

Chernobyl: New Safe Confinement and Spent Fuel Storage Facility



European Bank
for Reconstruction and Development



26 April 2011 marks the 25th anniversary of the accident at the Chernobyl nuclear power plant. Since then Ukraine and the international community have been working continuously on overcoming the legacy of the accident and converting Chernobyl into a safe and secure site. Today two major technical tasks remain: The first is to make the destroyed unit 4 environmentally safe. The second is to safely and securely store the spent nuclear fuel from reactors 1 – 3. This is the most important stage in the decommissioning of these units.

The Shelter and the New Safe Confinement

The purpose of the New Safe Confinement is to seal off the destroyed unit 4 of the Chernobyl nuclear power plant and to allow for the eventual deconstruction of the current structure known as "shelter" or "sarcophagus" which was erected in the immediate aftermath of the 1986 accident under extremely perilous circumstances.

This structure, for which a complex stabilization program has been completed in 2008, was never intended as a permanent structure.

A longer term strategy was laid out by a team of Western and Ukrainian experts in 1997 in the Shelter Implementation Plan (SIP). In the same year, the international community led by the G7 set up the Chernobyl Shelter Fund (CSF) at the EBRD to implement the Plan. The SIP defines five central tasks to decrease the risk to workers, the population and the environment and to transform Chernobyl into an environmentally safe site for at least the next 100 years. The plan

sets out a step-by-step approach, To select adequate technical solutions as data and information on the structure are gathered.

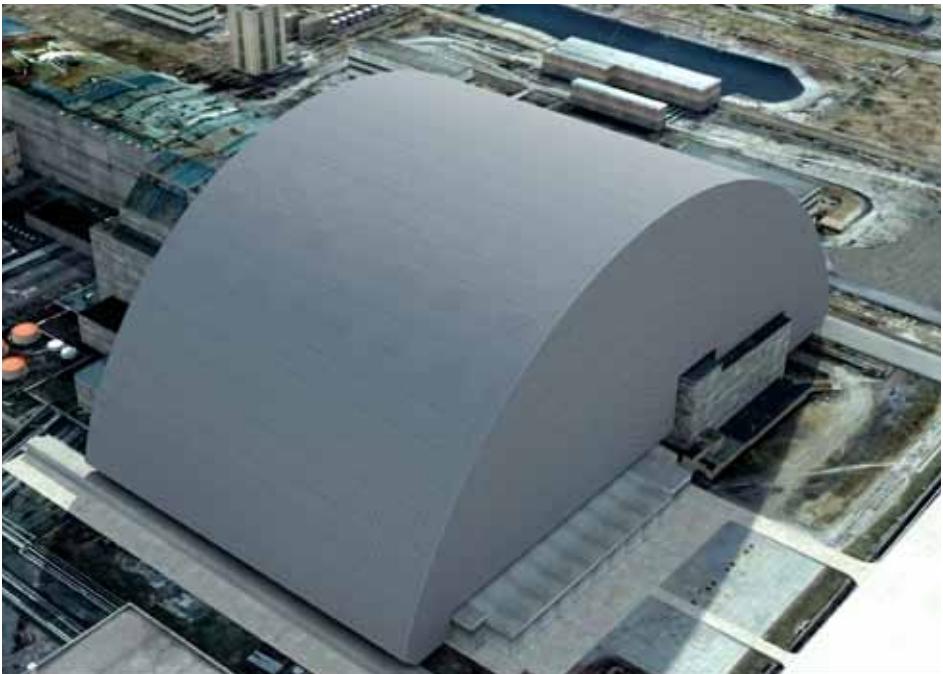
The most spectacular and visible project under the SIP is the New Safe Confinement, which will have a span of 257 metres, a length of 164 metres, a height of 110 metres and a weight of 29,000 tons. It will be assembled on site, but away from the highly radioactive unit 4, and then slid into place, covering the reactor building. It will protect

Timeline

1986	1995	1997
<ul style="list-style-type: none">▶ 26 April: Explosion of reactor 4 of the Chernobyl Nuclear Power Plant.▶ April - October: Construction of sarcophagus as a temporary measure.	<ul style="list-style-type: none">▶ G7/EU and Ukraine sign Memorandum of Understanding▶ EBRD Nuclear Safety Account extended to include the decommissioning of Chernobyl reactors 1-3.	<ul style="list-style-type: none">▶ May: G7/EU and Ukraine agreement on the Shelter Implementation Plan (SIP);▶ September: Establishment of the Chernobyl Shelter Fund (CSF) at the EBRD▶ November: First pledging event in New York▶ December: CSF becomes operational



Nuclear Safety web site
www.ebrd.com/nuclearsafety



against the incursion of water and snow and prevent the release of contaminated materials.

