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ITER ORGANIZATION
2014 ANNUAL REPORT

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FEBRUARY
- ITER Council meets for an extraordinary session

APRIL
- Successful conclusion of final ITER Itinerary test
- Cryostat Workshop finalized

MAY
- First Open Doors event of the year
- Third edition, ITER Robots contest
- Two-day press event orgainized at Headquarters

JUNE
- Fourteenth ITER Council

AUGUST
- Tokamak Complex basemat: last concrete poured

SEPTEMBER
- First components delivered to ITER
- Fourth edition, ITER Games
- Headquarters extension completed (+300 desks)

OCTOBER
- Second Open Doors Day attracts 1,300
- 87 companies attend first Industrial Info Day

NOVEMBER
- Fifteenth ITER Council nominates new Director-General
- First concrete poured for Tokamak Complex walls

DECEMBER
- 90.5% Procurement Arrangements signed (in value)
- 95% of toroidal field Nb3Sn strand completed (497 tonnes)
- ITER receives 16,824 visitors in 2014

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The ITER Project is entering a new and decisive era. The time of "learning" is past, and we are now moving into the critical – and technically challenging – phases of intense manufacturing, delivery control, assembly and installation

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Manufacturing activities progress on the ITER cryostat in India. (Pictured: one of the six 60° segments of the cryostat base, tier 2.)
Photo: ITER India

FOREWORD FROM THE CHAIR OF THE ITER COUNCIL

Ten years ago this month, in June 2005, the ITER Members gathered at a ministerial-level meeting in Moscow to announce that a site for the ITER Project had been agreed upon. One of the world's largest collaborative efforts in science – aiming to prove the scientific and technological feasibility of fusion – would take shape on a site in southern France put forward by the European Union.

Now, ten years into this international and historic quest for clean energy, the project is fully engaged in component manufacturing and building construction. The first major components are already arriving at the ITER site.

I took up my duties as ITER Council Chair at the beginning of 2014 as the ITER Organization submitted an action plan for improved project management and oversight in response to the recommendations of the 2013 Management Assessment. These actions – which propose improvements in the organizational structure, the systems engineering process, project management methods, and the coordination between the central ITER Organization and the seven Domestic Agencies – are absolutely necessary to accompany the successful transition of the project from design completion to construction and assembly.

The ITER Council supports the direction the project is taking – it is clearly the right one – and is overseeing action implementation.

The project as a whole (the Central Team and each Domestic Agency) is now working to establish a revised technical baseline that is fully "owned" by all Members. This new baseline, which will cover all activities through the start of deuterium-tritium operation, must be credible and achievable, and will be instrumental in maintaining the confidence of our stakeholders in the seven ITER Members.

Leading this effort is the new Director-General of the ITER Organization, Bernard Bigot. Nominated at the Fifteenth meeting of the ITER Council in November 2014 on the basis of the recommendation of a search committee, he was confirmed at an extraordinary Council meeting on 5 March 2015.

The ITER Council places its full confidence in Director-General Bigot to lead the project forward with energy, professionalism and talent and supports the action plan that he has presented for the acceleration of the pace of project execution and the completion of the construction phase.

I'd like to conclude by saying that although we have still a long way to go, we are making progress and the pace of progress is accelerating. Hundreds of talented people – at the ITER Central Team and the ITER Domestic Agencies in the seven Members, in fusion laboratories around the world, and in industry – are working tirelessly for the success of fusion and the project.

Robert Iotti, Chair of the ITER Council
June 2015

Now, ten years into this international and historic quest for clean energy, the project is fully engaged in component manufacturing and building construction

FORWORD FROM
THE DIRECTOR-GENERAL

The floor of the Tokamak Complex, the B2 basemat, is poured in 15 segments over a nine-month period (December 2013 - August 2014).

FOREWORD FROM
THE DIRECTOR-GENERAL

The ITER Project is entering a new and decisive era. The time of "learning" is past, and we are now moving into the critical – and technically challenging – phases of intense manufacturing, delivery control, assembly and installation.

As the new ITER Director-General since 5 March 2015, it is my responsibility to implement the changes necessary to create the conditions for the effective and integrated management of the ITER Project during these important years. ITER is unique not only for its extremely challenging science and technology, but also for the complex in-kind procurement system which leaves the responsibility for procuring the components with the seven Domestic Agencies (under the tight cooperation and supervision of the ITER Organization). As such, it requires a new organization that is specifically tailored to the manufacturing, construction and assembly activities ahead.

The most important characteristic of the new organization is the profound integration of the ITER Organization Central Team and the seven Domestic Agencies. We must work together as a single entity in order to find solutions to existing schedule delays and to establish a definitive, robust baseline that is fully agreed upon by all the partners. The new organization must also strengthen the important functions of central integration (design, configuration, systems engineering); project control (monitoring and, more importantly, controlling and steering the project baseline); quality control, assessment and assurance; and safety (supporting the Director-General in his role of nuclear operator).

The action plan for the new phase of the ITER Project has been accepted by all Members and will be progressively implemented. It will require a real change in how we work and manage the project but – I can't emphasize this enough – the future performance of the project depends on this new integrated articulation between the Central Team and the Domestic Agencies. The key words are simplification, traceability and efficiency; all project stakeholders must act with mutual trust, project loyalty and team spirit.

Under the stewardship of my predecessor, Professor Osamu Motojima, construction began on the ITER platform, component manufacturing was launched in the industries of the seven ITER Members, and the ITER Organization became the first fusion installation in history to be licensed as a nuclear operator. In 2014 the basemat of the Tokamak Complex was finalized, a project highlight that crowns years of work to construct the seismic foundations of the machine and opens the way to the erection of the building that will house the ITER fusion experiments. I'd like to expressly thank Professor Motojima for his commitment and his unwavering dedication during his term as ITER Organization Director-General.

As we advance toward our common goal of building and operating the largest fusion research facility ever built, I look forward to working with the many capable people within ITER and in the wider fusion community of laboratories, research institutes and industries.

Let me reiterate my conviction that the development of fusion energy is not negotiable. If the world wants to quit its dependence on burning fossil fuels and the ever-rising greenhouse gas emissions that they cause, we have to deliver fusion energy to the grid as soon as we can.

Bernard Bigot
Saint Paul-lez-Durance, May 2015

EXECUTIVE
SUMMARY

The ITER construction platform in April 2014.
Photo: © LESENECHAL/PPV-AIX.COM

EXECUTIVE SUMMARY

Approximately 12 metres below the level of the construction platform, workers began in 2014 to frame out the lower walls of the Tokamak Complex, the seven-storey edifice that will house the ITER fusion machine and plant systems.

This milestone marks the end of the preparatory phase of the project, during which the site in southern France was readied for construction, the machine's anti-seismic foundations were set into place, and component and system designs were brought to a level of maturity that allowed procurement to begin.

Now, industrial activity in the ITER Members is transitioning from qualification activities to series production, and the first completed components have begun to arrive on site. In 2015, over 1,000 people will be involved in on-site construction and the first massive components will travel along the ITER Itinerary from the Mediterranean Sea to Saint Paul-lez-Durance. The ITER Organization is working today to prepare the resources, the tools and the strategy to manage the challenging tasks of assembly and installation.

Continuous and persistent delay in the achievement of schedule milestones continued to affect project execution in 2014. As part of actions to reverse the trend, the ITER Organization moved to address the complex issues of design maturity, systems engineering and configuration management in an integrated manner, to enhance the schedule control capability of the project as a whole, and to reinforce the collaboration with the ITER Domestic Agencies.

To lead the project as it enters a new phase, the ITER Council nominated Bernard Bigot, from France, to succeed Osamu Motojima as Director-General of the ITER Organization. The nomination, which took place during the November Council meeting, will be confirmed in early 2015.

ORGANIZATION

Emphasis on systems engineering

In 2014, the ITER Council convened for one extraordinary and two regular meetings at the ITER Headquarters under the chairmanship of Robert Iotti from the USA.

An extraordinary meeting on 13 February (IC-Ex/02.14) was held to review action plans proposed by the Director-General and the Council Preparatory Working Group (CPWG) in response to the recommendations of the third biennial ITER Management Assessment in 2013. The Council also met for its regular annual meetings on 18-19 June (IC-14) and 19-20 November (IC-15); the Management Advisory Committee (MAC), the Science and Technology Advisory Committee (STAC) and the Test Blanket Module Program Committee (TBM-PC) convened ahead of each meeting to provide support for strategic issues.

The first US-procured transformer for ITER's steady state electrical network arrives by ship. Early next year, it will be the first Highly Exceptional Load to travel along the ITER Itinerary.

In response to recommendations from the Management Assessment, the ITER Organization initiated a number of structural changes to align the Organization with the challenges of assembly and installation. Resources were reinforced in the area of systems engineering and integration, a division was created for configuration control and design completion, and the management of computer-aided design (CAD) contracts was overhauled. Systems engineering and CAD core teams were recruited within the framework of the Plant System Engineering Directorate, newly created as part of a System Engineering Group that associates the directorates for Plant System Engineering, Tokamak and Buildings & Site Infrastructure.

A new top body, replacing the ITER High-Level Coordination Team, was created to improve ITER Organization-Domestic Agency interaction in October. The ITER Chief Executive Team (ICET) has the authority to make decisions on critical schedule issues or barriers to project performance that impact multiple stakeholders. Week-long Unique ITER Team meetings continue to be scheduled regularly as an important forum for bilateral and multilateral exchanges on specific topics.

The External Management Advisory Board (EMAB) was formed in 2014 to advise the ITER Organization management on creating a project culture and enhancing project-wide nuclear safety culture. The Board also assesses the practical implementation of the Management Assessment response action plan.

ITER PROJECT BASELINE

Tracking project performance

The ITER Organization monitors project performance by tracking the achievement of schedule milestones, as reported monthly by the Domestic Agencies and the technical directorates, against the Annual Work Plan. Schedule performance for critical milestones degraded further mid-year and was particularly serious in two areas: the fabrication of the vacuum vessel and the construction of buildings. Continuous and increasing schedule delays, despite efforts to implement corrective measures, are the biggest challenge that the project is facing.

In parallel to its superintendence of the 2014 Annual Work Plan, the ITER Organization began work to develop a credible and technically feasible project schedule up to deuterium-tritium operation. The ITER Organization worked in collaboration with the Domestic Agencies to assess design maturity and systems integration and to identify potential risks to the schedule. An Updated Long-Term Schedule – the new ITER Baseline – will be submitted to the ITER Council in 2015 after the independent assessment of an expert group.

The ITER Organization continues to seek savings within its annual and lifecycle budgets in order to augment the funds in the IO Reserve. Earned value management (EVM) will be introduced in the next budget cycle for ITER Organization work scope to provide a link between schedule performance and cost.

