Slovenská Nukleárna Spoločnosť SNUS General Assembly 2007

with Technical Conference

Mochovce Unit 3 & 4 Completion

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Status of Feasibility Study

- Purpose of the Feasibility Study was to define in detail all technical, economic, financial, legal and authorization aspects of MO 34 completion in order to provide SE and Enel Top Management with all the necessary information for a final decision on Mochovce 3&4

- Feasibility study has started in January 2006. SE had the commitment to complete the Feasibility Study within 12 months from Closing of SE acquisition (April 2007)

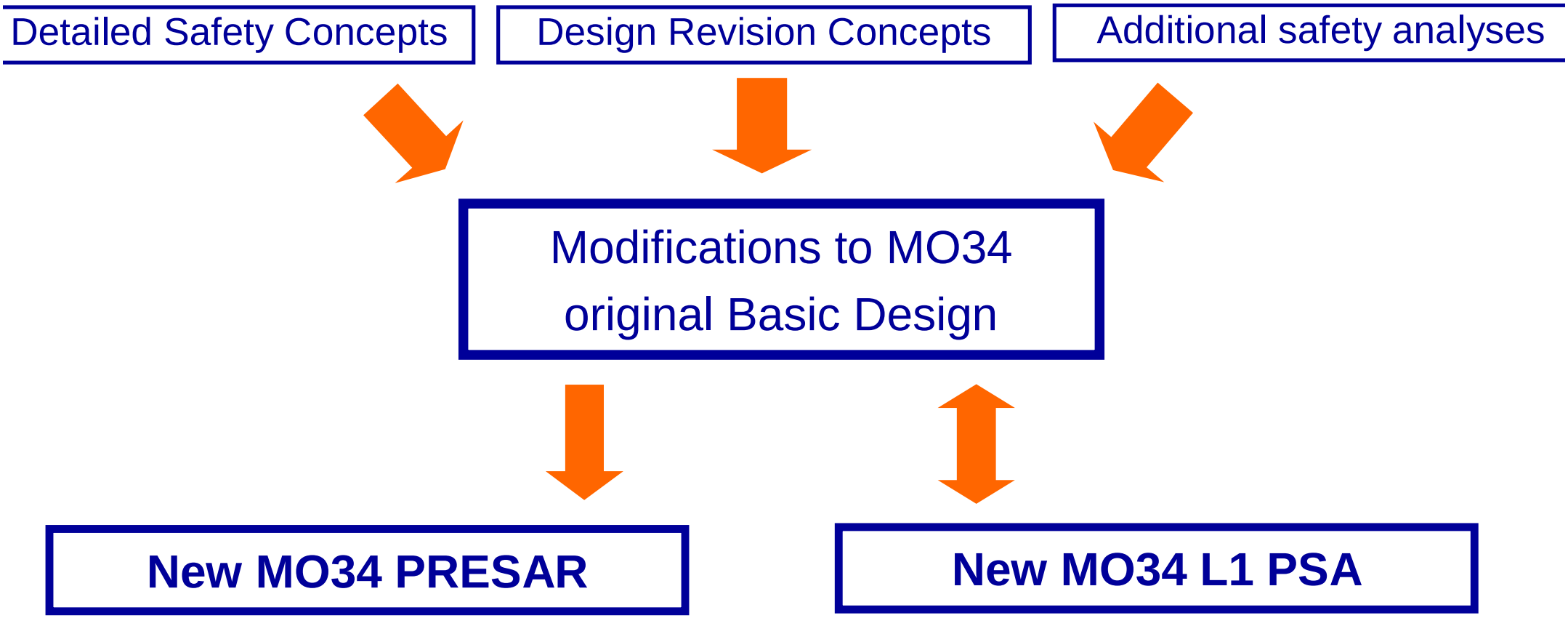
- In order not to delay completion of Mochovce 3&4, SE has decided to perform, in parallel to the Feasibility study, also all design and permitting activities which are required for the completion of Plant. *This has involved anticipation of expenses for approximately 700 MSKK (or approx. 20 M€)*

