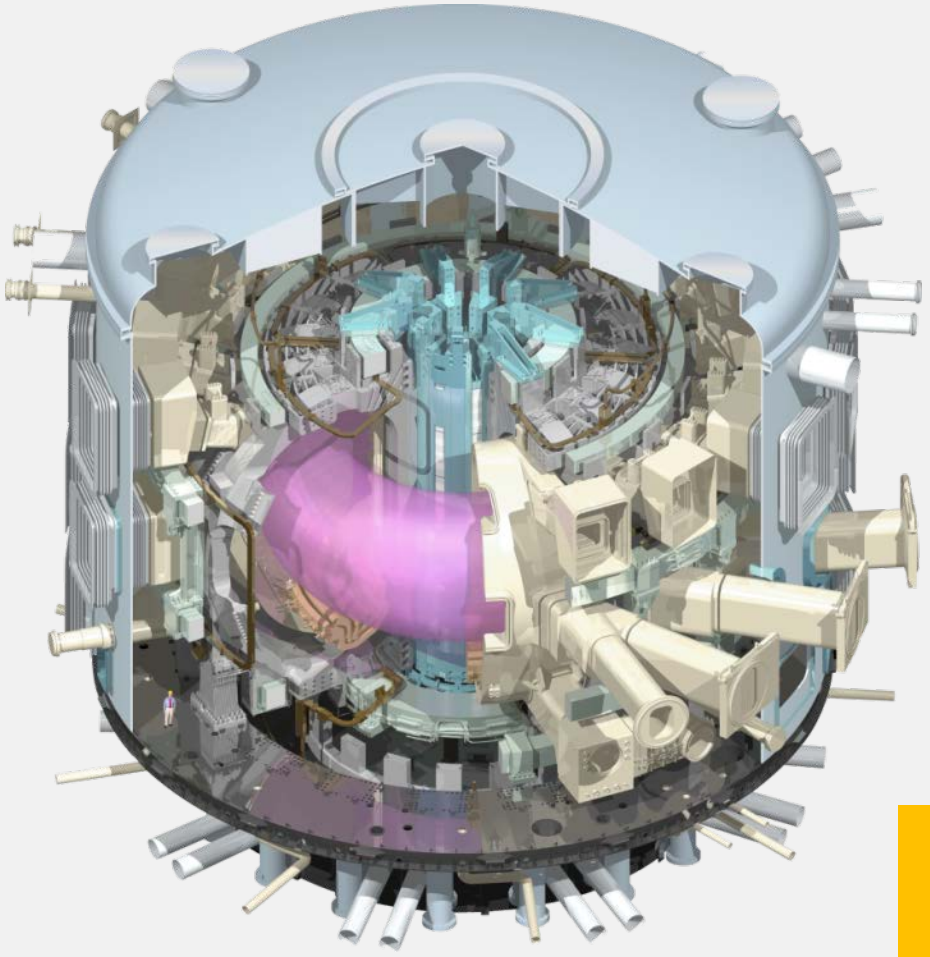
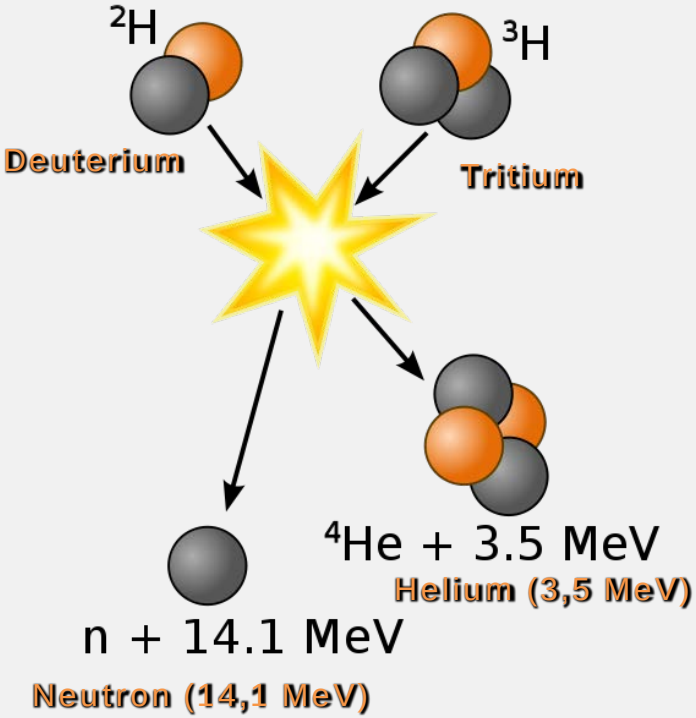
ITER Status of In-Kind Procurement





