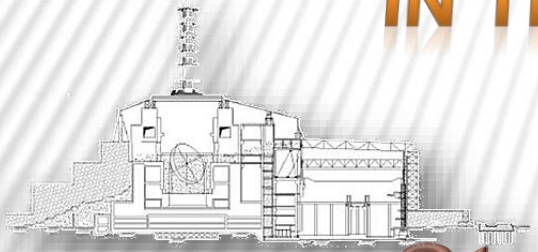
European Bank
for Reconstruction and Development

ГСП ЧАЭС

BECHTEL

REALIZATION OF THE SHELTER IMPLEMENTATION PLAN AS A KEY MILESTONE IN THE AREA OF CONVERSION



Plans

NSC Construction,

Stabilization,

History,

S. Deriuga, NSC Deputy Project Manager for Technical Direction

SIP Evolution (1986 – 1998)

Timeline	
26 April 1986	❑ Accident Occurred - Began short term measures to bring situation under control
June 1986	❑ Resolution of Government Commission - Long-term conservation of Unit 4
30 November 1986	❑ Object Shelter Completed
1992	❑ International Tender for Conversion to Environmentally Safe System - Seeking best project and technical solution - Tender Jury accepted 7-step concept 1. Analysis of current state of the Object Shelter 2. Inform the community on the Shelter and site condition 3. Stabilization of the Shelter 4. Construction of a new safety enclosure over the Shelter 5. Construction of storage facilities for radioactive waste (RAW) 6. Construction of technological facility for RAW processing 7. Removal, decontamination and storage of radioactive materials
1994	❑ European Commission initiated Tender for feasibility study for conversion to environmentally safe system
1995	❑ The feasibility study on Shelter conversion was completed and Alliance delivered report with 5-point conclusion 1. The existing Shelter is not stable nor seismic-resistant. Emergency measures must be taken 2. The existing structures of the Shelter do not allow to safely remove radioactive waste 3. It is necessary to construct new protective enclosure to allow the safe dismantlement of Unit 4 4. The need for construction of a radioactive waste processing and storage area 5. Ukraine is not able to finance the project without International assistance
11 September 1995	❑ Cabinet of Minister designated the State Atomic Energy Committee as the “Client” for OS conversion efforts
June 1997	❑ G-7 adopted the Shelter Implementation Plan (SIP)
20 November 1997	❑ Donor Countries assumed responsibility for SIP implementation and established the Chernobyl Shelter Fund (CSF) ❑ The European Bank for Reconstruction and Development (EBRD) was appointed as the Administrator of the CSF
20 April 1998	❑ Western Consortium selected for SIP-Project Management Unit

MAIN SIP OBJECTIVES:

- Reduce the OS collapse potential
- Reduce the OS structural collapse consequences
- Improve nuclear safety
- Improve worker and environmental safety
- Develop the long-term strategy and study for Object Shelter conversion into an environmentally safe system

S I P T A S K S

Objective 1	Task 1	Stabilization design integration and mobilization
	Task 2	Stabilization of the Western section
	Task 3	Stabilization of “Mammoth” Beam and Southern section
	Task 4	Stabilization of the Eastern and Northern sections
	Task 5	Stabilization of the roof, roof supports and covering
	Task 6	Structural investigation and monitoring
	Task 7	Geotechnical investigations
	Task 8	Seismic characterization and monitoring
Objective 2	Task 9	Emergency preparedness
	Task 10	Dust management
	Task 11	Emergency dust suppression system
Objective 3	Task 12	Criticality and nuclear safety
	Task 13	Contained water management
	Task 14	FCM characterization
Objective 4	Task 15	Radiological protection program
	Task 16	Industrial Safety, fire protection and access control
	Task 17	Integrated monitoring system
	Task 18	Integrated database
Objective 5	Task 19	FCM removal and waste management strategy
	Task 20	Development of FCM removal technology
	Task 21	Safe Confinement strategy
	Task 22	Safe Confinement construction

PHASE 1
1998 – 2000

Engineering studies
Urgent stabilization

- Repair of VS-2 ventilating tower
- Reinforcement of Beams Б1, Б2 Western Supports
- Installation of VS-2 Aircraft Warning System
- OS roof sealing
- Motor roads for RAW transportation

TRANSITION PERIOD
2000 – 2001

Taking Key Programmatic SIP Decisions

- P1- Stabilization and Shielding Strategy
- P2 – Roof, Supports and Structural Stabilization Strategy
- P10 – Safe Confinement Strategy

PHASE 2
2001 – 2023

Detailed Design
Implementation of construction and installation activities

- SIP Facilities Infrastructure
- OS Safety Enhancement
- Stabilization
- Monitoring System and Database
- NSC Construction
- Deconstruction of Unstable Shelter Structures

Phase I (1998 – Mid-2000) – Early Biddable Projects

Development of Strategy, Programs, Conceptual Design, Including Implementation of 2 Top-Priority Stabilization Measures

Package A
Civil Engineering

Scope:

- Geotechnical Studies
- Design of the Structural Monitoring System
- Infrastructure for Stabilization Measures
- Determination of the SOW for Stabilization
- Decision Regarding New Safe Confinement Strategy

Package B
Operation & Monitoring

Scope:

- Industrial and Fire Safety
- Integrated Monitoring System and Database
- Seismic Monitoring
- Radiological Protection Program

Package C
Emergency Systems

Scope:

- Development of Emergency Plans
- Emergency Safety Related System
- Dust and Water Monitoring

Package D
FCM Removal Strategy

Scope:

- Preliminary Characterization of Fuel Containing Materials
- Conceptual Study of FCM Removal Strategy & Associated RAW Management
- Conceptual Study of FCM Removal Technologies and Decision Regarding FCM Removal Prototype

Implementation of 2 Top-Priority Stabilization Measures:

- (1998) Repair of Unit 3&4 Ventilation Stack Foundation and Bracing
- (1999) Reinforcement of Beam B1 and B2 Supports

Transition Period (mid 2000 – early 2001)

Brief description of studies under top-priority projects and taking decisions for the "Key Programmatic Stages"

Programmatic decisions shall be taken for key stages based on the integrated data accumulated during the previous years of SIP implementation. The Programmatic decisions shall be taken to determine the ways for SIP implementation, and they show transition to the following stage when performing design and construction activities in the framework of SIP tasks. The decisions shall be taken by the Client and non-objected by the EBRD on behalf of the Assembly of Contributors based on the technical consultancy provided by the International Advisory Group (IAG) and the independent group of Ukrainian experts.

- **P1 – Stabilization and Shielding Strategy**
- **P2 – Roof, Supports and Structural Stabilization Strategy**
- **P3 – Structural Report and Structural Monitoring System**
- **P4 – Seismic Monitoring System**
- **P5 – Criticality and Nuclear Safety**
- **P6 – OS Contained Water Management**
- **P7 – FCM and RAW Management Strategy**
- **P8 – Study and Development of FCM Removal Strategy**
- **P9 – FCM Removal Prototype**
- **P10 – New Safe Confinement (NSC) Strategy**

MAIN COMPLETED PROJECTS UNDER SIP PHASE II (2001 – 2016)

- Design and Construction of Small Stroibaza facilities
- Design and Construction of Change Facility for 1430 persons
- Personnel Training Center. Design and Construction
- Rehabilitation Center. Construction
- Technological Equipment for Canteen 19
- Offsite Utilities and Associated Facilities
- Design and Construction of Water Intake Wells
- Upgrade of Pripyat Sewage Treatment Facilities
- Construction of SPS and Sanitary Lock in the DS at elevation 5.800, Reconstruction of LRW collection and removal system
- Design, Fabrication and Commissioning of Modernized Dust Suppression System (MDSS)
- Supply, Supervision of Installation and Commissioning of RAW Transport Monitor
- Design and Installation of Measuring Unit for Object Shelter RAW (SRW) Characterization
- NSC Preparatory Works. Berm Wall Removal
- NSC Site Preparation. Clearance, Leveling and Excavation for Construction of NSC Foundations
- Stabilization Measures at the OS
- Reconstruction of VS-2 “BYPASS” System Air Duct
- OS Integrated Automated Monitoring System
- Integrated Shelter Database
- Upgrade Physical Protection and Access Control System
- OS Fire Protection System

OS conversion into an ESS shall be achieved through implementation of 3 stages

Conversion — **Stage 3**

Remove the fuel containing materials and long-lived RAW from the OS, perform its conditioning with the following storage and disposal in the RAW storage facilities in accordance with the effective standards; complete the OS decommissioning

Preparation for Conversion — **Stage 2**

Create additional protective barriers, primarily the New Safe Confinement in order to provide required conditions for a technical activity at Stage 3, and ensure the personnel, public and environment safety; preparatory and engineering activities intended to develop a technology for fuel containing materials (FCM) removal from the Object Shelter at Stage 3; create the infrastructure for the management of Object Shelter RAW

ПОМ

Stabilization — **Stage 1**

Stabilize the existing facility, enhance its operational reliability and longevity of structures and systems ensuring stabilization and monitoring of OS safety parameters

ПОМ

Stage 1

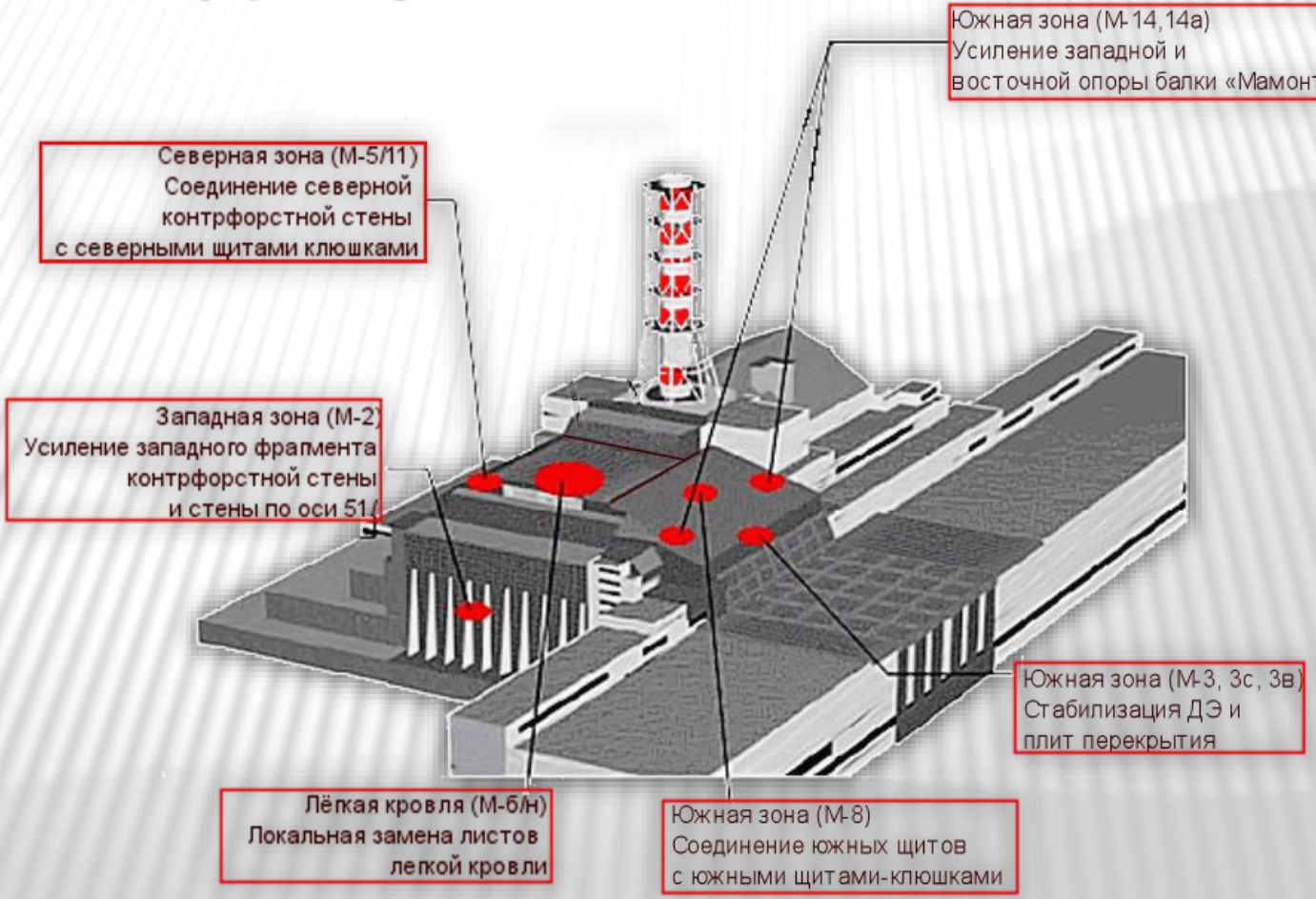
Stabilization of Object Shelter Localizing Facility