The new structure will be equipped with two cranes with a lifting capacity of 50 tons each. Dismantled shelter components can be laid down or processed inside the New Safe Confinement which will have a lifespan of at least 100 years.

The contract for design and construction of the New Safe Confinement was signed in September 2007 with the consortium NOVARKA, formed by the construction companies Bouygues and Vinci. While the detailed design is currently being finalised, work on the foundations has already started. Work on the structure will begin as soon as the design receives regulatory approval from the Ukrainian authorities, expected in early 2011.

The New Safe Confinement is the most visible - and with a cost of some two thirds of the total also the most expensive - but far from the only task under the Shelter Implementation Plan. Among SIP tasks already achieved are:

- ▶ Stabilisation of the roof and the western wall of the Chernobyl

shelter 2004-2008 with eighty per cent of the roof load transferred to a new external support structure. Extremely challenging tasks inside the shelter were also successfully carried out, reducing the risk of collapse. The stabilisation was finished on-time and within the cost estimate of about US\$ 50 million. It is the largest internationally-funded and completed project at the site to date.

- ▶ The necessary infrastructure has been put in place without which the construction of the New Safe Confinement could not take place. The future main construction area has been fitted with road and rail connections. Site services like power, water, drains and communications supplies have been comprehensively refurbished.
- ▶ A new, state-of-the-art facility for 1,430 workers has been built which offers medical and radiation protection facilities and an ambulance. In the neighbouring town Slavutych a hospital wing has been refurbished and equipped.
- ▶ Training courses have introduced a new safety culture among the workforce. A radiological

protection strategy and programme for workers are in place and an emergency plan for accidents has been developed. State-of-the-art biomedical protection and screening programmes have been installed and radiation protection equipment has been procured.

- ▶ Studies were carried out to assess the site's risks and assessed the probability of criticality incidents as virtually non-existent. Measurement of neutron flux is part of an integrated monitoring system, completed in 2010, which combines data on parameters such as radiation levels but also seismic activity and the structural behaviour of the shelter.

Financing of all activities under the Shelter Implementation Plan – including the New Safe Confinement – comes under the Chernobyl Shelter Fund, established at the EBRD and with the Bank as fund manager in 1997. As of end-2010, the Chernobyl Shelter Fund has recorded contributions of €864 million. The Donor Assembly has so far approved nine grant agreements committing €811 million to the completion of the project.

1998

- ▶ Year-end: Implementation of first projects: Contracts for project management unit and engineering tasks signed; SIP implementation begins

2000

- ▶ May: Second pledging event in Berlin
- ▶ Year-end: Ukraine shuts down last operating Chernobyl reactor (Unit 3).

2001

- ▶ April: Decision in principle on the design of the New Safe Confinement (NSC)

Interim Spent Fuel Storage Facility 2

The second major task at Chernobyl is from a safety point of view by no means less important. About 10 years after the end of nuclear power generation on the site the Interim Spent Fuel Storage Facility 2 (ISF-2) will provide a crucial component of a preparatory stage for the decommissioning of units 1-3.

Spent fuel is currently stored at the site in an interim wet storage facility constructed in Soviet times (ISF1) and in pools in the units. Some spent fuel is still stored in the fuel ponds inside the three units, which means that certain safety and operational functions – such as cooling – need to be maintained and that the actual decommissioning or dismantling of equipment cannot start. This facility does not conform to modern standards and it appears unlikely that its current licence would be extended when it expires in 2016.

The Interim Storage Facility 2 will provide dry storage for the more than 20,000 spent fuel assemblies from the operation of Chernobyl NPP for a period of at least 100 years.