Ken Blackler
Construction Management

Introducing

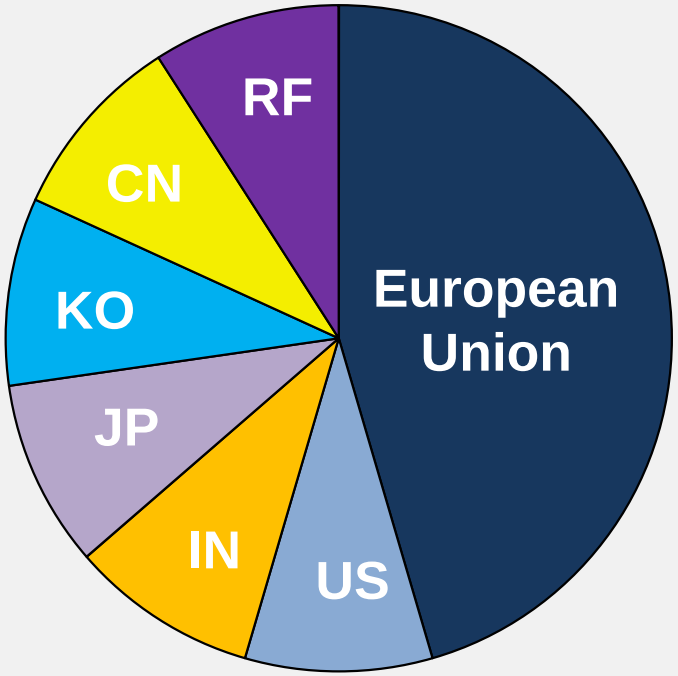
ITER KEY FACTS

7 Members: China, EU, India, Japan, Korea, Russia & US

Designed to produce 500MW of fusion power for an extended period of time

10 years construction, 20 years operation

Cost reported to be 15 billion Euros*

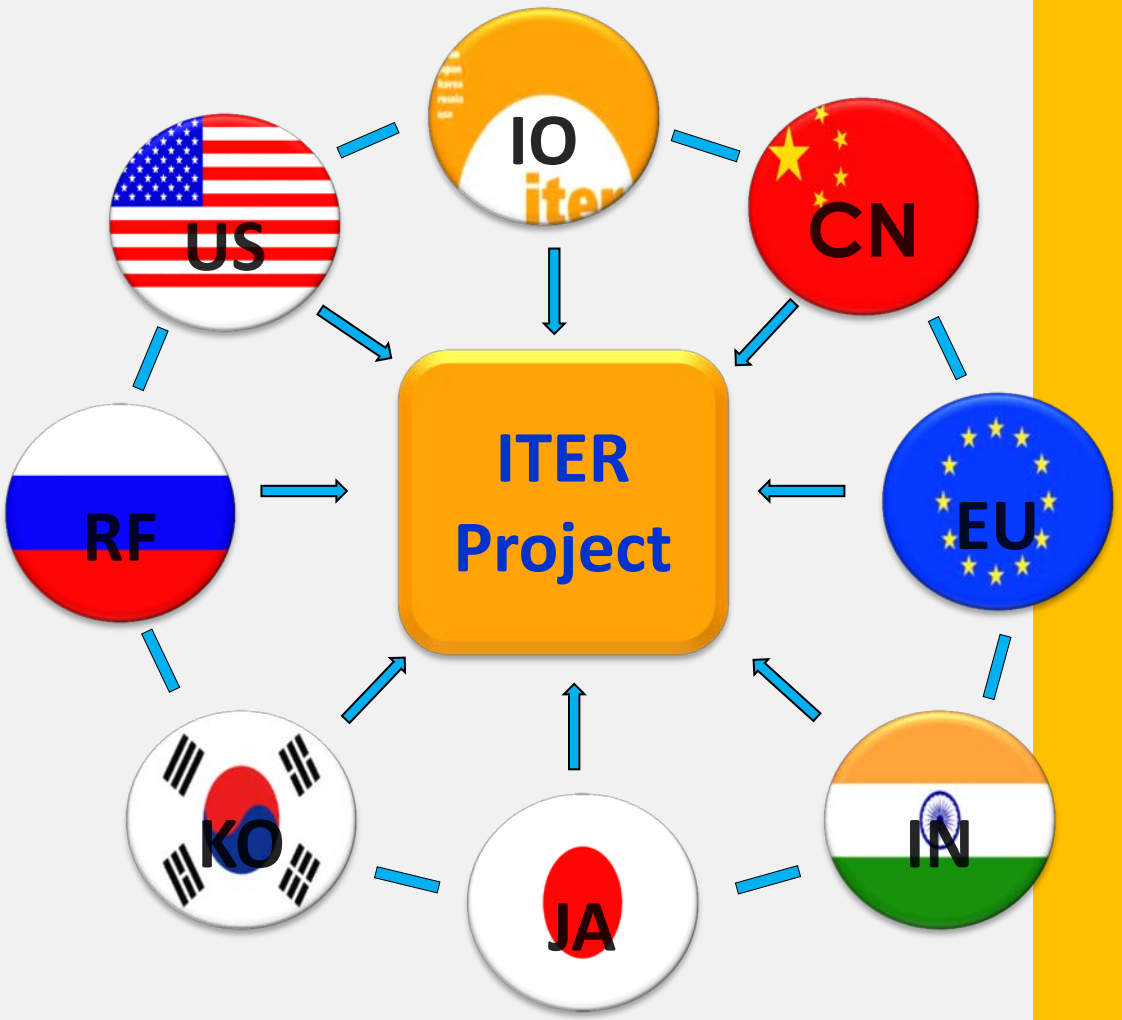


* TGV line from Marseille to Nice (16bn€)
London Olympics 2012 (14bn€)

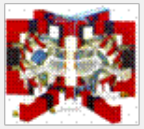
ITER: an integrated project:

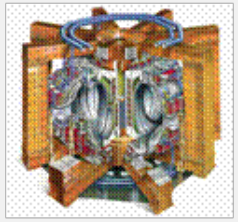
Central Team & Seven Domestic Agencies

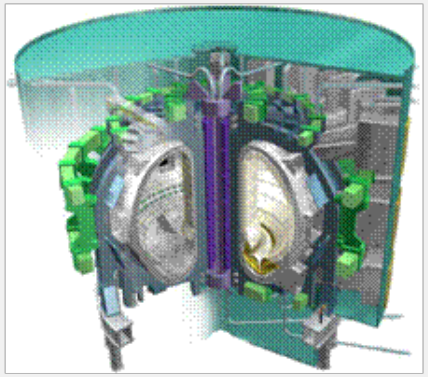
- **The 7 ITER Members make cash and in-kind contributions (90%) to the ITER Project. They have established Domestic Agencies to handle the contracts to industry.**
- **The ITER Organization Central Team manages the ITER Project in close collaboration with the 7 Domestic Agencies.**
- **The ITER Members share all intellectual Property generated by the Project.**

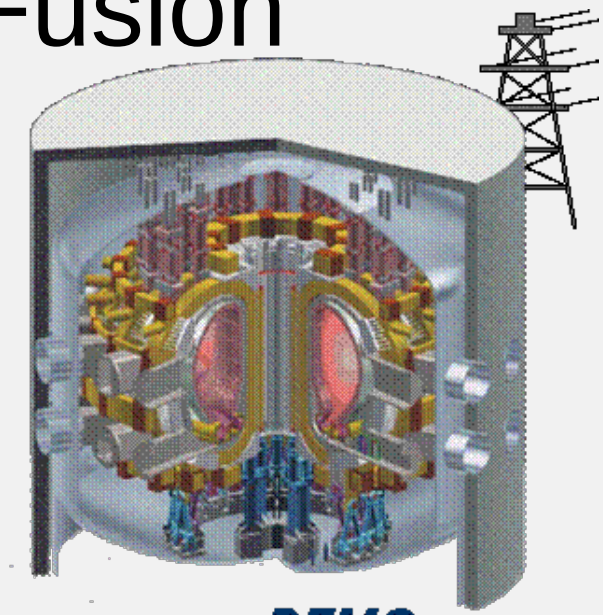


Path Towards Fusion









Tore Supra	JET	ITER	DEMO
25 m^3	80 m^3	800 m^3	~ 1000 - 3500 m^3
~ 0 MW_{th}	~16 MW_{th}	~ 500 MW_{th}	~ 2000 - 4000 MW_{th}