CONSTRUCTION

A new phase begins

Four years of work on the ITER platform to create a ground support structure and seismic protection system for the Tokamak Complex were brought to an end in August with the completion of the B2 slab, the basemat that will support the machine and systems. This major project milestone now opens the way for a new phase in ITER construction – erection of the seven-storey Tokamak Complex. Work began in November on the lowest-level B2 walls.

The management of the first in-kind components of the ITER assembly phase kicked off with deliveries of electrical components for the ITER plant in September. A material management system is now in place and three light-frame storage facilities have been erected. A more permanent warehouse facility and logistics platform is also planned; the contract was signed and work started in 2014 to prepare the site and the access roads. After an ultimate convoy test, the ITER Itinerary for component transport was declared ready to receive the first HEL loads (Highly Exceptional Loads) in 2015. In parallel, the ITER Organization approved a full set of management plans that detail the preparation and execution of site assembly and installation.

Work was finalized on the Cryostat Workshop and on the 35-metre extension to ITER Headquarters that increases the building's capacity to approximately 800 staff. The installation of the steel superstructure of the Assembly Building began in October. Construction will start on a number of auxiliary buildings in 2015.

LICENSING

Understanding and applying nuclear safety and quality requirements

As a licensed nuclear installation in France, ITER is subject to regular inspection by the French Nuclear Safety Authority (ASN). In 2014, ASN carried out five on-site inspections and one in-factory inspection, where particular attention was paid to the management of the supply chain and the propagation of safety and quality requirements. An ASN hold point on the central, most technically challenging portion of the B2 slab was lifted in July after intensive exchanges to demonstrate the robustness of the design. The President of the ASN was invited to address the Fifteenth Meeting of the ITER Council in November to explain the mission, responsibilities and expectations of the French Nuclear Safety Authority to the delegates of the ITER Members.

In the last months of 2014, five tall cranes are installed in and around the Tokamak Pit to prepare for the start of wall construction.

EXECUTIVE SUMMARY

During a five-year campaign to produce niobium-tin (Nb35n) strand for the toroidal field magnets, eight suppliers in six ITER Members produced 497 tonnes of material – or 95% of the required lengths. (Pictured, a facility in Europe.) *Photo: F4E*

The ITER Organization continued to interact with the Local Commission for Information (CLI), which is the project's interface with the local population on questions of nuclear safety, radioprotection and the installation's impact on personnel and the environment. A public meeting was held in July on the subject of worker conditions on the ITER site and the planned arrival of a large construction workforce; this meeting was the occasion for the ITER Organization, Agence Iter France and the construction consortiums to present the facts directly to the public.

PROCUREMENT ARRANGEMENTS

Nine-tenths concluded

Ninety percent of allocated work scope for ITER construction has now been signed over to the Domestic Agencies. The ITER Organization concluded six Procurement Arrangements in 2014 for procurements related to the blanket system, some diagnostics, and electron cyclotron heating (bringing the total to 104) as well as six Complementary Diagnostic Arrangements. The applicable documents relative to each work package – back to the first signatures in 2007 – were aligned during the year with current versions of ITER Organization procedures, plans and policies. Procedures were also simplified for both in-cash and in-kind procurement processes in 2014.

MANUFACTURING

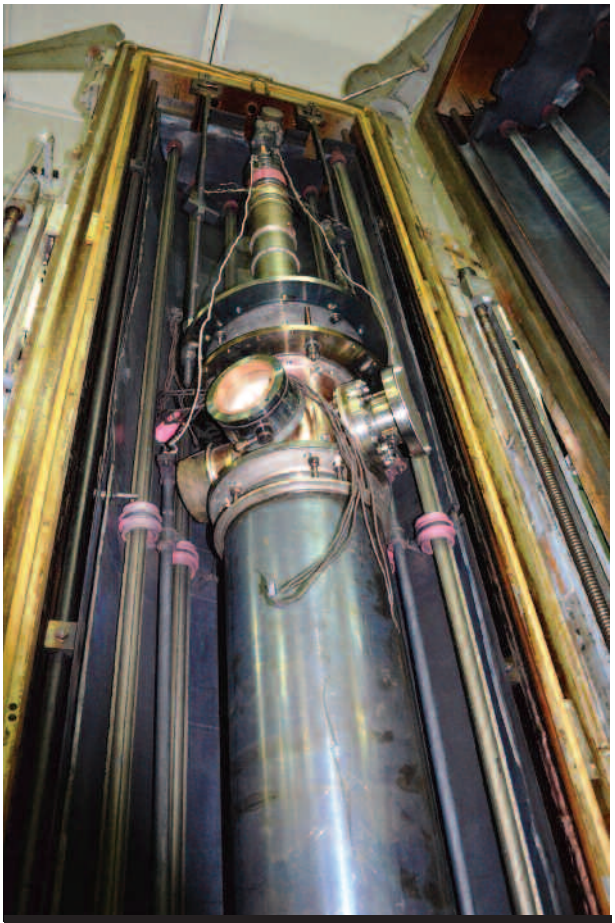
In the hands of industry

Manufacturing or pre-manufacturing activities are underway on a large number of ITER components and plant systems. The longest-lead procurement program – for the ITER toroidal field magnets – shifted focus in 2014 to coil production as 95 percent of superconducting strand and 71 percent of conductor unit lengths have now been completed. Double pancake series production started in Europe and qualification activities on the coil structures advanced in Europe and Japan. Mockup fabrication to validate manufacturing processes and tooling is underway for the poloidal field coils, the central solenoid, the correction coils and the magnet feeders. Manufacturing has also started on all coil power supply components.

The first segments of the ITER cryostat came off the production line in India, following the successful realization of full-scale mockups. Successful milestones were also recorded in the development of ITER's cryoplant and cooling water systems. Two of five Tokamak Cooling Water System drain tanks were completed in the US, and India launched the fabrication of buried piping for the component cooling water, chilled water and heat rejection systems.

Europe manufactured the cryopanels and the thermal shields for the pre-production cryopump, successfully validating manufacturing processes. Many of the sub-components are also ready to be integrated into the main assemblies. The US tested two concepts for mechanical roughing pumps during the year and has manufactured a full-scale cryogenic prototype. The first components for the steady state electrical network (SSEN) were shipped from the US to ITER.

Korea, which is responsible for the fabrication of two vacuum vessel sectors, has produced parts of sector 6 and launched activities on sector 1 despite delays in the qualification process; progress was stalled in Europe, however, due to technical difficulties. This priority activity will be the subject of an intensive recovery program in 2015. A full-scale prototype of the vacuum vessel thermal shield was successfully completed in Korea where a new facility was also inaugurated for fabrication and final assembly. In-wall shielding plates and blocks have entered production in India, and Europe successfully manufactured a 1:6-scale prototype for the blanket's normal heat flux first-wall panels.



Twenty-four powerful heat-generating units like these will inject microwave beams to heat the ITER plasma and drive plasma current. Called gyrotrons, they are in an advanced stage of development in Russia (pictured), Europe, Japan and India. *Photo: ITER Russia*

In Korea, work is underway on prototype segments of vacuum vessel thermal shielding. *Photo: ITER Korea*

R&D

Demonstrating ITER technologies

Worldwide research and development (R&D) continued in 2014 on plasma-facing components as part of the ITER tungsten divertor strategy. The physics case for the surface shaping of tungsten monoblocks is advancing on the basis of dedicated experiments and simulations; prototypes were evaluated at the Divertor Test Facility in Russia; and a characterization program was initiated to better assess the failure modes of tungsten material. A final demonstration of divertor cassette remote handling was achieved in October at the Divertor Test Platform in Finland.

The strategy for disruption mitigation in ITER was refined in 2014, as shattered pellet injection was chosen as the baseline technique during a system-level design review. The US is testing prototype components for shattered pellet injection, while at the same time maintaining R&D on a second technique, massive gas injection.

Several years of R&D activity on in-vessel coils for plasma vertical stability and Edge Localized Mode (ELM) control concluded with the completion of full-size prototypes. Technical issues with brazing remain and an alternative design is under investigation.

The buildings of the Neutral Beam Test Facility were finalized in 2014 and work will start next year to integrate the components of the negative ion source testbed, SPIDER. R&D milestones in 2014 for the ion cyclotron heating system included successful high heat flux tests on mockup Faraday shield elements in Europe, the development of part of the high power amplifiers in India, and the testing of transmission line components in ITER-relevant conditions in the US. Manufacturing is set to start on the high voltage power supplies in Europe for the electron cyclotron system following the completion of the final design.

Several test components for safety-important diagnostic viewing windows were developed in 2014 and significant experimental results were achieved in the investigation of cleaning techniques for inaccessible mirrors. A series of gasket tests was carried out for the Port Plug Test Facility, in Russia, that will test the upper and equatorial port plugs before their installation.

FINANCE

Guaranteeing rigorous financial management

Fully 87 percent of the commitments and 84 percent of the payments planned for the year were effectively executed. The link between budgets and schedules was strengthened to improve budgetary planning and new tools to facilitate European value added tax (VAT) procedures for deliveries from the Domestic Agencies were successfully implemented.

The spring audit of the Financial Audit Board, comprising experts from the seven ITER Members, led to the certification of the accounts, an unqualified audit report, and a management letter. The Financial Audit Board recognized improvements in the areas of accountability and transparency in financial management, contract administration, and budgetary controls. The Board returned in September to conduct an on-site audit of the semi-annual trial balance, treasury management, remuneration, budget execution and the detailed testing of cash commitments.

Savings negotiated in the areas of specialized external services and large contracts contributed to the transfer of EUR 8.3 million to the IO Reserve in 2014.

