

Status Report of the ITER Project

- How to Improve Performance of ITER Project -

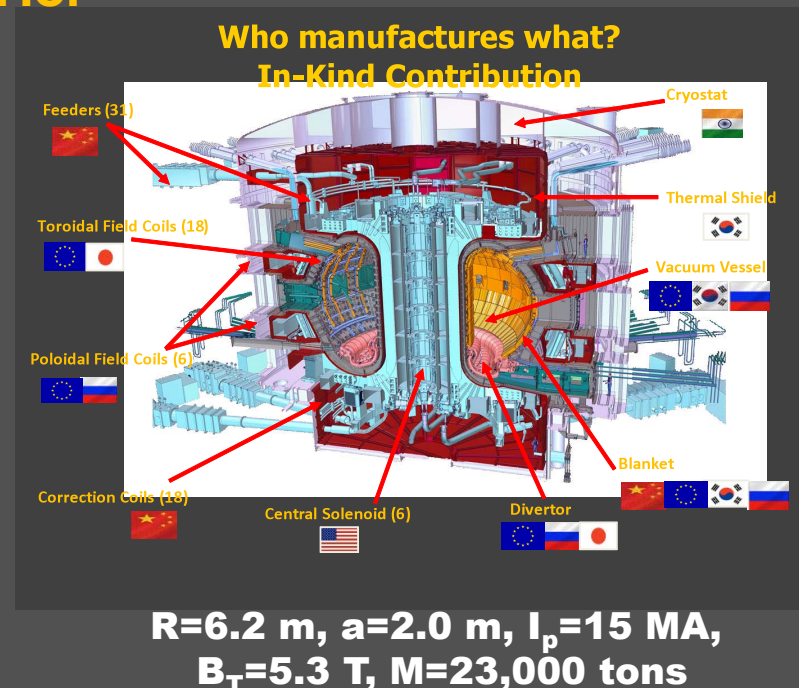
FUSION POWER ASSOCIATES
34th Annual Meeting and Symposium
December 10-11, 2013
Capitol Hill Club, Washington, DC 20003

Osamu Motojima
Director-General of the ITER Organization

Aerial view of ITER Site in September 2013 (F4E)

Objectives of the ITER Project

- ITER is a necessary step on the way to a commercial fusion reactor;
- ITER will demonstrate the availability and integration of science and technologies, and safety features for a fusion reactor;
- The self-sustained D-T burning plasma in ITER will generate 500 MW which is 10 times more power than it receives;
- The ITER Project creates a new collaborative culture and standard solving energy and environmental problems and contributing to the world peace;
- All of the intellectual properties obtained belongs equally to all seven Members and utilized for DEMO.



Cost, schedule and technical risks have been my priority since I arrived to the position of Director-General in 2010.

- Together with IO and DA staff, through the creation and effective collaboration of the Unique ITER Team (UIT);

ITER project progress is substantial; however, together with the seven DAs as UIT we urgently need to:

- Stop collectively schedule slippage;
- Implement recovery actions aiming to recover the delays as quickly as possible;
- Consider additional measures to minimize the impact on the fabrications in the Members as well as on the D-T Operation. -

➡ ***To improve our Project Performance is the top priority.***

Schedule Performance / Achievements Highlights

- **Highlight of achievements:**

- 82.17% of the total value of **In-Kind Procurement Arrangements** (PA Contracts) has been signed with Domestic Agencies;
- For half a year, there have been no further delays on the Main Tokamak Complex, Vacuum Vessel, Poloidal Field coils, Toroidal Field coils and Central Solenoid coils;
- The achievement of forecasted critical (VV, PF, TF etc) and super-critical milestones (Building) up to June is 92%;
- The progress rate of reference milestones is roughly 52% of those planned from August 2012 to August 2013;
- The reference schedule is not consistent with the 23 months delay of Tokamak complex;
- We are not successful in reducing the number of delayed milestones.
- **A Test Convoy** started to run on 16th September and arrived at ITER on 20th September.