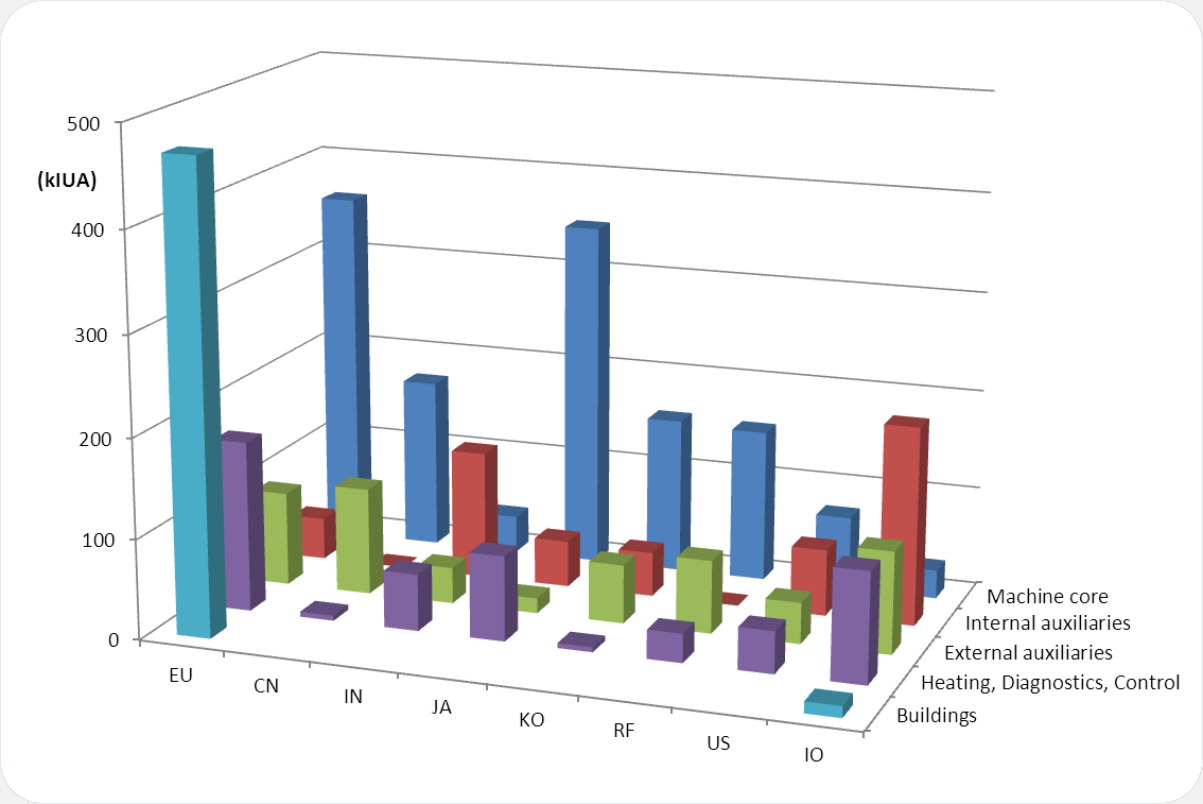
- Dominant self heating ---------->

ITER: Demonstrate the technological feasibility of fusion as an energy source

DEMO: The next step will be to demonstrate commercial power generation

In kind Contributions

Almost all of the components will be provided to the ITER Organization through in-kind contributions from the seven Members



China, India, Japan, Korea, Russia and the United States have responsibility for ~ 9% of procurement packages.

Europe's share, as Host Member, is ~ 45% (construction and manufacturing).

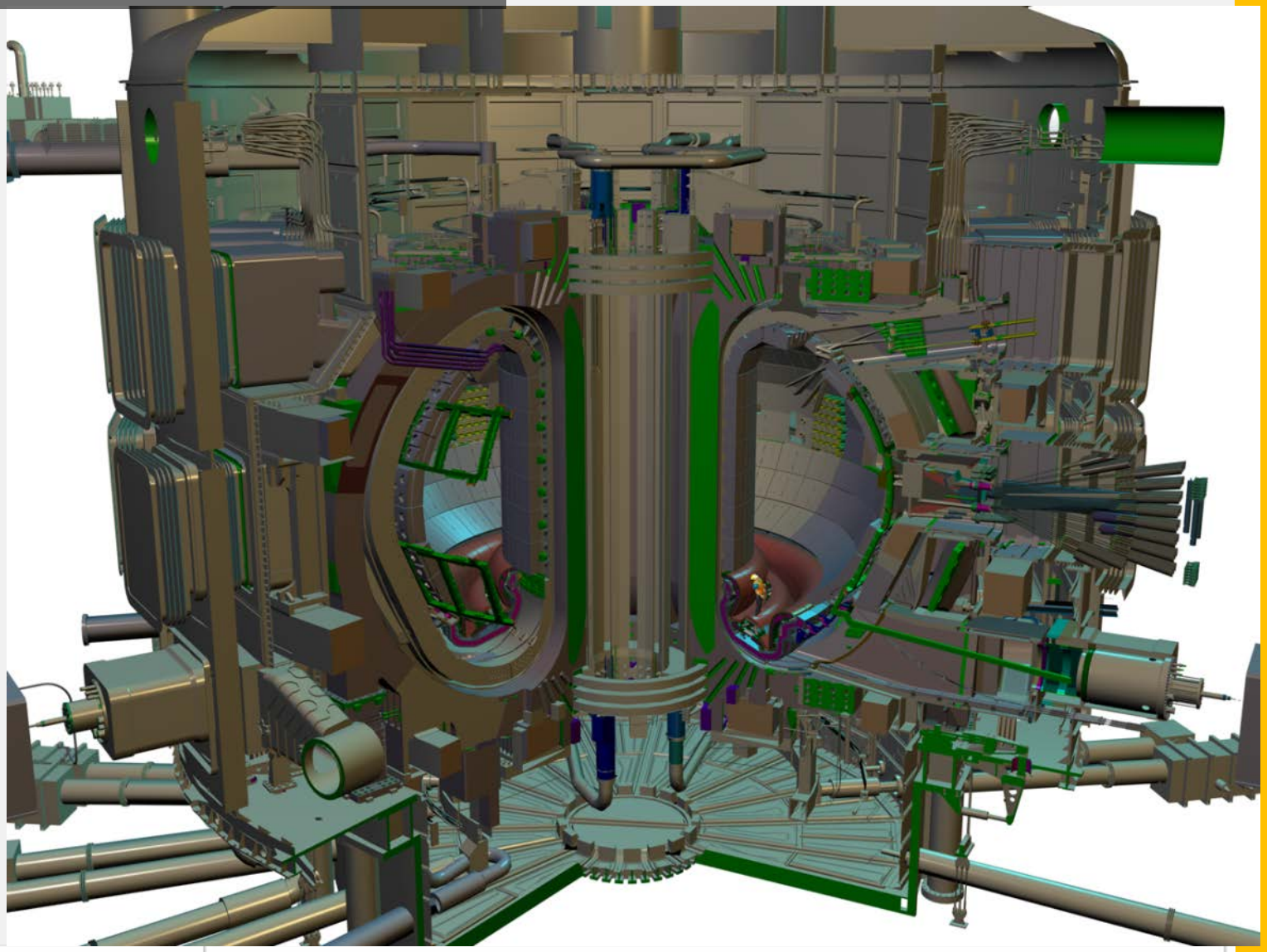
ITER Currency

- ITER has defined an ITER Unit of Account (IUA)
  - Project uses EURO for financial accounts/cash
  - Member contributions, lifecycle expressed in kIUA (1IUA ≈ 1700 $€_{2014}$)
  - Avoid multiple currencies with fluctuations and eliminate inflation
  - Members do not report actual cost, nor does the IO manage their costs
- Parties provide 84% in-kind, 16% in-cash
- Real cost may be several times kIUA cost….