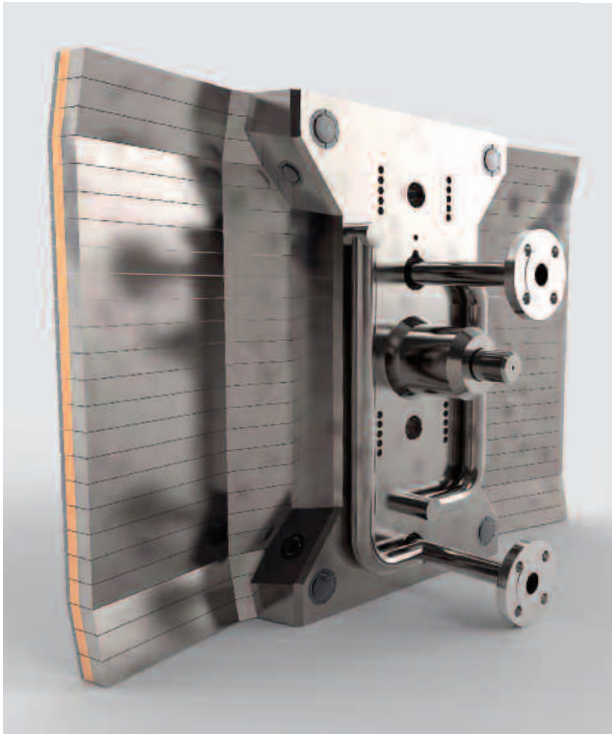
The final total of commitment appropriations for 2014 was EUR 233.4 million (including EUR 13.1 million in the IO Reserve) to which EUR 11.8 million of de-commitment from previous years' contracts was added and against which commitments of EUR 201.5 million were made, leaving a balance of unused commitment appropriations of EUR 43.7 million to be carried forward to 2015. The payment appropriations for 2014 were EUR 280.3 million (including EUR 45.7 million in the IO Reserve). Of this, EUR 197.1 million was paid, leaving a balance of unused payment appropriations of EUR 83.2 million (see Financial Tables).

STAFFING

Staffing for construction and assembly

As a result of 129 appointments and 44 departures during the year, on 31 December 2014 the ITER Organization employed 609 staff members (see Staffing Tables). The marked increase in staff numbers (+18 percent) is attributable, in part, to the recruitment of 54 CAD designers beyond the staff cap in order to form a core CAD (computer-aided design) team. The number also includes 6 postdoctoral researchers funded under the Monaco-ITER Partnership Arrangement and 16 staff funded by the US Domestic Agency for work on the Tokamak Cooling Water System. Thirty visiting researchers from the Domestic Agencies, 23 student interns, and 80 experts also joined the ITER Organization in 2014. A fourth recruitment campaign for Monaco Fellows was conducted during the year for appointments beginning in 2015.

In an important milestone for staff relations at ITER, the Director-General officially recognized the creation of the ITER Staff Association (ISA) in September. The ISA governing board is the Staff Committee, which is elected annually to represent staff in dialogue with ITER Organization management. A new status – ITER Emeritus Fellow – was created in 2014 for former members of management who have made substantial contributions to the ITER Project.



Qualification activities are advancing in Europe on the plasma-facing elements of the ITER blanket with the manufacturing of full-scale prototypes. The first-wall panels (pictured) will sustain some of the highest heat flux from the plasma.

The president of the European Commission, José Manuel Barroso (centre), visits ITER in July 2014.

EXTERNAL RELATIONS

Promoting worldwide connections

Since 2008, the ITER Organization has signed 39 Memorandums of Understanding or agreements for technical cooperation, including 17 with ITER Member universities. In 2014, Memorandums of Understanding were concluded with the Politecnico di Milano (Italy); Université Aix-Marseille and the Ecole Centrale Marseille (France); Universidad Carlos III de Madrid (Spain); Kyoto University (Japan); and Ghent University (Belgium).

The first ITER Business Forum (IBF/14) to take place in Asia was held in July in Korea. This international business forum, which was launched in 2007, answers to the strong demand from industry for information on ITER procurement opportunities. An industrial information day at the biennial Symposium on Fusion Technology (SOFT) in October also attracted a large number of companies.

Close to 17,000 people visited the ITER construction site in 2014, including several thousand in the context of two Open Doors Day events. In July, the Organization welcomed European Commission President José Manuel Barroso, who visited ITER accompanied by French Secretary for Higher Education and Research Geneviève Fioraso as part of a tour of strategic projects in Europe aimed at fighting climate change. Special programs were organized for international journalists and camera teams, including a two-day press event in May.

The third ITER Robots contest was held for secondary school teams in conjunction with Agence Iter France, the Académie d'Aix-Marseille and the Magnetic Fusion Research Institute (IRFM); in this annual contest, students pit their Lego robots against an ITER-like remote maintenance task. In another outreach event, the fourth edition of the ITER Games teamed participants from local sports clubs with ITER staff and contractors in a number of sporting events. Finally, a three-month general-public exhibition on ITER ran at the French Cité des Sciences et Industrie in Paris.

BY DEPARTMENT

In China, double-torch automatic MIG welding trials are carried out on full-scale prototypes of magnet feeder system components.
Photo: ITER China

2014 HIGHLIGHTS
BY DEPARTMENT

OFFICE OF THE DIRECTOR-GENERAL (ODG)

The Office of the Director-General is responsible for ensuring the timely, informed and smooth decision making of the ITER Director-General in strategic planning activities. The Office facilitates communication with ITER Member Heads of Delegation by organizing the Director-General's mission calendar and the meetings of the ITER Chief Executive Team. It is also charged with maintaining external relations, including relations with the Host State and local government; developing and maintaining a comprehensive communication strategy; and interfacing with the ITER Council.

Following Council approval in February of a detailed ITER Organization action plan to address the recommendations of the third biennial management assessment, and its recommendations for further action, ODG supported the implementation of managerial and organizational reforms. Approximately 30 actions were initiated and tracked through specific success indicators, and progress was reported to the ITER Council and advisory boards.

The Office supported the Director-General in his engagements to represent the ITER Project to the seven ITER Members and at international events such as the International Atomic Energy Agency (IAEA) Fusion Energy Conference in October. At the ITER Headquarters, ODG managed Unique ITER Team weeks as well as the regular Chief Executive Team and ITER Organization Project Board meetings. The Office was also represented at meetings of the international advisory committee for the Provence-Alpes-Côte d'Azur International School in Manosque, where 51 percent of the 609 students attending in 2014 were from ITER families.

Communication & External Relations fielded media requests throughout the year and prepared one- or two-day programs for journalists and camera teams who travelled to the site. In May, a dedicated press event attracted 40 journalists from 15 countries; this successful event will be repeated in 2015. The on-line publication *Newsline* continued to diffuse the latest project news once per week; *ITER le Magazine*, for the general public, was published five times during the year in French and translated into the ITER languages Chinese, English, Hindi, Japanese, Korean and Russian.

In the face of strong demand the ITER Organization now organizes two Open Doors Day events during the year; since 2007 close to 84,000 people have visited the ITER worksite, including nearly 17,000 in 2014. The ITER visits team collaborates with Agence Iter France and the European Domestic Agency to offer visitors – whether scientists, foreign officials, school children, industry representatives or members of the public – a program adapted to their needs.

Close to 84,000 people have visited the ITER site since land clearing began, including nearly 17,000 in 2014.

The ITER Organization worked with the Domestic Agencies in 2014 to publish a photo book in June that spotlighted progress in construction and manufacturing. A second six-minute video on ITER assembly was also released during the year, describing in-vessel component assembly. Work on the all-new ITER website is progressing and the entirely revamped and modernized site will be released in 2015.

LEGAL AFFAIRS (LGA)

Legal Affairs advises the Director-General, the departments and the governing bodies of the ITER Organization. In 2014, Legal Affairs was involved in governance issues and international labour law; the interpretation of ITER constitutive agreements; and support for the Test Blanket Module (TBM) Program, notably in relation to the finalization of the Specific TBM Arrangements and as a participant in the TBM radwaste working group. In parallel, it continued to manage the nuclear liability issues with the Members and ongoing negotiations with the Nuclear Energy Agency concerning the inclusion of ITER in the Paris Convention.

Legal Affairs was responsible for drafting agreements, license agreements and Memorandums of Understanding

on international scientific collaboration with institutes of the ITER Members. The Office accompanied ITER construction by leading negotiations on the necessary notarial deeds and site agreements and by providing support in relation to administrative authorizations such as building permits. Legal Affairs also advised on the French laws and regulations to be observed by the ITER Organization in application of Article 14 of the ITER Agreement and interfaced with French authorities on these issues, in particular concerning working conditions on the construction platform.

To protect ITER Organization interests, the legal team managed pre-litigation and litigation cases and most insurance policies. It also provided advice on the implementation of privileges and immunities, contractor work permits, value added tax (VAT) exemption, and customs.

In order to raise staff awareness on the legal framework of the ITER Organization, Legal Affairs conducted trainings on the specific status of international civil servants and on intellectual property. A legal portal was made available on the ITER intranet for access to all legal information and reference documents, and a similar portal is planned for the public website.

Legal Affairs continued to manage intellectual property (IP) issues in 2014, coordinating the implementation of the IP legal framework within the ITER Organization through the IP Board as well as advising line management and technical responsible officers on IP issues such as publications, contracts, Procurement Arrangements, non-disclosure agreements and communication. Significant developments were recorded in the coordination and management of IP issues with Domestic Agencies, in particular the interpretation of the IP rules of the ITER Organization. The sixth Intellectual Property Contact Persons Meeting took place at ITER in October.

The maritime leg of the ITER Itinerary – four hours of barge transport across inland waterways – is successfully staged in April, opening the way for the transport of the first large components in 2015.

INTERNAL AUDIT (IAS)

The work of the Internal Audit service is aligned to the business goals and objectives of the ITER Organization and audits are conducted according to a comprehensive risk-based plan that is updated periodically. In 2014, IAS carried out an audit of the amendments to Task Agreements and the report was submitted to the Management Advisory Committee. Other important topics of audit during the year included the intellectual property process, the Management and Quality Program (MQP), the purchase of software and licenses, and an account of in-kind transactions for the Financial Statements. It also performed advisory services as requested periodically by management.

> Since 2007 close to 84,000 people have visited the ITER worksite, including nearly 17,000 in 2014

IAS also followed up on the implementation status of its recommendations; a large number were addressed and implemented during the reporting period by line management. An annual risk assessment exercise that had culminated in a three-year rolling audit plan for the Organization was carried out at the end of the year and the results were also furnished to Financial Audit Board.

ITER COUNCIL SECRETARIAT (ICS)

The ITER Council Secretariat supports the activities of the ITER Council and its subsidiary bodies such as the Management Advisory Committee (MAC) and the Council Preparatory Working Group (CPWG) in accordance with the Rules of Procedure of the ITER Council. In 2014, the ITER Council met for an Extraordinary Meeting in February, for its Fourteenth Meeting in June and its Fifteenth Meeting in November. The Management Advisory Committee met twice: in May (MAC-17) and in October (MAC-18). ICS also supported the Financial Audit Board in relation to its 2014 financial audit activities.

In response to recommendations from the 2013 ITER Management Assessment, the CPWG proposed a number of actions aiming to improve the functioning of the ITER Council and the governance of the project. Among the actions implemented since IC-14, prioritization of the items on the meeting agenda – through the compilation of routine or non-controversial items for "en bloc" approval or noting – now allows the Council to focus its discussion on issues of critical importance. In parallel, a new professional staff position was created in ICS in order to support the strengthening of the ITER Council.