Purpose of OS Localizing Facility stabilization is to reduce the risk of its structural collapse and the risk of radioactive substances release to the environment

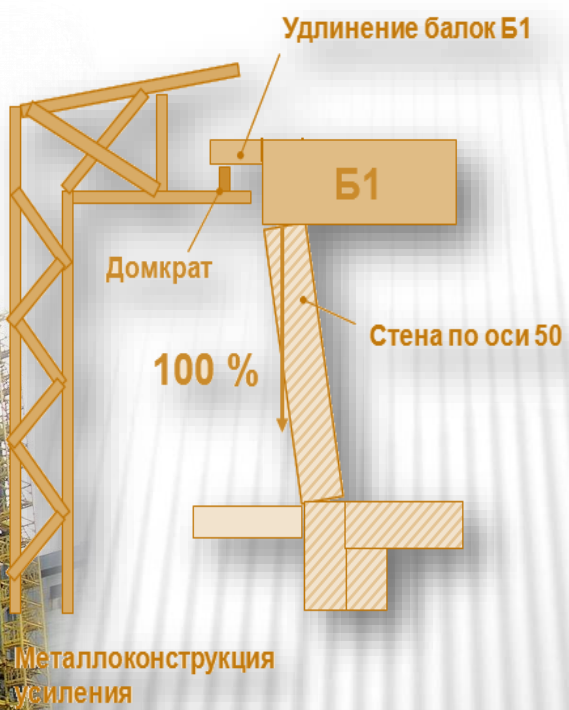
COMPLEX OF TOP-PRIORITY STABILIZATION MEASURES

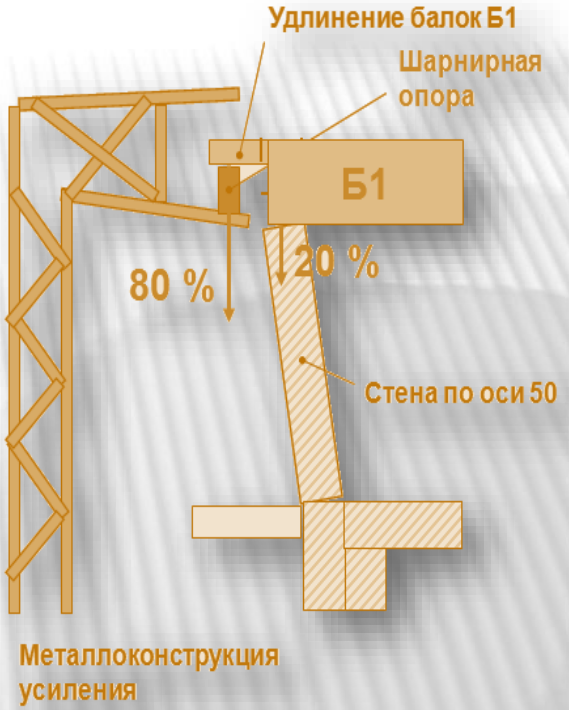
№	Work Area	Brief technical characteristics
2	Western Zone	New structure to accept the vertical and horizontal bearing pressures from Beams Б1/Б2 along axes 50/П и 50/Ж
3	Southern Zone	Reinforcement of Deaerator Stack frame
5	Northern Zone	Provide connection of roof elements along axes П-С with the Buttress Wall and add the additional volume of concrete to reach the design level
8	Roof and Roof Supports	Provide joint operation of southern hockey sticks and southern panels
11	Northern Zone	Provide connection of hockey sticks with the Northern Buttress Wall through grouting fixation anchors
14 14a	“Mammoth” Beam Western Support “Mammoth” Beam Eastern Support	Strengthen the western support braces to resist the extreme loads. Ensure stability of the eastern support under extreme loads
N/N	Local Sealing of Light Roof Structures	Potential replacement of a shaped decking within work areas to ensure safe implementation of stabilization measures

Top-priority stabilization measures zones



MEASURE № 2

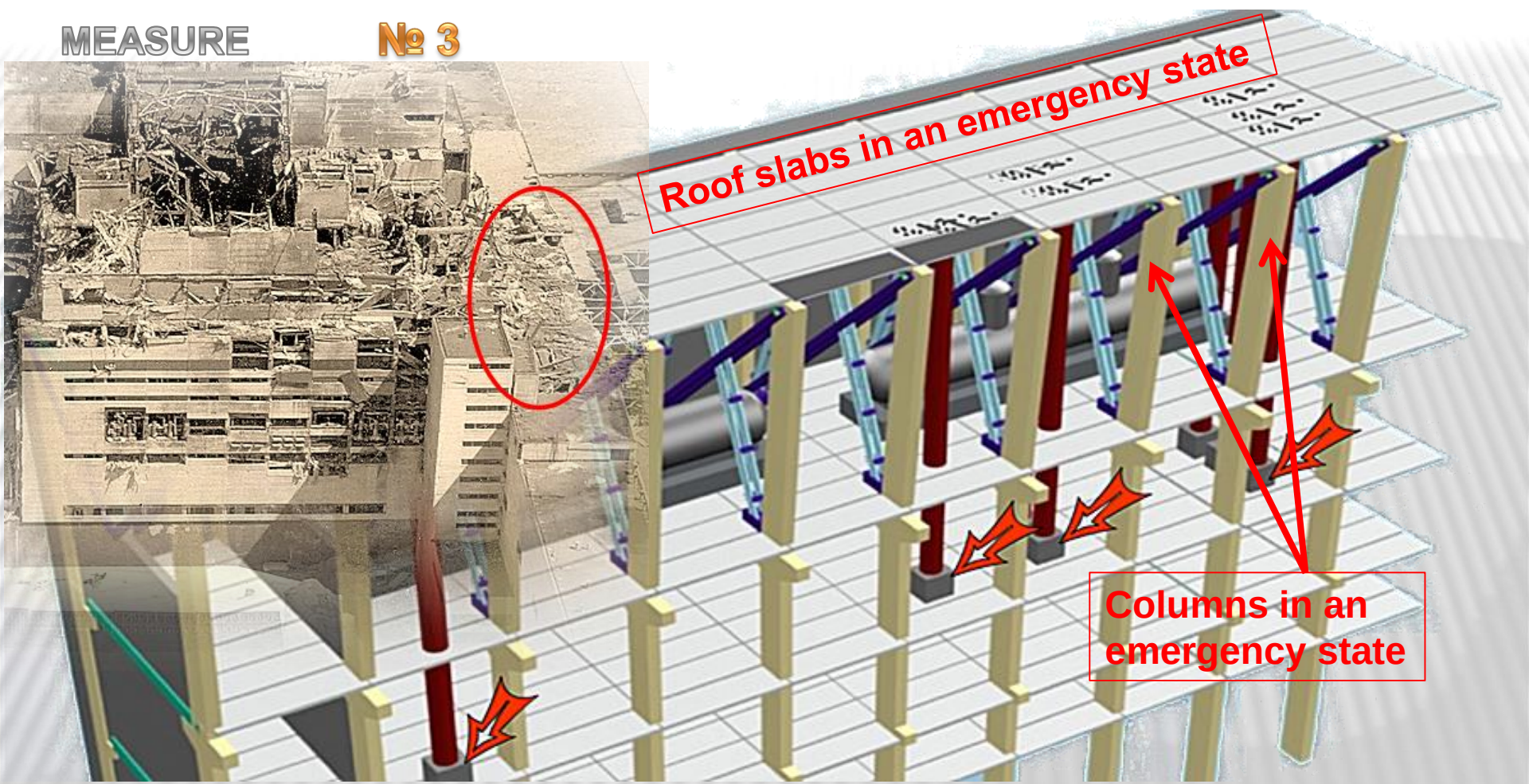




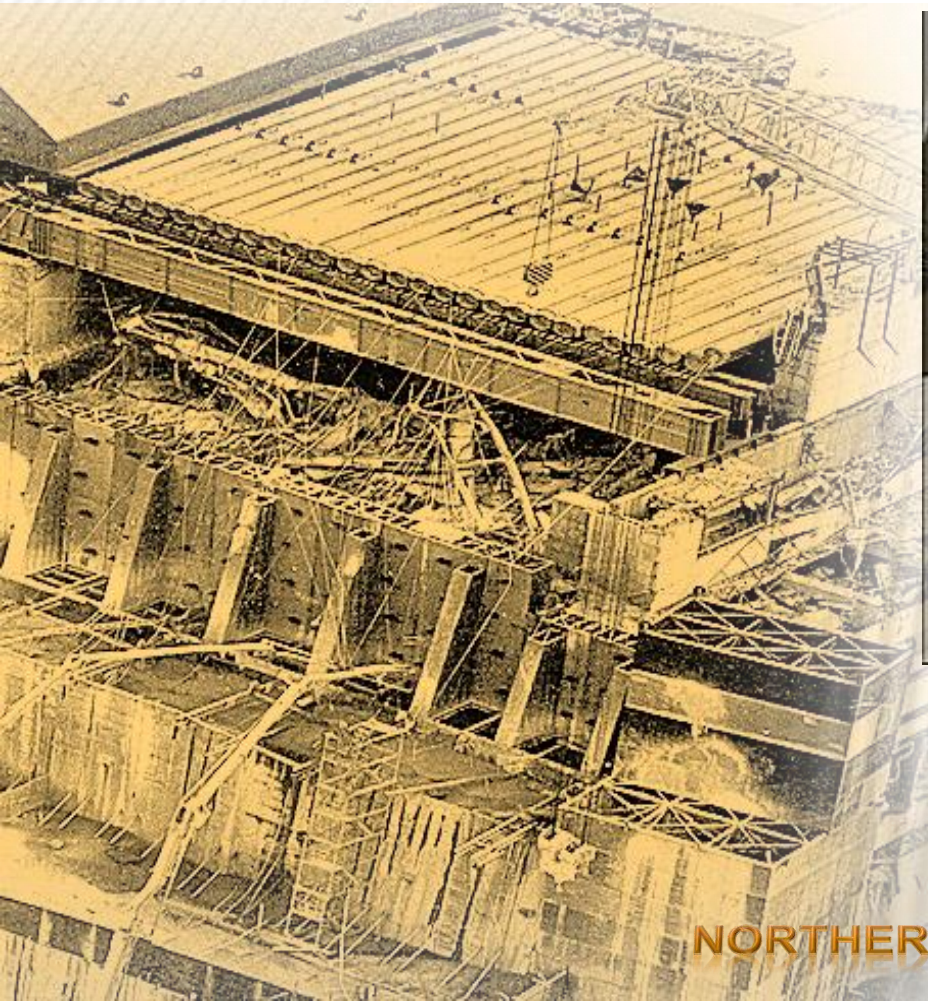
80% of load from Beams Б1/Б2 transferred to DSSS structures