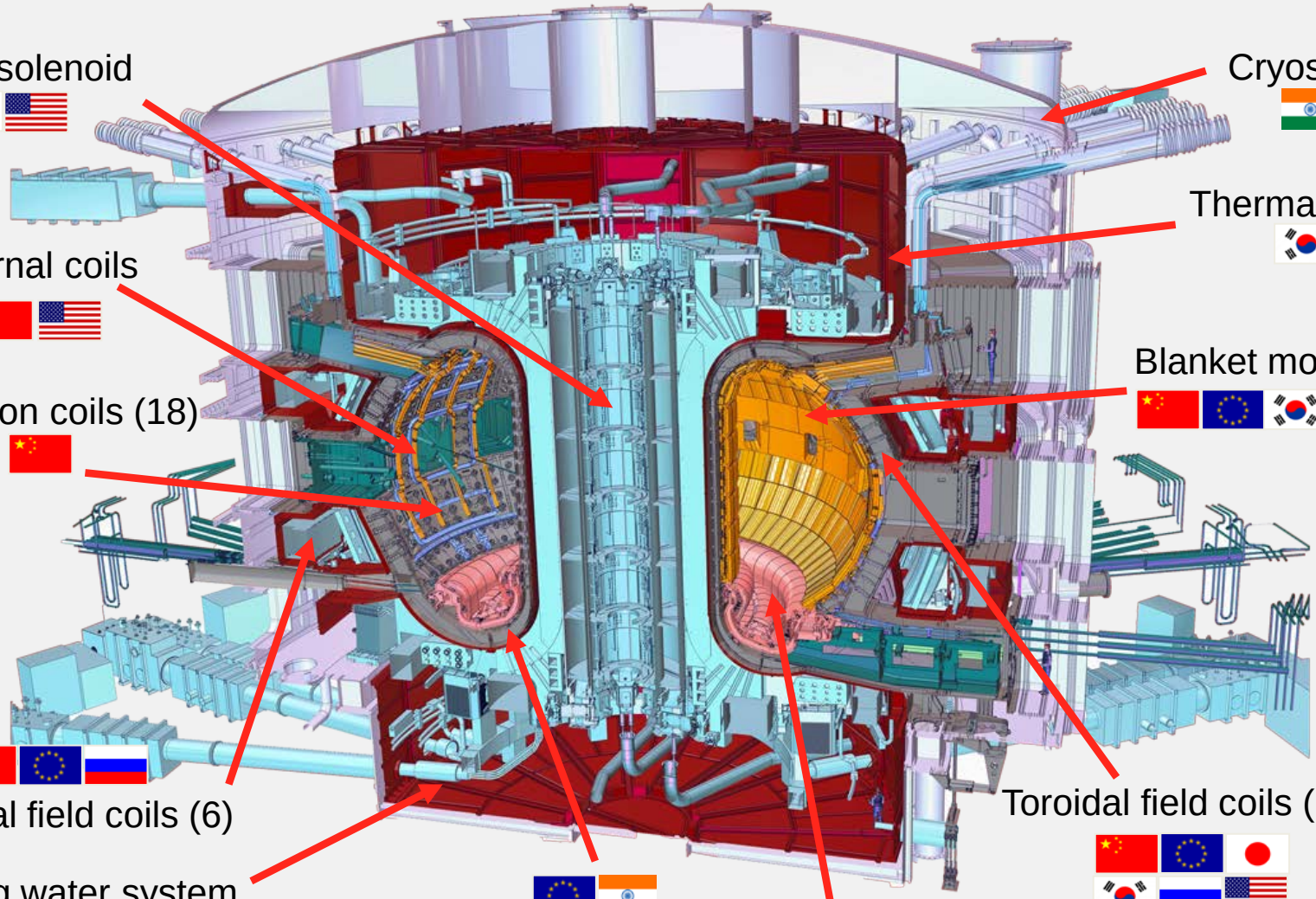
Procurement Arrangement

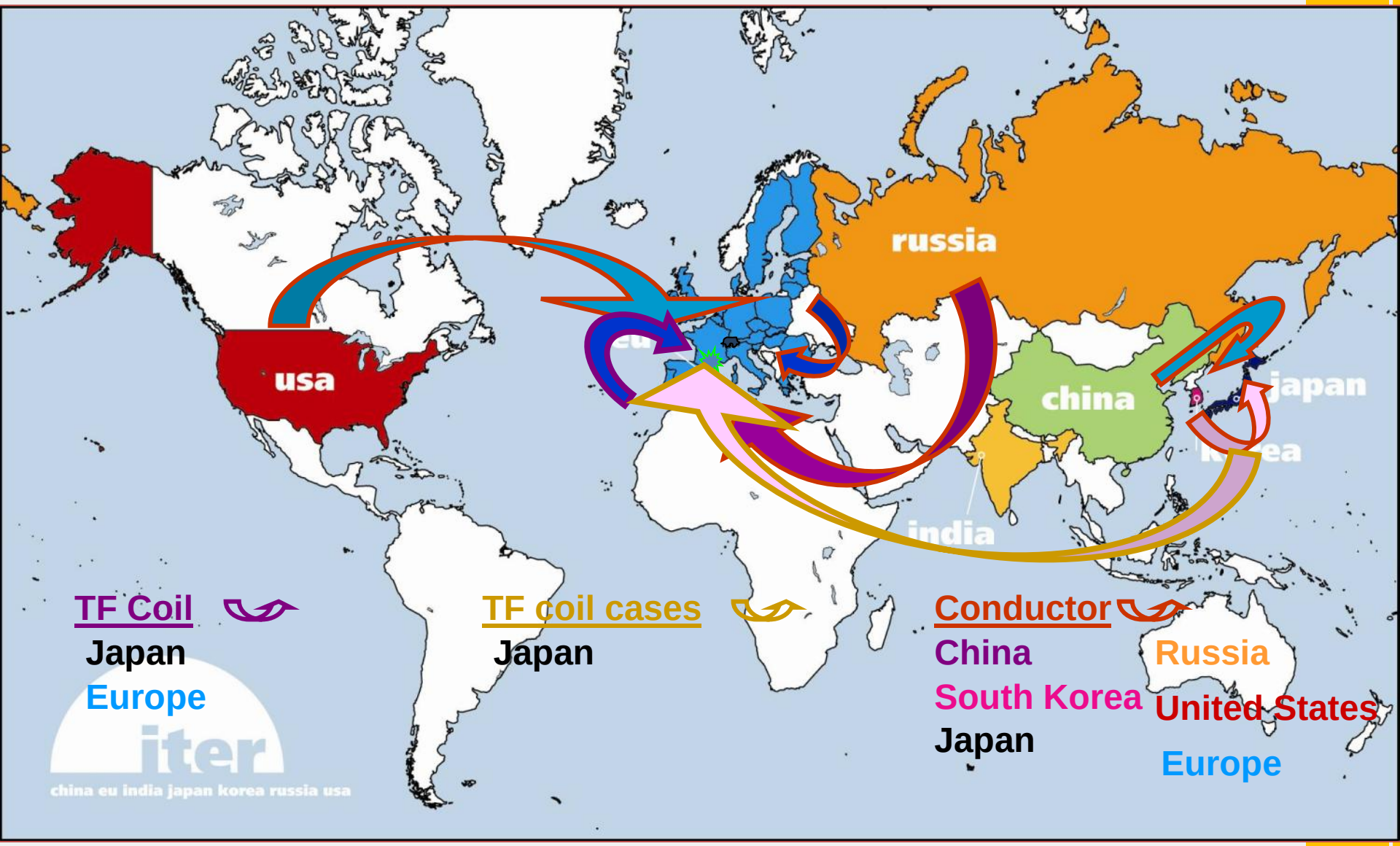
- "Contractual-like" document between ITER Organisation and Member's Domestic Agency
  - DA is procurement body within Member state
  - Contractual body for in-kind supplies
- Main -> General & Special Conditions
- Annex A -> Management Conditions
- Annex B -> Technical Specifications

ITER Machine



Who Manufactures What?




russia
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Conductor
China
South Korea
Japan
Russia
United States
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iter
china eu india japan korea russia usa

Worksite Progress

Assembly Hall

Components will be pre-assembled in this 60-metre high building prior to their integration into the machine. Lifting operations for the 730-ton roof were completed on 10 Sep. 2015

