Status of progress of the European procurement for ITER

JM Filhol, on behalf of Fusion For Energy

MIIFED16 – Monaco
8-10 Feb 2016

CONTENTS

- Status on Procurement Arrangements (with IO)
- Informing about Procurement at F4E
- Some data about procurements activities
- Progress on construction
- Main upcoming CFT for 2016 / 2017
- Conclusion
EU PROCUREMENT ARRANGEMENTS

- 76 (*) PA to be signed for EU for a total credit of ≈ 1108 kIUA
  (*) 50 PAs plus 26 Diagnostics PA Amendments

- 31 EU PA signed as of end 2015 for a cumulated credit of ≈ 969 kIUA (*)
  (*) Including only the value of Diagnostics PA Amendments signed to date.
  1 PAs signed in June 2015 Remote Handling (Cask and Plug)

- 8 EU PA currently planned to be signed during 2016:
  - Blanket First Wall
  - Divertor Toroidal & Radial Rails
  - FE Cryopump, Distribution Cold Valve Boxes and Warm Regeneration Box
  - Primary Leak Detection & Localisation System
  - Neutral Beam (Vacuum Vessel, Passive Magnetic Shield & FE Components)
  - Neutral Beam (Active Correction Coils)
  - Diagnostics (several amendments)
  - Radiological and Conventional Waste Treatment and Storage

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EU PROCUREMENT ARRANGEMENTS
SIGNED AS OF END 2015 (1/3)

<table>
<thead>
<tr>
<th>PA Signed (EU)</th>
<th>Type</th>
<th>Signed</th>
<th>Credit (kIUA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Magnets - 1.1.P6A.EU.01 Toroidal Field Magnet Conductors</td>
<td>BP</td>
<td>Dec-2007</td>
<td>43.39</td>
</tr>
<tr>
<td>2 Magnets - 1.1.P1A.EU.01 Toroidal Field Magnet Windings</td>
<td>BP</td>
<td>Jun-2008</td>
<td>89.74</td>
</tr>
<tr>
<td>3 Buildings - 6.2.P2.EU.01 PF Coll fabrication building</td>
<td>FS</td>
<td>Nov-2008</td>
<td>12.80</td>
</tr>
<tr>
<td>4 Magnets - 1.1.P6C.EU.01 Poloidal Field Magnet Conductors</td>
<td>BP+FS</td>
<td>May-2009</td>
<td>11.23</td>
</tr>
<tr>
<td>5 Buildings - 6.2.P2.EU.02 Architect Engineering Services</td>
<td>FS</td>
<td>May-2009</td>
<td>55.10</td>
</tr>
<tr>
<td>6 Buildings - 6.2.P2.EU.03 TKM Excavation &amp; Ground Support Structure</td>
<td>FS</td>
<td>May-2009</td>
<td>31.00</td>
</tr>
<tr>
<td>7 Buildings - 6.2.P2.EU.04 Anti-Seismic Bearing</td>
<td>FS</td>
<td>May-2009</td>
<td>6.20</td>
</tr>
<tr>
<td>8 Magnets - 1.1.P3A-B.EU.01 Poloidal Field Coils 2, 3, 4, 5 &amp; 6</td>
<td>BP</td>
<td>Jun-2009</td>
<td>40.86</td>
</tr>
<tr>
<td>9 NB H and CD - 5.3.P6.EU.01 NB Power Supply</td>
<td>FS</td>
<td>Jul-2009</td>
<td>31.38</td>
</tr>
<tr>
<td>10 Electrical PS - 4.1.P1A-8B.EU.01 SSEN and PPEN Detailed System Engineering Design</td>
<td>FS</td>
<td>Oct-2009</td>
<td>7.00</td>
</tr>
<tr>
<td>11 Vacuum Vessel - 1.5.P1A.EU.01 Vacuum Vessel-Blanket Manifolds &amp; Hydraulic Connectors</td>
<td>BP</td>
<td>Nov-2009</td>
<td>92.19</td>
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<tr>
<td>12 Divertor - 1.7.P2B.EU.01 Inner Targets</td>
<td>BP</td>
<td>Mar-2010</td>
<td>20.20</td>
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<tr>
<td>13 Magnets - 1.1.P2A.EU.01 Pre-Compression Rings</td>
<td>BP</td>
<td>May-2010</td>
<td>0.60</td>
</tr>
</tbody>
</table>
## EU PROCUREMENT ARRANGEMENTS
### SIGNED AS OF END 2015 (2/3)