DEPARTMENT FOR ITER PROJECT (DIP)

The Department for ITER Project comprises the six technical directorates that are responsible for the construction of the ITER installation. The Department's objective is the timely construction of ITER within the given budgetary framework and in strict respect of all safety regulations.

The Department spearheads the technical directorates by coordinating their work and securing overall technical integration. DIP reports regularly to the Director-General, interfaces with the ITER Domestic Agencies, and at all times tracks cost-saving and cost-containment solutions within its directorates.

In 2014, a dedicated division for configuration control was created to report directly to the Department for ITER Project. A Systems Engineering Group (SEG) was also organized within DIP under the authority of the Chief Executive Engineer, incorporating the directorates for Tokamak, Plant System Engineering and Building & Site Infrastructure. Its goal is to eliminate further delay due to systems integration and safety performance and to accelerate component manufacturing.

CONFIGURATION CONTROL DIVISION (CCD)

In 2014 the Configuration Control Division focused on activities related to configuration management and progress toward freezing the design of the ITER systems. An action plan endorsed by the ITER Council was launched to reinforce the systems engineering culture at the ITER Organization and to implement a common, up-to-date and consistent configuration across the project.

The careful management of design reviews, Project Change Requests and Project Requirements resulted in a significant decrease in the number of proposed changes compared to the previous year and a faster processing time. An effort to validate and control the propagation (flow down) of safety requirements to the design solutions was undertaken in collaboration with the Nuclear Safety, Licensing & Environmental Protection Division.

To strengthen the existing configuration management process as well as clarify procedures and work instructions throughout the ITER Organization, Domestic Agencies and suppliers, a configuration management task force was launched. The Division is also developing a proposal for the stepwise implementation of a product life management (PLM) tool for the ITER Project; this PLM would provide a management system to follow the progress of the design plan and document-based configuration, to improve the change management process, and to support integration of all project design activities.

A systems maturity evaluation working group was created during the year to define the system maturity indicators for the project and to provide periodic reports on maturity status and progress. Within this framework, the Configuration Control Division led work related to the development of design plans by plant system and the establishment of procedures for related design verification.

On a November evening, work continues in the Tokamak Pit. Foundations are in place and work has begun on the walls of the building that will house fusion experiments.

DIRECTORATE FOR PROJECT CONTROL & ASSEMBLY (PCA)

The Directorate for Project Control & Assembly assures the coordinated direction of project controls and construction management. It manages the ITER schedule, monitors schedule delay and recovery actions, performs risk analysis, and drives assembly and installation activities. In 2014, the Maintenance & Remote Handling Section was transferred to the Plant System Engineering Directorate.

Beginning in 2014, the project-wide Annual Work Plan was the principal tool for measuring and managing monthly progress toward project construction. High-level Strategic Management Plan milestones (the most critical for schedule achievement) were tracked monthly alongside system-level milestones to provide a metric to the ITER Organization and Domestic Agencies on project performance.

The Project Controls Division concentrated on the implementation of the Annual Work Plan and – based on its experience in developing and monitoring the 2014 Plan – commenced work on the 2015 Annual Work Plan and the Updated Long-Term Project Schedule.

Aggressive (deterministic approach) and confidence (probabilistic approach) target dates were set for all milestones, reflecting the different approaches to risk in the ITER Members. Through monthly Project Performance Review meetings, the Division reviewed schedule

performance and proactively monitored forecasts so that actions to avoid or mitigate delay could be taken. Schedule performance for critical milestones degraded further against confidence targets in the middle of the year and was particularly low for the vacuum vessel (36 percent achievement) and the buildings (48 percent achievement). In contrast, non-critical systems performed at the level of the 2014 confidence target.

The ITER Organization and the Domestic Agencies, as the Unique ITER Team, worked to implement detailed corrective actions to stop the schedule slippage in critical systems. In October, a project-wide scheduling workshop was held with the participation of ITER Organization and Domestic Agency management, technical teams and schedulers.

The development of an updated long-term schedule proceeded according to plan in 2014 and a common, probabilistic approach to integrating risk was decided. The work will be carried out in three phases: the verification of logic ties between all activities (particularly the delivery plan, machine assembly schedule and plant installation schedule); the resource-loading of ITER Organization activities; and the confrontation of the resulting project-wide resource-loaded schedule against actual resources. The Updated Long-Term Schedule will be submitted for review by the ITER Council in 2015 after the independent assessment of an expert group.

> In 2014, the project-wide Annual Work Plan was the principal tool for measuring and managing monthly progress toward project construction

In complement to the Annual Work Plan, earned value management (EVM) will be introduced next year for ITER Organization work scope. This tool, implemented through collaboration between Project Controls and Finance & Budget, will provide a link between schedule performance and cost for improved management visibility.

During 2014, the Assembly & Operations Division developed a complete set of management plans to describe how the site assembly and installation of the Tokamak and plant will be prepared and executed. Among other topics, the plans address safety management, work coordination, and the way in which integrated teams (construction staff plus engineering staff from the ITER Organization and the Domestic Agencies) will be established for the planning, supervision and surveillance of the works. On the request of the ITER Council, the Division is benchmarking the ITER Organization approach to assembly and installation against other large projects; this comparison of different strategies for construction management will be the object of a report to Council in 2015.

To support the elaboration of a long-term schedule for assembly and installation, a new work breakdown structure (WBS) was created to cover all site works. Through close interaction with the technical directorates, each construction work package was detailed in construction process descriptions; in 2014 over half of these documents were completed (90 percent for critical-path activities). The process descriptions will be further elaborated to include all required technical information for detailed execution planning by the contractors.

Based on these inputs, a new assembly and installation schedule was integrated in October with detailed work schedules for system design and procurement. An intense optimization period followed, during which the Division sought to identify time-saving opportunities (work in parallel, simplified processes). This led to a complete and optimized integrated lifecycle schedule for the ITER Project that defines the need dates for all components.

Technical work underpinning the planning and scheduling effort continued in 2014. The development and qualification of the detailed processes and tools for on-site vacuum vessel welding is nearing completion and several mockups have been built to confirm and qualify the most challenging assembly activities. A Final Design Review was held in December for 21 assembly tools (a sub-group of the 128 special-purpose tools that will be supplied by the Korean Domestic Agency).

Assembly & Operations successfully implemented Intergraph SmartPlant® Materials in time for the delivery of the first components in September and completed its integration into the ITER data management system SAP. This tool will fully interface with the construction planning system, SmartPlant® Construction, scheduled for rollout in 2015.

In the last five years, the Chepetsky Mecanical Plant (Udmurtia, Russia) has produced 100 tonnes of niobium-tin (Nb3Sn) strand and 125 tons of niobium-titanium (NbTi) strand for ITER magnets. *Photo: ITER Russia*

In Japan, final helium tests are carried out on spooled 760-metre conductor unit lengths for ITER's toroidal field coils. *Photo: ITER Japan*

The commissioning schedule, which describes the period between the completion of assembly and machine operation, was re-evaluated by the Commissioning & Operations Section in 2014. Work is also underway on a plan for operations, which will describe the operation of the ITER machine in detail. A final design review was held for the site access control system.

DIRECTORATE FOR CODAC, HEATING & DIAGNOSTICS (CHD)

The Directorate for CODAC, Heating & Diagnostics has responsibility for three systems essential to the correct and safe operation of the ITER Tokamak and the execution of the ITER physics program: control, data access and communication (CODAC), which gathers and analyzes data and sends signals to other Tokamak systems in order to control the plasma; diagnostic systems, which measure and allow optimization of the plasma performance; and heating and current drive systems, which add heat and current to the plasma so that fusion conditions can be initiated and maintained.

The main challenge of the Control System Division in the years to come will be to integrate 200 local plant control systems, supplied within the scope of procurement packages, into a coherent whole.

Good progress was made in 2014. The first CODAC final design review in March targeted plant control system interfaces and infrastructure, an intermediate review was held for the central interlock system for machine protection in June, and the central safety system is ready for the review of its preliminary design in early 2015.

Because of its safety function – ensuring that people and the environment are protected from radiation – the central safety system is subject to nuclear licensing. In the face of a wide number of interfaces, cross-discipline coordinating boards were set up during the year for machine protection, nuclear safety and occupational safety. These boards, among other tasks, consolidate the definition, specification and allocation of functions.

The Division optimized the build-to-print design for the site network infrastructure, including hundreds of kilometres of fibre optics and copper cables as well as myriad cubicles and network access points. A call for tender for supply and installation will be launched in time for the installation work to start as soon as the first buildings and service trenches are ready.

A joint team from the Magnet and Control System divisions developed a control system for the high temperature superconductor (HTS) current lead test bench at the Institute of Plasma Physics, Chinese Academy of Sciences (ASIPP). Its successful commissioning in July was the occasion to validate the hardware and software solutions chosen to build the ITER CODAC and the central interlock systems. Two more versions of the conventional software package CODAC Core System were released and training sessions were organized at ITER and at three Domestic Agencies. In December, a technical user meeting brought together 155 participants involved in the design and manufacturing of plant system instrumentation and control (I&C) from all ITER Members.

Nine diagnostic signatures were achieved in 2014: a Procurement Arrangement with Europe for the In-Vessel Viewing System; fifth- and sixth-round diagnostics Procurement Arrangement signatures with the US; and six Complementary Diagnostic Procurement Arrangements. Three Domestic Agencies have now completed arrangements to cover their full diagnostic scope – Korea in 2013 and China and the US in 2014.

Strong progress was recorded in the development of diagnostic systems and components. Contracts to integrate equatorial ports 11 and 12 were launched with Russia and China respectively; the diagnostic first wall progressed to its final design review in December; several test components for safety-important viewing window components were developed; and significant experimental results were achieved in the investigation of cleaning techniques for inaccessible diagnostic mirrors that, in particular, tested the effect of magnetic field.

An effort to streamline the development of common diagnostic items, particularly safety-important items, led to a proposed outline for cost sharing. The Division also updated requirements for dust and erosion during the year to reflect the new context of ITER's all-tungsten divertor, in which deposition is expected to play a more significant role than erosion. Finally, good progress was

Strong progress was recorded in the development of diagnostic systems and components

made with the in-vessel diagnostic wiring system despite the challenges of space constraints, interfaces, parasitic effects due to neutrons, and heat loading; the good performance of this system will be essential to transporting diagnostic signals from inside the machine.

In Russia, a series of gasket tests was carried out for the Port Plug Test Facility that will enable the verification of the upper and equatorial port plugs before installation.