*It is urgent to create a “project culture” within ITER
as an independent international organization*

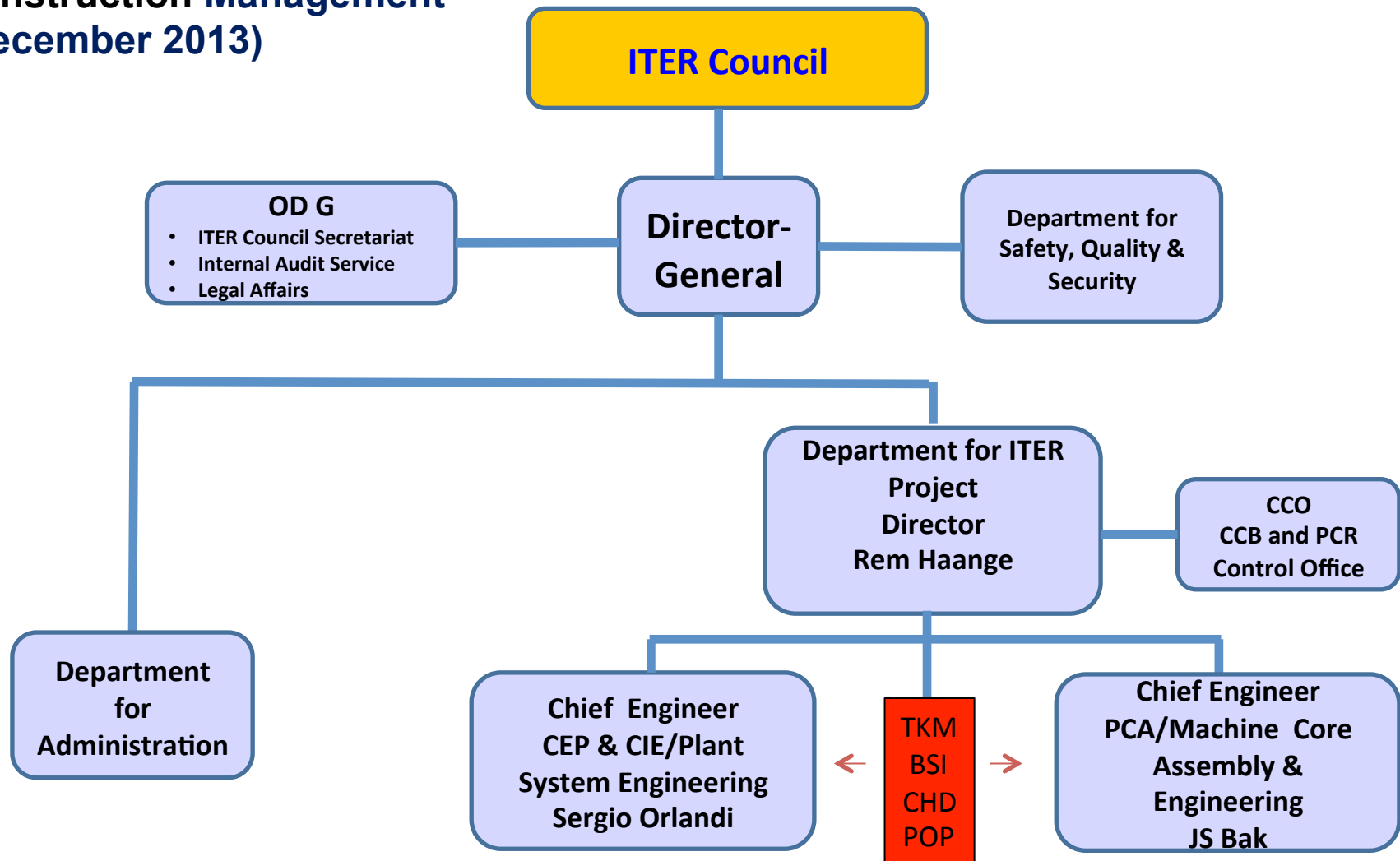
- Develop a process where objectives and strategy defined by the DG;
- Support an atmosphere of open, constructive engagement and a bias for action;
- Establish metrics that measure the state of the “project culture”;
- Continue to evaluate the “project culture”;
- Hold the project leadership accountable for progress and improvement of “project culture” metrics.

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- 1) Project Culture is under control by DG
 - IO should have international Project Culture properly integrated and supported together with the seven DAs, according to each specific Mission in ITER Project;
 - DG requests ITER Council to give more authority and flexibility to implement the action plan pushing the boundary further.

 - 2) Project Performance is under control by DDG-DIP Director in order to:
 - Stop further slippage and look for zero costs recovery actions;
 - Create 2014 Annual Work Plan consistently with the integrated achievable time schedule;
 - Establish consolidated and realistic schedule towards machine completion and first plasma.

The key is “Centralization of Construction Management”.

Reinforcement of Organizational Structure and Centralization of IO Construction Management (December 2013)



- The centralization of IO construction management has already begun, i.e., combining CIE with CEP.
- Bureau of International Cooperation is abolished.