<table>
<thead>
<tr>
<th>PA Signed (EU)</th>
<th>Type</th>
<th>Signed on</th>
<th>Credit (kIUA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>14 Buildings - 6.2.P2.EU.05 Building Construction</td>
<td>FS</td>
<td>May-2010</td>
<td>337.93</td>
</tr>
<tr>
<td>15 NB H and CD - 5.3.P9.EU.01 Neutral Beam Test Facility Components</td>
<td>FS</td>
<td>Oct-2010</td>
<td>27.00</td>
</tr>
<tr>
<td>16 Cryoplant &amp; Distribution - 3.4.P1.EU.01 Cryoplant (LN2 and Auxiliary Systems) + instal.</td>
<td>FS</td>
<td>Jun-2011</td>
<td>30.68</td>
</tr>
<tr>
<td>17 <strong>Diagnostics</strong> - 5.5.P1.EU.00</td>
<td>FS</td>
<td>Dec-2011</td>
<td>24.63</td>
</tr>
<tr>
<td>17 <strong>Diagnostics</strong> - 5.5.P1.EU.01 Magnetics</td>
<td>FS</td>
<td>Dec-2011</td>
<td>1.112</td>
</tr>
<tr>
<td>17 <strong>Diagnostics</strong> - 5.5.P1.EU.02 CER</td>
<td>FS</td>
<td>May-2013</td>
<td>0.03</td>
</tr>
<tr>
<td>18 Divertor - 1.7.P1.EU.01 Cassette Body and Assembly</td>
<td>BP</td>
<td>May-2012</td>
<td>11.20</td>
</tr>
<tr>
<td>19 EC H and CD - 5.2.P4.EU.01 EC HV Power Supply</td>
<td>FS</td>
<td>May-2012</td>
<td>11.63</td>
</tr>
<tr>
<td>22 Tritium Plant - 3.2.P5.EU.01 Water Detritiation System Tanks, Water Detritiation Systems</td>
<td>BP+DD</td>
<td>Dec-2012</td>
<td>2.55</td>
</tr>
<tr>
<td>23 R/H Equipment – 2.3.P5.EU.01 Ex-Vessel Neutral Beam Remote Handling Equipment</td>
<td>FS</td>
<td>May-2013</td>
<td>6.00</td>
</tr>
<tr>
<td>24 Rad Protection – Radiological Protection for Design – 6.4.P1.EU.01</td>
<td>FS</td>
<td>Sept-2013</td>
<td>0.60</td>
</tr>
</tbody>
</table>

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## EU PROCUREMENT ARRANGEMENTS
### SIGNED AS OF END 2015 (3/3)

<table>
<thead>
<tr>
<th>PA Signed (EU)</th>
<th>Type</th>
<th>Signed on</th>
<th>Credit (kIUA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 Cryoplant- 3.1.P1.EU.01 Cryo-Distribution Warm Regeneration Lines</td>
<td>FS</td>
<td>Sept-2013</td>
<td>0.02</td>
</tr>
<tr>
<td>26 Electrical PS - 4.1.P6A.EU.01 Emergency Power Supply</td>
<td>FS</td>
<td>Dec-2013</td>
<td>5.70</td>
</tr>
<tr>
<td>27 Electrical PS - 4.1.P8C.EU.01 SSEN Components</td>
<td>FS</td>
<td>Dec-2013</td>
<td>5.00</td>
</tr>
<tr>
<td>28 Electrical PS - 4.1.P1A-B8.EU.02 SSEN and PPEN Installation</td>
<td>FS</td>
<td>Dec-2013</td>
<td>27.52</td>
</tr>
<tr>
<td>29 Remote Handling – 5.7.P1.EU.01 In-Vessel Viewing System</td>
<td>FS</td>
<td>Dec-2014</td>
<td>6.80</td>
</tr>
<tr>
<td>30 Upper Launcher – 5.2.P1B.EU.01 Electron Cyclotron Control System</td>
<td>BP</td>
<td>Dec-2014</td>
<td>1.40</td>
</tr>
<tr>
<td>31 Remote Handling - Cask and Plug System</td>
<td>FS</td>
<td>June-2015</td>
<td>17.00</td>
</tr>
</tbody>
</table>