The buildings of the Neutral Beam Test Facility (NBTF) in Italy were finalized in 2014 and are ready for occupation. All of the components of the negative ion source testbed SPIDER are in fabrication: factory acceptance tests were successfully held in Europe for the vacuum vessel and the ion source and extraction grid power supply, and India delivered the very first component – the SPIDER beamdump – in December.

For MITICA, which will test the full-size ITER heating neutral beam injector, all of the build-to-print mechanical components reached the final design stage and procurement has been launched in Europe. Progress was also reported for the diagnostic neutral beam: the building is ready in India, prototyping activity has ended for the beam source, the acceleration grid power supply tender has been launched, and the system integration review for beamline components was completed.

The ITER Organization signed the Procurement Arrangement for the Electron Cyclotron Plant Controller in December with Europe following a successful conceptual design review. The final design of the electron cyclotron high voltage power supplies was completed, opening the way for the manufacturing of the eight sets of power supplies under European responsibility, and a contract was concluded for the safety important component (SIC) qualification of the diamond window design.

For the ion cyclotron system, the preliminary design of the plant controller was approved in March; high heat flux tests were successfully performed on mockup Faraday shield elements in Europe; and part of the high power amplifiers in the ion cyclotron radio frequency range were developed in India. High power transmission line components were tested in relevant conditions on a dedicated multifunction test stand in the US while, in Europe, a task was launched for the design activities of the ion cyclotron antenna.

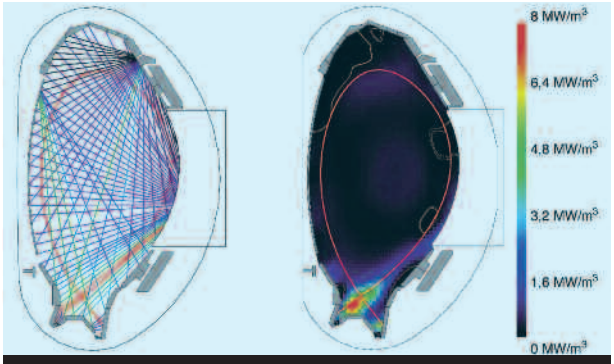
DIRECTORATE FOR PLASMA OPERATION (POP)

The Directorate for Plasma Operation supports ITER construction and operation in all matters related to physics performance projection and plasma control requirements, the assessment of plasma-related specifications for engineering systems, and the coordinated implementation of the Test Blanket Module Program.

The worldwide plasma physics community continued to be active in 2014 in support of the ITER physics basis. Through the International Tokamak Physics Activity (ITPA), which operates under the auspices of ITER, progress was achieved in many issues essential to ITER and to the achievement of fusion energy.

In 2014, a study involving six tokamaks resulted in a new, optimized shape profile for the ITER inner first wall panels. The study, which demonstrated the existence of a narrow feature in the near scrape-off layer (SOL) heat flux channel in inner wall limited plasmas, showed that the reference inner first wall panel toroidal shape profile would not be optimized to handle power fluxes during ITER plasma start-up. The proposed shape profile optimizes power spreading on the panel and has been adopted in a new reference toroidal shape design.

Through a combination of melt modelling and experimental electron beam testing, POP completed the physics demonstration that stainless steel can be used as front surface-facing material for the diagnostic first wall and electron cyclotron heating ports. This represents a significant cost reduction for the ITER Organization and considerably simplifies the design compared to the original with beryllium armour.



Sophisticated bolometer cameras will record heat and X-radiation from the ITER plasma. Pictured: bolometer measurements on the ASDEX Upgrade plasma in Germany that detect radiation density across the cross-section of the plasma (credit: Matthias Bernert, IPP).

Collaborative R&D continues in support of the tungsten divertor strategy. A worldwide experimental effort and fine-scale particle-in-cell simulations have been established to provide a physics case for the surface shaping of tungsten monoblocks in preparation for the final design decision to be taken at the end of 2015. At the 21st International Conference on Plasma Surface Interactions in May, ITER was well represented, with staff featuring in nearly 10 percent of all submitted papers.

A framework service contract to support the preliminary design of the ITER Plasma Control System kicked off in July. To prepare for the 2015 release of the Plasma Control System Simulation Platform (PCSSP) – a simulation tool that has been under development since 2011 to support work on the plasma control system – the Directorate prepared the design document and user's guide. Interface sheets between the plasma control system and the central interlock system, the magnet power supplies, the ion cyclotron resonance heating system, and the neutral particle analyzer were approved.

The ITER Research Plan was updated in the areas of plasma control, scenarios and disruptions during the year. Improvements to disruption and runaway electron modelling were made to include the effects of impurities on runaway generation, and the physics specification requirements for the disruption mitigation system were updated with recent experimental results. ITER's plasma scenarios were also refined: the 15 MA inductive, hybrid, and steady-state plasma design scenarios now include heating and current drive source models; initial simulations of half field half current early

L-mode scenarios in H plasma were carried out; and the impact of inner wall shield block thickness increase on plasma performance was simulated and found acceptable. The Directorate also contributed plasma operations requirements to CODAC, diagnostic and actuator plant system design reviews.

The worldwide plasma physics community continued to be active in 2014 in support of the ITER physics basis

In other experimental results, profile control experiments on the Korean tokamak KSTAR demonstrated temperature profile control with neutral beam and electron cyclotron heating. Neutral beam heating and current drive capability and fast ion loss calculations were run, and heating and diagnostic neutral beam shine-through simulations were refined to understand the impact on neutral beam commissioning and operations.

The ITER Test Blanket Module (TBM) Program has begun to transition from scientific research to nuclear engineering and realization. Conceptual design work is underway on all six Test Blanket Systems. In July, joint conceptual design reviews were held for China's helium-cooled ceramic breeder system and for associated ITER Organization activities (the design of common components and their integration and the design of maintenance tools in TBM port cells/Hot Cell). Design activities under ITER Organization responsibility, such as TBM port cell components, specific maintenance tools and equipment, also advanced and the conceptual design review for the first TBM components expected on site – the connection pipes – was held in September.

All six Test Blanket System Preliminary Safety Reports were approved and five out of six TBM Arrangements were signed (China, Korea, Japan and two with Europe) – these Arrangements govern the TBM Program up to delivery and site acceptance tests. The signature of the last TBM Arrangement, with India, is scheduled for February 2015. Work also began during the year on the framework for the additional arrangements that will be needed to cover assembly and installation, testing, commissioning and operations.

Good results were reported from the DIII-D tokamak in the US, where TBM mockup experiments indicated that the magnetic field errors introduced by the TBMs in ITER can be corrected using non-axisymmetric control coils so that the impact on high performance plasma operation is reduced to a tolerable level.

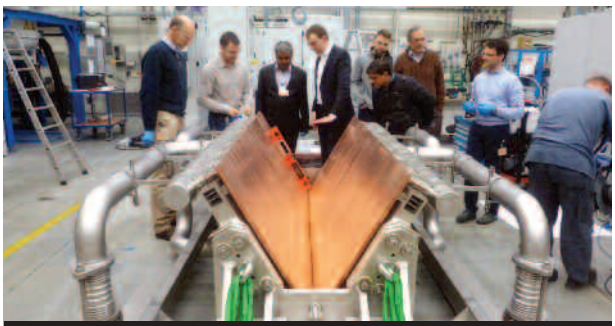
Work also began during the year on a strategy to implement ESP/ESPN regulations on the design of the TBMs. Since all TBMs use specifically developed reduced-activation ferritic/martensitic (RAFM) steels as structural material, this implementation could imply the need for an additional RAFM experimental program by the ITER Members.

The working group on radwaste management assessed data supplied by the ITER Members in 2014 on the radwaste of individual Test Blanket Systems. Convergence toward a common approach for tritium inventory assessments was noted, but work remains to assess the amount of tritium remaining in waste and corresponding outgassing for each system. A draft roadmap was presented by Agence Iter France for the establishment of tripartite agreements between the Host state, the Members and the ITER Organization that will establish a framework for the management of the radwaste associated with each Test Blanket System.

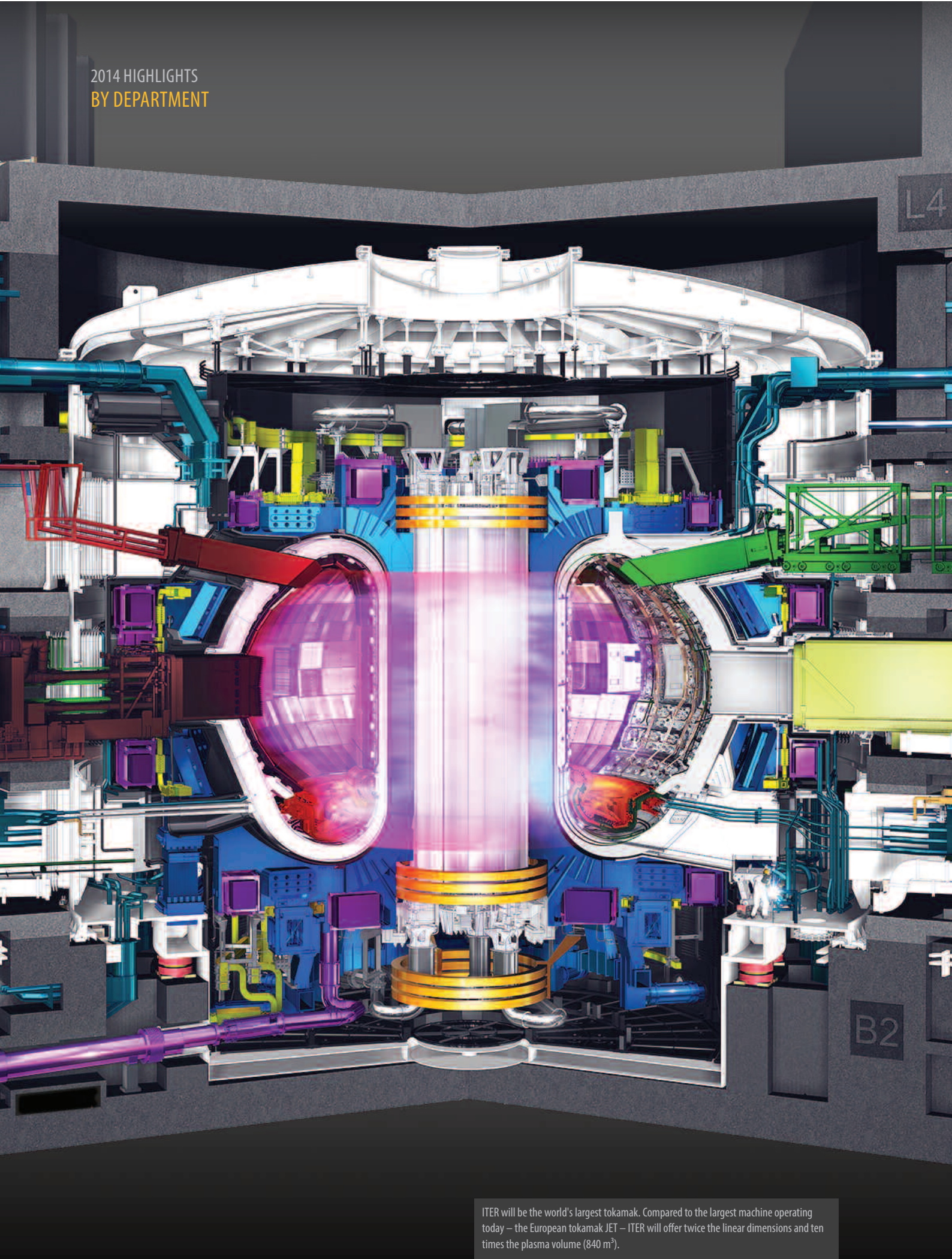
SYSTEMS ENGINEERING GROUP (SEG)

