Bomb Grade HEU travels back to Russia with IAEA assistance

In the latest episode of spent nuclear fuel repatriation, the IAEA has helped move hazardous high-enriched uranium (HEU) from the Czech Republic safely back to Russia.

The material consisted of 80 kg of spent HEU fuel and 280 kg of spent low-enriched uranium (LEU). It had been given to then-Czechoslovakia by the then-USSR and used in the Rez research reactor to produce radioisotopes for medicine, industrial and research purposes.

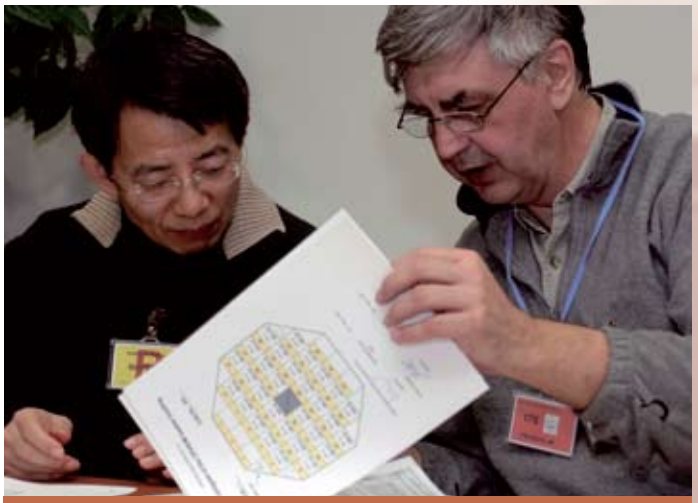
As the country that originally supplied the HEU, Russia will reprocess the spent fuel for further civilian use in the Mayak facility near the Ural Mountains, and thus prevent ing the possibility of it falling into the wrong hands.

The pictures that follow show the moments of final preparations and repatriation of the spent nuclear fuel.

Day 1

09:00 hours

Only armed with his navigational computer, IAEA safeguards inspector Jeong Eui Sang drove 4 hours from Vienna to his next assignment to Prague, Czech Republic. He is to verify the shipment to Russia of spent high enriched uranium (HEU) fuel from a Czech research reactor.



21:00 hours

The last one of the hundreds of meetings over four years to prepare the secret shipment. IAEA Inspector Jeong Eui Sang discusses with Czech officials the procedures to be followed. This will be the eighteenth shipment of Russian origin HEU fuel to be returned to Russia under an IAEA Technical Cooperation project that runs with extra-budgetary funding from the US Department of Energy's National Nuclear Security Administration.

22:00 hours

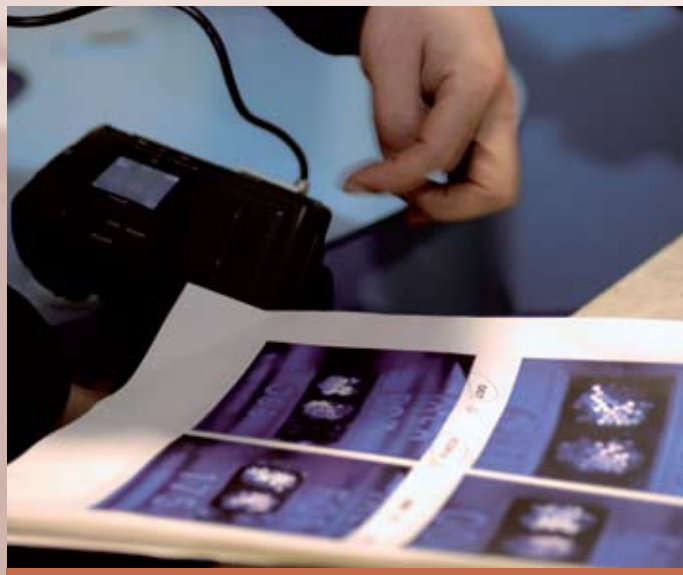
IAEA safeguards inspector Jeong Eui Sang starts his manual work by climbing the scaffolding to reach an IAEA surveillance camera. He downloads images from the camera that monitored the hall until today, 7 days a week, 24 hours a day.

22:30 hours

Inspectors from the IAEA and the Czech State Office for Nuclear Safety jointly verify that the load in the casks is indeed the one that was so far under their control.

23:00 hours

IAEA Safeguards Inspector Jeong verifies seals that were earlier applied by his inspector colleagues who monitored the loading of the fuel. Czech national inspector Adam Pavlik overviews the process.