Manufacturing Progress

China

China is responsible for the procurement of 14 poloidal field AC/DC converter units that will provide reliable, controlled DC power to the ITER poloidal field magnetic coils. In February 2015, a prototype converter unit was successfully tested, opening the way to future batch production.

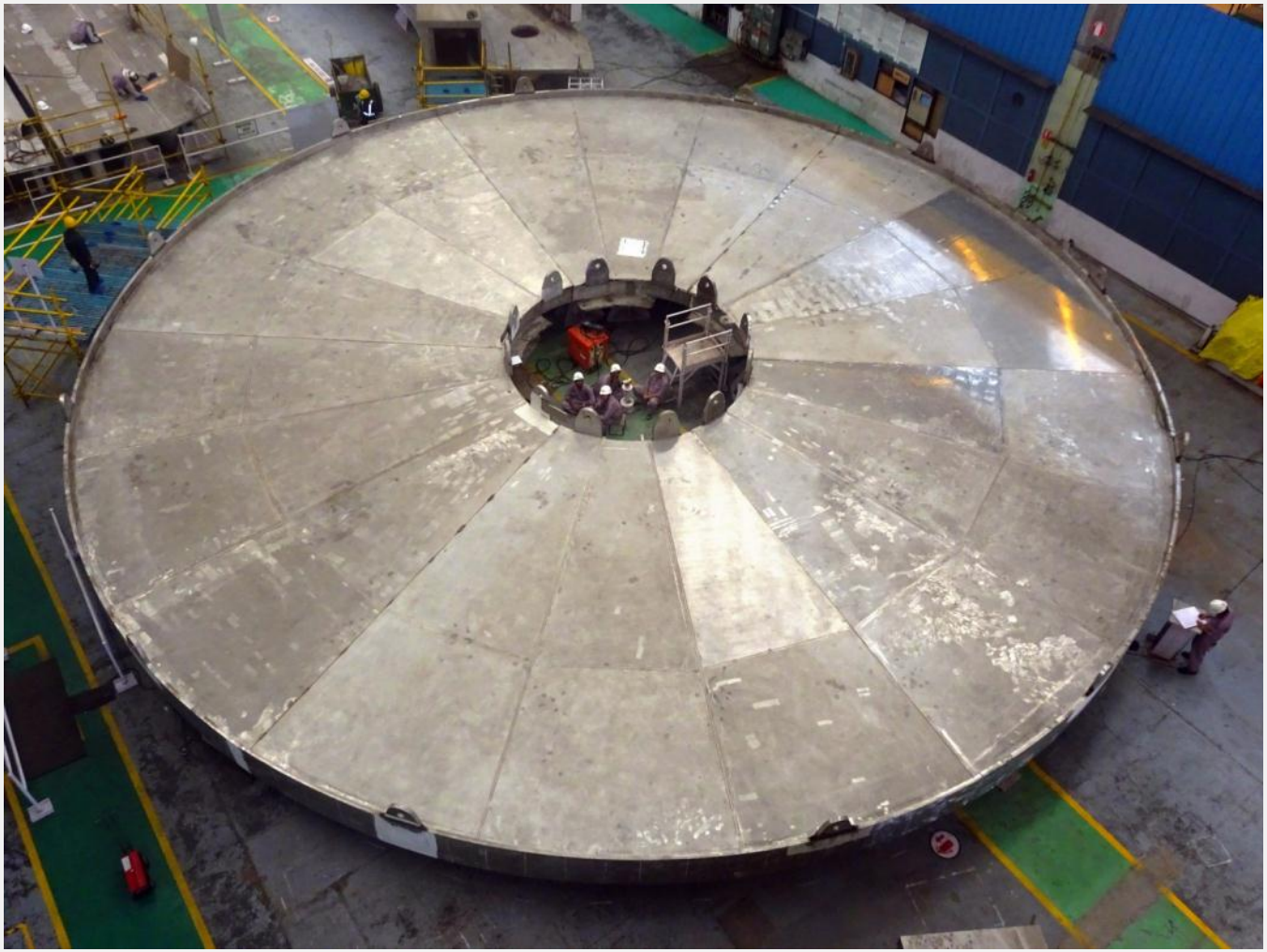
Manufacturing Progress

Europe

Europe is responsible for delivering remote handling systems for the divertor, the neutral beam system, in-vessel viewing and metrology, and the cask transfer system for activated components—in all, about EUR 250 million of investment. At the Divertor Test Platform facility hosted by the VTT Technical Research Centre in Finland, the final demonstration of the divertor cassette remote handling system was carried out in February 2015.