The ITER Organization implemented an integrated approach in 2014 to improve the functional analysis of integrated systems and manage component interfaces in real time. Through the creation of the Systems Engineering Group, systems engineering and interface issues are now managed transversally across the Tokamak, Plant System Engineering, and Buildings & Site Infrastructure directorates. In the frame of these activities, the functional analysis of the cryogenic system has been coupled with magnets and the thermal shield, for example; the long-term analysis of the water cooling function has been coupled with the vacuum vessel and in-vessel coils.

At regular group meetings, members of the SEG directorates tackled cross-functional issues such as heating loads, the configuration and performance of HVAC (heating, ventilation and air conditioning), fire protection strategy and building pressurization. Following a study of cryostat pressurization in different accidental scenarios, a safety device was implemented to protect the cryostat shell and its anchorage



In December, the Indian Domestic Agency delivers its first component to Neutral Beam Test Facility in Italy – a beam dump destined for the full-scale ITER ion source test bed called SPIDER.



ITER will be the world's largest tokamak. Compared to the largest machine operating today – the European tokamak JET – ITER will offer twice the linear dimensions and ten times the plasma volume (840 m^3).

configuration against expected and unexpected accidental events. The layout configuration of the cryostat was also the object of an integrated revision process due to the large differential displacements affecting the cryostat shell in internal accidental scenarios as well as due to inertial forces.

A common systematic approach is now underway for design, procurement, pre-fabrication/installation, and for in-service inspection, maintenance and replacement over the full life of the plant. For all plant system engineering expansion joints, it was decided that a centralized approach will be implemented by the Remote Handling Section.

DIRECTORATE FOR TOKAMAK (TKM)

The Directorate for Tokamak is responsible for completing the design, preparing procurement documentation, and monitoring hardware procurement and testing for the internal components, the vacuum vessel, the cryostat and the magnets.

A number of milestones moved the procurement of the ITER blanket forward in 2014. Procurement Arrangements were signed for the enhanced heat flux first wall panels and the blanket module connections with Russia; a framework agreement for design and analysis tasks with Europe was successfully completed; and a contract to qualify blanket manifold supports was launched following a tender process. Europe also completed a 1:6-scale prototype for the normal heat flux panels and launched three contracts for full-size prototypes. Within the Blanket Integrated Product Team, the ITER Organization and the procuring Domestic Agencies reached agreement to increase blanket dimensions in order to improve shielding performance and help maintain the volumetric heating in the coils and the vacuum vessel at acceptable levels.

As part of ongoing R&D on tungsten divertor technology, prototypes were evaluated at the Divertor Test Facility in Russia and a characterization program was initiated to better assess the failure modes of the tungsten material. Europe placed contracts for the fabrication of three divertor cassette body prototypes; the techniques used in their fabrication, which must respect in particular stringent quality and vacuum class requirements, will serve as a basis for all divertor and blanket procurements. A dedicated working group for divertor cost containment was formed to review divertor requirements, centralize lessons learned to date, and simplify or clarify some requirements in the interest of cost savings.

Manufacturing activities for the ITER vacuum vessel did not progress as well as expected in 2014, particularly in Europe – where the fabrication of the first sector was stopped due to technical problems. Production in Korea was slowed by delays in the qualification process, however the manufacturer has produced parts of sector 6 and has started on sector 1 and the ports. Korea also concluded a contract during the year for the manufacture of vacuum vessel gravity supports. The overall delay in vacuum vessel activities is being addressed by all parties as a matter of top concern due to the highly negative impact on project schedule.

> After a five-year international effort, 95% of toroidal field strand lengths have been produced (497 tonnes)

The design and analysis of thermal shielding is advancing in Korea, where the contractor completed a full-scale prototype of the thermal shield and inaugurated a new factory for the fabrication and final assembly. All plate material for the thermal shield has now been procured. Full-scale production was launched in India for the in-wall shielding plates and blocks and separate contracts for the welding and machining of lower brackets and support ribs were placed by the ITER Organization.

China completed full-scale prototypes of the in-vessel coils, marking the end of a multi-year R&D program. However, due to issues relating to the final brazing of the coils to the conductors, the detailed design is undergoing review and an alternative design is under investigation. The ITER Organization, which will procure the in-vessel coils through direct contract, carried out the preliminary market survey.

Full-scale prototypes and the first segments of the cryostat base pedestal and lower cylinder were successfully manufactured in India. The contractor also updated the design of the cryostat lower sections and finished the manufacturing design of the upper sections. R&D on the rectangular bellows ended successfully and final design reviews were held for the circular bellows and torus cryopump housing. Work on the vacuum vessel pressure suppression system (VVPSS) progressed despite the complexity of interfaces.

The international procurement of the ITER magnet systems continued at a steady pace in 2014, as the focus shifted from conductor to coil manufacturing. All qualification activities on the toroidal field double pancake prototype were successfully completed in Europe and vacuum pressure impregnation (VPI) is underway; next year, rigorous testing is planned on the first completed prototype. Manufacturers in Japan wound and heat treated the first dummy double pancake following the successful commissioning of the winding line in 2013.

Series production was launched at the European

winding facility where toroidal field double pancakes are wound, heat treated and transferred inside of a radial plate. The development program for the coil structures also passed several important milestones: coil case mockups and the first series segments were machined and welded in Japan and Korea; welding processes and non-destructive inspection were implemented in Japan; mechanical tests were carried out on pre-compression ring materials in Europe; and a gravity support mockup was built in China. In June, Europe signed a contract for the final stages of toroidal field coil manufacturing (cold testing, insertion).

Contracts placed in Europe heralded progress toward the start of manufacturing activities for poloidal field coils 2-5. Three of six contracts have now been signed including winding tooling (May), site and infrastructure (December), and engineering integration (2013). China delivered a second batch of dummy conductor during the year to the Poloidal Field Coils Winding Facility to qualify the production line. Building and tooling activities are complete and qualification activities progress in Russia for poloidal field coil 1 and in China for poloidal field coil 6.

In the US, winding began on the central solenoid mockup module that will serve to commission the production line. A contract was signed for part of the structural support system (lower key blocks), procurement of the tie plates is underway, and the final design review for the central solenoid assembly tooling was held in September for the earliest-need items. Joint samples for the central solenoid (US) and the correction coils (China) were successfully manufactured and tested.

Qualification activities for the ITER correction coils advanced in China, where dummy conductors were wound, impregnated with resin (VPI) and tested, and the first reduced coil case models were manufactured. For the magnet feeders, work began on three pairs of prototype high temperature superconducting (HTS) leads that will pass full current cryogenic qualification in 2015. Milestones were also recorded for the various feeder components, with successful prototyping efforts on the in-cryostat feeder, the cryostat feed-through, the coil terminal box/S-bend box assembly, and the vacuum vessel.

In 2014, the ITER Organization entered into a five-year collaboration with the French Alternative Energies and Atomic Energy Commission (CEA) to operate the Magnet Infrastructure Facilities for ITER – a facility to test the assembly of magnet components such as feeders and coil instrumentation. The procurement of magnet instrumentation went ahead as planned and the first shipments reached the Domestic Agencies.

After a five-year international effort to produce the niobium-tin (Nb3Sn) strands necessary for ITER's toroidal field conductors, 95 percent (497 tonnes) of toroidal field strand lengths have been produced and four Domestic Agencies – Korea, Japan, Europe and Russia – have completed their share. Seventy-one percent of toroidal field conductor unit lengths are now registered in the ITER Conductor Database, as well as 26 percent of poloidal field conductor unit lengths, 14 percent of central solenoid unit lengths, and 50 percent of correction coil/feeder unit lengths.

In the US, winding begins on the central solenoid mockup module that will serve to commission the production line. *Photo: US ITER*

According to the terms of a procurement implementation agreement signed between Europe and Russia, Russia will manufacture NbTi strand and cables for both Russian and European poloidal field conductor lengths, while Europe will jacket both Russian and European cables. The first production lengths of poloidal field cable were successfully manufactured in Russia and jacketed and compacted in Europe. For the central solenoid, Japan delivered the first 5 (of 49) Nb3Sn superconducting lengths to the US, representing about 10 percent of total needs. Qualification tests of central solenoid conductor samples at the SULTAN facility in Switzerland satisfied all ITER requirements.

> Following the endorsement of the ITER Council at its Fourteenth meeting, 54 CAD designers and 20 systems engineers were recruited to form "core teams"

DIRECTORATE FOR PLANT SYSTEM ENGINEERING (PSE)

The Directorate for Plant System Engineering provides a fully qualified range of services and facilities required for the operation of the ITER Tokamak. The Directorate is responsible for the design, Procurement Arrangements, fabrication, and testing of a large number of systems – cooling water, cryogenics, hot cell, radwaste, fuelling and wall conditioning, tritium, vacuum, steady state and pulsed electrical power supplies, magnet coil power supply and remote handling. In 2014, the Directorate incorporated the former Central Integration & Engineering (CIE) divisions for computer-aided design and design coordination as well as project engineering and systems/space management integration.

The PSE Directorate was created in 2014 to reinforce systems integration engineering and to strengthen assembly integration activities between machine core and plant systems. PSE began the year by closely reviewing the cost management of external computer-aided design (CAD) services. Changes introduced to the ITER Organization approach – such as the creation of a CAD work plan with emphasis on coherence with work packages, cost negotiation with consortia, the transition to deliverable-based, firm-price contracts, and an overall reduction in external specialized services – have resulted in higher quality output and savings of approximately 20 percent.