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ITER TASK AGREEMENTS SIGNED WITH EU AS OF END OF 2015

- 246 ITAs issued to EU for a total Euro amount of ~10 M€
- 25 ITAs are still ongoing
- No ITAs are anticipated for 2016, however some amendments will be issued.

INFORMING ABOUT PROCUREMENT

Organisation of **market surveys** on dedicated components before launching important CFT.

Organisation of **Industrial information days** on dedicated components before launching important CFT.

**ILOs network** is F4E preferred main channel of communication to disseminate information on F4E procurement activities, gather feedback and interest from industry and organize Information Meeting and Market surveys etc.

The F4E **Industry Portal** is the place where you find all relevant information about the upcoming or on-going Call for Tenders, market surveys, information days,..
MARKET SURVEYS

80 F4E Market Surveys performed in 2010-2015
Number of answers

Number of answers
MARKET SURVEYS

80 Market Surveys performed in 2010-2015
(% per technical area is shown here)

CODAC, ANTENNAS
5%
REMOTE HANDLING
10%
NEUTRAL BEAM & PS
15%
IN VESSEL
15%
MAGNETS
15%
BIPS
15%

Source FAIE Market Intelligence

MARKET SURVEYS

1852 Companies answered to Market Survey(s)
(average # of answers is shown here)

MAGNETS
15%
REMOTE HANDLING
86%
CODAC
58%
ANTENNAS
12%
OTHER
10%
Cryoplant Fuel Cycle
9%
IN VESSEL
9%
TRIM
8%
BIPS
38%

Source FAIE Market Intelligence
INFORMATION DAYS

42 Information Days organized 2010-2015
1848 participants

STATISTICS ON F4E INDUSTRY PORTAL (END 2015)

1883 entities in F4E Industry Portal
% registrations per Country

F4E Industry Portal
Number of registered Entities

Source: F4E Market Intelligence
By the end of 2015

F4E has signed:

- 435 operational procurement contracts (72 in 2015)
- 123 grants (with Fusion associations) (9 in 2015)

⇒ for a total ~ 3.6 B€
Some statistics about contracts

Overview of managed Procurement files as per 31/10/2015

Contractors/Beneficiaries of F4E contracts/grants as per Geo-Distribution’ 15 (cut-off date 01.07.15)
Some statistics about contracts

Average Success Rate per country as per Geo-Distribution’ 15
(cut-off date 01.07.15)

REVISED F4E FINANCIAL REGULATION (FR)
AND IMPLEMENTING RULES (IR)

Background

• On 3 December 2015, the F4E Governing Board adopted a revised Financial Regulation (FR) and Implementing Rules (IR) to align with the new financial framework for EU bodies and institutions.

• The revised FR and IR will enter into force retroactively on 1 January 2016 once the Commission gives the official green light (expected in the coming days).

• However, the new procurement and grant rules will only enter into force on 1 June 2016. They apply to calls launched after that date. Ongoing contracts and grants remain unchanged.
Main Changes:

- More room for negotiations in procurement procedures:
  - Competitive procedure with negotiation becomes a standard procedure and can be used for procurements which are not “off the shelf”
  - Negotiated procedure allowed based on single tender for supplies/services for R&D purposes in ITER and Broader Approach context below 134 K EUR.
- More flexible conditions for modifying existing contracts without launching a new procurement procedure (amendments).
- Direct procurement contracts with ITER Organization, Domestic Agencies and F4E Host States are possible without prior procurement procedure.

