TRANSFORMING CHERNOBYL

The works to transform Chernobyl into a safe and secure state are nearing conclusion. The New Safe Confinement (NSC), a gigantic steel arch, has been erected and is now being equipped with systems and tools to make the site safe for generations to come.

Impressive progress has been made and we are confident that the NSC will be completed and operational by the end of 2017.

The Chernobyl project would not have been possible without the active involvement and generous contributions of the international community and Ukraine. The fact that to date more than 40 countries and the EBRD have provided funds speaks for itself.

As the project is now far-advanced it is possible to make a reliable cost estimate based on the final design of the NSC and the progress on the ground. Total costs for the Shelter Implementation Plan – of which the NSC is the most prominent element – were estimated to be €2.1 billion in 2014, leaving a large funding gap of €615 million.

The EBRD shareholders' decision in November 2014 to commit an additional €350 million (from the Bank's reserves) for the NSC and an anticipated €165 million from the G7/European Commission have significantly reduced the funding gap. However, a shortfall of €100 million remains.

Ukraine is currently in a vulnerable state and cannot be left to bear this uniquely hazardous burden alone. The EBRD welcomes the leadership of the G7 to secure the full funding of the project.

Suma Chakrabarti, EBRD President

European Bank
for Reconstruction and Development

PART OF A LARGER PLAN

The New Safe Confinement (NSC) is a structure intended to cover the destroyed reactor unit 4 at Chernobyl, the site of the world's worst nuclear accident. The NSC is being built under the framework of the Shelter Implementation Plan (SIP), a strategy document developed by Western and Ukrainian experts and funded by the European Commission and the United States of America. This plan set out a step-by-step approach addressing the immense challenges faced at Chernobyl. While the SIP defined five central goals, it did not prescribe specific technical solutions but outlined a route to meeting the key safety objectives. This approach provided the necessary balance between clarity and flexibility as the international community's work together with Ukraine got under way. Before the construction of the NSC could commence, extensive preparations had to be implemented, ranging from research and engineering for conceptual designs to the development of the site infrastructure and procedures for worker protection. As work progressed, adaptions were made as necessary to achieve the overall goals of the SIP.

The Plan includes over 300 sub-projects, most of which have been completed. Here is an overview of the main achievements:

Infrastructure

The necessary infrastructure has been put in place without which the construction of the New Safe Confinement could not take place. The main construction area has been cleared, a clean platform for arch assembly, a modern access control system installed and decontamination facilities comprehensively refurbished. A new changing facility for workers has been built featuring medical and radiation-protection facilities.

Stabilisation

The roof and the western wall of the existing Chernobyl Shelter were successfully stabilised between 2004 and 2008. Eighty per cent of the roof load was transferred to a new external support structure. Extremely challenging tasks inside the Shelter such as the installation of new structural supports in the "de-areator" were also successfully carried out, reducing the risk of collapse.

Protection and safety for workers

A radiological protection strategy, a programme for workers and an emergency plan for accidents have been developed and implemented. State-of-the-art biomedical protection and screening programmes have been installed and radiation protection equipment has been procured. A new safety culture has been introduced and health and safety records have been outstanding.