3) Two Chief Engineers strengthen systems engineering & design integration

- Two Chief Engineers for Plant System Engineering and Machine Core Assembly & Engineering are implementing “Centralization of Construction Management”;
- Plant Integration being organized to specifically focus on Systems Integration (issuing intelligent Process and Implementation Diagram, Functional Analysis and Systems Specification), Buildings Integration, Layout Integration, and Integrated Time Schedule among Building Systems and Components;
- Project organization by systems (and not just components) is in progress;
- Timelines on a system-by-system basis for preparation of documents required for commissioning and providing assurance with regard to the quality plan and design plan have been drawn up.

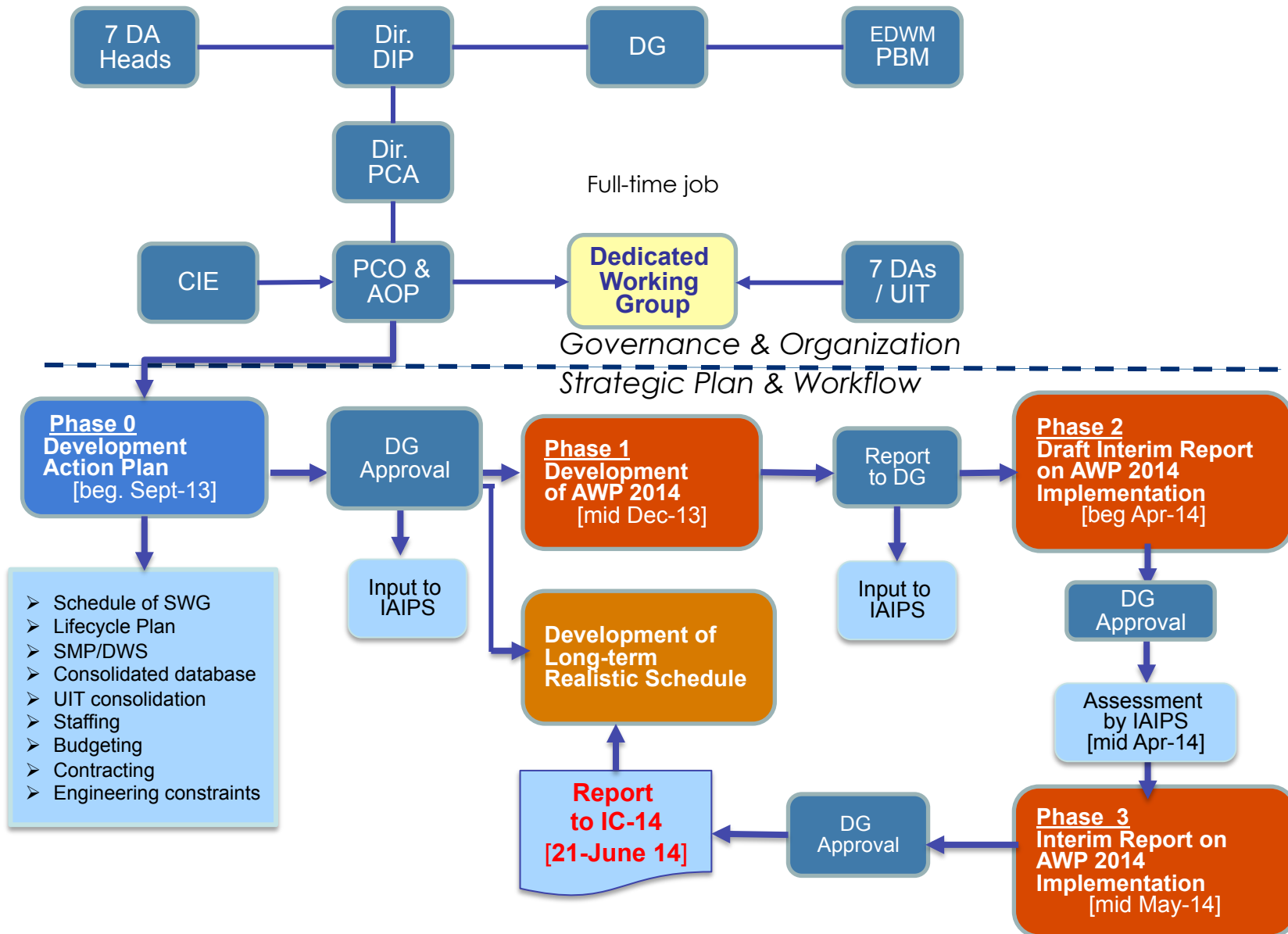
IO reinforces to;

- Strengthen systems engineering and design integration;
- Align IO and DA interests;
 - Align the interests of the IO staff with the DAs.
- Implement a comprehensive process simplification and reduction-in-bureaucracy program:
 - Simplify decision-making processes, approvals, communications etc.;
 - Benchmark IO processes against best practices and adopt specific goals for efficiency based upon benchmarking process
 - Number of Directorate will be reduced by 30%
- Document processing (design approvals, PCR approvals, hiring etc.) should be revised.