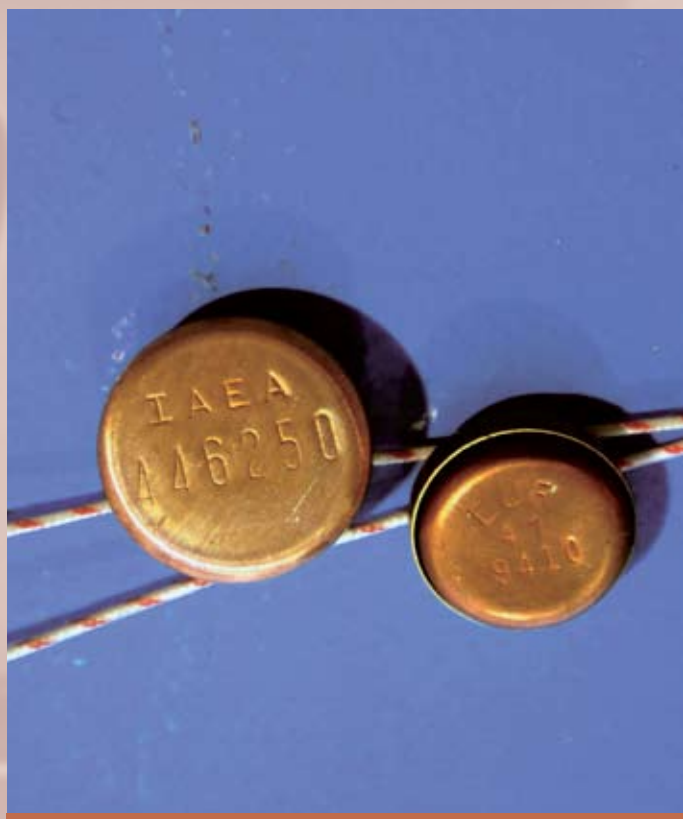


23:00 hours

IAEA's Cobra seals can be verified in situ. The wire and the seal are photographed at the moment when they are applied. A special camera tells inspector Jeong in a moment whether the seal has been tampered with or not.

23:30 hours

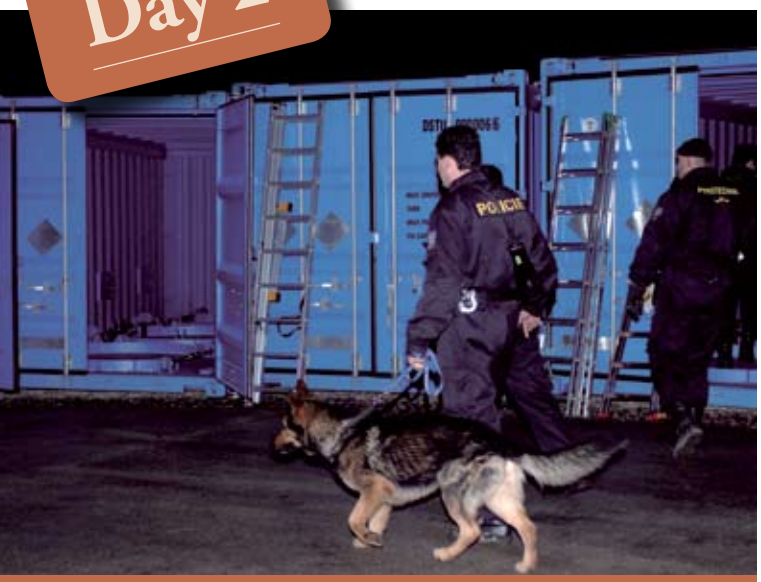
After verifying that the Cobra seals are intact, Mr Jeong replaces them with metal IAEA seals. They will be sent back to the IAEA's Vienna Headquarters by the Russians after the haul arrives in the Mayak facility, where it will reprocessed.



Midnight

Both IAEA and EURATOM seals assure the casks will not be opened until the cargo reaches its final destination.

Day 2



01:00 hours

Tight security measures are in place. Czech police officers and their sniffer dogs search all the containers for explosives.

02:00 hours

A crane carefully loads the SKODA VPVR/M casks into shipping containers. These are high capacity casks used for the first time in this ongoing project. A comparison: 63 kg of spent HEU was returned from Uzbekistan in 2006 in four separate shipments with containers available then, whereas 80 kg of HEU in the new SKODA casks could be carried in one go during this shipment.