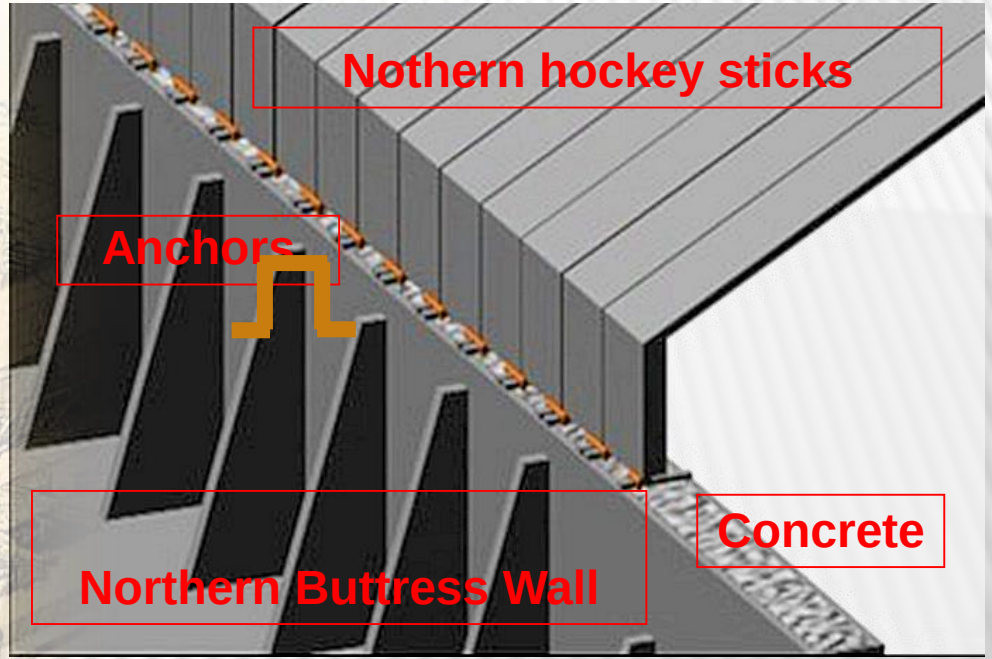
WESTERN WALL DESIGNED STEEL STRENGTHENING STRUCTURE (DSSS)