Monitoring

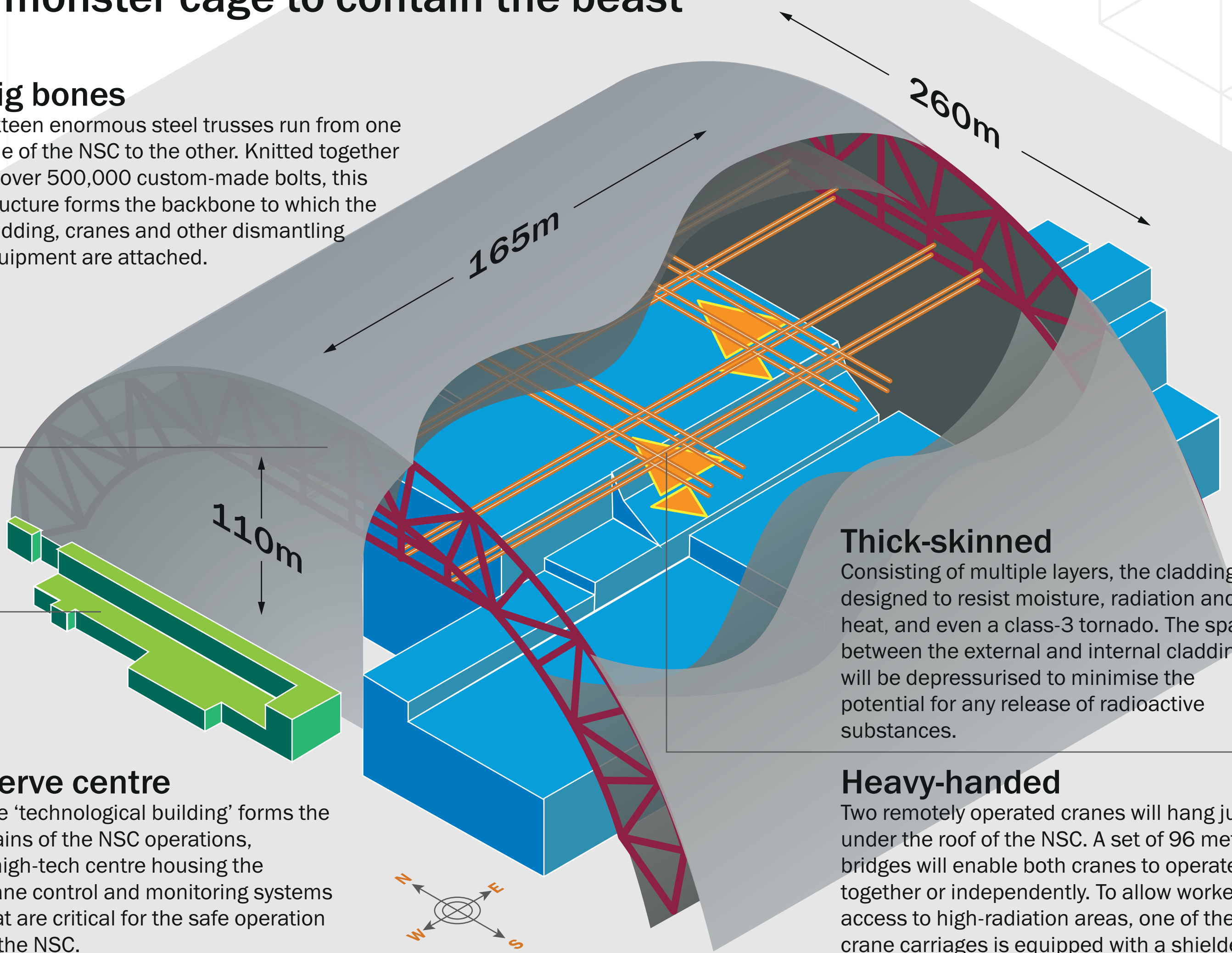
Detailed studies has been carried out to assess risks at the site. The probability of criticality incidents was examined and assessed as virtually non-existent. Today an integrated monitoring system is in place which tracks data on parameters such as radiation levels but also seismic activity and the structural behaviour of the old shelter.

ONE OF A KIND

The New Safe Confinement (NSC) is a unique feat of engineering. The arch-shaped structure is a huge lattice of tubular steel members built on two longitudinal concrete beams. The NSC has been constructed in two halves which have now been lifted to their full height and moved together, to be joined in early 2015. The next step will be to install heavy-duty cranes and auxiliary systems for the safe operation of the NSC and for future dismantling and waste-management activities.

In its final position the NSC will enclose the shelter and prevent the release of radiation. At the same time, it will protect the shelter from external impacts such as extreme weather; the NSC will be strong enough to withstand a tornado. Its sophisticated ventilation system will minimise the risk of corrosion, ensuring that there is no need to replace the coating and expose workers to radiation during the structure's lifetime, which is a minimum of 100 years.

A monster cage to contain the beast



Big bones

Sixteen enormous steel trusses run from one side of the NSC to the other. Knitted together by over 500,000 custom-made bolts, this structure forms the backbone to which the cladding, cranes and other dismantling equipment are attached.

Thick-skinned

Consisting of multiple layers, the cladding is designed to resist moisture, radiation and heat, and even a class-3 tornado. The space between the external and internal cladding will be depressurised to minimise the potential for any release of radioactive substances.

Nerve centre

The 'technological building' forms the brains of the NSC operations, a high-tech centre housing the crane control and monitoring systems that are critical for the safe operation of the NSC.

Heavy-handed

Two remotely operated cranes will hang just under the roof of the NSC. A set of 96 metre bridges will enable both cranes to operate together or independently. To allow workers access to high-radiation areas, one of the crane carriages is equipped with a shielded protective box.

The remains of unit 4

Underneath the hastily constructed concrete sarcophagus lies the damaged reactor itself. Approximately 5,000 metric tonnes of sand, lead and boric acid – was dropped from helicopters during the weeks that followed the accident – is mixed with more than 200 tonnes of uranium, forming a lava-like mass. These so-called Fuel Containing Materials (FCMs) remain highly radioactive and represent the most significant radiological hazard at the site.