Manufacturing Progress

India



India is responsible for the fabrication and the assembly of the 30 x 30 m. ITER cryostat. Pictured, six 60° base plates are temporarily assembled at the factory in order to check tolerances prior to shipment to ITER. The first cryostat elements are scheduled to arrive at ITER in November 2015.

Manufacturing Progress

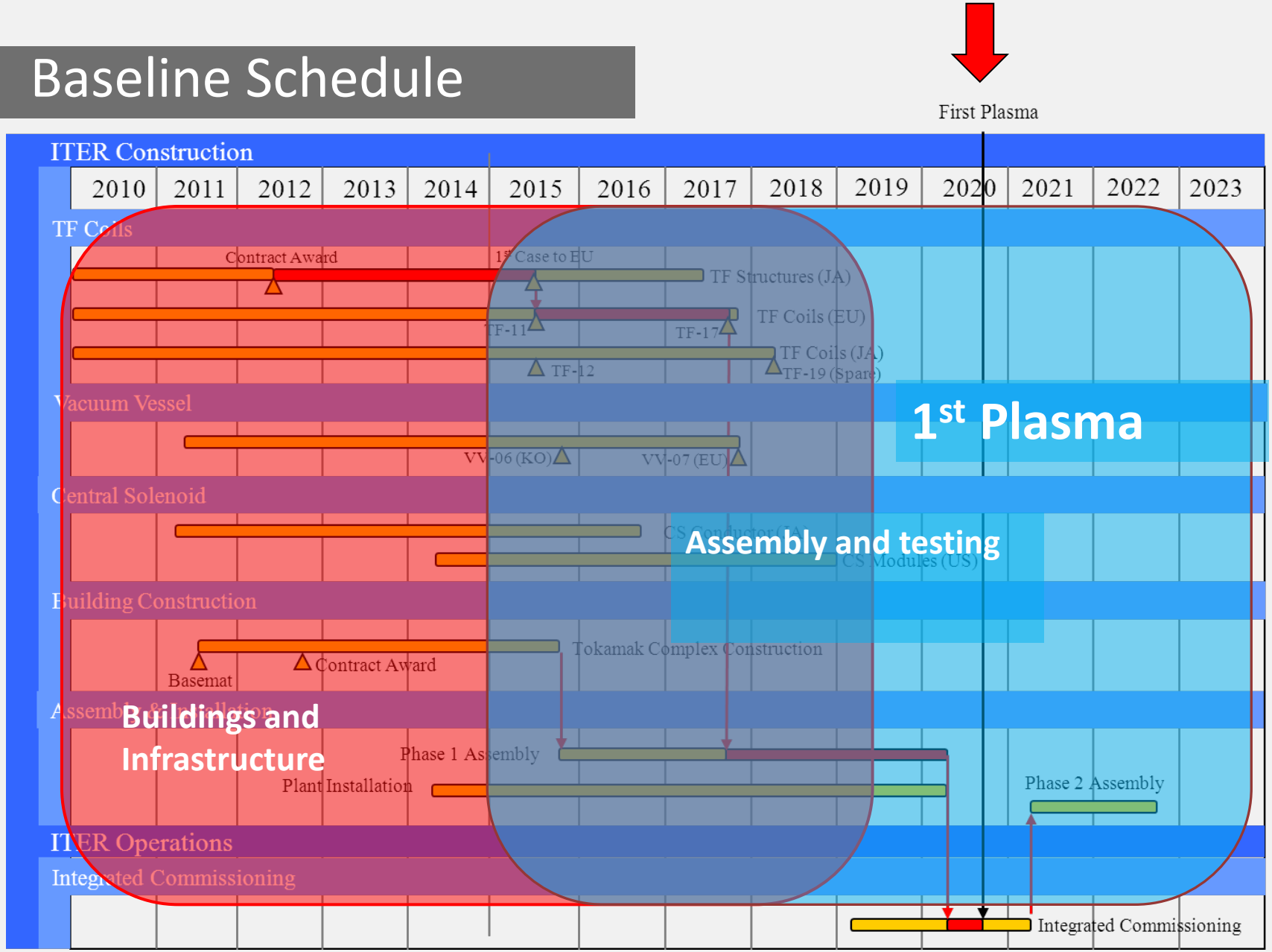
USA

The US is responsible for the design, R&D, and manufacturing of the main central solenoid magnet (using conductor supplied by Japan), as well as the associated structure and tooling. At General Atomics' Magnet Technologies Center in Poway, California, winding operations began in April 2015 on a mockup module.