MEASURE № 3

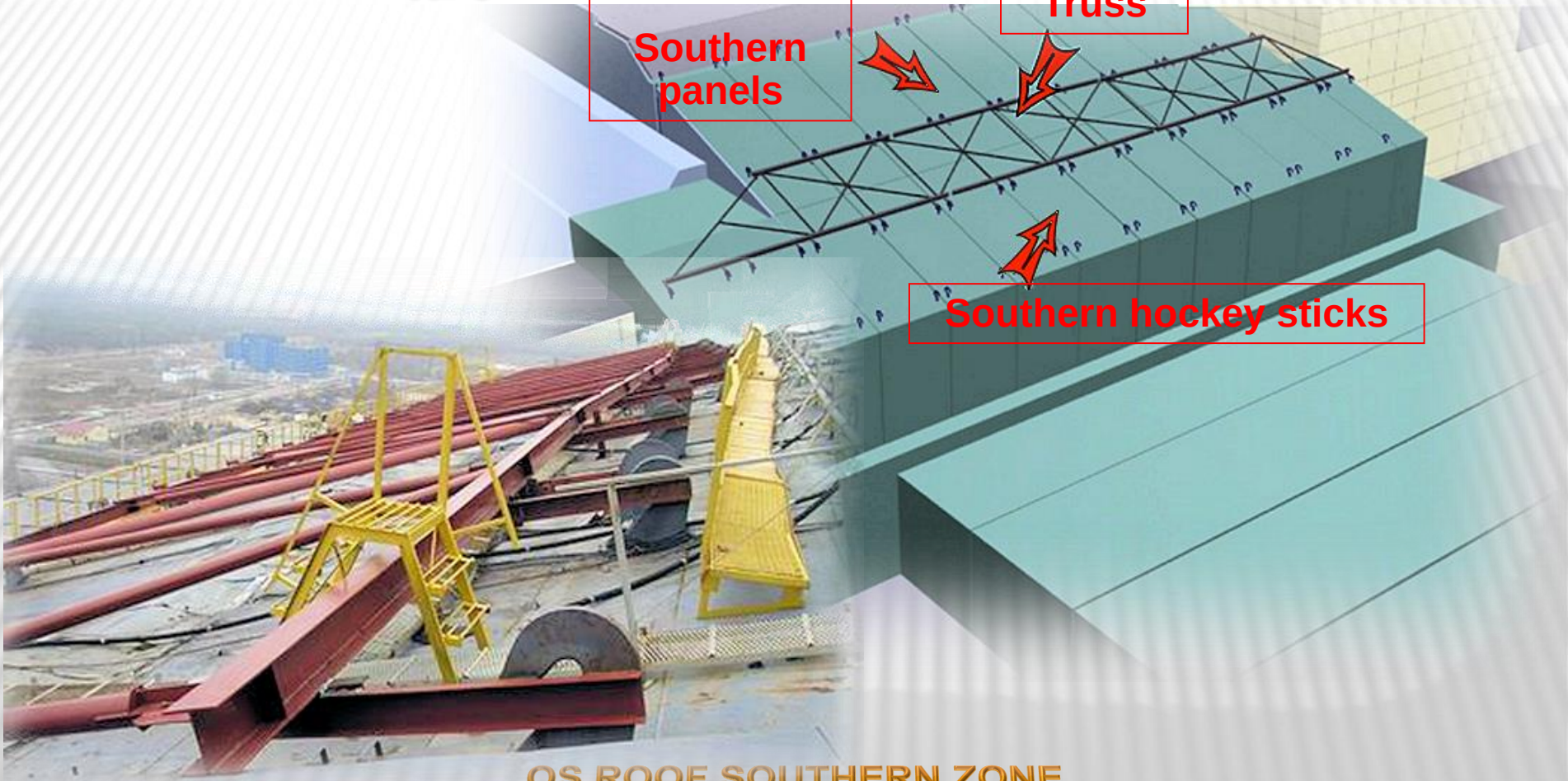


STABILIZATION OF DEAERATOR STACK FRAME



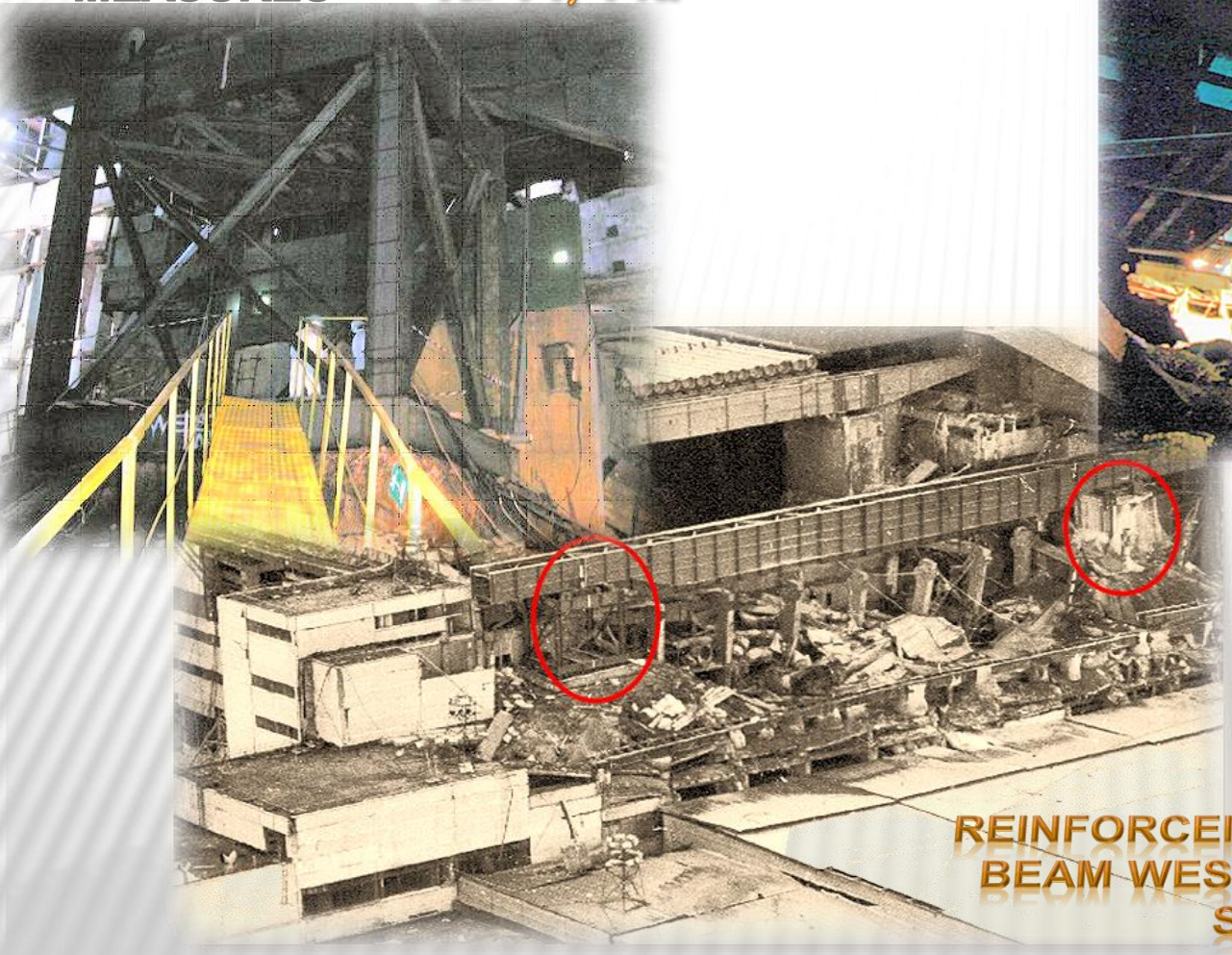


NORTHERN ZONE



OS ROOF SOUTHERN ZONE

MEASURES № 14, 14a



REINFORCEMENT OF "MAMMOTH" BEAM WESTERN AND EASTERN SUPPORTS

MEASURE N/N

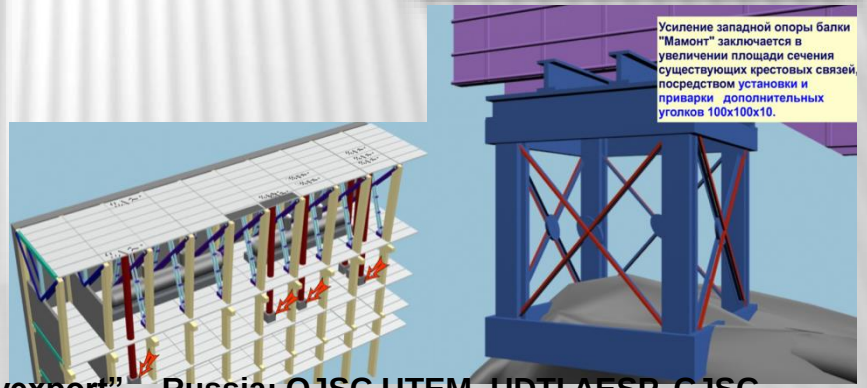
OS LIGHT ROOF

Probability of OS structural destruction before and after stabilization

Structures and elements	Stabilization measure number	Destruction probability		Governing load
		before stabilization, year^{-1}	after stabilization, year^{-1}	
Wall along axis 50 with the adjacent frame	№ 2	**$1{,}3 \cdot 10^{-1}$**	**$2 \cdot 10^{-3}$**	Seismic
Western Buttress Wall	№ 2	$1 \cdot 10^{-4}$	$1 \cdot 10^{-4}$	
Roof between Western Buttress Wall and the wall along axis 50	№ 2	$1 \cdot 10^{-4}$	$1 \cdot 10^{-4}$	
Western hockey sticks	№ 2	**$1{,}4 \cdot 10^{-2}$**	**$1 \cdot 10^{-4}$**	Extreme wind
Deaerator Stacks	№ 3	**$1{,}3 \cdot 10^{-1}$**	**$1 \cdot 10^{-3}$**	Seismic
“Mammoth” Beam supports				
western: - vertical load	№ 14	$1 \cdot 10^{-4}$	$1 \cdot 10^{-4}$	
- horizontal load	№ 14	**$1{,}3 \cdot 10^{-1}$**	**$1 \cdot 10^{-3}$**	Seismic
eastern: - vertical load	№ 14a	$1 \cdot 10^{-4}$	$1 \cdot 10^{-4}$	
Southern panels	№ 8	$1 \cdot 10^{-4}$	$4 \cdot 10^{-4}$	Extreme wind
Southern hockey sticks	№ 8	**$1{,}4 \cdot 10^{-2}$**	**$4 \cdot 10^{-4}$**	Extreme wind
Northern hockey sticks	№ 5/11	**$1{,}4 \cdot 10^{-2}$**	**$1 \cdot 10^{-4}$**	Extreme wind

Stabilization Measures Detailed Design was completed during the period from 2004 through to 2008

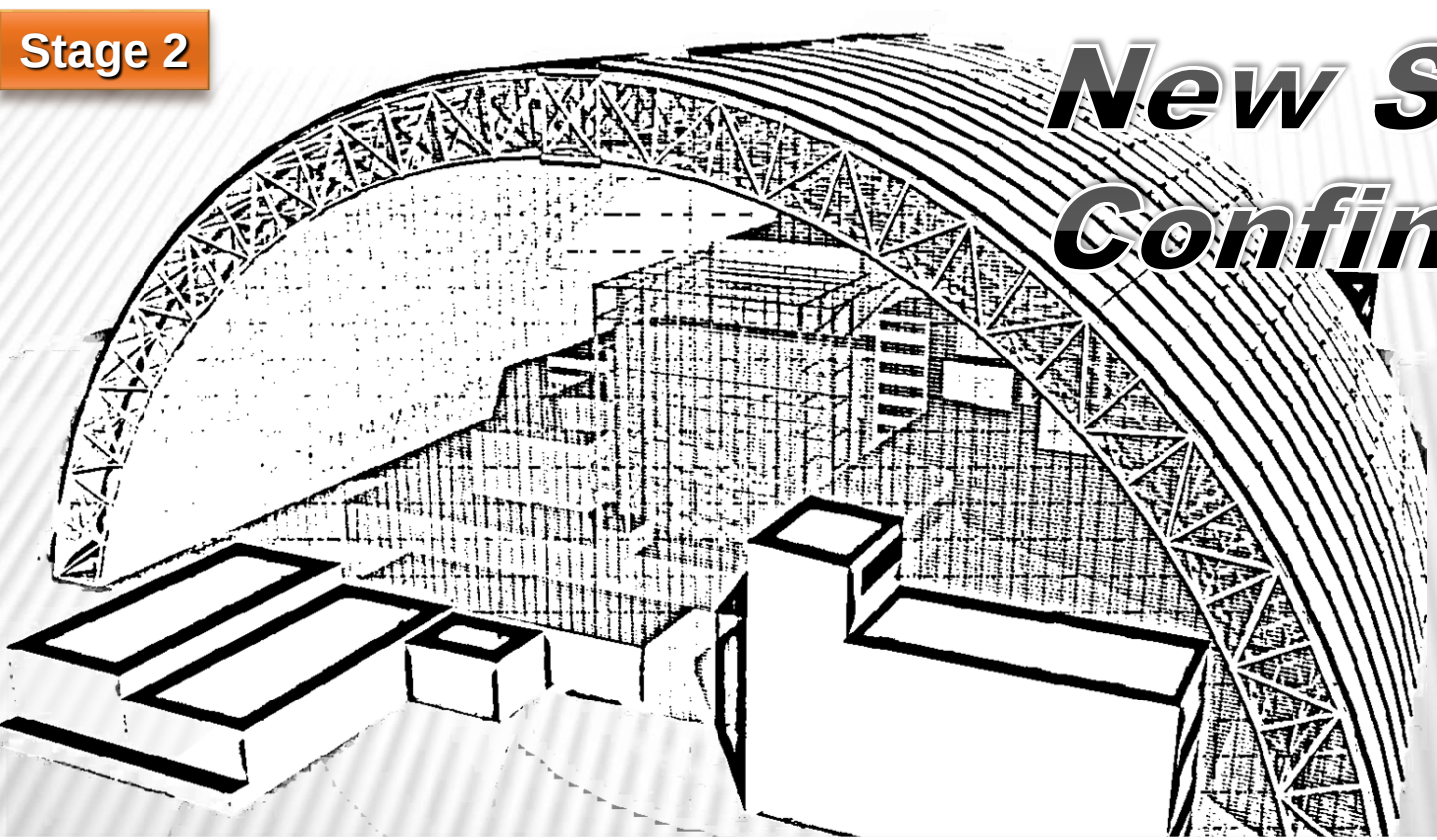
The completed top-priority stabilization measures allowed enhancing safety of the OS localization facility considering limited life-time of stabilized structures (up to 15 years) assuming the NSC will be constructed and the early deconstruction of unstable structures will be completed during the aforementioned period



Contractor - “Stabilization” Consortium comprised of: “Atomstroyexport” – Russia; OJSC UTEM, UDTI AESP, CJSC “Rovno NPP Construction Administration” - Ukraine

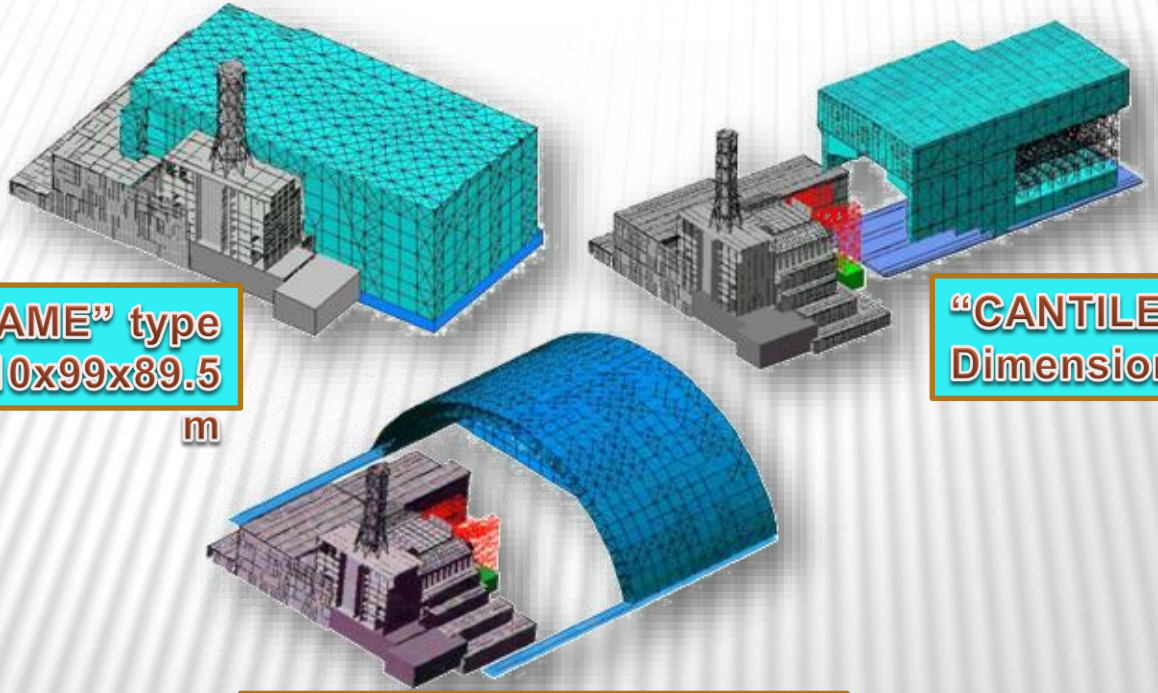
Stage 2

New Safe Confinement



Protective facility, which includes a complex of process equipment for removal of fuel containing materials from the damaged Unit 4 of Chernobyl NPP and for management of radioactive waste, as well as other systems intended for conversion of the mentioned unit into environmentally safe system and to ensure safety for personnel, public and environment (Law of Ukraine “On General Principles of Further Operation of ChNPP and Conversion of Damaged Unit 4 Into Environmentally Safe System”)