To develop the realistic schedule:

- Agreed coded DWS:
 - IO and DAs as UIT has agreed on the process for selection of SMP and coded DWS milestones for the 2014 AWP.
 - Confirmation/adjustment of submitted SMP and coded DWS milestones is under way after the DWS submission on 5th Dec 2013.
- Consolidate probabilistic and deterministic DWS, IO take responsibility, use both methodology to adjust each members condition:
 - IO to consolidate probabilistic and deterministic forecast dates confirming the selected option by DA: 5 options have been proposed by IO.
- What are the lessons we can learn from AWP2014 and when:
 - Development and implementation of high confident schedule will be learned and applied for AWP2015 and long-term schedule for reporting them to IC.

Strategy on How to Create the Realistic Schedule



2014 Annual Work Plan (2014 AWP)

- The 2014 AWP is under development through a bottom up from Detailed Work Schedule (DWS) consistent with available resources and budgets for each organisation (IO and 7 DAs).
- The 2014 AWP is now being integrated by the IO/PCO (Project Controls Division) following the DWS submission by IO and DAs on the 5th of December.
- The 2014 AWP will be finalized and approved by DG with the agreement of Unique ITER Team (UIT) in December 2013.

- The 2014 AWP includes an analysis of schedule impacts on critical systems to make sure a high confident performance in 2014.
- The critical path to each key milestone in 2014 will be reviewed every month to implement proactive actions for its achievement.
- For the development of long-term schedule, the IO is testing a probabilistic risk analysis to confirm the schedule contingency.
- Long-term schedule will be reported to IC in June 2015 .

***It is my pleasant duty to thank all seven Members,
DAs and IO as UIT for their large effort and
contribution towards the progress of the ITER
Project***

- 1) Over the past two years, the ITER Project has made the transition from design to building up the infrastructure by IO and seven DAs;
- 2) Design completion is leading to actual manufacturing of in-kind components.

***Our aim and responsibility is to show the progress
of ITER construction and to keep the project risks in
terms of scope, cost and schedule at an acceptable
level by the stake-holders;***

- 3) The IO secures that all of the Intellectual Properties and Experimental Results are shared equally by seven Members and utilized for DEMO;
- 4) The IO is opening the door more widely to the world;
- 5) The IO also considers its duty to encourage the younger generation.

Thank you for your attention



Major Achievements

License:

- Creation Decree awarded and signed by the French Prime Minister (Nov. 2012)

Construction

- Buildings: (EU)

Manufacturing

- Vacuum Vessel: (EU & KO)

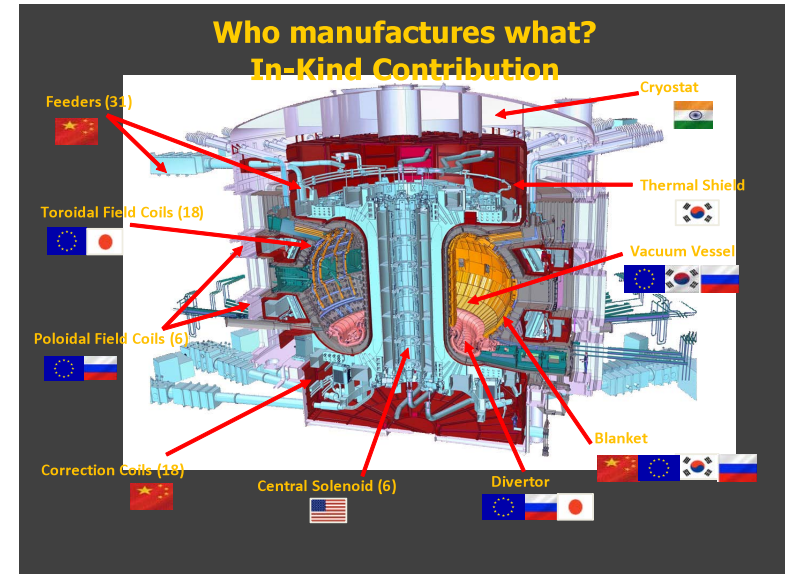
- Cryostat: (IN)

- Poloidal Field Coils: (EU & RF): PF1, Dummy conductor

- Toroidal Field Coils: Conductors : 6 DAs, Coils: EU & JA, Coil manufacturing (EU-DA).