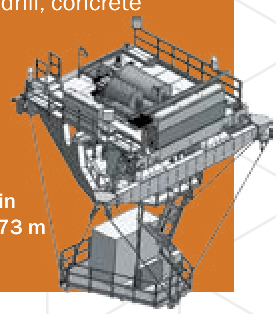
Analysis shows that less than 5 per cent of the radioactivity contained in Unit 4 was released to the environment during the accident.

Studies of the existing sarcophagus (the 'object shelter') are well advanced and deconstruction of its most unstable parts can commence once the NSC is completed. The FCM removal will start at a later stage and will take decades to complete.

Many hands make light work

A mobile tool platform can be fitted to either carriage, which includes a manipulator arm, core drill, concrete crusher and 10 tonne vacuum cleaner.

Carriage specifications
Size: 6.5x7.0 m
Speed: 0-15 m/min
Capacity: 50 tonnes
Lifting speed: 0-10 m/min
Vertical lifting distance: 73 m



Source: EBRD, Bechtel International Systems

THE NSC IN NUMBERS

Located two hours drive north of the Ukrainian capital Kiev, the accident at Chernobyl spread radioactive dust across Europe and poisoned the surrounding area.

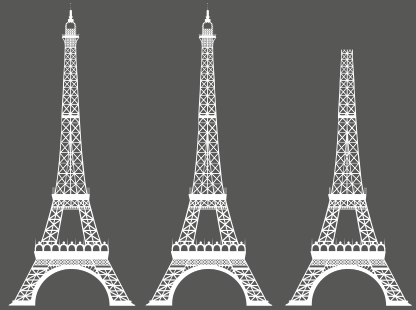
Built to last

Huge doesn't begin to describe this structure

The metal frame alone weighs…

25,000 tonnes

…nearly three times the weight of Eiffel Tower



And at

110 metres

… is tall enough to cover Notre-Dame de Paris

Total equipped weight

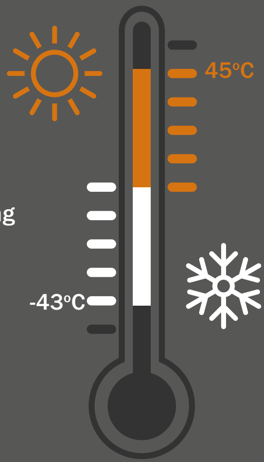
31,000 tonnes

The majority of the steel structure has been fabricated in Italy.

The test of time

With an expected minimum life time of 100 years the NSC will need to deal with all that Mother Nature can throw at it.

The confinement is built to withstand temperatures ranging from -43˚C to +45˚C



…and a category-3 tornado (wind speeds of 254–332km/h)

Big and smart

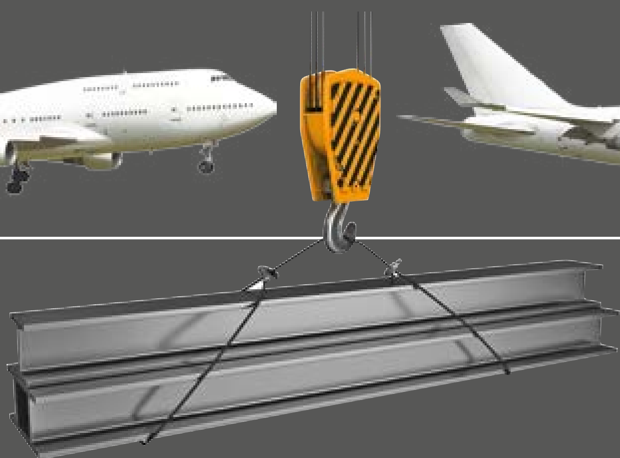
Vaguely similar to an aircraft hanger the total length of the NSC is

165 metres or …

2x remotely-operated cranes will allow workers to dismantle and remove highly radioactive material without entering the danger zone.

… longer than

two jumbo jets



Each crane girder is

100 metres long…

… and supports

50 tonnes

Source: EBRD, Novarka

Human resources

1,200

workers on site during peak construction periods

Workers have had to fit over

500,000

specially manufactured bolts

To ensure that workers on the NSC are safe from excessive exposure to radiation, strict dose limits are observed. Dose rates in the main arch construction area are:

0.0075 mSv/hr

An average dental x-ray is

0.014 mSv

Safety is paramount. The project has an excellent safety record with first class safety procedures in place.

An international workforce of over

27

nationalities

Moving heaven and earth

Once joined and fitted with cranes the NSC will be slid the final 250 metres and begin final commissioning.