- **SE was able to announce the positive decision about completion on MO 3-4, two months in advance of the deadline.**

Feasibility Study structure

Objectives	Means	Activities	Status
Investment decision	Provide final analysis of the following aspects: ü technical, ü economical, ü financial, ü legal, ü permits	ø *Revision of Basic Design doc.s*, ø *Technical verifications of assets,* ø Detailed cost estimation, ø *Detailed scheduling*, ø Defin. of contracting strategy, ø Structure of Owner's Company, ø Defin. of financing sources, ø Permitting framework, ø Risk analysis	ü Completed
Approval of Design Changes	Submit revised documents to approval of UJD and other Authorities, as required	To submit to approval: ø *Design Safety Concepts*, ø *Revised Basic Design doc's*, ø Revised PRESAR, ø Revised QA program,	In progress (Sept. 07)
Preparatory works for Tenders	Define contracting strategy, start pre-qualif. process, prepare tender documents	ø Defin. of contracting strategy, ø Preparation of technical doc.s, ø Preparation of contractual doc.s	In progress (Sept. 07)

MO34 Engineering Activities



MO34 Safety Improvements

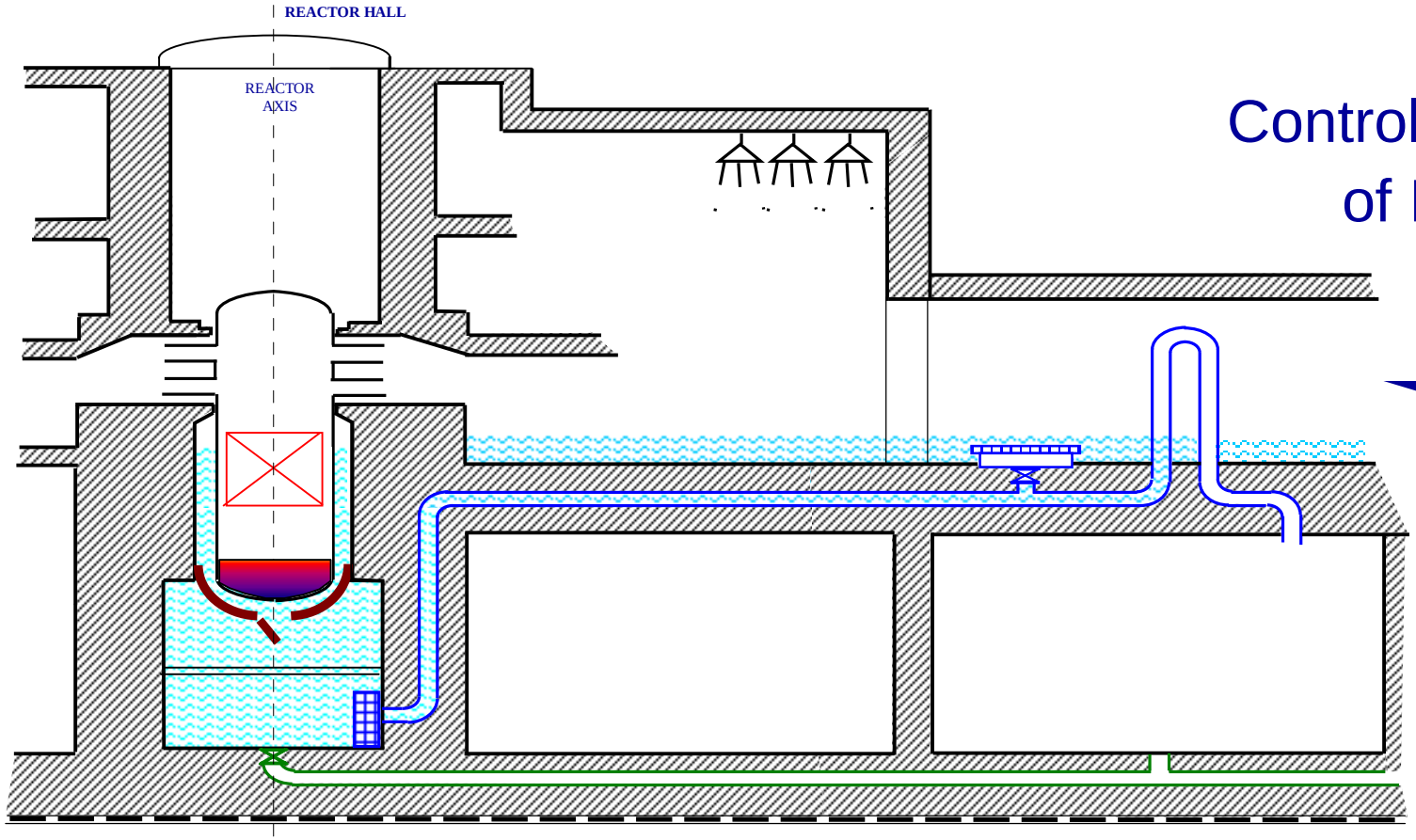
- Reference source for the improvements:
  - IAEA's "*Safety Issues and Their Ranking for WWER 440 Model 213 Nuclear Power Plants* **"** (1996);
  - feedback from EMO12 and EBO34's operational experience
  - WENRA Reference Levels
- Among the many improvements considered:
  - design measures for the mitigation of Severe Accidents;
  - new state-of-the-art I&C;
  - specific solutions for the reduction of internal hazards (fire fighting, internal flooding, etc.);
  - improved design of safety systems and safety-related equipment for higher reliability (e.g., SGs) and better separation (e.g., EFWS) (feedback from EMO12);