Concepts of protective facility considered at P10 stage

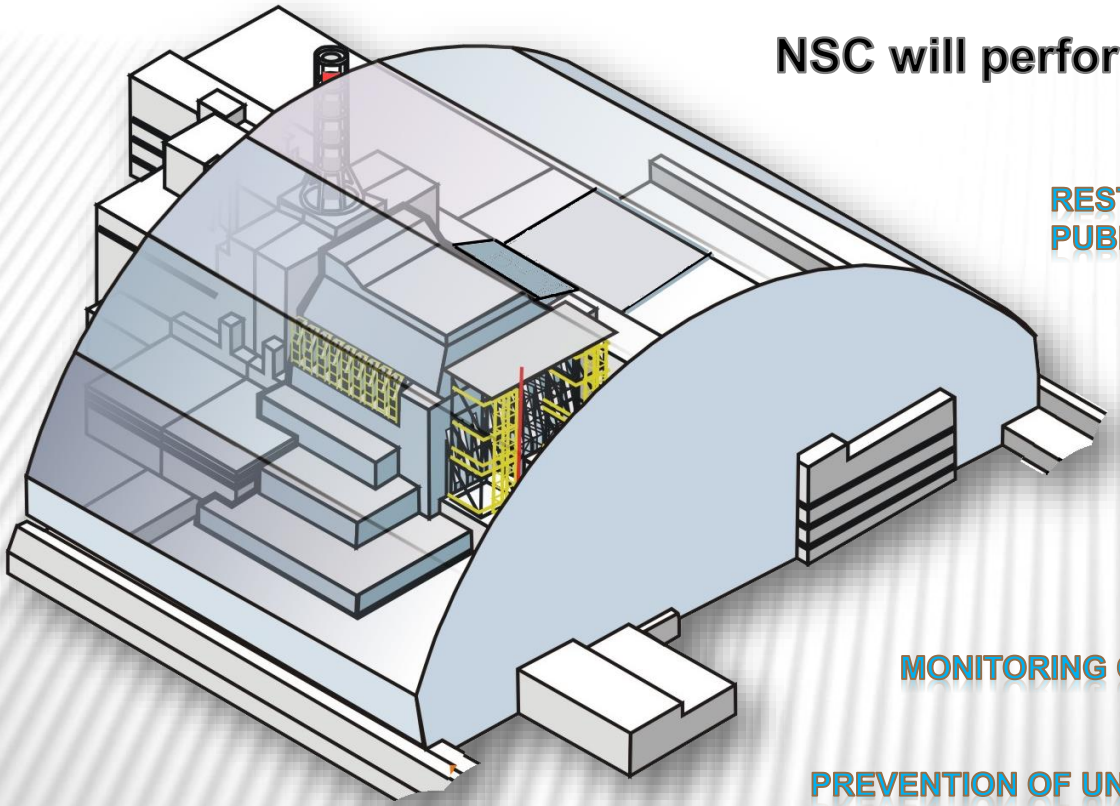


"FRAME" type
Dimensions 210x99x89.5 m

"CANTILEVER" type
Dimensions 114x246x97 m

"ARCH" type
Dimensions 257x167x109 m

NSC will perform the following main functions



RESTRICTION OF RADIATION IMPACT ON PUBLIC, PERSONNEL AND ENVIRONMENT

RESTRICTION OF IONIZING EXPOSURE AND RADIOACTIVE SUBSTANCES DISSEMINATION

TECHNOLOGICAL SUPPORT

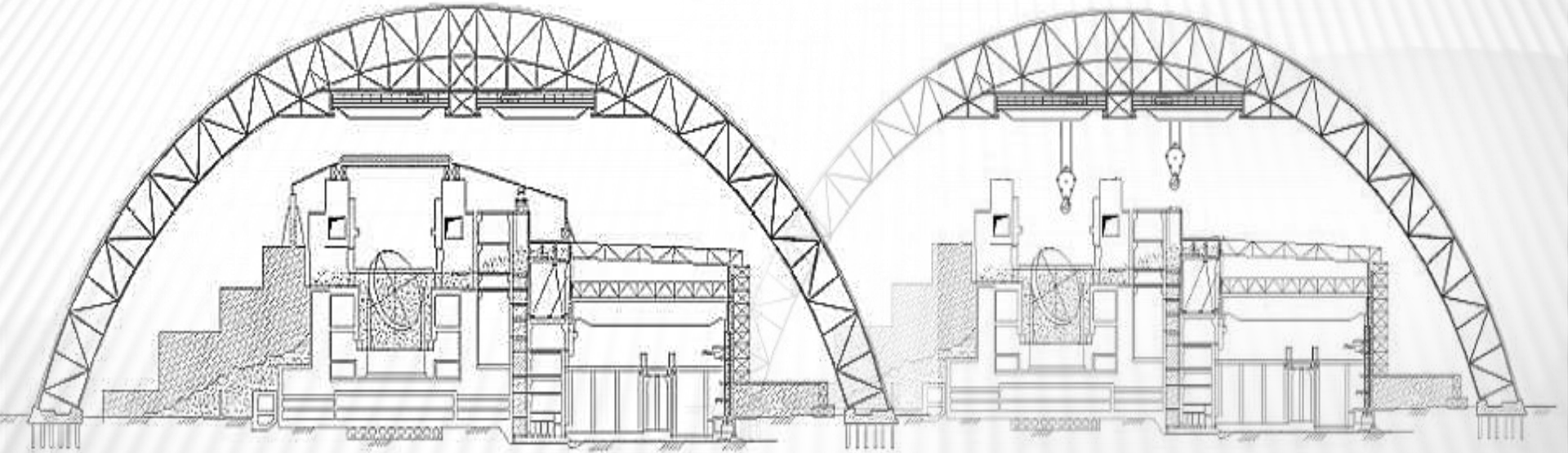
MONITORING OF THE FACILITY STATUS PARAMETERS

PREVENTION OF UNAUTHORIZED ACCESS TO FCM AND RAW

FURTHER IMPLEMENTATION STRATEGY OF NSC PROJECT

CS-1 (commissioning stage 1)

CS-2 (commissioning stage 2)



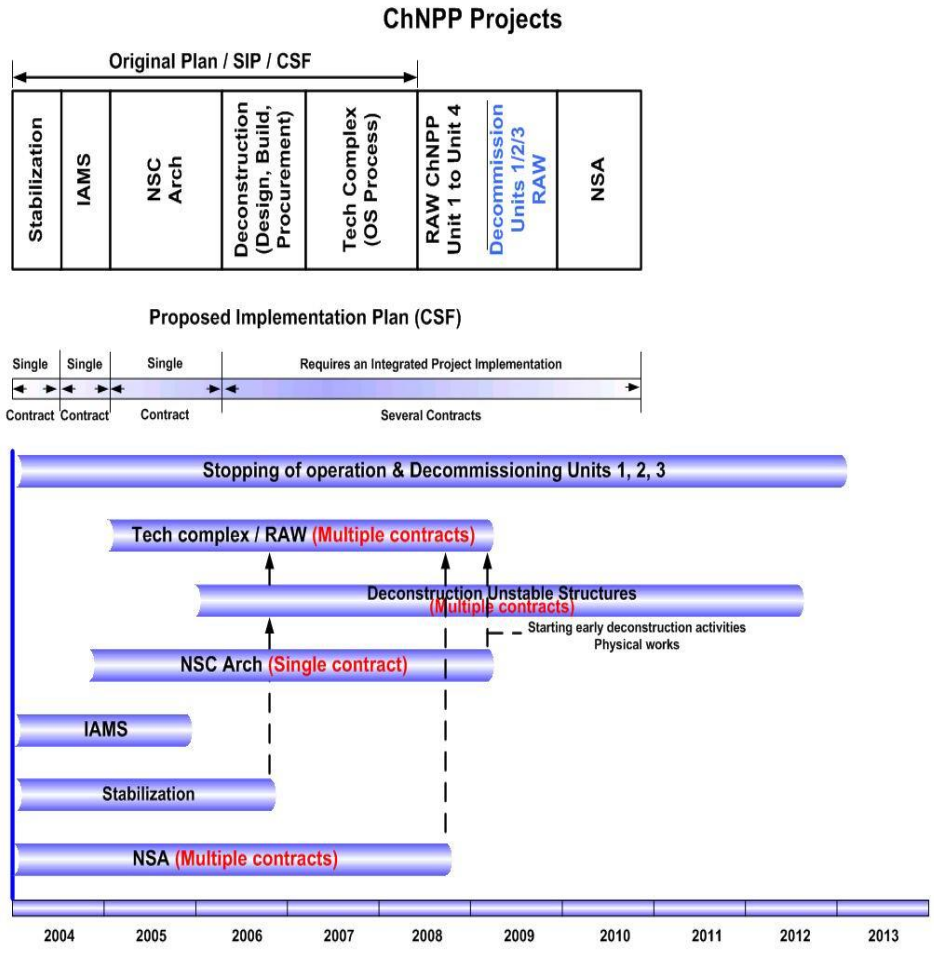
Design, manufacture, construction (installation), commissioning of protective facility with technological life support systems and required infrastructure

Infrastructure for deconstruction of unstable OS structures:
- design for deconstruction of unstable OS structures;
- procurement/installation of deconstruction equipment.

FURTHER IMPLEMENTATION STRATEGY OF NSC PROJECT

Сводная таблица этапов реализации проекта НБК			Подрядчики
ПОМ	1ый этап - проектирование и выполнение подготовительных работ	Фаза 1	Демонтаж бермы пионерной стены	1.A
			Очистка участка	1.A
			Планировка территории	1.A
		Фаза 3	Строительство новой ВТ	1.B
		Фаза 2	Объекты Подрядчика по НБК	1.C (=2.A)
	2ой этап - проектирование, строительство и ввод в эксплуатацию НБК	Пусковой комплекс 1	Основные конструкции НБК	2.A
			Системы (обработки) для конструкций НБК	2.A
			Вспомогательные объекты НБК	2.A
			Демонтаж ВТ	2.A
		Пусковой комплекс 2	Проект демонтажа нестабильных конструкций ОУ	2.B
			Закупки /установка оборудования демонтажа	2.B
	3ий этап - ранний демонтаж или усиление нестабильных конструкций ОУ	Проектирование и строительство технологического корпуса по обращению с РАО в рамках интегрированной программы ЧАЭС		3.A
		Демонтаж нестабильных конструкций ОУ		3.B
Вне ПОМ	Инфраструктура и технология удаления ТСМ			4

NOVARKA CONTRACT



NSC PREPARATORY WORKS

REMOVAL OF PIONEER WALL BERM

Contractor: Corporation “UkrTransStroy”

More than 23,000 m^3 of PM and 1st and 2nd category RAW removed

Start of works	Completion of works
19 July 2005	30 May 2008

NSC PREPARATORY WORKS

Preparation of NSC construction site

Clearance and excavation for construction of NSC foundations

Contractor: SE “UTEM-Engineering",

JSC “YuzhTeploEnergoMontazh"

Start of works	Completion of works
03 April 2008	26 August 2010

CONTAMINATED EQUIPMENT REMOVED FROM TRENCHES IN THE COURSE OF EXCAVATION WORKS

NVS CONSTRUCTION AND ASSOCIATED SYSTEMS

VS-2 DECONSTRUCTION

15 July2010

22 October 2013

27 April 2012

27 March 2014

Contractor: Consortium “Shelter”

“AtomStroyExport” (Russia)

“UkrEnergoMontazh” (Ukraine)

Designer:

Consortium KSK

General Contractor:
“UkrTransBud”

Designer:
“AtomEnergoStroyProekt”

Supplier of high capacity cranes:
SARENS

Subcontractors:

“UTEM-Engineering”
Survey, WEP development

“UTEM-TransService”
Soil and RAW transportation

“BudEnergoMontazh”
Closure of VS-2 opening, dust suppression

“UTEM-KranService”
Installation/deconstruction of КБГ

NSC ENCLOSING PERIMETER END WALLS

General Contractor
JV Object "Shelter" - Ukraine
"KievMetroStroy"
"UkrEnergoMontazh"
"UkrBud"
"UkrStroyMontazh"

December 2014 – October 2017

9.6 thousand m^3 of concrete have been placed and about thousand and a half tons of reinforcement installed. 1,400 m^3 are still expected.

