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A DECADE OF IAEA COOPERATION WITH THE RRRFR PROGRAMME

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ABSTRACT

The Russian Research Reactor Fuel Return (RRRFR) Programme was launched in 2002. Since then the programme has successfully completed 52 safe shipments of nearly two tons of fresh and spent HEU fuel from different countries using Russian fuelled research reactors to the country of origin. The IAEA has been a very active supporter of the RRRFR Programme since its inception. Under the auspices of the RRRFR Programme, the IAEA has ensured a broad range of technical, advisory and organizational support to the HEU fuel repatriation. This presentation is an overview of the RRRFR programme's achievements with special consideration of IAEA's contribution. It includes the history of the shipments in terms of fresh and spent fuel, and a detailed discussion of programme specific technical support activities given by the IAEA during the programme implementation. Finally, the presentation captures the consolidated knowledge of the unique international programme gained from the shipments' preparation and termination, and shares the most important lessons learned.

1. INTRODUCTION

The IAEA has been involved for almost 30 years in international nuclear non-proliferation efforts associated with reducing the amount of highly enriched uranium (HEU) in international commerce. The IAEA's projects and activities have directly supported the Reduced Enrichment for Research and Test Reactors (RERTR) programme, and have been directly involved with the efforts to return research reactor (RR) fuel to the country of origin where it was enriched. The IAEA is a primary partner in the Global Threat Reduction Initiative (GTRI) and carries out many projects and activities supported by the GTRI.

The preparation for the RRRFR programme started in December 1999 [1], when, on the basis of the successful implementation of the US initiated HEU Research Reactor Fuel Take-back Programs, at the IAEA General Conference in September 1999, U.S. announced that the US was prepared to work with Russia and the IAEA to manage and dispose of Russian-origin HEU RR fuel remaining in a number of countries. This then led to the IAEA taking the initiative and in October 2000 the IAEA's Director General sent a letter to the governments of relevant countries for the elimination of HEU fuel from Soviet RRs. Fourteen out of sixteen responses were favourable, that concerned 20 RRs, which led to the launching of the RRRFR programme in 2002.

A major expansion and strengthening of IAEA's activities in support of – among others – HEU fuel take back programmes started in 2004 after three important international events in Vienna and Bratislava:

- Announcement of the GTRI by the United States Secretary of Energy Spencer Abraham in May 2004 at the IAEA headquarters;

- A US-RF bilateral agreement was signed by the Presidents of the USA and the Russian Federation in Bratislava (Bratislava Agreement) in May, 2004 following the GTRI's announcement;
- The GTRI Partners Conference from September 18-19, 2004, adopted the conference findings supportive of the goal of accelerating and expanding relevant programmes among others such as RRRFR programme.

2. SHIPMENTS ACCOMPLISHED

Since the first shipment made in August 2002, the RRRFR programme successfully completed 52 shipments of nearly two tons of fresh and spent HEU fuel from different countries using Russian fuelled research reactors to the country of origin.

2.1 Fresh RR HEU fuel shipments

In the case of fresh shipments from 2002 to 2013 under contract agreement by the IAEA, 25 shipments representing a total amount of about 790 kilograms of fresh HEU were returned safely to the Russian Federation. The shipments are listed in Table 1 in a chronological order. The first actual step in the implementation of the RRRFR programme was in 2002 when the Serbian Government decided to shut down the RA reactor permanently in Vinča [2], and to participate in the international nuclear non-proliferation efforts to minimize HEU in international commerce. Thus the Republic of Serbia was the first IAEA Member State to return fresh HEU fuel to the Russian Federation that followed further twenty shipments.