- Central Solenoid: (US & JA)
the CSJA3 sample and tie-plate

- Tokamak Cooling Water System (US):
Centralized piping procurement



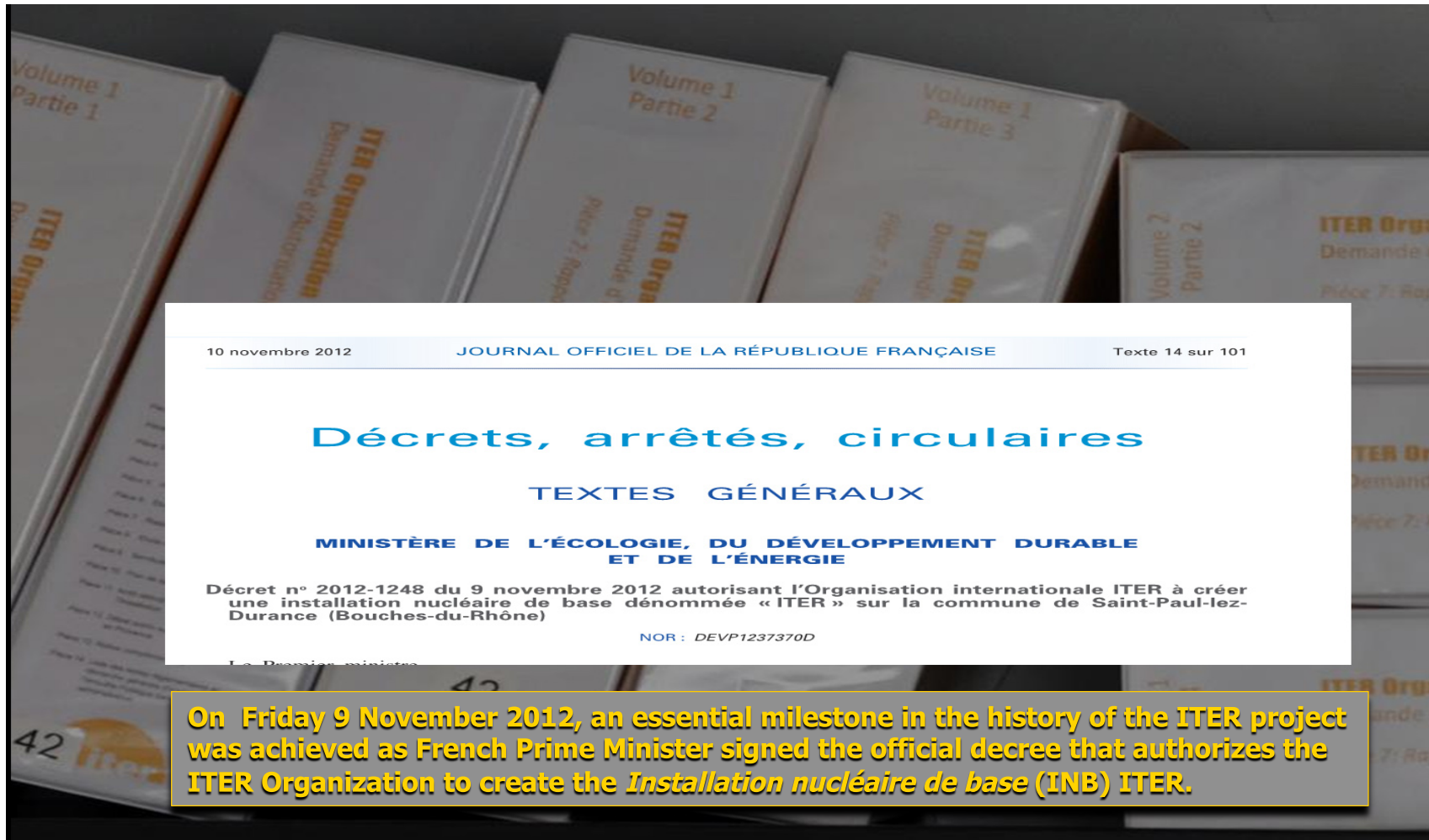
Video from DAs

Procurement Arrangements (PA) are important milestones

- By end of September, 92 PAs signed out of 140;
- The signed value is 2470.6 kIUA, representing 85.4% of the total 2891.3 kIUA for the ITER Construction.