Major construction works on the end walls have been accomplished (first stage) for NSC Enclosing Perimeter project, which will allow to slide the Arch into its design position and seal it.

Scope of work includes reinforcement and sealing of existing structures of ChNPP II stage (Units 3&4), to which Arch end walls will be abutting. Also it includes design and construction of new partition walls within existing structures of TH, DS, Unit V and ASRU of ChNPP II stage, as well as preparation of existing structures to installation and fixing of flashing anchors.

DESIGN, CONSTRUCTION AND COMMISSIONING OF NSC CS-1

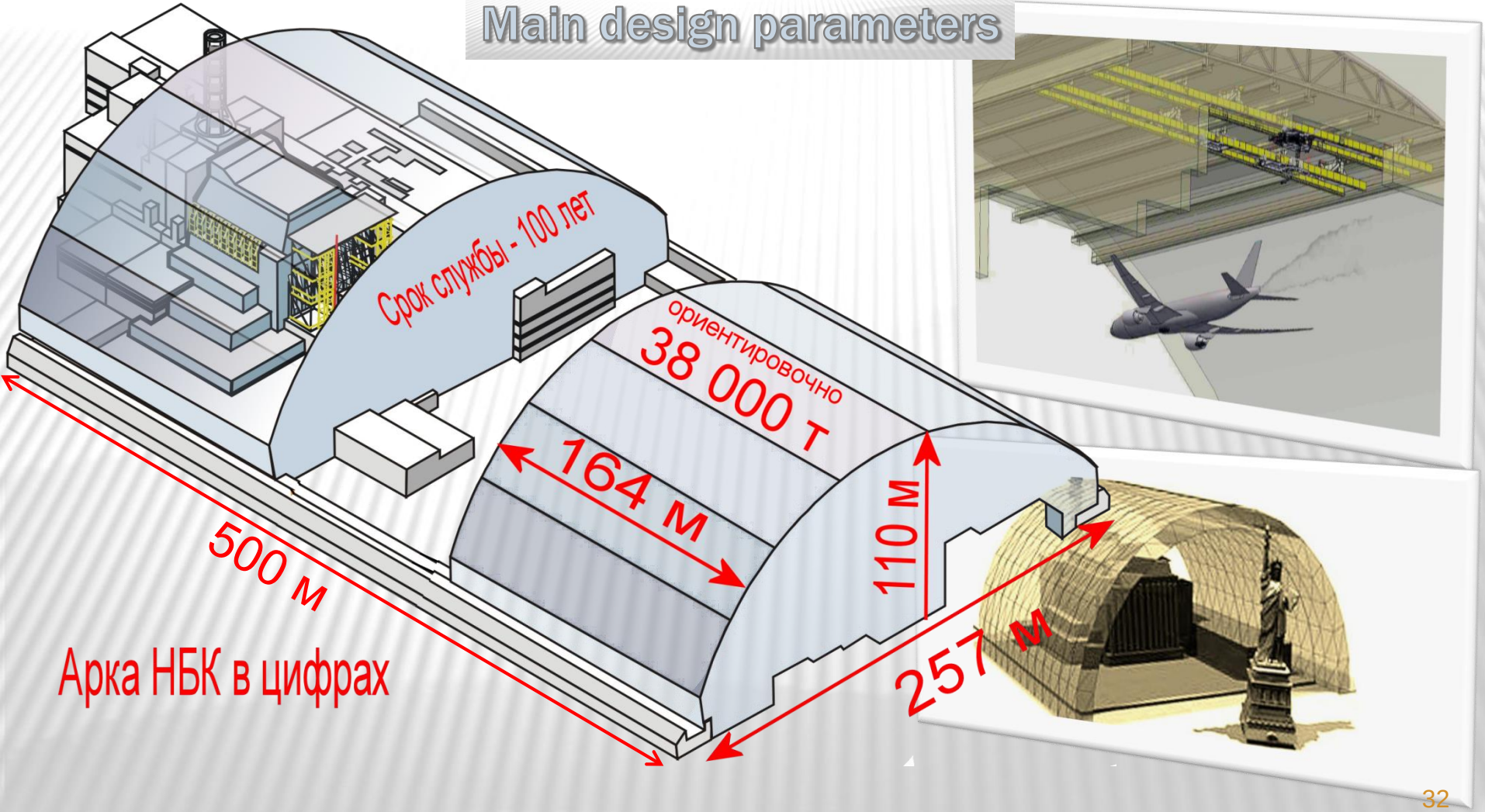
10 August 2007 - 30 November 2017

General Contractor
JV NOVARKA - France

VINCI Construction Grands Projets,
Bouygues Travaux Publics

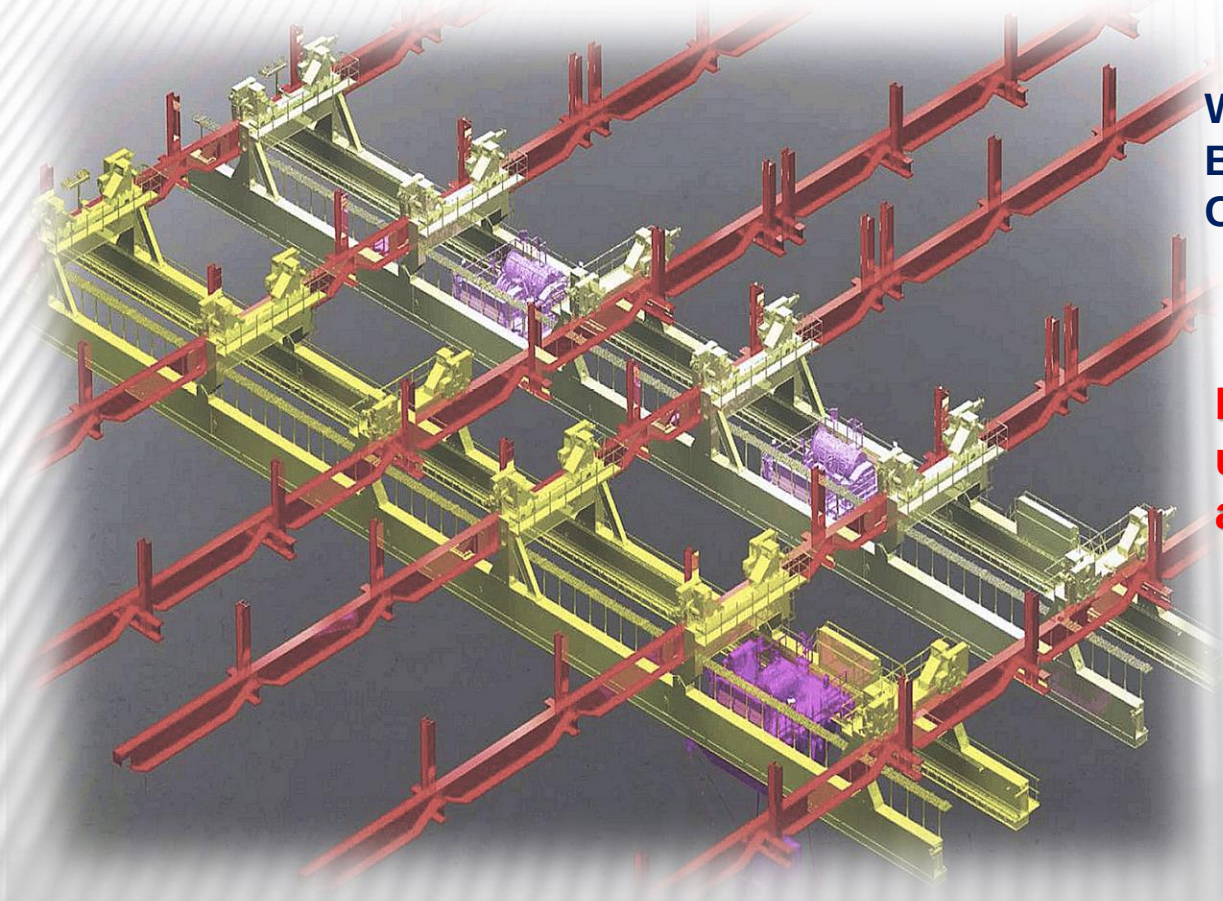
Major subcontractors:
CIMOLAI – Italy
Design and manufacture of steel structures
PaR **– USA**
Design and manufacture of MCS
OKYANUS – Turkey
Design, supply and installation of cladding

Main design parameters



Арка НБК в цифрах

NSC Main Cranes System



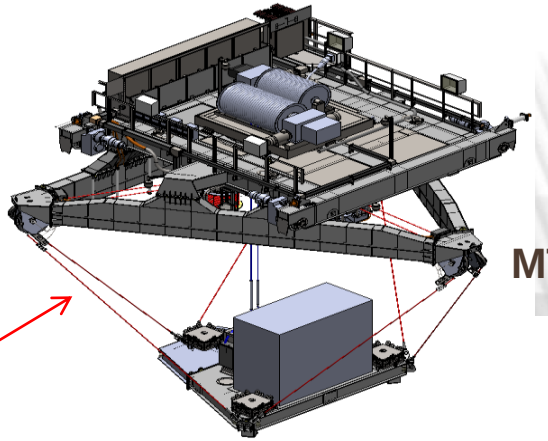
Weight: 1500 t
Bridge length: 96 m
Crane runway height:76m

Purpose: Deconstruction of unstable structures and FCM and RAW management works

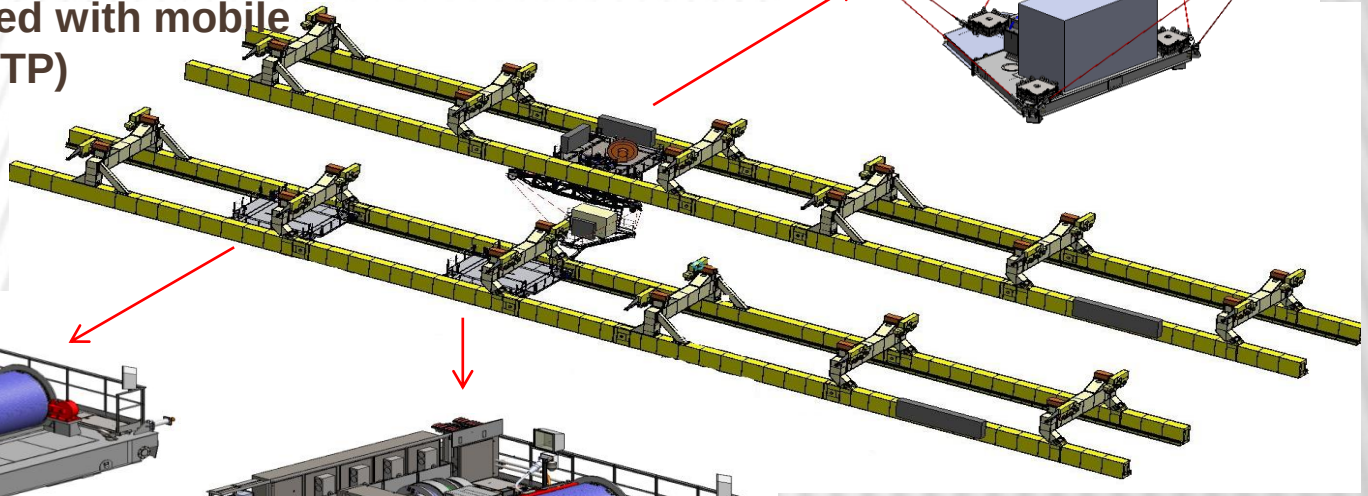
The longest elements is 55 m
The heaviest element is 83 t
2,200 t of steel structures
8,500 t of mixed debris