Systems:

- Buildings
- Magnets
- Vacuum Vessel
- In-vessel components
- Remote Handling
- Cryoplant & Fuel Cycle
- Neutral beam and heating
- EC and IC heating systems
- Diagnostics
- Codac
- TBM

Dedicated presentations MIIFED16

I. Rodriguez (Wed. 15h30)
K. Smith (Wed. 9h00)
P. Lorenzetto (Wed. 11h30)
C. Damiani (Wed. 14h00)
A. Teissier (Wed. 10h30)
T. Bonicelli (Wed. 9h)
G. Counsell (Wed. 10h30)
F. Sartori (Wed. 11h30)
M. Ferrari (Wed. 15h30)
### MAIN EUROPEAN IN-KIND CONTRIBUTIONS TO ITER

#### Systems:
- **Buildings**
- **Magnets**
- **Vacuum Vessel**
- **In-vessel components**
- **Remote Handling**
- **Cryoplant & Fuel Cycle**
- **Neutral beam and heating**
- **EC and IC heating systems**
- **Diagnostics**
- **Codac**
- **TBM**

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- F. Sartori (Wed. 11h30)
- M. Ferrari (Wed. 15h30)

### CURRENT STATUS OF ITER WORKSITE

Construction progress is visible on a weekly basis
### OVERVIEW OF THE BUILDING TENDER BATCHES

<table>
<thead>
<tr>
<th>Situation on Building contracts in place</th>
<th>Contract Signature</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 TB00 – Tokamak complex pit, seismic isolation, slabs</td>
<td>signed</td>
<td>Completed</td>
</tr>
<tr>
<td>2 TB01 – site adaptation</td>
<td>signed</td>
<td>Completed</td>
</tr>
<tr>
<td>3 TB alpha – Galleries around Tokamak complex</td>
<td>signed</td>
<td>Completed</td>
</tr>
<tr>
<td>4 TB02 – Tokamak complex cranes</td>
<td>signed</td>
<td>Running</td>
</tr>
<tr>
<td>5 TB03 – Tokamak complex civil work &amp; finishing</td>
<td>signed</td>
<td>Running</td>
</tr>
<tr>
<td>6 TB04 – HVAC, Elec &amp; Fluid Networks</td>
<td>signed</td>
<td>Running</td>
</tr>
<tr>
<td>7 TB05 – 3 Buildings for Magnet PS and reactive power</td>
<td>signed</td>
<td>Running</td>
</tr>
<tr>
<td>8 TB06 – Electrical equipment (SSEN/PPEN)</td>
<td>signed</td>
<td>Running</td>
</tr>
<tr>
<td>9 TB07 – Buildings for cooling plants</td>
<td>signed</td>
<td>Running</td>
</tr>
<tr>
<td>10 TB16– Site infrastructure works</td>
<td>Signed end 2015</td>
<td>Starting</td>
</tr>
</tbody>
</table>

+ Architect Engineer, Support to the Owner, HSPC

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### TOKAMAK PIT & TRITIUM BUILDING

- Bioshield 3,5 m thick more than 400 kg of steel per m³
**DIAGNOSTIC BUILDING**

Level B1 columns preparation

Level B1 partition wall between Diagnostic and Tokamak buildings

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**CRYOPLANT BUILDING**

Foundations and galleries reinforcement works
Background:

Batching plant
750 T OVERHEAD CRANES

Manufacturing of TKM/ASS HALL crane at Asturfeito /NKM

BUILDINGS : OVERVIEW OF THE MAIN TENDERS IN 2016-2017

<table>
<thead>
<tr>
<th>Upcoming Contracts for the buildings</th>
<th>Launch CFT</th>
<th>Contract Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Buildings TB11 – Small finishing works : civil work adaptation, cladding adjustment, plumbing, small painting, …</td>
<td>Q2 2016</td>
<td>Q4 2016</td>
</tr>
<tr>
<td>2 Buildings TB13 – Emergency Power Supplies 1st stage : electrical distribution B44/B45/B46/B47</td>
<td>Q4 2016</td>
<td>Q2 2017</td>
</tr>
</tbody>
</table>
**MAGNETS**
**SUPERCONDUCTORS FOR TF AND PF**

<table>
<thead>
<tr>
<th>Conductor type</th>
<th>Km of conductor to be delivered</th>
<th>Km Fabricated so far</th>
<th>Completion [%]</th>
<th>Expected completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>TF</td>
<td>20</td>
<td>19.5</td>
<td>98</td>
<td>February 2016</td>
</tr>
<tr>
<td>PF</td>
<td>22</td>
<td>11</td>
<td>50</td>
<td>End 2016</td>
</tr>
</tbody>
</table>

**TF conductor:**
Diam. 43.7mm, 1400 Nb3Sn+Cu strands

**PF conductor**
1400 NbTi + Cu strands

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**EU TF COILS: MAIN STEPS FOR DOUBLE PANCAKES PRODUCTION**

- Winding of the conductor
- Heat treatment and transfer to radial plate
- Wrapping of turn insulation
- Double Pancake Completed
- Vacuum Pressure Impregnation
- Cover plates welding
# EU TF COILS: STATUS OF THE PRODUCTION

<table>
<thead>
<tr>
<th>Production of the Double Pancakes</th>
<th>EU</th>
</tr>
</thead>
<tbody>
<tr>
<td>DP Winding completed</td>
<td>40</td>
</tr>
<tr>
<td>Conductor inserted in RP after HT</td>
<td>33</td>
</tr>
<tr>
<td>DP cover plate welded</td>
<td>23</td>
</tr>
<tr>
<td>DP completed (impregnated)</td>
<td>12</td>
</tr>
</tbody>
</table>

Stacking of the 1st Winding Pack Completed!

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# POLOIDAL FIELD COILS PF2-6 PROCUREMENT

<table>
<thead>
<tr>
<th>Contracts</th>
<th>Call for tender Publication</th>
<th>Contract signature</th>
<th>Duration</th>
<th>Procurement procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering Integrator</td>
<td>Jan-2013</td>
<td>Aug-2013</td>
<td>6 years</td>
<td>Negotiated – Contract signed</td>
</tr>
<tr>
<td>Winding Tools</td>
<td>Jul-2013</td>
<td>Apr-2014</td>
<td>3 years</td>
<td>Negotiated – Contract signed</td>
</tr>
<tr>
<td>Site &amp; Infrastructure</td>
<td>May-2014</td>
<td>Nov-2014</td>
<td>5.5 years</td>
<td>Open – Contract signed</td>
</tr>
<tr>
<td>Impregnation and Additional Tools</td>
<td>September-2014</td>
<td>July-2015</td>
<td>5 years</td>
<td>Open – Contract signed</td>
</tr>
<tr>
<td>Cold Test facility</td>
<td>March-2015</td>
<td>February-2016</td>
<td>1.5 years</td>
<td>Restricted: Evaluation Completed</td>
</tr>
<tr>
<td>PF6 - ASIPP</td>
<td></td>
<td>Oct-2013</td>
<td>3 years</td>
<td>Co-operation Agreement signed</td>
</tr>
</tbody>
</table>

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Winding Tooling for PF5 in Cadarache

Winding Tooling for PF6 in ASIPP, China

Vacuum Vessel Manufacturing Progress

Lateral Mid-port machining

Industeele plate hot forming

Centering Key machined

Walter Tosto
**Vacuum Vessel Manufacturing Progress**

**Bending Forging T-Adaptor**

**Forging T-Adaptor after Bending**

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**Machining Forging T-Adaptor**

**Machined Forging T-Adaptor**

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Vacuum Vessel Manufacturing Progress