MO34 Severe Accidents
Design measures

- The design measures have been conceived with the basic aim of:
  - ü ensuring in-vessel retention and cooling of core debris;
  - ü preventing containment failure (including measures to avoid H_2 deflagration/detonation);
  - ü preventing high-pressure core-melt scenarios;
  - ü improving Operator response in a Severe Accident Scenario:
    - introduction of the Safety Parameter Display System;
    - improving the I&C system dedicated to Severe Accident events (Post Accident Monitoring System qualified for SA)

In-vessel retention of corium

- Principal measure for the overall SAM strategy;
- Similar solution implemented in Loviisa NPP;



Controlled drainage of BC trays

Hydrogen management

- Hydrogen management is fundamental for successful SAM strategy;
- In DBA scenarios, the production of hydrogen is limited;
- In early phase of SA scenarios: up to 500 kg of H_2 are released into containment;
- It is necessary to avoid H_2 detonation

Improved H_2 management for SA scenarios

- Additional equipment is installed in the containment:
  - 32 autocatalytic recombiners;
  - 30 autocatalytic igniters (for the most critical scenarios).

Primary-circuit depressurization

- Interface between preventive and mitigative actions:
  - prevention: bleed and feed with ECCS to prevent/delay CD;
  - mitigation: low-pressure conditions before corium relocates onto the lower head of RPV.
- **Technical solution adopted**: depressurization line in addition to the existing pressurizer lines, with two manually-operated valves;
- In all the scenarios, the pressure in primary circuit is brought to < 20 bar in less than 10 minutes
- The solution has been adopted in other NPPs with advanced programs for SA management (EPR, Loviisa)

Instrument & Control system

- State-of-the-art technology (increased reliability, maintainability, integrity, security);
  I. Use of advanced digital control system:
     - increase of control and monitoring capacity of NPP;
     - implementation of predictive and supervision functions;
  II. Improved HMI;
- Qualification of PAMS for SA conditions and inclusion of new, dedicated signals for the SAM strategy, e.g.:
  – core outlet temperature (signal for transition to SA);
  – water level in reactor cavity;
  – hydrogen concentration in different compartments of containment;

Reduction of internal hazards

- Feedback from the operational-experience on EMO12 for the reduction of hazards (identified by IAEA) associated to:
  - high-energy pipe rupture (on both primary and secondary loop)
  - internal flooding;
  - fire.