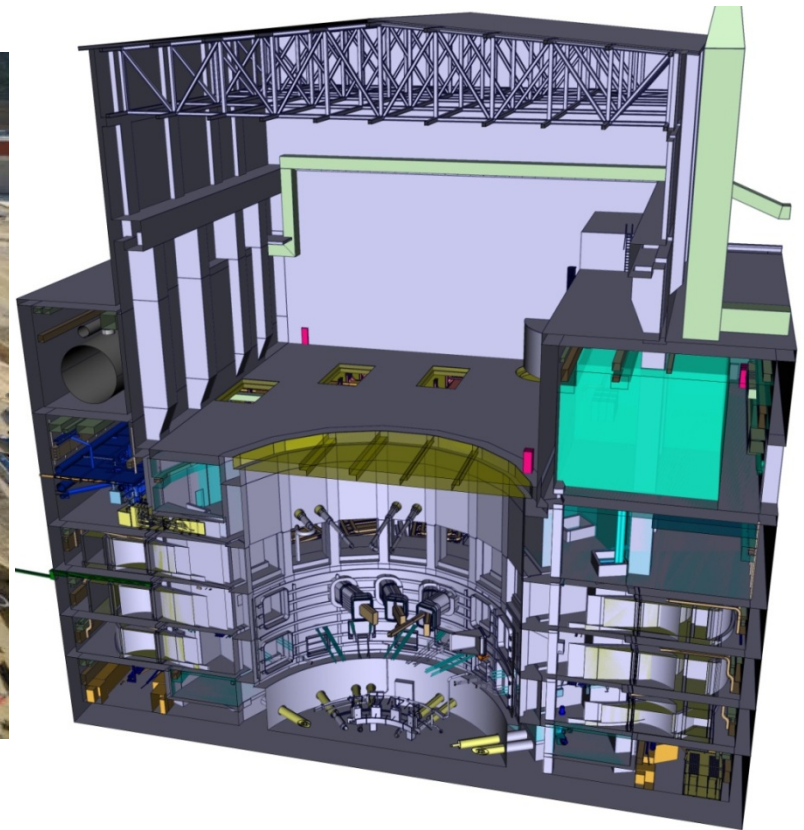


Creation Decree Granted by French Government has been awarded and signed by the French Prime Minister (Nov. 2012)



Construction of Basement of Tokamak Complex (B2 slab;TB00) is on-going

EU



Preparation for the 1.5-metre-thick B2 slab is being finalized in the Tokamak Seismic Pit. 15,000 m³ of concrete will be poured, which—added to the weight of the rebar (~ 4,000 tons)—will amount to a load of some 37,500 tons. The B2 slab will support the 360,000-ton Tokamak Complex. June 2013.

Site Construction Progresses (1)



View of the On-Site Construction



PF Coil Winding Building



VV EU



Mock-up of the inboard part of a vacuum vessel segment, produced by Walter Tosto SpA, in Chieti, Italy.

VV fabrication in Korean Industry



At Hyundai Heavy Industries in Ulsan, South Korea, fabrication of the first two sectors of the full-scale vacuum vessel mockup for the ITER is in full swing.

Worksite Progress

The Cryostat Workshop

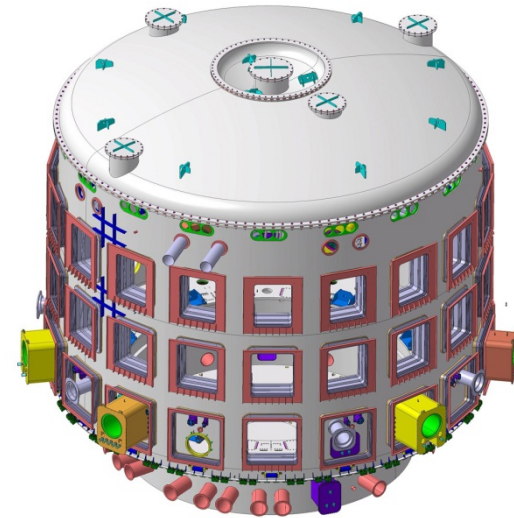
INDIA



Following Indian tradition, coconuts were broken and their flesh shared between participants in the dedication ceremony of the Cryostat Workshop. In this 5,500 square metre building, India will assemble and weld the giant component (30 x 30 metre) that surrounds the machine.

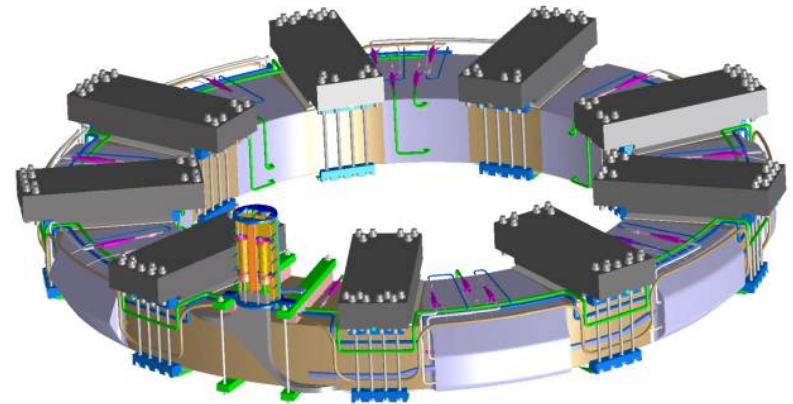
The first phase of the Manufacturing Readiness Review (MRR) for Cryostat Base Section & Lower Cylinder was successfully held (IN April 2013)

INDIA



The Manufacturing Readiness Review (MRR) for Cryostat Base Section & Lower Cylinder was held on 16-17 April 2013 at the Indian manufacturer Larsen & Toubro's Hazira facility.