Table 1. Fresh RR HEU fuel returned to Russia under IAEA contracts

No.	Country	Facility	Container used	Mode of transport	U-mass [kg]	Actual Finish
1	Serbia	RA , Vinca	TK-S16	Air transport	48.0	2002-08-08
2	Romania	WWR-S Magurela	TK-S16	Air transport	14.0	2003-09-30
3	Bulgaria	IRT-2000, Sofia	TK-S16	Air transport	17.0	2003-12-23
4	Libya	IRT-1 Tajura	TK-S16	Air transport	17.0	2004-03-07
5	Uzbekistan	WWR-SM Tashkent	TK-S16	Air transport	3.0	2004-09-09
6	Czech Republic	LWR-15, Rez	TK-S16	Air transport	6.0	2004-12-21
7	Latvia	IRT-M, Salaspils	TK-S16	Air transport	3.0	2005-05-25
8	Czech Republic	Critical Assembly, CTU	TK-S16	Air transport	14.0	2005-09-27
9	Libya	IRT-1 Tajura	TK-S16	Air transport	3.0	2006-07-25
10	Poland	MARIA	TK-S16	Air transport	39.8	2006-08-10
11	Czech Republic	Rez	TK-S16	Air transport	0.2	2006-10-15
12	Germany	RRR	TK-S16	Air transport	268.0	2006-12-18
13	Poland	MARIA	TK-S16	Air transport	8.8	2007-08-28
14	Vietnam	Dalat	TK-S16	Air transport	4.0	2007-09-17
15	Romania	Pitesti	TK-S16	Air transport	30.0	2009-06-28
16	Hungary	BRR	TK-S16	Air transport	18.6	2009-07-06
17	Czech Republic	Rez	TK-S16	Air transport	12.2	2010-06-18
18	Belarus	Minsk, Pamir mobile fuel	TK-S16	Air transport	47.0	2010-11-29
19	Ukraine	Sevastopol	TK-S16	Air transport	25.1	2010-12-29
20	Ukraine	KINR	TK-S16	Air transport	9.8	2010-12-29
21	Ukraine	Kharkov 1st	TK-S16	Air transport	15.7	2010-12-29
22	Kazakhstan	Alatau	TK-S16	Air transport	33.0	2011-11-30
23	Ukraine	Kharkov 2nd	TK-S16	Air transport	108.6	2012-03-21
24(*)	Poland	MARIA after conversion	TK-S16	Air transport	26.8	2012-09-22
25(*)	Hungary	BRR	TK-S16	Air transport	16.8	2012-12-17
Last update: 2013-06-19				**TOTAL**	**789.3**	

(*) = The IAEA was not a contracting party

After the first couple of shipments a "standard" preparatory shipment scenario was applied in each case that included a fission material verification made by IAEA safeguards inspector(s),

and a combined fuel characterisation and visual inspection procedure accomplished jointly by facility operators and experts representing the contractors. After a painstaking inventory and fuel condition survey, the fuel is packed in TK-16S Russian type containers under the IAEA's vigilance, to be transported by trucks to the nearest airport and later sent by commercial cargo aircraft to its final destination in the Russian Federation. The licensing procedures as well as the radiation-, emergency preparedness- and physical protection measures are routinely applied after the first couple of shipments.

2.2 Spent RR HEU fuel shipments

In contrast to the relatively simple and "standardised" fresh fuel shipments, shipment of the spent nuclear fuel (SNF) assemblies requires a more extensive preparation, including package design approvals, site preparation to be able to serve the transport containers, circumspect transport route and mode selection, trans-boundary shipment approvals (if the facility country does not have a common border with the RF) to transport SNF through the territory of a third country.

Table 2 shows shipments carried out under the RRRFR programme in a chronological order. Since 2006, altogether 27 shipments from RR sites to RF were safely and successfully accomplished, which means a total of about 1.2 tons HEU SNF removal. The first, so called "pilot shipment" was accomplished in January 2006 followed by three other SNF transports from Uzbekistan. Russian type TUK-19 casks were used for the first four shipments, while later the newly developed Skoda type VPVR/M casks were also used.