- The measures adopted for MO34 will be based on the solutions adopted for EMO12.

Design Modification – Environment Protection

Radwaste Production Minimization

- Improvements of management and control of chemical processes and on-line measurements
  - Returning medium to the process, shortening the sampling routes, circulating the sampling route
  - Reduction of waste volume at sampling and reduction of performed samples number
- Surface finishing improvement
  - Critical items: reactor coolant pump, main isolating valve, primary flanges of steam generator and specified welded joints.
- Modifications of method of waste water sorting and collection
- Upgrading of the decontamination system (use of state-of-art technologies)
- Modification of radioactive fluid chemical treatment processes
- For contaminated equipment, use of new generation of oils and lubricants, which have longer replacement frequency

Design Modification – Efficiency Improvement

- Cooling Towers Packing Replacement
  - enhancement of efficiency
  - replacement of asbestos packing with plastic material
- Increasing efficiency of Steam Turbine
- Improved performances of new components
- Improved raw water chemical treatment for reduction of fouling/scaling

Design Modification – Operational improvement 1

Planned Outages reduction

- The extent of long outages is determined by the duration of RPV inspections,
- The extent of short outages is determined by the duration of the refueling activities
- Present in service inspection program for EMO and EBO is 4 years. For EMO3&4 a new improved outage program has been developed based on 8 years ISI inspection, on the basis of:
  - Recent studies on material resistance
  - Acquired experience in similar NPPs
  - Technical improvement in non-destructive tests

  ÚJD approval of the new inspection program is required
- Refueling activities will be reduced down to 20 days
  - Improved procedures using feedbacks from EMO and EBO operating experience
  - New refueling machine (increased speed, increased reliability, new control system)

Design Modification – Operational improvement 2

Unplanned Outages reduction

- Improvements of Design and Operation procedures will be achieved using results provided by an analysis of:
  - Components reliability
  - Influence of personnel on operational events
  - Effect of material ageing for safety important components
  - Improvement of in-service inspection procedures

Design Modification – Operational Improvement 3

MAIN OPERATIONAL TARGETS

KEY PARAMETERS	TARGET
Unit Capability Factor (**UCF**)	93%
Unplanned Capability Loss Factor (**UCLF**)	0,40%
Collective Radiation Exposure (**CRE**)	0,25 Man Sievert
Unplanned Automatic Scrams per 7000 h Critical (UASR)	0,00
Industry Safety Accident Rate (ISAR)	0,00

Condition assessment of existing equipment / civil works

Scope of Work

Perform an assessment of *equipment* / *structures* preservation status, to verify their usability for MO 3-4 completion.

Methodology

A “samples methodology” has been used:

Ø ***Equipment***

- Items store/installed in MO34 Plant Area are about: **16.000.**
- About **3.200** are under a Preservation Program (started on 2001);
- The chosen “sample” is made up of **1064** items (about **30%** of preserved equipment)
- Main equipment which has been evaluated: *Steam Generator, Reactor Pressure Vessels, Main isolation valves, Diesel motors 3300 KW, LP Emergency pumps, Main cooling pump, Turbine, HP and LP haters and re-heaters.*

Ø ***Structures / Buildings***

- Samples of steel and concrete structures belonging to **26 main structures/buildings** (composed of **71 substructures** such as *concrete reinforced structure, foundations, underground concrete tunnels, fire –fighting coating, prefabricated structure, steel structure, hydro isolation-roof, etc*)

Condition assessment of existing equipment / civil works

Equipment Categories and tests

The following categories has been used to graduate the “quality assessment” activities on Technological components

- **Type A - Critical components** (not easy replaceable or with high cost or long fabrication/delivery time);
  - **A1** detailed visual inspection and non-destructive tests;
  - **A2** partial disassembly in order to perform the detailed inspections and tests.
- **Type B - Other Components**
  - **B1** detailed visual inspection and non-destructive tests;
  - **B2** general visual inspection able to confirm the equipment existence and absence of significant damages.