The Directorate also spearheaded the effort to create an in-house pool of resources with flexibility to act on CAD or systems engineering issues across the technical directorates. Following the endorsement of the ITER Council at its fourteenth meeting, 54 CAD designers and 20 systems engineers were recruited to form "core teams" under the supervision of PSE. By the end of the year PSE had achieved cost savings of EUR 4.07 million, principally in the areas of cryogenics and cooling water, which were moved to the IO Reserve.

As part of the transfer-of-scope arrangement for the Tokamak Cooling Water System (TCWS) reached in 2013 with the US, recruitment was launched for 25 TCWS engineers. Within the Cooling Water System Section, the new team accomplished a number of steps toward TCWS final design, including the creation of a cost-loaded schedule, technical specifications for TCWS piping, and thermo-hydraulic and mechanical analysis on the primary heat transfer system. Preparations are now underway for support contracts in the areas of process and systems analysis, engineering services, and thermal-hydraulic analysis.

In July, a value engineering study was initiated to address a TCWS radiological issue – radiation originating from the decay of activated elements in the primary cooling water system – that must be lowered to fulfil Preliminary Safety Report (RPrS) requirements and to ensure the protection of electronic components in the Tokamak Building. After evaluating several re-design solutions, one (whose implementation would respect both building and safety constraints) was submitted as a Project Change Request in December.

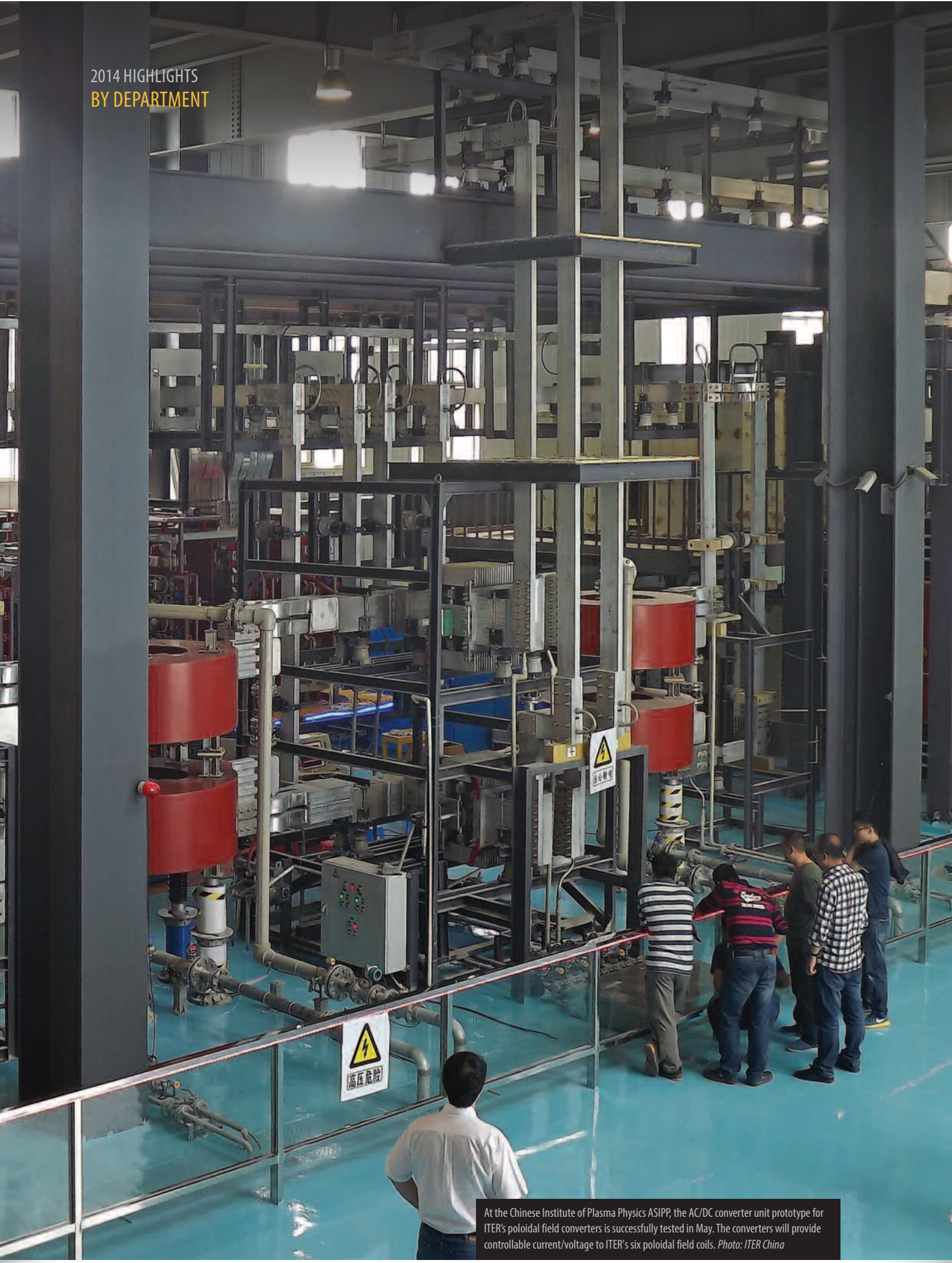
Two TCWS drain tanks were ready in December for shipment to the ITER site and fabrication activities on three others neared completion in the US. India started manufacturing on the first lot of buried piping for the component cooling water, chilled water and heat rejection systems and the procurement of heat exchangers, cooling towers and ozone equipment also moved forward. The Section prepared pipe stress analyses and developed design changes to address safety issues for the chilled water system during the year.

The Final Design Review for ITER's liquid helium (LHe) plant took place in November, crowning several years of collaborative work to design a system tailored to the demanding cryogenic needs of the ITER magnets and cryo-sorption panels. This important project milestone now opens the way for manufacturing to begin.

In June, Europe held the preliminary design review for the liquid nitrogen (LN2) plant and procurement began on the heat exchangers, compressors, turbines and tanks. Contracts for part of the cryogenic lines and for cold circulators were signed in India, where fabrication is also underway on a full-scale prototype cryogenic line and dedicated test infrastructure. By optimizing the routing of the cryogenic lines, the cryogenic distribution network, and the cryogenic master controller, the Cryogenic System Section was able to realize cost savings during the year. The master controller cubicle was delivered to the site and is now connected to the CODAC network for development; manufacturing has also started for the master controller.

After years of R&D on the divertor remote handling system, a major milestone was reached in 2014 as Europe selected a manufacturing consortium. A final

The most heavily reinforced part of the Tokamak Complex basemat is the central portion, located under the machine.



At the Chinese Institute of Plasma Physics ASIPP, the AC/DC converter unit prototype for ITER's poloidal field converters is successfully tested in May. The converters will provide controllable current/voltage to ITER's six poloidal field coils. *Photo: ITER China*

demonstration of divertor cassette remote handling was achieved in October at the Divertor Test Platform in Finland.

As operator, the ITER Organization must be able to monitor the status of the vacuum vessel (ageing, stress level, fatigue) throughout operation. The Remote Handling Section initiated in-service inspection and maintenance activities during the year to investigate alternative tool and instrumentation strategies for areas of the vacuum vessel that lack accessibility; within this scope a study has been launched on the status of all expansion joints. In-service inspection and maintenance activities, which are critical for the operation strategy and project cost optimization, will continue in 2015.

All of ITER's fuelling and wall conditioning procurements have now moved from their conceptual to their preliminary design phases. A contract was signed in China for glow discharge cleaning and the ITER Organization signed an agreement for disruption mitigation with the US, where two approaches are under development. The first – shattered pellet injection – was chosen as the baseline technique during a system-level design review in 2014. (In support of this technique, the US successfully manufactured a three-barrel injector and is testing prototypes of the pellet flight tube and the propellant gas recirculation system.) Development on massive gas injection, the second approach, continues as part of risk mitigation and a prototype was laboratory tested in 2014.

The design of the Tritium Plant moved forward in 2014 within the framework of French nuclear requirements and prescriptions. Significant progress was made in systems design and building interfaces: an agreement for the joint procurement (ITER Organization-Japan) of the detritiation system was reached and plans made for the system's nuclear qualification; the conceptual design of the analytical system was completed; the recommendation to use scrubber column rather than molecular sieve technology for the detritiation system was confirmed; and a safety analysis on Tritium Plant equipment resulted in a 900-page document that identifies all hazards and lists measures for prevention, detection and mitigation.

Three technologies are under consideration for highly tritiated water processing, which will allow for the optimization of the Tokamak Exhaust Processing system. The overall strategy for fuel cycle operations was reviewed with a mind to safety and individual system optimization; gaining approval for the approach to neutral beam cryopump regeneration was a key accomplishment during the year. As part of a PSE simulation effort, a state-of-the-art chemical engineering modelling tool was established to assist in overall plant and individual system design. The basis is now set for the preliminary design of the radiological and environmental monitoring system, following R&D on the electromagnetic effect on equipment.

The Vacuum Section opened a vacuum lab in the basement of ITER Headquarters in 2014 in order to provide project-wide support for the qualification of materials and components. A new framework for the standardized procurement of all-metal high-vacuum valves, open to ITER as well as all Domestic Agencies, will result in cost savings in qualification and valve purchases. The Section successfully held design reviews during the year for the vacuum vessel leak detection and localization system as well as for cryopump front-end distribution; the next step will be the signature of Procurement Arrangements.

Eight shipments of high voltage equipment reached ITER and were celebrated as the very first project components to be delivered and stored on site

Europe manufactured the cryopanels and the thermal shields for the pre-production cryopump, successfully validating manufacturing processes. Many of the sub-components are also ready to be integrated into the main assemblies. The manufacturing qualifications for the neutral beam cryopump were completed and the build-to-print design and specifications will now allow Europe to procure the first pump for MITICA, part of the Neutral Beam Test Facility in Italy. The US tested two types of concept mechanical roughing pumps during the year and has manufactured a full-size cryogenic roughing pump for testing in 2015.

Eight shipments of steady state high voltage equipment reached ITER in 2014 from the US and were celebrated as the very first project components to be delivered and stored on site. One of four Steady-State Electrical Network (SSEN) transformers was unloaded and stored in Marseille for delivery early next year; in parallel, work advanced on the construction design for the first load centre and associated low voltage building. An agreement signed with the US in February transferred the procurement of some SSEN materials (gantry and structures) to the ITER Organization.

A major step toward the manufacturing of the Pulsed Power Electrical Network (PPEN) was achieved in China, where manufacturing readiness reviews held at three suppliers proved the high standard of the design. The Electrical Engineering Division supported Europe in the final and manufacturing design of the

emergency electrical distribution network, and helped to prepare for electrical network installation. It also provided electrical engineering support to ITER plant systems such as vacuum, cryogenics and cooling.