The foundations contain

20,000 m^3 of concrete

equivalent to

3,200

truckfuls of concrete

A sophisticated ventilation system will minimise the risk of corrosion, ensuring that there is no need to replace the coating.

Exterior cladding

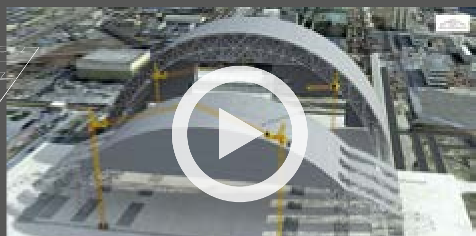
86,000 m^2

equivalent to

12

football pitches

Tracks will guide the NSC as it is pushed into position over the course of **2** days



Watch an animation of the construction http://bit.ly/1MtWzqN

History in the making

1986

Nuclear accident at unit 4 of the Chernobyl Power Plant ejects radioactive dust into the air and leaves significant amounts of material containing nuclear fuel in the lower floors of the building.

Some 200,000 people, including all those living in the nearby town of Pripyat, were evacuated. Within months, engineers and workers managed to cover the open reactor with an enclosure.

1997

Agreement was reached on the Shelter Implementation Plan (SIP) as a strategy document and in September 1997 the Chernobyl Shelter Fund (CSF) was set up at the EBRD.

2002

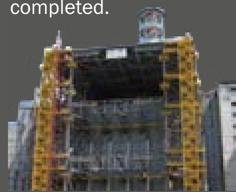
Essential preparatory work was undertaken on the site to allow the construction work to begin and protect the workforce as much as possible.

2007

The contract for the construction of the New Safe Confinement was awarded to the Novarka consortium consisting of the French companies Bouygues and Vinci.

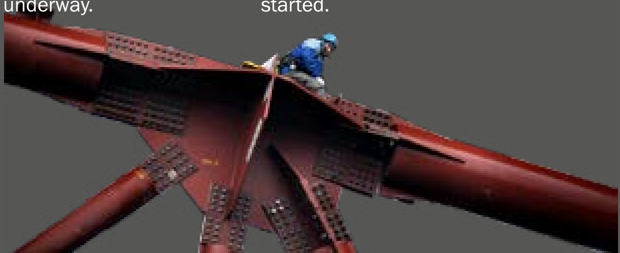
2008

Stabilisation of the existing Shelter was completed.



2010

Site preparation and foundation work were underway.



2012

The construction of the gigantic structure was started.

2014

The two halves were lifted to their full height.

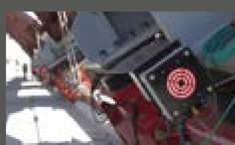
2015

Both halves joined together.

Installation of the auxiliary systems and the equipment for dismantling.

2016-17

Structure slid into place over the destroyed unit 4 and final commissioning commenced .



2017

Project completed by end of November 2017

AN INTERNATIONAL EFFORT

The EBRD manages two donor funds on behalf of the international community which finance the decommissioning infrastructure and related works in Chernobyl. The Bank has also become the largest contributor to the NSC and ISF2 projects, with total commitments from its own resources of €675 million.

As fund manager the EBRD works closely with the government of Ukraine to help ensure that projects are implemented efficiently. The Bank enters into grant agreements with the recipient organisation and disburses funds to contractors. All contracts are awarded in compliance with the EBRD's procurement rules and policies.

The Nuclear Safety Account (NSA)

Established in 1993, the NSA is the EBRD's oldest donor fund for nuclear safety. Today the NSA finances the ISF2 and the LRTP (see box). To date, the Fund has received €365 million from 18 donor countries and the EBRD has provided additional funds for the ISF2. Earlier projects in Bulgaria, Lithuania and Russia under the NSA with a total value of €140 million have been successfully completed.

The Chernobyl Shelter Fund (CSF)

The CSF was established at the EBRD in 1997. It finances the activities under the Shelter Implementation Plan, of which the NSC, with an estimated cost of €1.5 billion, is the biggest part. The total cost of the Shelter Implementation Plan is expected to be €2.1 billion: €1.4 billion has been disbursed by the end of 2014. The funds are directly supervised by the donors who hold Assembly meetings twice a year. All contributors are represented in the Assembly, the highest decision-making body of the Fund.

There are 26 contributors to the Fund: Austria, Belgium, Canada, China, the Czech Republic, Denmark, the EC, Finland, France, Germany, Greece, Ireland, Italy, Japan, Kuwait, Luxembourg, the Netherlands, Norway, Poland, Russia, Spain, Sweden, Switzerland, Ukraine, the United Kingdom, and the United States.