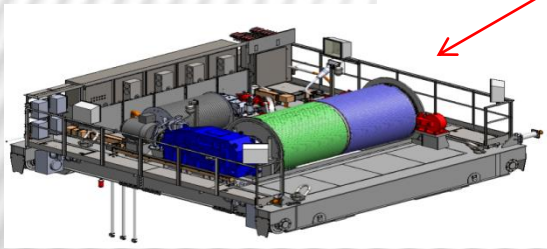
MCS Configuration

2 x 96 m bridges
1 x 50 t classic carriage
1 x 50 t safe carriage (to lift protective box with personnel capacity will be reduced to 35 t)
1 x carriage equipped with mobile tool platform (MTP)

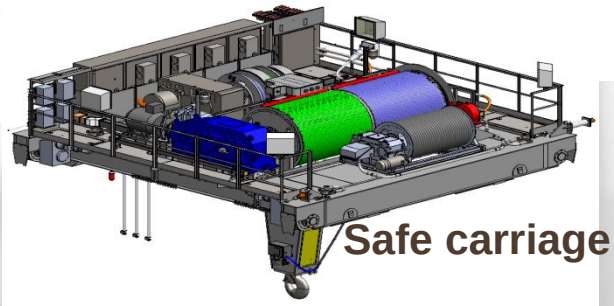


MTP

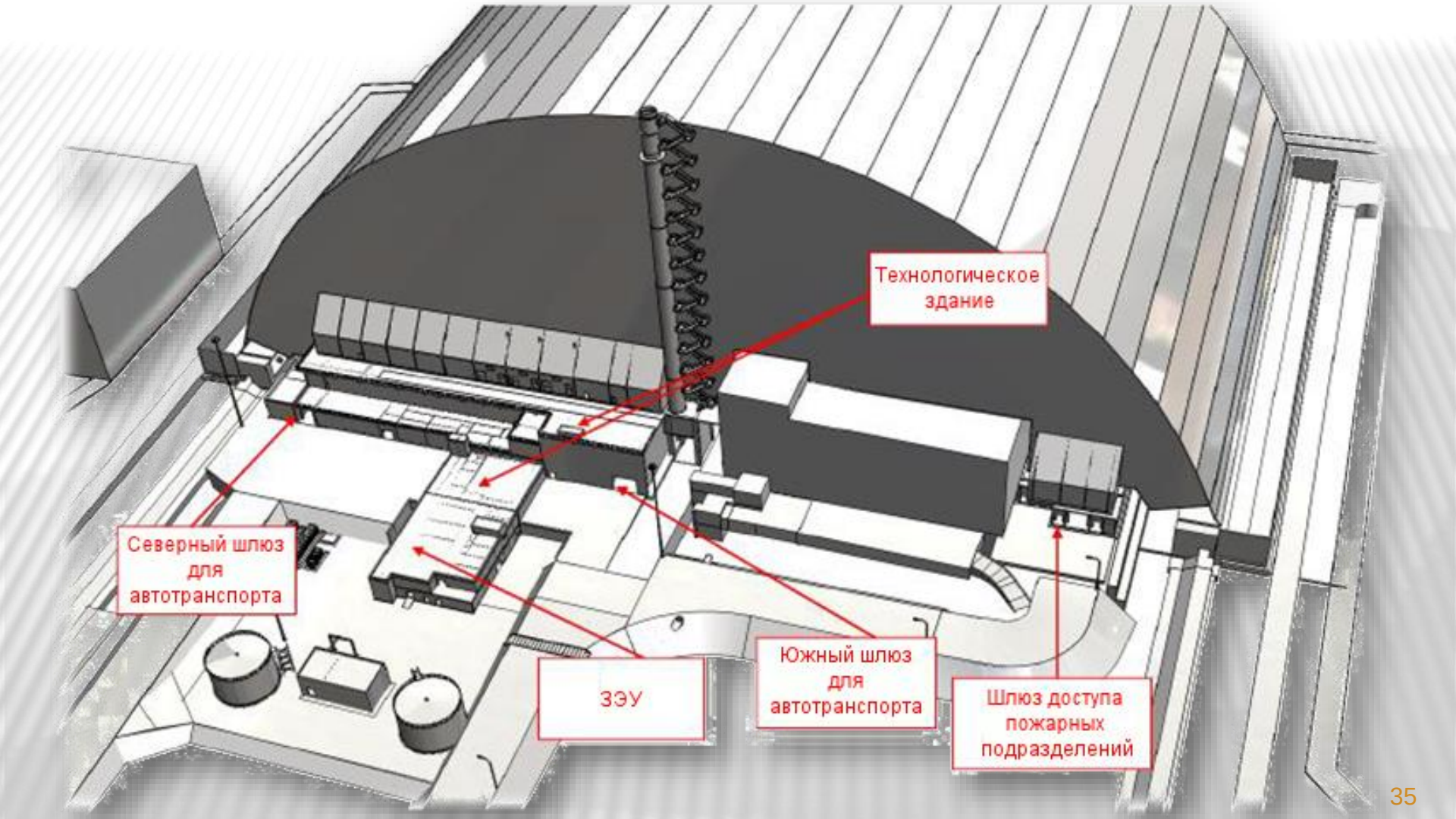




Classic carriage



Safe carriage


Технологическое здание
Северный шлюз для автотранспорта
ЗЭУ
Южный шлюз для автотранспорта
Шлюз доступа пожарных подразделений

ERECTION STAGES OF THE ARCH STEEL STRUCTURES

23-24.11.2012 – Первый подъем восточной части Арки
23-24-Nov-2012 – East Arch first lifting

13-25.06.2013 – Второй подъем восточной части Арки
13-25-Jun-2013 – East Arch second lifting

14.09.2013 - 11.10.2013 – Третий подъем восточной части Арки
14-Sep-2013 – 11-Oct-2013 – East Arch third lifting

01.04.2014 - Перемещение восточной части Арки в зону ожидания
01-Apr-2014 – East Arch sliding to the stand-by area

03.04.2014 - Перемещение восточной части Арки в зону ожидания
03-Apr-2014 – East Arch sliding to the stand-by area

26.04.2014 - .19.05.2014 Первый подъем западной части Арки
26-Apr-2014 – 19-May-2014 West Arch first lifting

02-26.08.2014 - Второй подъем западной части Арки
02-26-Aug-2014 – West Arch second lifting

24.10.2014 - 12.11.2014 - Третий подъем западной части Арки
24-Oct-2014-12-Nov-2014 – West Arch third lifting

26.11.2014 – Обратная надвижка восточной части Арки
26-Nov-2014 – East Arch back sliding

NSC CS-1. WORKS PROGRESS ON SITE

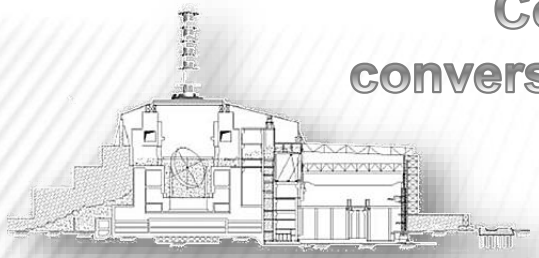
- Construction of the main facility – Arch – East and West – completed.
- Cladding installation – 99%
- Arrangement of Operation and Transfer zone foundations – completed.
- Installation of main cranes system, ventilation system – close to completion.
- Construction of TEC and auxiliary facilities – ongoing.
- Installation of flashing anchors – 48%.
- Arch sliding is scheduled between 13 to 19 November 2017.
- NSC commissioning is expected at the end of 2017.

Updated rev.08 of the Programme as of 30 September 2016

ks / Надвижка Арки в

	Операция окончательной надвижки	07-Nov-16	17-Nov-16

Completion of stage 2 of the strategy for the OS conversion into environmentally safe system, implemented under SIP



NSC CONSTRUCTION COMPLETION
30 NOVEMBER 2017

NSC CS-1 COMMISSIONING

NSC CS-2 COMMISSIONING
– CSF obligation, delayed purchase

DECONSTRUCTION OF UNSTABLE STRUCTURES – before 2023
To be implemented at the cost of Ukrainian contribution to CSF.

Stage 3

Not included in SIP

Objective of final stage of the Object "Shelter" conversion lies in brining it to fully environmentally safe condition, complying with criteria of general safety objective for OS.

Funding not defined

General safety objective is considered achieved, if risks related to the existing facility – both short term and long term – are reduced down to reasonably achievable levels, considering economical and social factors, and are acceptable for long-term perspective (taking into account possible consequences for health of future generations).

"Works on creation of technologies and creation of infrastructure required for FCM removal and its management as HLW will represent ***third commissioning stage of NSC"*** (Strategy of further implementation of NSC project)

Current level of knowledge is insufficient to determine timeframe for resolution of tasks of the third, final stage of the OS conversion.

Status of SIP goals and tasks

Goal 1
Reduction of Shelter collapse probability

- **Task1** Stabilization Project Integration and Mobilization
- **Task 2** Stabilization of western area
- **Task 3** Stabilization of Mammoth beam
- **Task 4** Stabilization of eastern and northern areas
- **Task 5** Stabilization of the roof, roof supports and decking
- **Task 6** Structural study and monitoring
- **Task 7** Geotechnical study
- **Task 8** Seismic characteristics and monitoring

Goal 2
Reduction of accidental collapse consequences

- **Task 9** Emergency preparedness
- **Task 10** Dust management
- **Task 11** Emergency dust suppression system

Goal 3
Improvement of Nuclear Safety

- **Task 12** Criticality and nuclear safety
- **Task 13** **Shelter contained water management**
- **Task 14** **FCM characterization**

Goal 4
Improvement of worker and environmental protection

- **Task 15** Radiation protection program
- **Task 16** Technical safety, fire protection and access control
- **Task 17** Integrated monitoring system
- **Task 18** Integrated database

Goal 5
Conversion into environmentally safe system

- **Task 19** FCM removal and RAW management strategy
- **Task 20** **Development of FCM removal technology**
- **Task 21** New Safe Confinement strategy
- **Task 22** **NSC construction and commissioning**

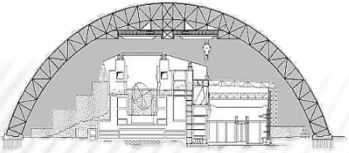
Task accomplished | **Task deferred** | **Task ongoing**

Deferred CSF funding of long-term SIP projects

CSF Assembly of Donors reviewed SIP completion cost estimate on 28 July 2010.
All future projects (except for NSC) were split in three categories by priorities in order to determine impact on SIP and reduction of completion cost.
Projects related to long-term operation of the NSC were considered as third group priorities:

1. FCM monitoring
2. Technological building for RAW management
3. OS water management
4. Deconstruction equipment
5. HLW containers

Taking into account current status of CSF funding, the Assembly of Donors made a decision to defer for indefinite period of time funding of tasks, which are not directly linked to NSC commissioning.



