthcoming implementations for commitments appropriations (CA) and payment appropriations (PA) for the year 2020:

Kozloduy programme (BG)

- the construction of the national disposal facility will move on;
- the plasma melting facility will enter into full industrial operation and create relevant know-how;
- the decontamination activities of the primary circuit will start;
- the management of legacy waste, and decontamination and dismantling activities in the reactor building;

Bohunice programme (SK)

- continued progress in dismantling large components from the reactor building, including the reactor vessels, leading to the last stage of decommissioning;

Outlook for the 2021-2027 period

The outlook for 2021 priorities:

Kozloduy programme (BG)

- the construction of the national disposal facility will move on steadily;
- the further progress will be made on the management of legacy waste, and decontamination and dismantling activities in the reactor building;

Bohunice programme (SK)

- the steady progress in dismantling large components from the reactor building, including the reactor vessels, leading to the last stage of decommissioning;
- the preparations will start for the demolition of buildings and site restoration

III. Programme key facts and performance framework

1. Financial programming

Legal Basis	Period of application	Reference Amount (EUR million)
Council Regulation (Euratom) No 1368/2013 of 13 December 2013 on Union support for the nuclear decommissioning assistance programmes in Bulgaria and Slovakia, and repealing Regulations (Euratom) No 549/2007 and (Euratom) No 647/2010	2014 - 2020	518,4

	Financial Programming (EUR million)							
	2014	2015	2016	2017	2018	2019	2020	Total Programme
Administrative support								
Operational appropriations	69,7	71,1	72,6	74,0	75,5	77,0	78,5	518,4
Total	**69,7**	**71,1**	**72,6**	**74,0**	**75,5**	**77,0**	**78,5**	**518,4**

2. Implementation rates

	2019				2020			
	CA	Impl. Rate	PA	Impl. Rate	CA	Impl. Rate	PA	Impl. Rate
Voted appropriations	76,994	99,99 %	62,183	99,99 %	78,537	0,00 %	97,800	0,00 %
Authorised appropriations (*)	76,994	99,99 %	62,183	99,99 %	78,537	0,00 %	97,800	0,00 %

(*) Authorised appropriations include voted appropriations, appropriations originating from assigned revenues (internal and external) as well as carried-over and reconstituted appropriations; the execution rate is calculated on 15 April 2020

3. Performance information

Programme performance

To date the progress against the objectives is generally satisfactory, although delays are progressively accumulating since 2014 in the overall implementation. As shown in the mid-term evaluation report COM(2018)468, technical challenges remain intrinsic to the decommissioning process, and the decommissioning market is still in a developmental stage. This has led to instances of setbacks among contractors. Further, delays have increased during regulatory approval processes in all three countries. However, the programmes' critical path is monitored with the highest level of attention and when risks are identified, mitigating actions like the parralel execution of tasks or the work in several shifts are proposed so that at this point in time the end-dates are maintained. After the mid-term evaluation in 2018 the time profile of the activities has been revised to re-calibrate the tracking of progress and performance. For both the Kozloduy and the Bohunice programme, the decommissioning programme’s end-date is maintained.

The Commission measures the progress and performance of the decommissioning programmes against the objectives set out in the relevant Council Regulations. Additionally, they have been monitored through the detailed target and schedules provided for in the implementation procedures and the Earned Value Management (EVM) system. In 2019, the Commission launched a call for tender for a study on the EVM systems already implemented in each of the decommissioning programmes. The main objective of this study is to further improve the existing earned value management systems. The analysis work started in January 2020.

As the nuclear decommissioning assistance programmes progress, knowledge dissemination and synergies are becoming more important, resulting in higher efficiencies and hence substantial time and cost savings in decommissioning projects. The two proposals on decommissioning programmes introduce knowledge dissemination and developing synergies as a specific objective. In the next 2021-2027 MFF knowledge dissemination, related to nuclear decommissioning will be introduced on a larger scale.