Fit-up T- Adaptor and Centering Key after bending/machining (first welding)

Walter Tosto

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Vacuum Vessel Manufacturing Progress

Machining of flexible housings (60/156 already completed)

Walter Tosto (Bucharest)

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Dimensional control of jigs for PS3 Sector 5

Machining Upper Toroidal T-RIB PS1  Left Side Module-1 PS4 Machining
Vacuum Vessel Manufacturing Progress

- All Material delivered for VV sector 5
- Machining on going
- Welding qualifications almost completed
- Materials for VV sector 4 and 3 ordered
- Manufacturing 7 sectors in parallel will be very challenging
  It requires increasing capacity
- VV sectors delivery on the critical path to First Plasma
In-Vessel Procurement Packages

- Blanket First Wall Procurement Package
- Blanket Cooling Manifold Procurement Package
  See presentation by Patrick Lorenzetto
- Divertor Cassette Body Procurement Package
- Installation of Divertor Cassette Plasma Facing Components
  See presentation by Patrick Lorenzetto
- Divertor Inner Vertical Target Procurement Package
- Divertor Rails
  > 2020.

ITER Blanket modules

440 shield blanket modules
FW surface: 680 m²
Blanket First Wall Design

ITER FW covered by 2 designs:
- Normal Heat Flux (NHF) (< 2 MW/m²)
- Enhanced Heat Flux (EHF) (< 4.7 MW/m²).

Total No. of NHF panels in European supply: 215

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ITER requires that the following two formal stages be passed by the DA's and industry prior to the start of series production:

**Stage 1. DA qualification phases**

- **Phase 1:** Validation of materials and bonding techniques through small-scale mock-ups manufacturing and High Heat Flux (HHF) testing.  
  - EU FW qualification mock-up after HHF test  
    - 240 mm (L) x 80 mm (w) x 81 mm (H)  
  - FW panel SP in the JUDITH2 test facility  
    - 630 mm (L) x 300 mm (w) x 150 mm (H)

- **Phase 2:** Manufacturing and HHF testing of FW semi-prototypes (SP).  

Manufacture small-scale and semi-prototypes

- >15 years R&D programme.  
- Hot Isostatic Pressing fabrication route selected by the EUDA for the manufacture of First Wall panels.  

- 316L SS / CuCrZr joining  
  - 1040 C, 140 MPa, 2 hrs  
  - Post HIP Solution Annealing HeatTreatment with fast cooling  
  - CuCrZr / Beryllium joining  
  - 580 C, 140 MPa, 2 hrs

- 4 FW semi-prototypes (630x300x150 mm) completed so far in the frame of Stage I of the pre-qualification programme.  
  - Two semi-prototypes by AREVA NP;  
  - One semi-prototype by IBERDROLA-AMEC-MIB consortium;  
  - One semi-prototype by Atmostat / Alcen.
Stage 2. Industrial pre-qualification phase

- Objective:
  Pre-qualify industrial companies (ITA C16TD169FE) with the manufacture and testing of full-scale FW prototypes.

- Status:
  On-going manufacturing of three full-scale FW prototypes by
  - Aicen-Atmostat,
  - Areva and
  - Iberdrola-Amec-MIB consortium.

  Completion expected by end of 2017.

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### ITER Divertor Procurement Sharing

<table>
<thead>
<tr>
<th>Divertor</th>
<th>Components</th>
<th>Credits kIU/k</th>
<th>Sharing</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>1: Cassette Body and Integration</td>
<td>10.88</td>
<td>EU</td>
</tr>
<tr>
<td>P2</td>
<td>2A: Outer Vertical Target</td>
<td>27.69</td>
<td>Japan</td>
</tr>
<tr>
<td></td>
<td>2B: Inner Vertical Target</td>
<td>19.62</td>
<td>EU</td>
</tr>
<tr>
<td></td>
<td>2C: Dome</td>
<td>14.57</td>
<td>Russia</td>
</tr>
<tr>
<td></td>
<td>2D: High Heat Flux Tests</td>
<td>8.0</td>
<td>Russia</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>80.76</td>
<td></td>
</tr>
</tbody>
</table>

The divertor procurement packages are "build to print"
Divertor cassette procurement package:
54 Cassette Assemblies (CA) as follows:

- 39 “Standard” Cassettes (w/o diagnostics/instrumentation) including 4 spares;
- 16 Diagnostic Cassettes;
- 3 Diagnostic Operational Instrumentation (DOI) Cassettes.