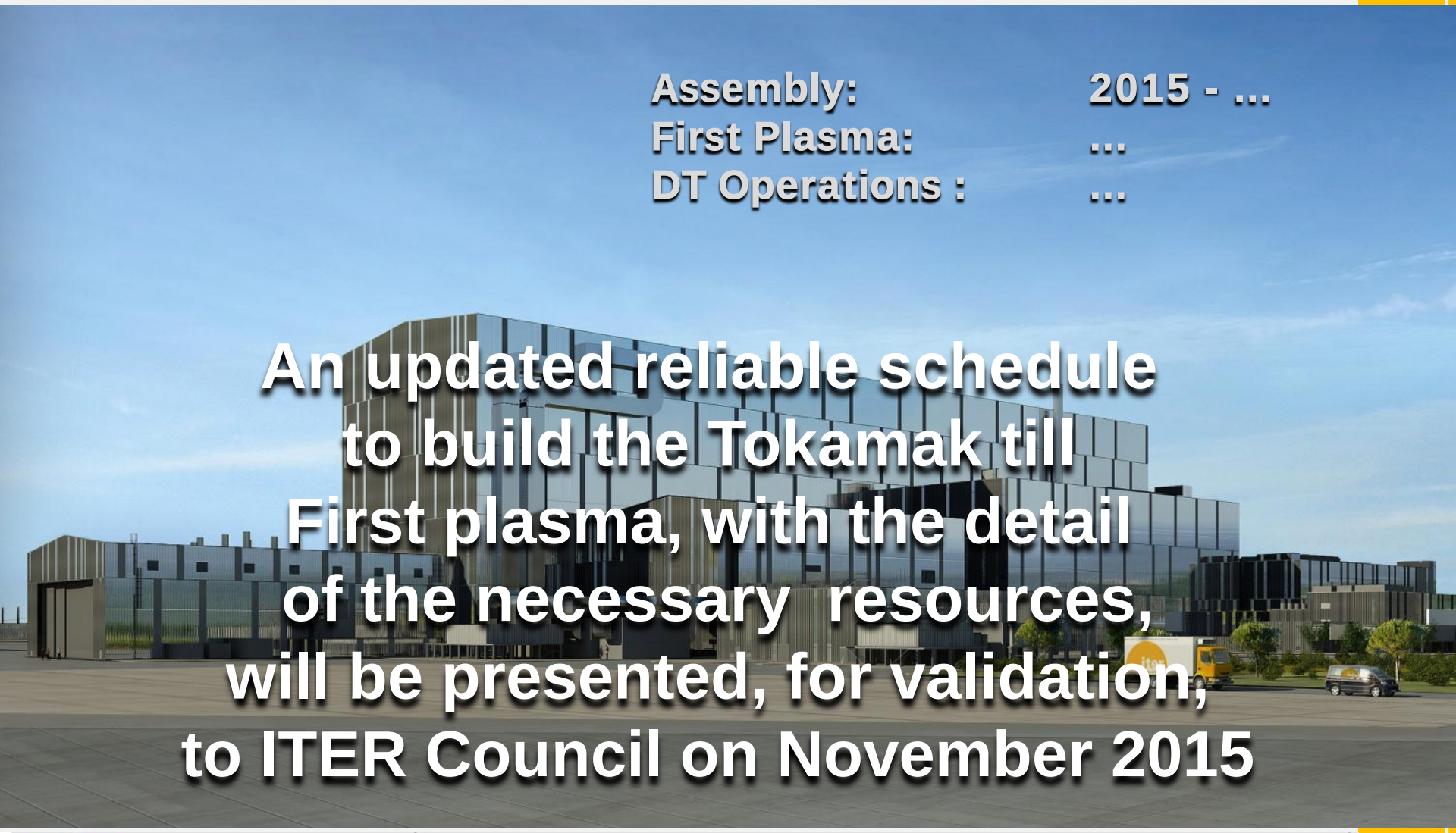
Door-to-door Delivery

14 January 2015:	**First of four 90-ton transformers procured by the US and manufactured in Korea**
20 March 2015:	**Detritiation tank (20 tons), procured by Europe**
2 April 2015:	**Detritiation tank (20 tons), procured by Europe**
20 April 2015:	**Second of four 90-ton transformers procured by the US and manufactured in Korea**
7 May 2015 (*pictured*):	**Two 80-ton, 61,000-gallon drain tanks for the tokamak cooling water system, procured by the US**

Baseline Schedule



Establishing a New Schedule



Assembly:	2015 - …
First Plasma:	…
DT Operations :	…

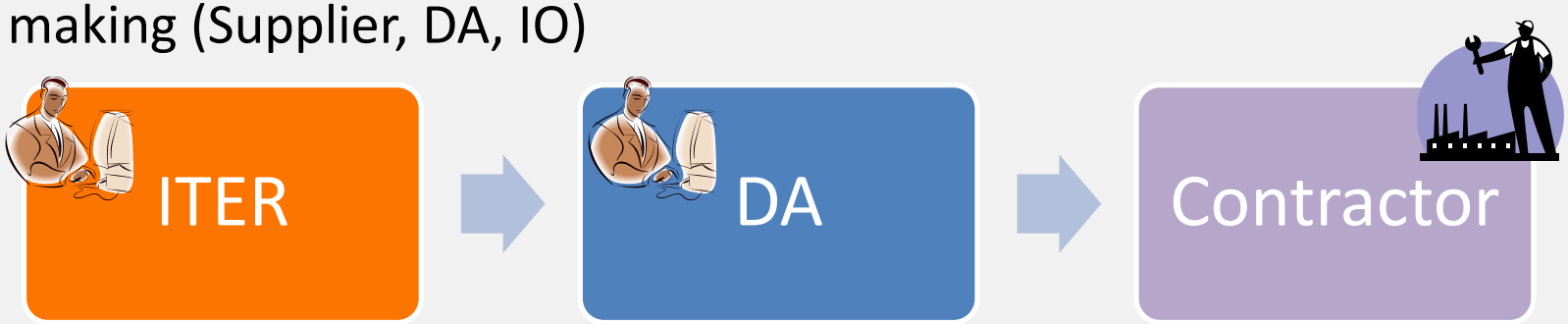
An updated reliable schedule to build the Tokamak till First plasma, with the detail of the necessary resources, will be presented, for validation, to ITER Council on November 2015

2015 Changes

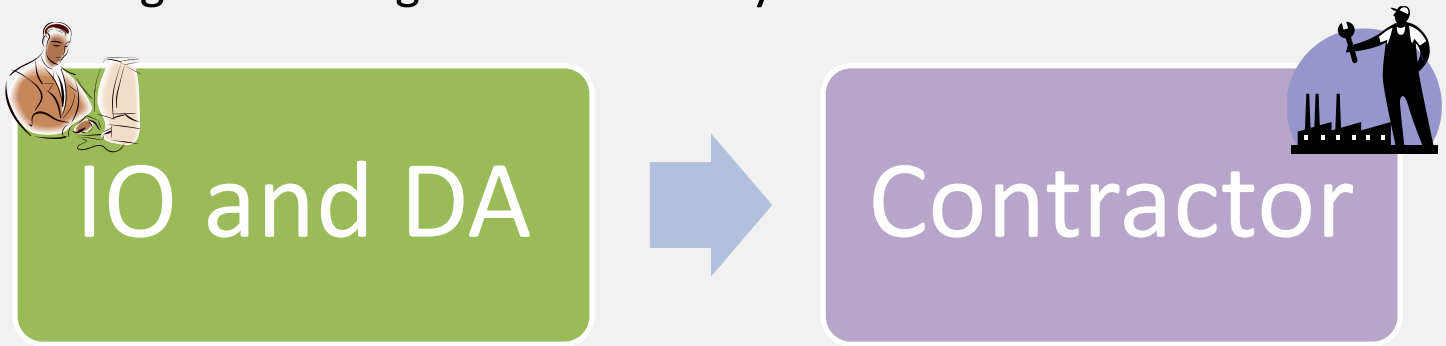
- New senior management team appointed
  - DG and 2 Deputies (COO and RCO)
  - Simpler departmental organization
- Action plan approved by ITER Council
  - Project Management improvements
  - Greater flexibility in re-organization
  - Increased authority of DG over DA
  - Mitigation actions for in-kind complexities

Mitigation - Project Team

- Large success factor is efficiency of multiple party decision making (Supplier, DA, IO)