Kozloduy programme (BG)

The Kozloduy programme progressed satisfactorily. The dismantling of equipment in the turbine hall was completed and the first operational campaign of the plasma melting facility (PMF) was finalised. The technical and financial evaluation of the PMF operational campaign will be held in 2020. The decontamination of the primary circuit was confirmed on the basis of experience from the Bohunice programme. The transportation of decontamination equipment used at Bohunice to Kozloduy was prepared with a view to decontaminating the primary circuits in 2020.

Bohunice programme (SK)

The Bohunice programme progressed well and reached an important milestone in the decommissioning programme by starting the dismantling of large components in the reactor building. Overcoming the technical and contractual challenges to reach this step is a good performance. However, the procurement procedure of major contracts caused a 10 months delay that potentially affected the

programme's end date. Far-reaching mitigating measures were taken to maintain the programme's end date at 2025. The most important measure consists of optimizing the planning of the demolition of the different buildings on site, which is the final stage in the decommissioning process

General objectives

General Objective 1: To assist the Member States towards the decommissioning end state of Kozloduy units 1 to 4 (Bulgaria) and Bohunice VI units 1 and 2 (Slovakia), whilst maintaining the highest level of safety

Indicator 1: Number of major components and systems dismantled in all the concerned nuclear reactors in accordance with the respective decommissioning plans

Baseline	2014	2015	2016	2017	2018	2019	2020	Target
2014	Milestones foreseen							2020
Kozloduy programme - Preparatory works have started for the decontamination and dismantling activities in turbine halls and auxiliary buildings. - dismantling of large components and equipment in the reactor buildings not yet started. - Facilities for the treatment and conditioning of waste are being put in place.	Decommissioning Licence for Units 1-2		Decommissioning Licence for Units 3-4					Ref. Detailed Decommissioning Plan 2014 The planned completion date for the decommissioning of Kozloduy units 1 to 4 is 2030.
	Actual results							
	Licence issued		Licence issued					
2014	Milestones foreseen							2020
Bohunice programme - Dismantling of V1 turbine hall has started. - Dismantling of external buildings (Phase 1) has started. - Preparation of decontamination of V1 primary circuits has started. - Stage 1 decommissioning waste management has started		Decommissioning licence 2nd (final) stage						Ref. Detailed Decommissioning Plan 2014 The planned completion date for decommissioning of BohuniceV1 units 1 and 2 is 2025.
	Actual results							
	Licence issued							

Specific objectives

Specific Objective 1: (Kozloduy) Performing dismantling in the turbine halls of units 1 to 4 and in auxiliary buildings

Performance

The total quantity to be dismantled equipment in the turbine hall has been re-evaluated to 33 216 tons of metals (instead of 40 400 tons). In the period between January 2014 and December 2019 the amount of dismantled metal was 29 448t, i.e. 89% of the target value by 2020.

Indicator 1: Number and type of systems dismantled

Baseline	2014	2015	2016	2017	2018	2019	2020	Target
2014	Milestones foreseen							2020
Systems dismantled out of 160 main and	28	55	82	110	135	141		100%
	Actual results							

auxiliary systems				60%	83%	100%		
2014	Milestones foreseen							2020
Metal dismantled	5 772	11 544	17 316	23 088	28 088	29 326	33 216	33 216
	Actual results							
	4 854	10 901	16 697	18 968	27 430	29 448		

Narrative: At end of 2019, 141 systems were dismantled and the overall objective has been achieved (Units 1-4 turbine hall fully dismantled).The initial target value was updated (141 instead of 160) as 19 support systems have to remain in operation to support decommissioning operation.

Specific Objective 2: (Kozloduy) Dismantling of large components and equipment in the reactor buildings of units 1 to 4

Performance

Dismantling activities inside the reactor building Units 1-2 have started. In the period between January 2014 and December 2019 the amount of dismantled metal was 723 t, i.e. 60% of the cumulative planned amount in 2020.