Three framework contracts awarded to the following companies:
- CNIM-SIMIC;
- Valkon Metalli (Hollming group);
- Walter Tosto.

Basis of the framework contract - full-scale prototype phase: March 2017;
Reopening of competition for the series production.

Several joining techniques are being developed in EU to bond the Tungsten monoblocks to the CuCrZr pipes:
- **Hot Radial Pressing** (HRPing);
- **Hot Isostatic Pressing** (HIPing);
- **Brazing** (furnace or inductive).
(1) Stage I - Technology Development and Validation

- Manufacture and testing of small-scale mock-ups (different W grades, different monoblock geometries).
- 3 pre-qualification prototypes completed.

Pre-qualif prototype fabricated by ANN-ENEA and tested at 10 MW/m² for 5000 cycles plus 1000 cycles at 20 MW/m².

Companies involved in Europe:
- Ansaldo Nucleare-ENEA,
- Atmostat-Alcen,
- CNIM-TPI,
- Research Instrument.

(2) Stage II - Full-scale demonstration:

On-going demonstration of the feasibility via full-scale prototype manufacturing and testing.

High heat flux testing programme for the full-scale prototypes:

- Plasma Facing Unit straight part
  - 5000 cycles at 10 MW/m²
  - 300 cycles at 20 MW/m²

- Plasma Facing Unit curved part
  - 5000 cycles at 5 MW/m²

Full-scale Plasma Facing Units produced by Ansaldo Nucleare - ENEA
**REMOTE HANDLING PROCUREMENT FOR SHORT TERM (2016-2017)**

- The 4 major procurements have been launched by means of 4 distinct framework contracts and will be pursued by placing specific contracts (Task Orders) to the awarded contractors within the 7-year contract duration:

- **Divertor RH System (on the top right):**
  
  Contract signed in April 2014 with Assystem UK (1st in cascade), preliminary design activities on going (3rd task order, to get to Preliminary Design Review, signed in December 2015)

- **Neutral Beam RH System (on the bottom right):**
  
  Contract signed with AMEC Foster Wheeler (1st in cascade), design preparatory activities on going (1st task order)

### Handling test on NB pipe tooling at RACE UK

### Handling test on cassette mock-ups at DTP2 Finland

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**REMOTE HANDLING PROCUREMENT FOR SHORT TERM (2016-2017)**

- In Vessel Viewing System:

  Contract signed with CNIM-Bertin in November 2015 (Tecnatome 2nd in cascade), design preparatory activities started (1st task order)

- **Cask and Plug RHS:**

  Tender evaluation completed, preparation to award decision underway

- **Engineering support contract in RH field (to replace the expired OMF 272):**

  OMF 633 has been tendered, awarded and signed in December 2015 with OTL
SPIDER (Source for Production of Ion of Deuterium Extracted from Radio frequency plasma)
MITICA (Megavolt ITER Injector & Concept Advancement)
**NBTF- Recent Pictures**

- SPIDER HV Deck
- SPIDER Transmission Line under Assembly
- SPIDER Ion Source Power Supplies installed inside HV Deck