Manufacturing of PF1 is going on schedule (RF)



Russian-produced poloidal field cable was jacketed and compacted at Criotec (Italy) before being spooled to await testing. The conductor will then return to Russia for the next stage in the poloidal field coil manufacturing process.

First delivery



CN

Three large crates, containing 737 metres of dummy conductor produced by China, were delivered to the ITER site on Monday 3 June. The conductors will be used to test the fabrication process of PF coil # 5.



Conductor Production In Japan

- JA has completed the manufacture of **5 x 415 m (sDP)** and of **7 x 760 m (rDP)** conductor Unit Lengths (UL's).



Cable Insertion

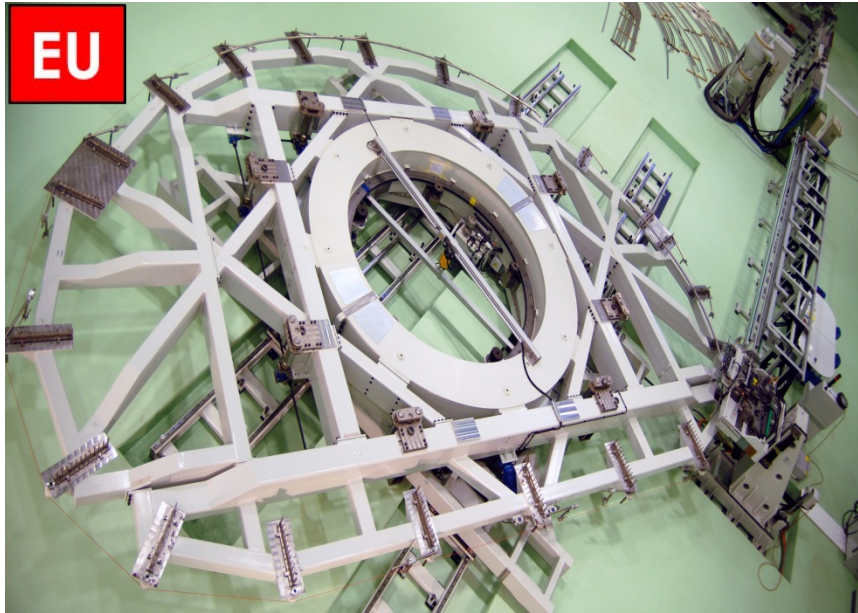


Compaction
& Spooling



Global He Leak Test
& Dye Penetrant Test

TF Coils: (Conductors : 6 DAs, Coils : EU & JA)



The Toroidal Field (TF) coils winding line is now ready. Located in Italy it will have the task of winding the superconducting coil cables into a D-shaped double spiral called a double pancake

Producing the ITER conductors means coordinating work with about 30 suppliers (here in Russia) and six Domestic Agencies around the world



Trial mock-up of the A1 (upper) section of an ITER TF Coil (Japan).