Table 2. Spent RR HEU fuel returned to Russia

No.	Country	Facility	Container used	Mode of transport	U-mass [kg]	Actual Finish
1	Uzbekistan	WWR-SM Tashkent	TUK-19	RW	10.0	2006-01-10
2	Uzbekistan	WWR-SM Tashkent	TUK-19	RW	13.0	2006-02-14
3	Uzbekistan	WWR-SM Tashkent	TUK-19	RW	14.0	2006-03-20
4	Uzbekistan	WWR-SM Tashkent	TUK-19	RW	26.0	2006-04-15
5(*)	Czech Republic	Rez	VPVR/M	RW	80.0	2007-11-29
6	Latvia	Salaspils	TUK-19	RW	14.4	2008-05-12
7	Bulgaria	Sofia	VPVR/M	RW	6.3	2008-07-04
8	Hungary	BRR	VPVR/M	PR-RW-**SV**-RW	154.5	2008-10-10
9	Kazakhstan	Alatau	TUK-19	RW	17.3	2008-12-25
10	Kazakhstan	Alatau	TUK-19	RW	16.6	2009-03-01
11	Kazakhstan	Alatau	TUK-19	RW	18.8	2009-04-01
12	Kazakhstan	Alatau	TUK-19	RW	21.0	2009-05-01
13	Romania	Magurele	TUK-19	AT	23.7	2009-06-29
14(*)	Poland	EWA	VPVR/M	PR-RW-**SV**-RW	187.0	2009-09-13
15	Libya	Tripoli	TUK-19	AT	5.2	2009-12-21
16(*)	Poland	EWA, MARIA	TUK-19, VPVR/M	PR-RW-**SV**-RW	137.4	2010-03-18
17(*)	Poland	MARIA	TUK-19	PR-RW-**SV**-RW	43.5	2010-05-23
18(*)	Ukraine	KINR	VPVR/M	PR-**RW**	55.9	2010-05-25
19(*)	Poland	MARIA	TUK-19	PR-RW-**SV**-RW	43.5	2010-07-24
20(*)	Poland	MARIA	TUK-19	PR-RW-**SV**-RW	43.5	2010-10-10
21	Belarus	Minsk. Pamir	VPVR/M	RW	42.0	2010-10-24
22(*)	Serbia	Vinča RA	TUK-19, VPVR/M	PR-RW-**SV**-RW	13.2	2010-12-17
23	Ukraine	After KINR conv.	VPVR/M	PR-**RW**	19.6	2012-03-25
24	Uzbekistan 1/2	After WWR-SM conv.	TUK-19	AT	36.4	2012-08-13
25	Poland	After MARIA conv.	VPVR/M	PR-RW-**SV**-RW	61.9	2012-09-15
26	Uzbekistan 2/2	After WWR-SM conv.	TUK-19	AT	36.4	2012-10-28
27	Czech Republic	After LVR15 conv.	VPVR/M	PR-RW-**SV**-RW	68.1	2013-04-05
Last update: 2013-06-19				**TOTAL**	**1209.2**	

(*) = IAEA involvement; PR = Public Road (highway, truck); RW = railway; SV = seagoing vessel; AT = air transport

As Table 2 shows, the transport modes imply a kind of "developments". In the beginning the railway mode was licensed only, later (due to transit difficulties in a third country) in 2008, sea transport and finally the air transport was applied in 2009. Now one can say that RR SNF assemblies can be transported by all modes. However it should be noted that the TUK-19 type package still have the license for air shipment only (Type "B" package according to the IAEA TS-R-1 [3]), while the VPVR/M package is under an air shipment licensing procedure in RF to get, as the first in the world, the Type "C" package design certificate [4].

SNF shipment preparation and termination is a very challenging and a very painstaking process. Although the main steps are similar to the fresh HEU fuel, but is much more complex, more expensive and time consuming especially when the SNF should be transported through the territory of one or more transit countries. There is no way to apply a unified preparatory procedure, since each shipment requires special preparation. It should be pointed out that some procedural modules (fuel characterisation, safeguards control, loading procedures, package preparation to transport, etc.) and supplementary equipment (spacers, transport flask) can be applied for future shipments.

The preparation and termination procedures are beyond the scope of this paper. These are well documented in IAEA-TECDOC-1632 [5].