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**NBTF- Recent Pictures**

- NBTF Cooling System (70 MW) under installation

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### NBTF CONTRACTS SUMMARY

**List of main NBTF Calls for Tender to be launched by F4E**

<table>
<thead>
<tr>
<th>Component</th>
<th>CfT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 MITICA SF6 Plant</td>
<td>CfT closed (Bids under evaluation)</td>
</tr>
<tr>
<td>2 MITICA Beam Source</td>
<td>CfT on-going (Deadline 4.3.2016)</td>
</tr>
<tr>
<td>3 MITICA Beam Line Components (Neutralizer, Calorimeter, RID)</td>
<td>2016 (Q4)</td>
</tr>
<tr>
<td>4 MITICA Cryopump</td>
<td>CfT under preparation (See A Teissier presentation)</td>
</tr>
<tr>
<td>5 MITICA Cryogenic Plant</td>
<td>Final stage of CfT on-going (See A Teissier presentation)</td>
</tr>
</tbody>
</table>

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**THE ITER HEATING NEUTRAL BEAM SYSTEM**

*All NB components (except VVPSS Box and bushing and the accelerator of HNB2) are procured by EU*
ITER HNB CONTRACTS SUMMARY

List of main HNB contracts for ITER to be launched by F4E (delivery Cadarache)

<table>
<thead>
<tr>
<th>Component</th>
<th>CfT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Beam Line Components (Neutralizer, Calorimeter, RID)</td>
<td>Under review</td>
</tr>
<tr>
<td>2 4 lots: Vessel (Beam Line + Beam Source), Drift Duct, Exit Scraper, Fast Shutter- All except Exit Scraper are SIC-1 (RCC-MR code)</td>
<td>Under review</td>
</tr>
<tr>
<td>3 Absolute Valve - SIC-1 (RCC-MR code)</td>
<td>Under review</td>
</tr>
<tr>
<td>4 ACC-Coils</td>
<td>Under review</td>
</tr>
<tr>
<td>5 Passive Magnetic Shielding</td>
<td>Under review</td>
</tr>
<tr>
<td>6 Beam Sources (included in FWC presently under CfT)</td>
<td>Under review</td>
</tr>
<tr>
<td>7 Assembly of HNB1 &amp; HNB2</td>
<td>Under review</td>
</tr>
</tbody>
</table>

Electron Cyclotron System
The EU gyrotron development programme

Design pre-validated in 2015

Short-pulse prototype at KIT tested by EGYC

- Nominal (stable) operating points found at HV and LV!
- Excellent agreement with simulations
- TEM00=98% (exceeding ITER specifications 95%)
- Gyrotron offers opportunities for >1MW output power!
The EU gyrotron development programme

Full design verification planned in 2016

- 1MW CW 170 GHz industrial prototype gyrotron based on the short-pulse: delivered in Nov-15, current under conditioning at the KIT gyrotron test stand

- Cryogen-free Superconductive Magnet for the CW gyrotron prototype (6.87 T at the cavity): Contract signed in 2015 → delivery planned in Autumn-16

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EC PS&S Contracts Summary

List of main EC Power Supplies and Sources Calls for Tender to be launched by F4E in a time scale to be defined

<table>
<thead>
<tr>
<th>#</th>
<th>Subsystem</th>
<th>CfT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Series production of Gyrotron tubes - (expected procedure: negotiated)</td>
<td>Under review</td>
</tr>
<tr>
<td>2</td>
<td>Series production of gyrotron superconducting magnets (cryogen-free)</td>
<td>Under review</td>
</tr>
<tr>
<td>3</td>
<td>Auxiliaries for the RF Sources (cooling manifold, supporting structures, control-command, etc.)</td>
<td>Under review</td>
</tr>
</tbody>
</table>
CONCLUSION

F4E has placed most of the large value contracts (> 100 M€).

F4E has now entered in a phase of placing many smaller value contracts (1 M€ to several 10 M€)

=> F4E activities are more and more oriented towards SMEs

F4E is still improving its procurement processes (new FR) and will communicate in the most efficient manner with industries. The F4E staff attending this MIIFED are available to inform, meet and discuss with industries and SMEs.

F4E management is working in very close contact with IO management towards a much stronger integration of the F4E and IO-CT teams in Cadarache.

Jean-Marc FILHOL - European procurement for ITER - MIIFED16, Monaco 9-Feb-2016