Argentina, Australia, Azerbaijan, Estonia, Hungary, Iceland, India, Israel, Kazakhstan, Korea, Liechtenstein, Lithuania, Portugal, Romania, the Slovak Republic, Slovenia and Turkey have also made donations to the CSF.

MORE TO DO

Reactor 4 is not the only challenge we are addressing in Chernobyl. Closing the three units of the Chernobyl Nuclear Power Plant that were not damaged in the 1986 accident was an urgent priority for the international community in the 1990s.

Once the decision to close these units had been taken, decommissioning infrastructure became an important part of international efforts to assist Ukraine. As with most nuclear plants in the former Soviet Union, there were serious shortcomings in the technical and financial provisions for the decommissioning process and an urgent need for infrastructure investments on the site.

The EBRD focused efforts first on Chernobyl's unit 3 – the last operating unit – and urgent safety and security upgrades led to its safe closure in 2000. The next main task was to create the infrastructure for the safe decommissioning of all three units at Chernobyl.

While some decommissioning infrastructure projects have been funded through bilateral aid, two key Chernobyl facilities are being financed by the EBRD-managed NSA.

The Interim Spent Fuel Storage Facility (ISF2)

The Interim Storage Facility is a key facility for the decommissioning of the Chernobyl Nuclear Power Plant. It will provide safe and secure storage of the spent nuclear fuel that was generated in units 1-3 when the plant was operational.

ISF2 is currently in the final phase of construction. It will process, dry and cut more than 20,000 fuel assemblies and place them in metal casks. These will be enclosed in concrete modules on site. The spent fuel will then be stored safely and securely for a minimum period of 100 years.

The completion of the facility – designed and built by the US company Holtec – is currently scheduled for late 2016. The total cost is estimated to be in excess of €300 million. Once all the fuel has been transferred to the ISF2 the current storage facility can be decommissioned. This will represent a major step forward in increasing nuclear safety at the site; the current facility (ISF1) does not conform with modern standards and its license is about to expire.

The Liquid Radioactive Waste Treatment Plant (LRTP)

The LRTP retrieves highly active liquids from their current tanks, processes them into a solid state and moves them to containers for long-term storage. The plant has been completed and received its operating license in December 2014. The start of operations is expected in early 2015. Construction has cost more than €35 million and was also funded through the EBRD-managed NSA.

NOT THE ONLY TASK

Jaslovské Bohunice, Slovak Republic

Transforming Chernobyl is the biggest, but not the only task the EBRD Nuclear Safety Department faces. The EBRD currently manages six nuclear safety funds, financed by the international community, that assist with the nuclear legacy in Eastern Europe and the former Soviet Union.

In addition to the Chernobyl Shelter Fund and Nuclear Safety Account, the EBRD also manages the three international decommissioning funds for the nuclear power plants in Jaslovské Bohunice (Slovak Republic), Ignalina (Lithuania), and Kozloduy (Bulgaria). The three countries all committed themselves to closing their first-generation Soviet-designed nuclear power plants after EU accession. These funds have also taken a leading role in the promotion of energy efficiency projects in countries which faced the early closure of nuclear power stations and a loss of generating capacity.

Ignalina, Lithuania

The Northern Dimension Environmental Partnership (NDEP) Support Fund was established at the EBRD in 2002 for the improvement of the environment in North-West Russia. The NDEP "Nuclear Window" provides funding for projects that mitigate the legacy of the operation of nuclear-powered ships and submarines of the Soviet-era Northern Fleet in Russia, focusing primarily on the safe retrieval of spent nuclear fuel.

Nuclear service ship "Lepse"

All funds are managed by the EBRD's Nuclear Safety Department on behalf of the contributing countries. The Department, in cooperation with specialised services of the Bank, is responsible for all technical, financial, administrative and legal aspects of fund management. It is also responsible for compliance with EBRD rules and policies, particularly with regard to procurement, environmental protection and public information.

Kozloduy, Bulgaria

Each nuclear safety fund is governed by rules agreed by the respective Assembly of Contributors to the Fund and approved by the EBRD Board of Directors. The Assembly approves and oversees funds management, work programmes and financial statements and decides on the financing of individual projects.

In addition to managing nuclear safety grant Funds, the EBRD Nuclear Safety Department plays an important role in Bank projects to upgrade nuclear safety levels at existing power plants. The EBRD can finance nuclear waste-management decommissioning and safety upgrade projects; in 2013 it signed a loan agreement, together with Euratom, for safety upgrades of operating nuclear power plants in Ukraine.

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