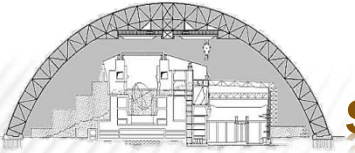
NSC CS-2 ENGINEERING

BACKGROUND

- "Early deconstruction" is a mandatory SIP activity, which shall be implemented by the end of 2023, taking into account design life time of the OS reinforcement structures.
- Feasibility Study (CD) of NSC: integrated deconstruction/management (Option 1) – integrated process for deconstruction and further management of deconstructed structures and associated RAW.
- IAG proposal (IAG10/04 от 24.11.10): deconstruction with deferred management (Option 2) – deconstruction, temporary storage (10 years plus), management.
- Action item of the meeting on 17 April 2012 (State Agency of Ukraine for Exclusion Zone Administration, ChNPP/PMU, SNRIU/SSTC NRS, EBRD) – to accept for implementation 2-stage process of NSC CS-2 engineering:
  - 1 stage (conceptual studies) – comparative analysis of "doses-cost-benefit" for two options of "early" deconstruction (Options 1 & 2)
  - Technical Decision (TD) for selection of "early" deconstruction option
  - 2 stage (engineering) – Detailed Design development based on TD
- Terms of Reference for stage 1 of NSC CS-2 design have been approved by ChNPP, reviewed/concurred by SSTC NRS (2012).
- Scope of Work for stage 1 was implemented during the period from February 2012 till July 2014 under the current SIP Contract # SIP09-2-001 for Client Engineer services (NIISK, ISP NPP, KIEP).

OUTCOMES OF STAGE 1

- Main reassessment results:
  - The following structures have been transferred to the “deferred” deconstruction stage: “Beams B1”,“Beams B2”, “System of beams B2 ties”, “Debris and floor slabs above Room 805/3”
  - The following six support structures have been added due to the technological deconstruction conditions: “Inclined shields leaning on panels of Turbine hall roof and on South panels -“hockey sticks”, “Pipes of the dust suppression system”, “Cat’s house unit”, “Distribution frame of the eastern support of the Mammoth Beam”, “Additional support of “Mammoth” beam”, “Mouse’s house unit”
- The CDS for the “early” deconstruction were optimized considering the following :
  - NSC CS-1 and internal Arch space design solutions
  - Infrastructure and equipment planned for the needs of unstable Shelter structures deconstruction within the NSC frames
  - Maximum use of the existing / planned ChNPP and Exclusion Zone RAW management infrastructure
- Both options are practically equivalent. To take the final decision for the selection of the “early” deconstruction option one should assess the potential risks associated with the RAW management infrastructure preparedness, or envision mitigation measures.



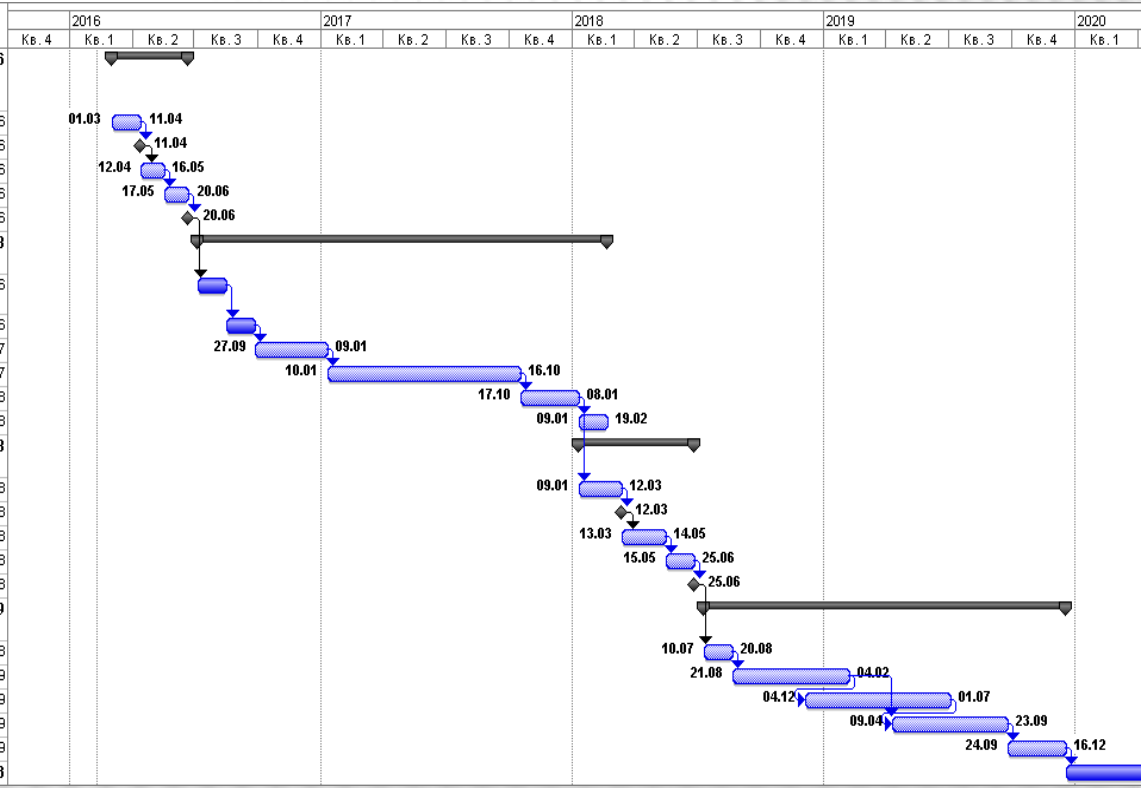
SELECTION OF 'EARLY" DECONSTRUCTION OPTION. TECHNICAL DECISION

IAG WORKING GROUP RECOMMENDATIONS :

- Approve Option 1 "Integrated Deconstruction/Management" for further implementation as the most cost effective.
- Arrange a "buffer area" within the NSC Arch (based on the site envisioned for Option 2) in order to:
  - mitigate the risks associated with the delay of commissioning of the required facilities of the RAW management infrastructure;
  - ensure the possibility of optimization of infrastructure comprehensive management for efficient treatment/processing of ChNPP RAW;
  - prevent re-design of NSC CS-2 and any related to re-design delays in commencement of deconstruction.
- The IAG Working Group recommendations have been fully accepted by the SIP-PMU and considered in the Technical Decision "On selection of an "early" deconstruction option for development of NSC CS-2 Working Design "Infrastructure for Deconstruction of Unstable Shelter Structures".
- The Technical Decision has been approved by the Employer (SSE ChNPP) and concurred with SNRIU.

Forecast schedule: NSC CS-2 – early deconstruction

Ид.	Название задачи	Длительность	Начало	Окончание
1	**Тендер. Проектирование ПК-2 НБК, 2-ой этап: Рабочий проект "Инфраструктура для демонтажа нестабильных конструкций ОУ"**	**80 дней**	**Вт 01.03.16**	**Пн 20.06.16**
2	Разработка тендерной документации	30 дней	Вт 01.03.16	Пн 11.04.16
3	Приглашение на тендер	0 дней	Пн 11.04.16	Пн 11.04.16
4	Подготовка тендерных предложений	25 дней	Вт 12.04.16	Пн 16.05.16
5	Оценка тендерных предложений	25 дней	Вт 17.05.16	Пн 20.06.16
6	Присуждение контракта	0 дней	Пн 20.06.16	Пн 20.06.16
7	**Разработка Рабочего проекта ПК-2 НБК "Инфраструктура для демонтажа нестабильных конструкций ОУ"**	**425 дней**	**Вт 05.07.16**	**Пн 19.02.18**
8	Корректировка документа "Проектные критерии и требования к ПК-2 НБК" (ПКТ)	30 дней	Вт 05.07.16	Пн 15.08.16
9	Согласование ПКТ Госатомрегулирования	30 дней	Вт 16.08.16	Пн 26.09.16
10	Предпроектные исследования	75 дней	Вт 27.09.16	Пн 09.01.17
11	Разработка Рабочего проекта	200 дней	Вт 10.01.17	Пн 16.10.17
12	Государственная комплексная экспертиза проекта	60 дней	Вт 17.10.17	Пн 08.01.18
13	Утверждение проекта	30 дней	Вт 09.01.18	Пн 19.02.18
14	**Тендер. Создание инфраструктуры для демонтажа нестабильных конструкций ОУ (ПК-2 НБК)**	**120 дней**	**Вт 09.01.18**	**Пн 25.06.18**
15	Подготовка тендерной документации	45 дней	Вт 09.01.18	Пн 12.03.18
16	Приглашение на тендер	0 дней	Пн 12.03.18	Пн 12.03.18
17	Подготовка тендерных предложений	45 дней	Вт 13.03.18	Пн 14.05.18
18	Оценка тендерных предложений	30 дней	Вт 15.05.18	Пн 25.06.18
19	Присуждение контракта	0 дней	Пн 25.06.18	Пн 25.06.18
20	**Создание инфраструктуры для демонтажа нестабильных конструкций ОУ**	**375 дней**	**Вт 10.07.18**	**Пн 16.12.19**
21	Этап мобилизации	30 дней	Вт 10.07.18	Пн 20.08.18
22	Реконструктивные работы и новое строительство	120 дней	Вт 21.08.18	Пн 04.02.19
23	Поставка оборудования	150 дней	Вт 04.12.18	Пн 01.07.19
24	Монтажные и пуско-наладочные работы	120 дней	Вт 09.04.19	Пн 23.09.19
25	Ввод в эксплуатацию	60 дней	Вт 24.09.19	Пн 16.12.19
26	**Ранний демонтаж нестабильных конструкций ОУ**	**1043 дней**	**Вт 17.12.19**	**Чт 14.12.23**



NEAREST FUTURE PRIORITIES

1. ***The highest priority is timey completion of NSC.***
2. ***Detailed Design (DD) for NSC CS-2 development shall commence immediately and based on it an Infrastructure for deconstruction of unstable OS structures shall be created.***
3. ***After CS-1 and CS-2 commissioning "early" deconstruction of unstable OS structures shall commence in order to be completed by the end of 2023 – life time limit for stabilized OS structures.***
4. ***FCM monitoring programme shall be implemented in order to collect data to support FS development for Task 19 and decision-making on P8.***
5. ***OS Conversion Strategy shall be updated taking into account national programs in the field of RAW management.***