Central Solenoid

JAPAN



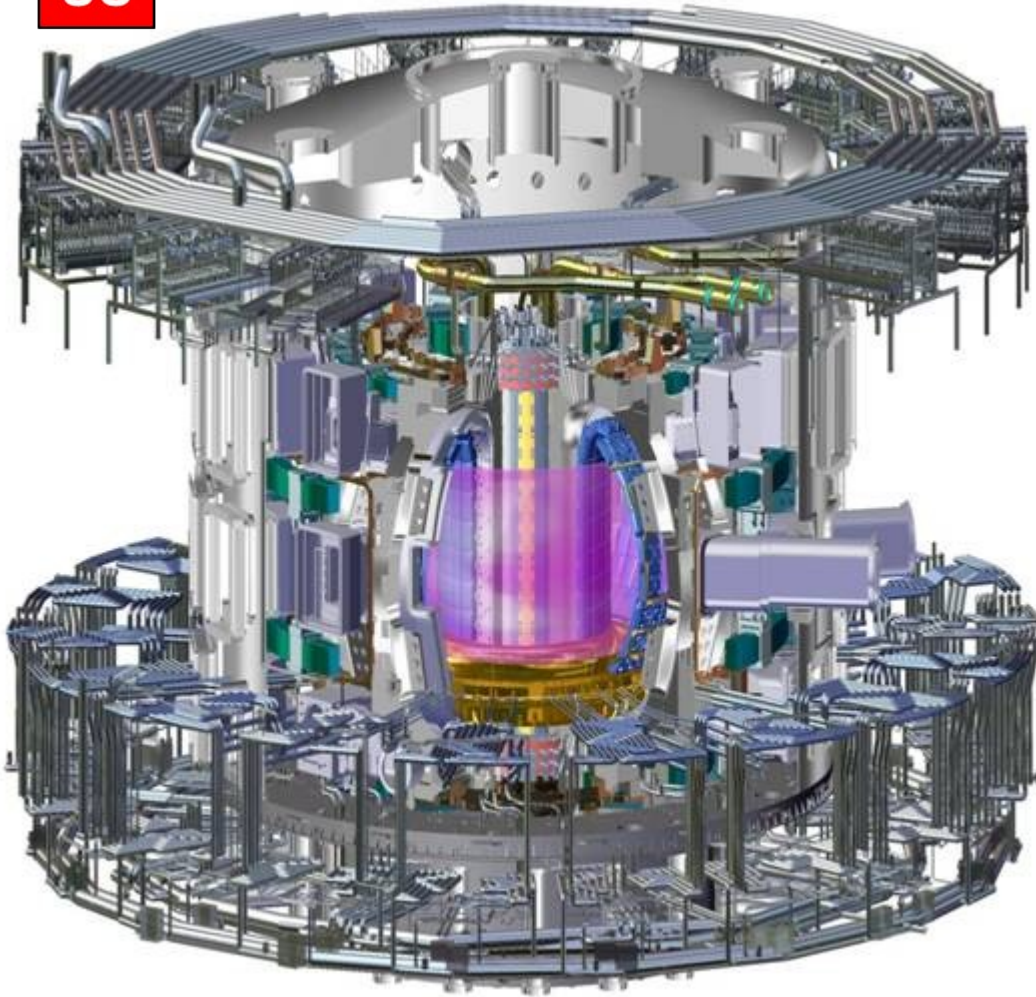
Successful completion of the SULTAN test on the CSJA3 sample that uses "short twist pitch" configuration with bronze route strands (JA, Dec 2012)

Final machining, in the US, of a tie-plate prototype forged and heat-treated in Germany. Two prototypes are being produced using two different techniques in order to select the most promising one. Tie-plates are used to keep the six CS modules assembled.



TCWS

US



The US is responsible for 100% of the design, engineering, and procurement of the Tokamak Cooling Water System (TCWS). Centralized piping procurement and improved design activities effort and collaboration between US-DA and IO are on going

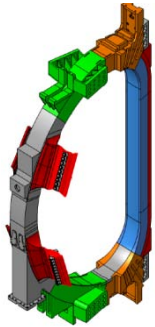
ITER Project Movies from DAs



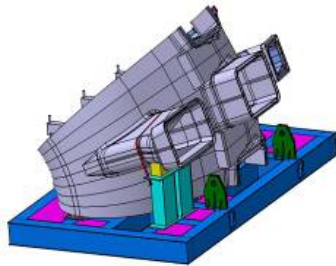
FRANCE

ITER Itinerary

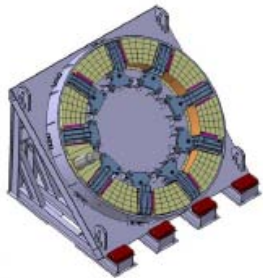
Local Communities Provided Road Upgrades



TF Coil ~360 t
16 m Tall x 9 m Wide



VV Sector ~400 t
12 m Tall x 9 m Wide

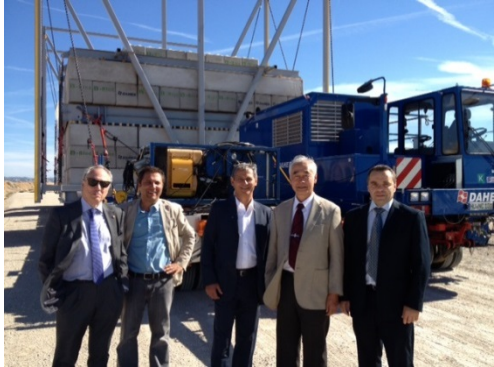


PF1 Coil ~200 t
9.4 m Dia



Heavy Component on Road
(TF Coils, VV Sectors, and PF1 Coil)

Itinerary: September 2013 Test Convoy
Middle of 2014 Real Component will arrive at ITER



Test Convoy at Marseille 13th September 2013
600ton, 352 wheels, 4km/hr (0.37MJoule)
Successful Test run for 4km.