01:30 hours

Trucks carrying shipping containers reverse into the storage hall for uploading the casks filled with HEU.

02:30 hours

Each cask is labelled according to international transportation regulations.

02:45 hours

Radiation levels are checked. Again and again. The hand-held reader shows no anomaly. And this is a good sign.

13:00 hours

The last cask is loaded and secured. Each shipping container houses two casks, bringing the weight of each container up to 28 tonnes.

16:00 hours

Mesice train station near Prague. The shipping containers are loaded on the train.

16:15 hours

For 28 tonnes on the rolls, and for 9 days, precision is key.

20:30 hours

A train from the pages of Cold War history will take the nuclear cargo back to Russia. In 1968, at the height of the so-called 'Prague Spring', Czechoslovak leader Alexander Dubcek travelled in this passenger car (seen in background) to meet Soviet leaders Leonid Brezhnev and Alexei Kosygin on the USSR-Czechoslovak border. This time, the car will carry the security officers who will accompany the train to Russia.

20:52 hours

A sigh of relief, followed by claps and cheers. The train heads eastbound. The IAEA has so far facilitated similar shipments from Serbia, Romania, Bulgaria, Libya, Uzbekistan, Czech Republic, Latvia, Poland and Vietnam.

Is the Czech Republic now safer? Not only this Central European country, but probably the world, experts say. There are still dozens of similar missions to undertake, before the men and women involved in this global project can rest.

Text: Ayhan Evrensel • Photos: Dean Calma/IAEA • All photos were taken on 30 November and 1 December 2007.
Very special thanks to Czech nuclear and security authorities for their incomparable openness and cooperation.

on the Nuclear Train leaving Prague

by Ayhan Evrensel

Rez, Czech Republic — It´s cold, freezing cold. On a rainy December night, dozens of men and women have gathered on a hillside near the river Vltava, best known for its romantic views over the Czech capital. But tonight, they have no time for taking romantic pictures. This operation is potentially dangerous and will last through the night.

Security officers and technicians have only a few hours to finalize arrangements for the shipment of a highly sensitive load: they will send 360 kg of highly radioactive spent nuclear fuel back to Russia, where it first came from decades ago. The haul, if it fell outside of security controls, could theoretically be used to make dirty bombs, or even, in the worst case scenario, nuclear bombs.

Security personnel are everywhere: each and every person involved has a crucial role to play in this joint action between the IAEA, the Czech Republic, Russia and the US, as well as Slovakia and the Ukraine.

Secure Containers

Special ID cards, radiation dosimeters and safety helmets are distributed to operation teams. After a short, last planning meeting, the first stop is the storage facility. This is where the spent fuel has been kept under IAEA safeguards in 16 radiation-proof casks for the past few months. These blue, two-meter high containers, made by the Czech high-tech company SKODA, are making their debut. In order to receive a transport licence, the cask went through a tough series of drop, puncture, fire, submersion and pressure tests.

With US funding, the IAEA purchased 10 of them, to be donated to the Czech Nuclear Research Institute Rez plc., which purchased a further six out of its own resources. Under an agreement with the IAEA, all 16 will remain in Czech hands to be used for similar shipments from around the globe during the next decade.

Ladislav Bartak, Director of the Department of Non-Proliferation in the Czech State Office for Nuclear Safety says: "These containers are the first foreign nuclear fuel casks to be accepted by the Russian Federation."

The material being sent back to Russia consists of 80 kg of spent high-enriched uranium (HEU) fuel and 280 kg of spent low-enriched uranium (LEU) fuel. It had been given to then-Czechoslovakia by the then-USSR and used in the Rez research reactor to produce radioisotopes for medicine, industrial and research purposes. After becoming irradiated in the reactor, it is now classified as spent fuel and the Czech Republic has no use for it.

Spent HEU is highly radioactive and if reprocessed, can be recycled for civilian as well as military purposes. Thus, it poses both a proliferation and a security risk. Russia, as the country that originally supplied the HEU, will reprocess the spent fuel for further civilian use in the Mayak facility near the Ural Mountains, thus preventing the possibility of it falling into the wrong hands.

Back in the cold hall, radiation levels on the surface of each 12-tonne cask are measured. The hand-held screen shows no anomaly. Now the casks can be loaded into regular shipping containers, which will be used to take the load on a special train to Russia.