Performed tests and Item for category

Tests	Number of Item examinated				
	A1	A2	B1	B2	Total
Detailed visual examination of exterior	157	37	174	0	**368**
Detailed visual examination of interior	107	5	116	0	**228**
Visual examination of internal parts	0	36	0	0	**36**
Confirm the equipment exists and no significant damage has occurred	0	0	0	696	**696**
Magnetic particle, liquid penetrant examination or other on external	141	25	33	0	**199**
Magnetic particle, liquid penetrant examination or other on internal	0	34	0	0	**34**
Eddy Current	2	14	0	0	**16**
Thickness Verification	97	30	18	0	**145**
Functional (ex. rotation of moving parts)	45	6	87	0	**138**
Electrical insulation resistance test	5	6	9	0	**20**
Electrical Resistance	5	0	9	0	**14**
Total	**157**	**37**	**174**	**696**	**1064**

Condition assessment of existing equipment / civil works

Test types on Buildings and Structures

Buildings/Parts (1)	Tests									
	Visual inspection	Mechanical sample	Core sample	Radar for concrete	Thickness measuring	Laboratory test	Functional	Corrosion measurement	Leak tightness by air pressure	Connection visual inspection
Turbine Hall (N 3)	X	X	X	X	X	X				
Electrical Building Lengthwise side (N 2)	X	X	X		X	X				
Electrical Building Cross side	X	X			X	X				
Bridge between 1st and 2nd Power Blocks	X	X								
Diesel Generator Station	X	X	X		X	X				
Reactor Building	X	X	X	X	X	X	X	X	X	
Nuclear Auxiliary Service Building	X	X	X	X	X		X	X	X	X
Bridge between 2nd Power Block and Nuckear Auxiliary Building	X	X	X							
Air Ducts to Stack	X	X								
Emergency Feed water System	X							X		
Conventional Island Cooling & Fire Fighting Water Pumping Station	X	X	X	X				X		
Nuclear Island Cooling Water Pumping Station	X	X	X	X				X		
High Pressure Air Compressor Station	X	X	X							
Forced Cooling Towers (N 3)	X		X	X				X		
Cooling Towers (N 4)	X		X	X				X		
Diesel Generator Station Lube Oil System	X	X	X	X				X		
Fuel Oil System - 2nd Power Block	X		X	X				X		
Underground Channels	X		X	X	X			X		

(1) Tests have been performed on Concrete Steel, Fire – Fighting Coating, External Cladding, Prefabricated structure, Ceiling, containment liner, steel structure, Hydro isolation-roof, Reinforcement.

Condition assessment of existing equipment / civil works

RESULTS on EQUIPMENT

- ü Components within the preservation program are in very good condition and some require minor refurbishment.
- ü Components not in the preservation program and stored in warehouses are generally in better condition than those that have been already installed;
- ü The preservation practices are generally satisfactory;

RESULTS on STRUCTURES/BUILDINGS

- ü There are no critical civil work parts or elements which may influence the present structural integrity and safety. Deteriorations may be repaired (refurbished).
- ü Short term interventions are needed only for damaged roofs in order to preserve the interior of the buildings and some underground parts.
- ü Other elements may be refurbished in the period of next five years i.e. in the period planned for NPP completion.

The new Environmental Impact Assessment Study for Mochovce NPI

On the basis of the valid construction permit and according to current legislation there is no legal obligation to follow an EIA procedure for the completion of MO34.

SE is performing a new EIA study as described below.