3. IAEA CONTRIBUTION AND SUPPORT ACTIVITIES

Under the auspices of the RRRFR programme, the IAEA ensures a broad range of technical, advisory and organizational support to the HEU fuel repatriation, as well as training and advice to support RR conversion from HEU to LEU since core conversion is mandatory for reactors to participate in the RRRFR programme. The Department of Nuclear Energy and the Department of Nuclear Safety and Security in particular, as well as the Department of Technical Cooperation and the Office of Procurement Services, play a key role in arranging fresh and spent fuel shipments, assisting in the planning of fuel return projects, and providing technological support for member states (MSs) participating in the RRRFR programme. This section provides an overview of IAEA's contribution in the RRRFR programme and summarises the support it provides to the MSs.

In general, IAEA's role in supporting projects like the RRRFR programme is threefold: (1) verification made by Safeguards; (2) standardization ensured IAEA Safety Standards document (e.g. Nuclear Safety-, Transport-, Emergency preparedness-, Waste management standards, etc.); and (3) technical cooperation ensuring multidisciplinary backing for MSs throughout technical cooperation mechanisms. The first two are a continuous IAEA service to the MSs. From the RRRFR programme's viewpoint, the third group plays a significant role through which programme specific support is provided.

Regarding technical cooperation mechanisms with respect to the RRRFR programme, support by the IAEA can be divided into four groups: (1) traditional support, (2) programme specific technical cooperation, (3) advisory support and (4) collecting and dissemination practices.

3.1 Traditional support

The traditional support is typically an integral part of a TC project launched by the IAEA that means in general: outlining a project, organising technical meetings, conducting fact finding missions, equipment and service procurements (issuing call for bids, contracting,

procurements and appraisal of deliverables), etc. Some of the most significant IAEA cooperation with regard to RRRFR programme support are as follows:

- Organising bilateral and multilateral meetings (nearly hundred meetings were organised including the organisation of the first serial of the tripartite initiative meetings in 1999 - 2000);
- Fact find missions between 2001-2004 (15 RR sites in 11 countries were surveyed);
- Agency is one of the contracting parties in case of fresh HEU shipments (21 contracts with their entire procurement support from the issuing call for bids to the deliverables' evaluations);

3.2 Programme specific technical cooperation

Within the framework of IAEA's Technical Cooperation projects two significant subject specific projects were launched: (1) Skoda VPVR/M cask procurement; (2) Vinča (Serbia) SNF return programme.

3.2.1 Skoda VPVR/M cask procurement

To transport a large quantity of SNF stored at many of Russian origin RRs, suitable new capacity packages for the RRRFR programme must be developed to haul all of the stored SNF with one shipment from some facilities (at the beginning 16 pcs. TUK-19 casks were available), and in addition ensure further transport package alternatives with an improved cask loading technology to meet the needs of the different RR site and SNF conditions stored at a facility. To assist in resolving this demand, the IAEA agreed to use their procurement system to send out a call for bid and procure enough casks to meet the foreseen shipment needs. After the bidding procedure the VPVR/M cask system of Skoda (Czech Republic) was selected from six international cask vendors. The Skoda proposal not only met all of the scope requirements, but also provided additional benefits to the programme: had NRI's offering to provide to the RRRFR programme their six VPVR/M casks after completing the transfer of their SNF to Russia.

The IAEA procured ten high capacity dual purpose (transport/storage) containers under a 4 million Euro contract. The complex procurement and implementation included outlining the technical requirements, evaluations of bids, contracting, quality inspections, evaluation of the results of the so called "dry run" and "wet run" tests [6].

Thus, due to this procurement the programme has now 16 VPVR/M casks and 16 TUK-19 casks. A comparison table of casks' utilisation is presented in Table 3 [7].

Table 3. Comparison table of casks' utilization

Cask	Casks available, since	Total No. of shipment used	Total No. of cask used	Total HEU mass
TUK-19	20 pcs, Jan 2006	18	283	433.2 kg
VPVR/M	16 pcs., May 2008	11	99	776.0 kg
Ref date: 2013-06-19			TOTAL	**1209.2 kg**

3.2.2 Vinča (Serbia) SNF return programme

The first TC project after the re-admission of the country was started in 2001. This was then followed by three essential specific projects. The strategic objectives of these projects were firstly to survey the Vinča site, identify the real conditions of the SNF as well as stabilize its

conditions (prevent as much as possible the escalation of further degradation and achieve a long term safe and stable state) [8].