The project will use existing concrete storage modules and a building for the processing of the assemblies. Processing will include cutting, drying and fitting of spent fuel into storage containers.

The contract to design and complete the facility was signed with the American company Holtec in September 2007. The design of the new facility was approved by the Ukrainian regulator in late-2010. Work can commence once the contract amendment for the implementation is signed. It is expected that the construction work will be finalised by 2014.

The ISF-2 is funded through the Nuclear Safety Account, set up by the G7 at the EBRD in 1993 to provide financial support for safety assessments and the short term safety upgrades of old Soviet designed nuclear power plants. The fund comprises 16 countries plus the European Commission and has so far received about €320 million in contributions from its donors.

ISF-2 Processing Building



Nuclear Safety Account

Established in 1993 at the EBRD to finance nuclear safety measures in Eastern Europe. Today the NSA finances two decommissioning facilities at Chernobyl.



2004

- ▶ Start of biomedical protection and screening programmes for workers in Chernobyl
- ▶ Year-end: Shelter stabilisation works begin

2006

- ▶ December: Stabilisation of Western wall structures in place

2007

- ▶ 7 August: Ukraine and EBRD sign grant agreement
- ▶ 17 September: Chernobyl Nuclear Power Plant signs contract for NSC and completion of Interim Storage Facility 2.

An international effort

The international efforts to support Ukraine to overcome the legacy of the 1986 Chernobyl accident are a demonstration of international solidarity and considerable contributions have been made.

Preparations are now underway for a pledging event for both Chernobyl projects in Kiev in April 2011 to coincide with the 25th anniversary of the accident. Together additional €740 million will need to be raised for the projects to be completed.

According to projections based on detailed engineering the completion of the Shelter Implementation Plan requires an additional €600 million and construction of the Interim Storage Facility (ISF-2) an extra €140 million.

To date the **Chernobyl Shelter Fund**, which funds the Shelter Implementation Plan, has received contributions from 23 countries, the European Commission and donations from six countries. The EBRD shareholders provided a €58 million grant for the New Safe Confinement.

CSF Contributions

Donor

Donor	Contribution (€ million)
European Community	250.0
United States	182.8
Germany	60.5
United Kingdom	53.1
France	52.5
Japan	45.7
Ukraine	45.0*
Italy	41.5
Canada	34.9
Russia	15.3
Switzerland	9.3
Ireland	8.0
Austria	7.5
Sweden	7.2
Norway	7.0
Netherlands	5.7
Kuwait	5.4
Spain	5.1
Denmark	5.0
Greece	5.0
Finland	4.9
Belgium	4.3
Poland	2.5
Luxembourg	2.5

* In addition, Ukraine has accepted to take over one SIP task valued at US\$ 22 million.

Donations have been made by Iceland, Israel, Korea, Portugal, the Slovak Republic and Slovenia.

The **Nuclear Safety Account**, which finances the Interim Storage Facility 2, has received contributions from the following 16 countries and the European Commission to date:

NSA contributions

Donor

Contribution (€ million)

France	63.3
United Kingdom	40.4
Germany	37.5
European Community	36.2
Japan	27.0
United States	26.3
Italy	21.2
Canada	15.3
Switzerland	10.9
Sweden	9.0
Russia	7.6
Finland	6.0
Ukraine	5.8
Netherlands	4.2
Denmark	4.0
Norway	4.0
Belgium	1.9

In addition, the EBRD shareholders provided a €77 million grant for the Interim Spent Fuel Storage Facility in 2008.



2008

- 80 per cent of roof load of Chernobyl Shelter to external support structure
- Beginning of site clearance (future assembly area for NSC)

2009

- Concept Design Safety Document (key licensing documents) approved.

2010

- Piling for NSC foundations begins
- Approval of ISF2 design
- Integrated Automated Monitoring System completed

For further enquires please contact

Nuclear Safety Department
European Bank for Reconstruction and Development
One Exchange Square
London EC2A 2JN
United Kingdom
Tel: +44 20 7338 7195
Fax: +44 20 7338 7175
Email: nuclearsafety@ebrd.com
Web site: www.ebrd.com/nuclearsafety

New Safe Confinement design images provided by Novarka