Indicator 1: Number and type of systems and equipment dismantled

Baseline	2014	2015	2016	2017	2018	2019	2020	Target
2014	Milestones foreseen							2020
	0	200	400	600	800	1 000	1 200	1 200
	Actual results							
	0	147	299	326	525	723		

Specific Objective 3: (Kozloduy) Safely managing the decommissioning waste in accordance with a detailed waste management plan

Performance

As of December 2019 the quantity of material released from regulatory control (free release) has reached 34 678t. i.e. 79% of the target in 2020.

At the same date, the production of final waste packages (i.e. Reinforced-Concrete Containers) for legacy waste and decommissioning waste was about 88% of the target in 2020.

Indicator 1: Quantity and type of safely conditioned waste

Baseline	2014	2015	2016	2017	2018	2019	2020	Target
2014	Milestones foreseen							2020
Free release of materials start	5 762	11 318	19 998	23 998	31 054	38 054	43 860	43 860
	Actual results							
	4 791	7 923	15 954	18 827	28 725	34 678		
2014	Milestones foreseen							2020
Treatment of historical radioactive waste	30	51	231	249	290	320	370	370
	Actual results							
	30	51	231	249	289	324		

Unit of measurement: Tonne

Specific Objective 4: (Bohunice) Performing dismantling in the turbine hall and auxiliary buildings of reactor V1

Performance

Dismantling in the turbine halls and auxiliary buildings completed.

Indicator 1: Number and type of systems dismantled								
Baseline	2014	2015	2016	2017	2018	2019	2020	Target
2014	Milestones foreseen							2020
Auxiliary Circuit System for Secondary Circuit – Phase 1 dismantled	Auxiliary Circuit System for Secondary Circuit - Phase 2	Electricity production system Auxiliary Circuit System for Secondary Circuit – Phase 1. Electric Power Supply System and Emergency Electric Power Supply System	Secondary Circuit Cooling System			Control System for Consumption of Electricity		All systems in the turbine hall and auxiliary buildings of reactor V1 dismantled
	Actual results							
	Auxiliary Circuit System for Secondary Circuit - Phase 2 dismantled	Electricity production, Auxiliary Circuit, Normal and Emergency Electric Power Supply Systems dismantled	Secondary Circuit Cooling System dismantled			Control System for Consumption of Electricity dismantled		

Specific Objective 5: (Bohunice) Dismantling of large components and equipment in the V1 reactor buildings

Performance

The project to achieve the 2019 milestone has been merged with the project 'Nuclear Steam Supply System' (original target date 2020) which is now expected to be implemented by the end of 2022.

Indicator 1: Number and type of systems and equipment dismantled								
Baseline	2014	2015	2016	2017	2018	2019	2020	Target
2014	Milestones foreseen							2020
Dismantling in reactor building not started			Primary Circuit Equipment Insulation		Auxiliary Building Systems / Parts of Spent Fuel Pools and Other Contaminated Tanks–Part 1		External Pipeline Systems	
	Actual results							
			Primary Circuit Equipment Insulation dismantled		Auxiliary Building Systems / SFP and contaminated tanks dismantled			

Comment: The completion of the dismantling of all components and equipment in the V1 reactor buildings is planned for 2025.

Specific Objective 6: (Bohunice) Safely managing the decommissioning waste in accordance with a detailed waste management plan

Performance

At the end of 2019 the quantity of material released from regulatory control (free release) has reached 131 736 t., i.e. 88% of the target 2020.

Indicator 1: The quantity and type of safely conditioned waste

Baseline	2014	2015	2016	2017	2018	2019	2020	Target
2014	Milestones foreseen							2020
Conventional waste produced	23 151	74 632	74 752	86 298	146 152	147 617	149 297	149 297
	Actual results							
	23 151	74 093	74 751	86 298	130 624	131 736		
2014	Milestones foreseen							2020
Hazardous waste produced	54	180	183	4 608	4 611	4 618	4 813	4 813
	Actual results							
	54	174	182	4 608	4 617	4 617		
2014	Milestones foreseen							2020
Radioactive waste produced	387	909	1 440	1 608	2 003	4 026	6 474	6 474
	Actual results							
	387	909	1 440	1 608	1 953	3 331		

Unit of measure: Tonne