WHY

- *To comply with SE/ENEL Environmental and Corporate Social Responsibility Policies*
- *For financing purposes*
- *For information to all interested stakeholders: local communities, Authorities, etc.*

HOW

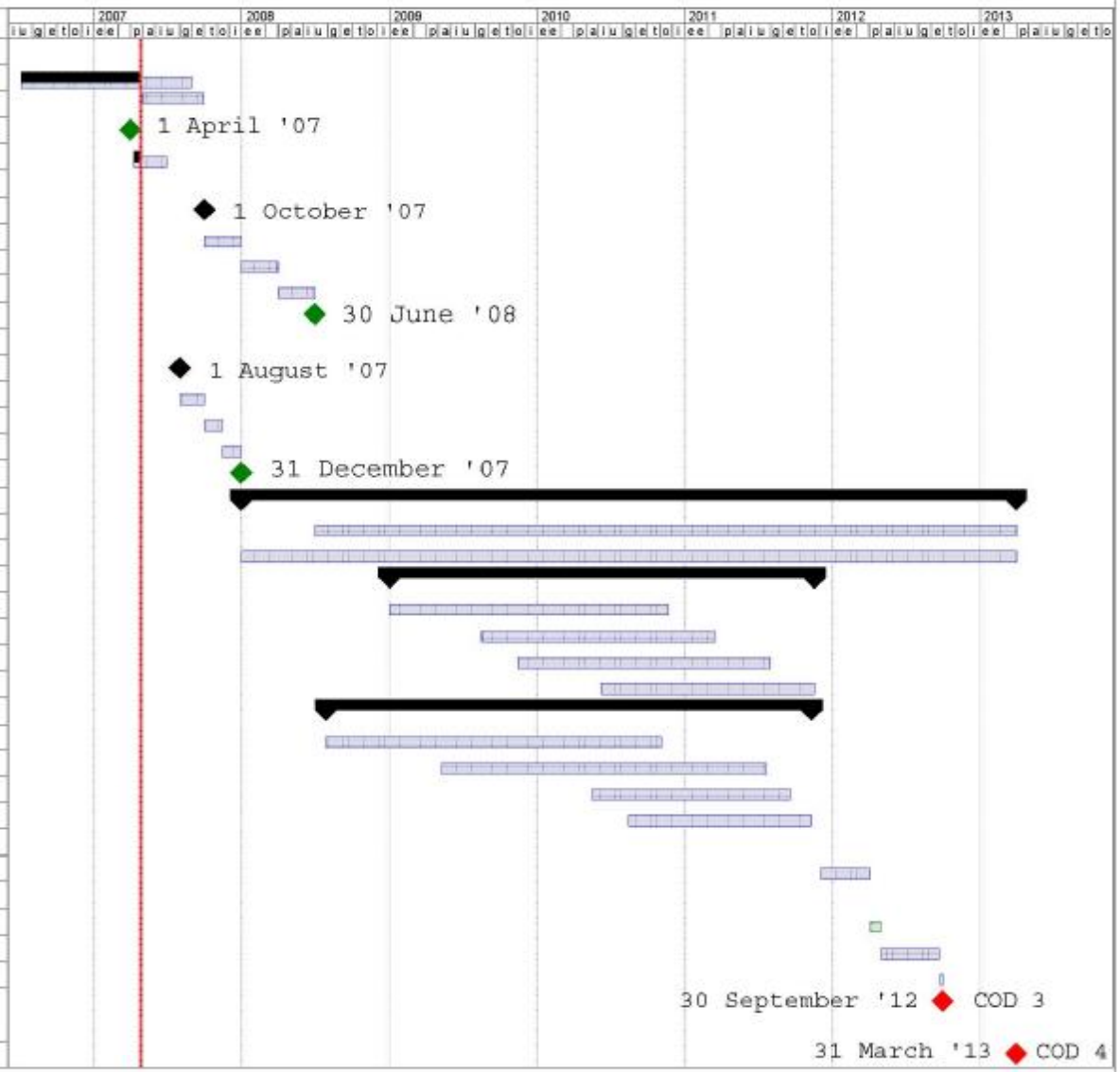
- *Format of EIA study in compliance with Annex 11 "Content and structure of the report…" of Act 24/2006 and "Equator Principles" (financial institutions benchmark for EIA study);*
- *Evaluation of impact with the four operating Units (EMO 1 to 4), taking as a reference the existing status (operation of EMO 1-2);*
- *EIA is divided into three main sections:*
  - *Programmatic Framework;*
  - *Design Framework;*
  - *Environmental Framework.*