HEU Under Control

IAEA Safeguards Inspector Jeong Eui Sang checks the seals of each of the 16 casks applied earlier by his colleagues. Between April and August 2007, the spent fuel rods were loaded into the casks under water, or in hot cells, which protect operators from radiation exposure. Several IAEA inspectors spent almost a month verifying the process.

The cobra and metal seals on the cover of the casks are intact. So the IAEA´s continuity of knowledge about the material is not in question, because without breaking the seals or wires, the casks cannot be opened.

"This cobra seal is an *in situ* verifiable seal," says Inspector Jeong Eui Sang. "I can verify it on the site that there was no tampering with it between the

sealing date and now. This means I can verify that all the material declared to the IAEA is here."

Inspector Jeong also downloads images from a surveillance camera overlooking the hall. Until today, all movements in the hall have been monitored by camera 24 hours a day, seven days a week.

The IAEA & HEU Take-back Operations

More than half of all the 245 operational research reactors worldwide are still fuelled with high-enriched uranium (HEU). This is considered a high-risk material since it can also be used in the making of a nuclear explosive device. In conjunction with the US Global Threat Reduction Initiative programme, the IAEA works with its Member States both to return the fresh or spent fuel to the countries of origin and to convert their research reactors to low-enriched uranium (LEU) fuel, which does not pose a proliferation risk. The final goal of these 'take-back' efforts is to reduce and eventually eliminate HEU from international commerce.

The IAEA has so far facilitated similar shipments from Serbia, Romania, Bulgaria, Libya, Uzbekistan, Czech Republic, Latvia, Poland and Vietnam. This is being done through an IAEA Technical Cooperation project that runs with extra-budgetary funding from the US Department of Energy´s National Nuclear Security Administration.

The latest shipment from the Czech Republic was the fifth spent HEU fuel shipment and altogether the eighteenth take-back mission of both spent and fresh HEU fuel. It brought the total amount of repatriated spent fuel to 590 kg.

Neither the operator of the facility, nor any third party knows the frequency with which the IAEA camera records images. This makes it impossible for anyone to move, replace, or touch any material or machinery without the IAEA noticing it. Now that the IAEA can verify that the load in the SKODA containers was indeed the one overseen throughout the past few months, the containers can be sent away.

Loading the Convoys

A truck convoy starts to line up. The first driver reverses his container truck into the storage hall. A crane lifts the first SKODA cask and carefully places it inside the ISO container. Radiation levels are measured again—everything is normal. Each truck carrying two SKODA casks will weigh 28 tonnes.

The first truck leaves the storage hall to park and wait for the next seven trucks. Dozens of police officers guard the trucks. Earlier, their search dogs checked the trucks against explosives.

The work continues through the night. After the final truck leaves the hall, Inspector Jeong climbs the scaffolding to remove the IAEA surveillance camera. "Since the fuel has left the storage facility and there is no other nuclear material left here, there is no need for us to continue surveillance in this hall," he explains.

After the final radiation control on the surface of the ISO containers, the convoy hits the road at noon. Due to tight security measures, very few people know its route and schedule.

The Long Train Ride Home

At a local station outside Prague a train from the pages of Cold War history awaits the nuclear cargo. In its passenger car Czechoslovak leader Alexander Dubcek travelled in 1968, at the height of the so-called 'Prague Spring', to meet Soviet leaders Leonid Brezhnev and Alexei Kosygin on the USSR-Czechoslovak border. This time, the car will carry the security officers who accompany the train to Russia.

It's dark, the rain has eased and the loading of all the eight shipping containers onto the train has just ended. Igor Bolshinsky says he slept only three hours in the last three days. He oversees the repatriation mission on behalf of the National Nuclear Security Administration of the US Department of Energy and has been involved in this project since its inception, almost four years ago.

"We don't want high-enriched uranium to get into the hands of the wrong people," he says. "That is why we are removing this material from all over the world. It´s a part of the non-proliferation commitment by the United States, the Russian Federation and the IAEA."

At 20:52, almost 24 hours after the action started, the train slowly starts rolling eastwards. Momentary euphoria, a sigh of relief. Mr. Bartak is happy. Is the Czech Republic safer now that this spent fuel is gone? "Not only the Czech Republic," he says, "but probably the whole world."

The final relief came when the cargo arrived safe and sound on 8 December at Mayak, after passing through Slovakia, the Ukraine and the European part of Russia.

Ayhan Evrensel is Press and Public Information Officer at the IAEA. Email: A.Evrensel@iaea.org