From 2004 the IAEA, the Nuclear Threat Initiative (NTI), the US-DOE and the European Union provided funds to cover the Vinča RA Reactor SNF removal[i]. With such financial support, upon the invitation of the IAEA, in May 2005 an international consultancy meeting was held in the Vinča Institute. The main goal was to draft the outlines of an international bid for the removal and transportation technology of the seriously corroded and leaking SNF assemblies in the storage pool adjacent to the reactor building. At the conclusion of this meeting an international tender was issued by the IAEA in the summer of 2005. An RF consortium was selected and an international tripartite contract between the IAEA, RF consortium and the Vinča Institute was signed in September 2006 for the safe removal of SNF from the Vinča RA Reactor and return to the RF (Vinča SNF return programme).

For the implementation of the tripartite contract consistently with the TC management principle a special PMO was appointed by the Agency to coordinate the programme implementation in all respect. During the programme performance, 16 technical officers, and two technical experts were assigned to the Project Management Unit at Vinča site. Thus, the IAEA not only contracted, but provided a general coordination managerial support, as well as an overall technical backing for the operating organisation and the officers of the regulatory body [9].

The project was completed as planned in December 2010: 8030 SNF was removed of more than two-and-half tonnes of highly radioactive spent fuel was removed [10]. This transport was the largest single shipment of SNF made under the RRRFR programme, and also this project became the largest and most complex TC project in the history of the IAEA with a total budget of over USD 55 million.

3.2.3 Advisory support

Advisory support was provided either upon demand by a regulatory body or a stakeholder involved in the shipment preparation:

- **Support provided upon the demand of a regulatory body.** The goal was to assist and advice the regulatory body to review the safety documentation prepared for a shipment, and assist onsite inspection. This support was ensured mainly in the form of a safety mission, as well as follow up missions with the involvement of external experts. During these missions the items reviewed were focused on QA/QC, training and education programmes, and their implementation, as well as on applied radiation protection measures, waste- and emergency preparedness programmes. The communication mechanism was always an issue in reviewing and implementing the lessons learned. Altogether four missions were conducted three of which concerned the Vinča project [11].
- **Support provided upon demand of a stakeholder.** This technical and advisory support was mostly case specific interactions requested by the operating organisations and/or stakeholders (contractual parties or even authorities). This contribution encompassed mainly the following four fields: (1) feasibility consideration and technology selection; (2) document preparatory support, (3) licensing support (local and trans-boundary licensing support), (4) on-site technical review and advisory support to implement equipment [12].

  (1) Feasibility consideration and technology selection: decisive role to survey the site condition, infrastructure availability to advise on the technology approach; or analyse

and evaluate transport route and mode considerations. Conclusions of these considerations served later as a guiding principle in the project implementation.

(2) Documentation of preparatory support: real consultative and advisory help, sometimes also direct contribution was given to develop SAR, OLCs, as well as licensing, authorization, technical, accompanying, emergency preparedness etc. documentation. The main objective that the IAEA intended to implement was the policy of safety awareness. Therefore it was consequently emphasized that the main objective of the mandatory documentation was to guarantee that all activities should be carried out with trained staff, in a planned, controlled and documented ways.

(3) Licensing support: while the onsite work meant a unique technical challenge for the operators, obtaining all authorisation and permits provided a puzzle for the legal entity intending to ship the SNF by means of different transport modes from export country throughout transit countries to the RF. The support encompassed the export country and transit countries as well. This support field together with the documentation preparatory support utilised mostly the experiences gained on previous shipments.

(4) On-site technical review: it took the form of on-site advisory support of the on-going activities, including staff training, equipment commissioning, test operation of newly manufactured or already used accessories, devices and tools, as well as implementation of work procedures (e.g. package maintenance before loading, cask loading and drying, waste management, etc.) and equipment as well. Even while walking through a facility, the IAEA's technical officer(s) revised the equipment conformity, assessed the work performed in accordance to the requirement and written procedures. Repeatedly revised and emphasised issues were: applied radiation protection measures, waste management, QA/QC plan implementation.