WHEN

- *Final Report will be available by the end of June 2007.*

MO3&4 Completion project

ID	Nome attività	End
1	**Preparation work and Contract Award**	lun 30/06/08
3	Basic design modifications	ven 31/08/07
5	Procurement Tech. Spec. Preparation	dom 30/09/07
6	**Pre-qualification start - Nuclear Island**	dom 01/04/07
7	Contractor(s) prequalification - Nuclear Island	sab 30/06/07
8	**Nuclear Island awarding phase**	lun 30/06/08
10	Invitation to Tender - Nuclear Island	lun 01/10/07
11	Bid preparation - Nuclear Island	lun 31/12/07
12	Bid evaluation - Nuclear Island	lun 31/03/08
13	Contracts negotiation - Nuclear Island	lun 30/06/08
14	**Contract Award with Contractor - Nuclear Island**	lun 30/06/08
15	**Conventional Island awarding phase**	lun 31/12/07
16	Request of Proposal - Conventional Island	mer 01/08/07
17	Preparation of Proposal - Conventional Island	lun 01/10/07
18	Evaluation of Proposal - Conventional Island	gio 15/11/07
19	Awarding phase - Conventional Island	lun 31/12/07
20	**EPCM Contract Award - Conventional Island**	lun 31/12/07
21	**Completion work**	dom 31/03/13
22	Detailed engineering / As built - Nuclear Island	dom 31/03/13
23	Detailed engineering / As built - Conventional Island	dom 31/03/13
24	**Nuclear Island**	ven 18/11/11
25	Long lead equipment manufactoring	lun 22/11/10
27	Long lead equipment erection	gio 17/03/11
28	Primary circuit erection, flushing, hydrotest	lun 01/08/11
29	System commissioning	ven 18/11/11
30	**Conventional Island**	ven 11/11/11
31	Long lead equipment manufactoring	gio 04/11/10
33	Long lead equipment erection	ven 22/07/11
34	Flushing, hydrotests	lun 19/09/11
35	System commissioning	ven 11/11/11
46	**Hot functional test**	mar 03/04/12
47	HFT preparation and Fuel loading preparation	mar 03/04/12
49	**Overall commissioning**	dom 31/03/13
50	**Fuel loading**	mar 01/05/12
51	Physical Tests	ven 21/09/12
53	Performance Test (144 hours)	dom 30/09/12
54	**COD Unit 3**	dom 30/09/12
55	**COD Unit 4**	dom 31/03/13



Project: MO3&4 Completion Proje
Date: gio 26/04/07

Attività | Avanzamento | Riepilogo | Attività esterne | Cardine esterno
Divisione | Cardine | Riepilogo progetto | Cardine esterno | Scadenza

Short term activities for completion of Mochovce 3-4

- *Start procurement activities for first construction contracts at site (Civil works and electrical works)* — *May 07*
- *First Civil and electrical works awarded (*)* — *July 07*
- *Completion of the approval process by UJD* — *Sept 07*
- *Site opening for construction activities (*)* — *Sept 07*
- *Start procurement for the Nuclear Island* — *Oct 07*
- *Contract award for the Nuclear Island* — *Jun 08*

(*) subject to Euratom art. 41 requirements

Some elements concerning positive follow-up for the Slovak Republic about Mochovce 3-4 completion

- *Global number of workers at site will start growing from September 07, reaching a maximum of about 3.300 people (2010-2011)*
- *Mochovce 3-4 operation and maintenance activities will require approx. 230 people from SE (2010-2012)*
- *Positive impact on local suppliers and contractors, provided quality and costs requirements are satisfied*
- *Positive follow-up in terms of use and growth of slovak engineering capabilities for Nuclear Power Plants*
- *Mochovce 3-4 is on the leading position on re-start of Nuclear construction sector in Europe; SE considers it as a model for future Nuclear growth in Slovakia and in the region.*