- In key areas Project Teams created
  - Buildings and Vacuum Vessel
  - Combine IO and DA resources
  - Formal letters of assignments from home organization
  - Delegated management authority for PA activities



Mitigation – Reserve Fund

- IO baseline includes no contingency
- Decisions to solve technical and procurement issues often imply cost increases for Domestic Agencies
- Creation of Reserve Fund with decision making powers given to IO DG
  - Allows technical decisions affecting cost to be implemented without delay
  - Strict allocation rules, for changes, missing scope and recovery actions
  - Not for “cost increases”

Mitigation - Centralization

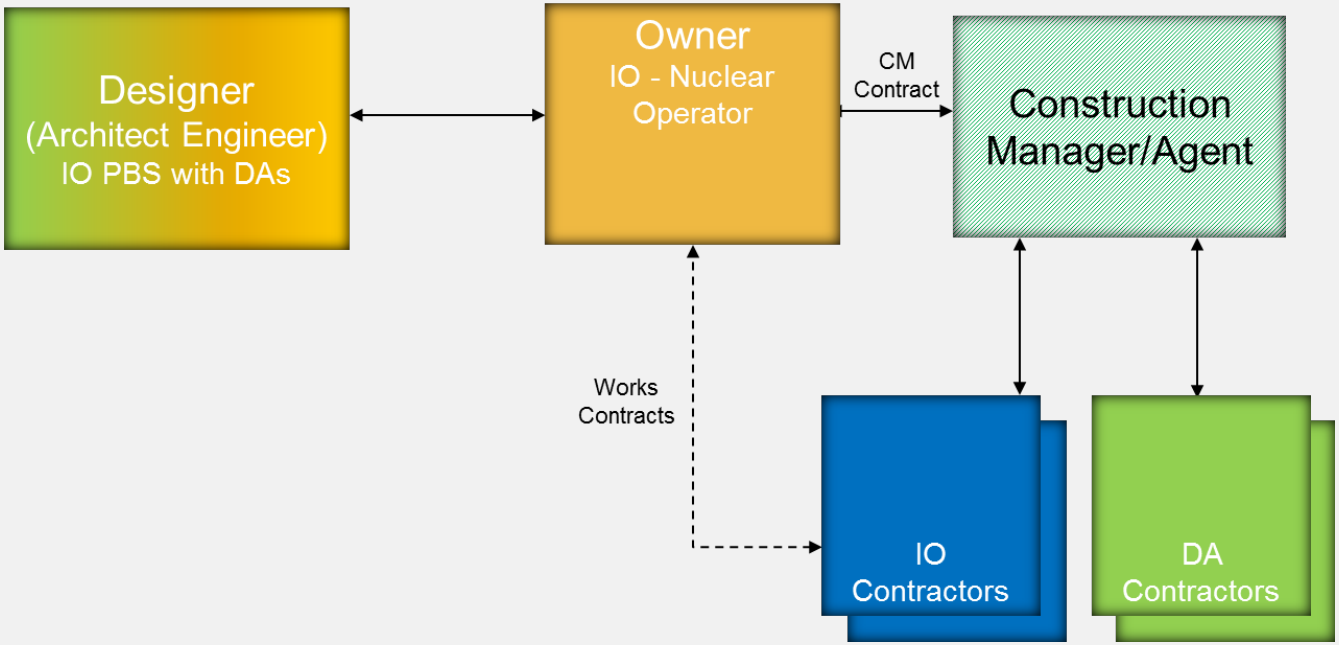
- Key areas of in-kind complexity identified
- Centralization by return scope to IO Central Team
  - Tokamak Cooling Water System (large number of interfaces)
  - Standard Piping (between services and each client)
  - Cabling (procurement and installation)
  - Nuclear Safety System (central design, licencing and procurement)
  - Installation activities (where DA agrees)

Other Issues Lessons Learnt

- Control of Deliveries
  - Global Logistics Provider
  - Multi-party procurement rules
- Customs/Duties/Taxes
  - Location of clearance
  - International organization privileges
- Transfer of Responsibility, Ownership
  - Complications of commitments as Member vs. responsibilities as supplier
- Warrantees
  - Longer schedules means warrantees expire before operations
- CE Marking
  - Education of industry, and identification of “manufacturer”

Construction

- New Construction Department created in 2015
  - Construction Management as Agent
  - Contract strategy approved and procurement process started



Contract Map

ITER Organization

Construction Manager-as-Agent CMA

Domestic Agency Works Contractors

Machine Assembly Works ASY

Mechanical & Piping Works MCP

Electrical, I&C Works EIC

Specialized Works

Super Conducting Joints

Cryogenics

Special Techniques SPx

Tokamak **Balance of Plant**

Works Contracts

Lifting & Handling LFT

Scaffolding SCF

Access, Plant Hire APH

Civils & Finishing CIV

Support Contracts

Industry Fair - Construction

- Information Day held in May 2015
- Over 200 representatives from 160 companies
- Purpose: Inform and motivate industry to participate in upcoming tenders
- Following this, the IO has met companies (market survey):
  - Opportunity to listen to the companies' feedback and lessons learned from similar contracts, for example regarding organization and site management;
  - Meetings held throughout June and July;
  - The IO has included the market survey outcome in the technical specifications as well as in the contract.

Market Survey – Construction Manager as Agent (CMa)

- Main discussion related to:
  - Lessons learned, success factors
  - Contract type, major risks and risk sharing
  - Proposed organizational structure, roles and responsibilities
  - Mobilization period, early engagement
  - Core team, continuity of key staff, flexibility
  - Payment scheme, incentivisation, key performance indicator (KPI)
  - Information required to prepare clear and comparable tender offer, such as policies, schedule, scope and volume of work to be managed.
- 40 companies nominated for tender
- Companies combined to make consortia
- Pre-qualification complete. Tender launch end of November

Market Survey - Works

- Good industrial capacity for conventional works (electrical, cabling, mechanical & piping)
- Market conditions favourable at this time
- Support to centralization of cabling, combining pre-manufacturing with installation of piping;
- Main discussion related to:
  - Information required to prepare clear and comparable tender offer, bills of quantity, definition of scope;
  - Contract form and pricing structures (Lump Sum, Rates, Cost Plus);
  - Methods of reimbursement, incentivization, KPI;
  - In-house and local industrial workshop facilities;
  - Centralization of cable procurement, pre-manufacturing;
  - Mobilization strategy, early engagement.
- Tenders early 2016

Conclusions

- ITER has experienced many challenges due to in-kind nature of project
- Highly complex procurement allocation has increased challenges
- Separation of Domestic Agencies from Central Team has led to slower decision making
- Mitigation Actions driven by new management implemented and Updated Schedule prepared to reflect new strategy


iter
japan
korea
russia
usa