3.2.4 Collecting and dissemination practices

Regional lessons learned workshops. As the first shipments were completed, experts were brought together to share their experience and knowledge with those who would be dealing with fresh and spent fuel shipments in the future under the umbrella of RRRFR programme. In 2005, the IAEA in cooperation with the US DOE initiated a yearly regional workshop on "Russian Research Reactor Fuel Return Programme Lessons Learned". The primary objective was – and still is – to bring together the core players in the preparation and accomplishment of shipments, and sharing experiences on lessons learned so that others may benefit in the future. Accordingly, the invited participants represent facility operators from 16 countries[ii], regulatory bodies, stakeholders ensuring financial and coordination support for the programme, as well as companies actively being involved in the programme completion on a contractual basis.

Table 4 shows the history of the Regional Workshops. Although the meeting indicated in the second row was a workshop on "International Legal Framework Applicable for Shipment of Russian-origin Research Reactor Spent Fuel to the Russian Federation" that replaced the annual regional workshop in 2007, but its main feature was gathering experience. Thus altogether six workshops on lessons learned were organised.

Regarding the workshop scenario, workshops consist of a series of review lectures given by the leading experts, followed by status reports from facilities, and round table discussions of relevant problems and tasks. The main benefit of the workshop is to exchange experience and methods for effective performance of RRRFR, to discuss, consider technical, legal, logistical, administrative and other experiences obtained during the programme implementation, as well

as to draw conclusions and lessons learned for improving safety, radiation and physical protection while shipping fresh and spent fuel. Experience shows that the annual workshop on lessons learned is an important tool in collecting and disseminating information. After the first three or four workshops, it was a common understanding that the Lessons Learned workshops ensure a stand-alone forum to exchange experiences (applied practices, methods, developed and implemented special auxiliary equipment, tools, etc.) and lessons learned, as well as capturing the consolidated knowledge of this unique historical international programme.

Table 4. History of the Regional Workshops on RRRFR programme Lessons Learned"

No	Place	Date	Participants
1	Belgrade, Serbia	October 2006	75 participants from 15 countries
	Poina-Brasov, Romania(1)	April 2007	43 participants from 10 countries and EU
2	Rez, Czech Republic	May 2008	97 participants form 17 countries
3	Varna, Bulgaria	June 2009	88 participants form 17 countries
4	Poina-Brasov, Romania	May 2010	71 participants from 16 countries
5	Jackson, WY-USA	June 2011	95 participants from 17 countries
6	Lake Balaton, Hungary	June 2012	76 participants from 17 countries
7	Sevastopol, Ukraine	June 2013	77 participants from 17 countries

(1): It was a Workshop on "International Legal Framework Applicable for Shipment of Russian-origin Research Reactor Spent Fuel to the Russian Federation" organised by the IAEA in cooperation with the European Union.

IAEA-TECDOC booklets issued to support RRRFR programme objectives. The IAEA-TECDOC publications are another effective tool to disseminate practical information and experiences. On the basis of the gathered experience during RRRFR programme's implementation the IAEA issued four booklets to support the programme implementation. They are:

- B. Yuldashev and J. Thomas: Technical and Administrative Preparation for Shipment of Russian-origin Research Reactor Spent Fuel to Russian Federation. IAEA Guideline document. Vienna, Austria. February 2007. This guideline document provides key information for the planning and return of Russian-origin SNF or materials containing HEU to the RF.
- IAEA-TECDOC-1593: Return of Research Reactor Spent Fuel to the Country of Origin: Requirements for Technical and Administrative Preparations and National Experiences. July 2008. This IAEA-TECDOC is a proceedings of technical meeting held in Vienna, August 2006 summarising shipment experiences 32 shipment preparation and operation experiences made under the umbrella of USA Foreign Research Reactor Spent Nuclear Fuel (FRRSNF) acceptance programme and RRRFR programme.
- IAEA-TECDOC-1632: Experience of Shipping Russian-origin Research Reactor Spent Fuel to the Russian Federation. November 2009. This IAEA-TECDOC is an extended summary and account of the experience obtained from the completion of international projects on return SNF to the RF from RRs in Uzbekistan, Czech Republic, Latvia, Bulgaria and Hungary;
- Draft of IAEA-TECDOC: Legal Aspects of Spent Nuclear Fuel Repatriation to Russian Federation - Lessons Learned. The need for a multilateral approach to reviewing both national and international legal obligations connected with the international transport of the SNF was first raised in the context of LL workshop held in Belgrade 2006. The TECDOC focuses on the national and international legal aspects of SNF fuel to the RF from RRs located in a number of States in central and Eastern Europe.

4. LOOK INTO THE FUTURE

The IAEA will continue to support RRRFR programme. This support encompasses the core conversion efforts of RRs since core conversion is mandatory for reactors to participate in the RRFR programme. A status review of the foreseen shipments intending to be accomplished under the umbrella of the RRRFR programme is shown in Table 5.

Table 5. Status review of the foreseen shipments

Location	Facility name	Type	Power	Core conversion		Due shipments
				Start	End	
Due HEU SNF shipments						
Dalat, Vietnam	Dalat RR	Pool	500 kW	–	*2011*	July 2013
Budapest, Hungary	BRR	Tank type	10 MW	Sept 2009	Dec. 2012	December 2013 (3 shipments)
Svierk, Poland	MARIA	Pool type	30 MW	July 2012	Jan 2014	2015
Germany, Rossendorf	–	–	–	–	–	3 postponed SNF shipments (no scheduled date yet)
Due HEU fresh shipments						
Minsk, Belarus	–	–	–	280.0 kg-		No scheduled date yet
Tashkent, Uzbekistan	IIN-3M FOTON	Pulse-type	10 kW	aqueous solution of uranium-sulphate of 4.5 kg		End of 2013

As it can be seen, after the core conversion three RR SNF shipments are still due between 2013-2015. Three postponed shipments from Germany are pending, dates for which are not yet scheduled. Also one fresh HEU shipments from Minsk (Belarus) is still due, but its date is still not scheduled yet.

5. SUMMARY AND CONCLUSIONS

The RRRFR programme was launched in 2002. The programme has successfully completed 52 shipments of nearly two tons of fresh and spent HEU fuel from different countries using Russian fuelled research reactors to the country of origin. Since the programme inception the IAEA, in cooperation with the US DOE, Russian Federation, European Union, and a number of individual Member States, has provided overall important technical support in the effort to return HEU RR fuel to the RF.

In this cooperation, the IAEA utilizes all its mechanisms available through its regular programmes and Technical Cooperation Programme to advance Member States and the international non-proliferation efforts to eliminate stockpiles of HEU fuel. The IAEA's contribution overlaps a broad range of technical, advisory and organizational support from usual IAEA services (safeguards, standardization, procurement, meeting organizing) with the programme specific support.

The IAEA initially contributed in collecting and disseminating practices when, in cooperation with the US DOE, initiated in 2005 to organise annually a Regional Workshop on Lessons Learned. The primary objectives were – and still are – to bring together the core players in the preparation and completion of shipments, and sharing the lessons learned, so that others may benefit in the future. Also, on the basis of this experience the IAEA issued four TECDOCs to support proactively the programme implementation. Experience shows that the annual lessons learned workshops as well as the TECDOCs are important tools in collecting and dissemination practices.

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[i] In 2004, a so called Vinča Institute Nuclear Decommissioning programme (VIND) was launched objective of which covers not only SNF removal but includes RA Reactor decommissioning, radioactive waste management and on-site radiation protection logistic.

[ii] Belarus, Bulgaria, Czech Republic, Germany, Hungary, Kazakhstan, Latvia, Poland, Romania, Russian Federation, Serbia, Slovenia, Ukraine, USA, Uzbekistan, Vietnam.