The final design of the poloidal field AC/DC converter was validated in October on the strong basis of full-scale prototype testing in China. Final design reviews were also passed for the AC/DC converter in Korea, the reactive power compensation and harmonic filtering system in China, and the DC busbar in Russia, and a conceptual design review was performed on the in-vacuum vessel power supply busbars. The Division advanced coil power supply integration during the year to ensure the consistency of the design solutions and supported the French Nuclear Regulator inspection of fast-discharge unit fabrication in Russia. Manufacturing is now underway on all power supply components.

The cable engineering team is designing cable tray networks for the Site Services Building, the underground galleries and the Tokamak Complex up to level L3. The team supported plant systems with the production of electrical diagrams, managed the cable database, and performed the design review for cable engineering in the cryostat ex-vessel. In 2014, a contract was signed with the French Alternative Energies and Atomic Energy Commission (CEA) for the qualification of equipment that will be subjected to static magnetic field.

The CAD & Design Coordination Division administers project CAD infrastructure in collaboration with IT and supports approximately 600 users at the ITER Organization, Domestic Agencies and suppliers. As part of its regular activities it certifies new users, enforces data quality control, maintains the context branch to provide the most valid interface data to concurrent users, and encourages standardization through the production of CAD catalogues.

The Division was closely involved in the PSE effort to revamp the management of CAD framework contracts, develop the CAD work plan for the technical directorates, and recruit the new core team. It produced process and integration diagrams, technical drawings, construction process documents and manufacturing drawings at the request of responsible officers in support of specific work packages. Priority was given to efficiency in CAD home production and in issuing fundamental documents like general arrangement drawings that contribute to project-wide configuration control.

The CAD infrastructure was assessed in 2014 in regard to its readiness for the construction phase of plant systems and improvements were proposed. With a new upgrade of the Catia/Enovia platform (V5 release R23), work has started to integrate plant design management software (PDMS) and to create the first bridges to the

High-precision manufacturing is carried out on a "rough" stainless steel radial plate for the toroidal field coils. When assembled, the grooves will house jacketed superconducting cable. *Photo: F4E*

SmartPlant® Construction planning system. User-friendly tools were selected to assure the production of intelligent process and integration diagrams, and to properly develop the plant layout configuration up to producing the detailed bill of materials area-by-area for the plant construction sequence. Selection is underway on a commercial tool for product lifecycle management (PLM) in collaboration with Configuration Control.

The Design Integration Section focused its efforts in 2014 on the completion of the definition baseline of the buildings, the tokamak and the port systems and on implementing the organization and functions of the area managers. Significant progress was made in interfaces and the implementation of approved Project Change Requests. The installation of a virtual reality room in the Headquarters extension was a welcome development for integration work.

Significant effort was made to review the advanced assembly strategy of the components and to verify mechanical interfaces, accessibility and welding space allotments. The vacuum vessel assembly process was reviewed and optimized based on model results. Design integration reviews were held for the first group of assembly tools, the cryostat rectangular bellows, and in-cryostat cable routing. The Division also performed consistency checks on the detailed design of many Tokamak components and systems, and supported the Domestic Agencies by performing tolerance assessments or dimensional variation studies on several critical components. Cooperation within the neutral beam cell task force resulted in the completion of the cell's construction design as well as progress in port cell integration activities and port plug handling. The Division is now managing integration issues that were raised during the year on the magnet systems.

Design Integration played an important role in the closure of the Manufacturing Readiness Review for the Tokamak Complex basemat slab (B2) and the preparation of level B2 civil works. Interfaces with the systems for the B2 level were frozen before wall pouring could begin. The configuration of level B1 floors and walls was delivered to the European Domestic Agency

and the ongoing design for building systems (ventilation, liquids, fire control) was regularly reviewed for space allocation and interfaces. The Section collaborated with Assembly & Operation to create integrated construction process descriptions for each building level and room. The Section was also closely associated with the start of work on auxiliary buildings, carefully controlling the parallel evolution in the design of both systems and buildings to monitor interfaces. Twenty-five design integration reviews or model approval meetings were held in 2014 for auxiliary buildings.

With the recruitment of 20 highly qualified systems engineers, PSE can now perform system-integrated engineering, verifying function and safety performance by coupling the functional analysis for each system to the relevant clients and suppliers. PSE has organized dedicated workshops on methodology within the ITER Organization and Domestic Agencies.

Significant effort was made to review the advanced assembly strategy of the components and to verify mechanical interfaces, accessibility and welding space allotments

Systems engineers were extensively involved in the value engineering study for the TCWS, in the functional analysis of specific systems, and in the evaluation of component and system design maturity. The core team also started to prepare for commissioning, with priority given to power distribution (scheduled to come on line in 2016). Systems engineers are preparing commissioning technical specifications and associated procedures system-by-system according to functional analysis in the time domain. These procedures will be essential to in-field commissioning by the operator.

Analysis & Standards was active in the completion of load reports for the building-equipment interface load database that is used to size Tokamak Complex embedded plates. The Section answered Requests for Information related to building design; supported the load definition and detailed design of the interface between the building and the cryostat; and provided technical support to the B2 slab task force. Independent verification of the B2 slab and anti-seismic bearings resulted in the horizontal seismic dynamic isolation of the Tokamak Complex from the ground.

The Section provided nuclear analyses calculations and definitions in support of a solution to the TCWS radiological issue. In tight collaboration with nuclear experts in the Domestic Agencies, more detailed nuclear analyses were performed on the vacuum vessel and toroidal field coils to reduce uncertainties. The global nuclear model of the Tokamak (C-lite) was further refined and distributed to the Domestic Agencies. The ITER policy on electronics exposed to radiation was discussed for implementation into the ITER systems.

Updated electromagnetic (EM) field maps (values and derivatives) now provide more detailed values for the region between the cryostat and the bioshield. Analyses were performed in support of the blanket, vessel cable arrays and cable trays, and the global model for EM analysis of the in-vessel components was distributed to all Domestic Agencies. The global model for EM interactions in the magnetic system was further improved through the inclusion of all in-vessel and correction coils. The Section presented its methodology, its model and the main EM load results at the IAEA Fusion Energy Conference in October.

The multi-system study of EM loads in the Tokamak has now been completed, with systematic assessments of the correction coils and in-vessel coils. Forty-eight System Load Specification Reports were added in 2014 bringing the total to 168, or approximately 80 percent of the work scope. The Section made considerable progress in the understanding of the physical mechanism responsible for the strong sideways forces experienced on tokamaks during asymmetric vertical displacement events and the relationship between asymmetry of plasma current and halo currents. The model was validated through intensive simulation activity and presented to the fusion community.

An effort to identify issues and barriers for codes and standards was completed during the year. Work on standardization continued, with the development of several integration documents. Support was provided for components under ESPN pressure equipment regulations and several components were assessed for exclusion. The Section also gave project-wide support for technical documentation, material procurement specifications, and manufacturing and material inspection procedures.

In April, four of the fifteen Tokamak Complex basemat segments are in place.

The heavily reinforced "B2 slab" will support some 400,000 tonnes of building and equipment, including the 23,000-ton ITER Tokamak.

DIRECTORATE FOR BUILDINGS & SITE INFRASTRUCTURE (BSI)

The Directorate for Buildings & Site Infrastructure ensures that all ITER project facilities are designed and constructed according to ITER Organization requirements in a timely and cost-efficient manner. BSI works closely with the Nuclear Safety, Licensing & Environmental Protection Division to implement processes and procedures to ensure compliance with the 1984 Quality Order in France and requirements coming from the French Nuclear Regulator. The BSI Directorate also interacts with the European Domestic Agency, responsible for the detailed design and construction of the site infrastructure and buildings.

The most significant construction milestone in 2014 was the completion of the Tokamak Complex "B2" basemat on 27 August. The realization of this heavily reinforced concrete slab, designed to support an estimated 400,000 tonnes of building and equipment, was the last in a series of steps undertaken since 2010 to create the ground support structure and foundations for the ITER Tokamak.

The final weeks of pouring activity on the most technically challenging part of the basemat – the central portion situated under the machine – could only occur after the release of a suspension (or "hold point") by the French Nuclear Regulator ASN. This release was achieved on 10 July as a result of very close cooperation between BSI, Safety, Quality & Security (SQS), and the European Domestic Agency buildings team.

With the B2 basemat in place, the consortium undertaking the Tokamak Complex construction moved in to take full possession of the area. After the installation of five tower cranes – one on each corner of the Tokamak Pit and one in the centre – work began in November on the first basement-level walls. Progress was made in parallel on a full-scale construction mockup that reproduces a 20° segment of the cryostat support system, the "crown," in order to test the constructability of planned rebar arrangements and the suitability of the concrete formulation in advance of construction.

The first structural elements of the Assembly Building were delivered to the site in October. By year-end, contractors had installed first-level pillars along the north side of the Assembly Building basemat and were beginning on the second level. The massive pillars are sized to support the 65-metre-high building as well as the two 750-tonne-capacity overhead cranes and the two 50-tonne-capacity cranes that will be used for the assembly of the Tokamak.

Work advanced in 2014 on the technical galleries around the Tokamak Building and on platform infrastructure works such as roads and drainage. Excavation began on the buried galleries of the Site Services Building, which will provide services such as compressed air and chilled water; this building must be in place in time to service the Assembly Building when completed. Building consortiums initiated design work on a large number of ancillary buildings or technical areas such as the Cleaning Facility, the Radio Frequency Heating Building, the power conversion and control buildings, and the cold basins and cooling towers.

The Cryostat Workshop was equipped with a gantry crane and was officially inaugurated in November. In this 110-metre-long manufacturing facility, the Indian Domestic Agency will begin assembling and welding the ITER cryostat sections next year. Work ended in 2014 on the Headquarters extension and by December most staff had moved in. The 35-metre extension adds approximately 300 desks to the building's overall capacity and includes office space for the ITER Domestic Agencies. BSI managed the re-allocation of offices within ITER Headquarters in consultation with all Directorates.

A second ITER Itinerary test convoy event was successfully staged in April to test the global logistics and management of the transport operations that will bring the largest ITER components from their Mediterranean docking point to the ITER site, some 104 km distant. The maritime leg of the journey – four hours of barge transport across inland waterways – was also successfully validated.

The most significant construction milestone in 2014 was the completion of the Tokamak Complex "B2" basemat

In September, ITER celebrated the arrival of the first plant components – crates of electrical equipment shipped by the US Domestic Agency. Although this was a standard delivery by truck and not a highly exceptional load, the delivery was the opportunity to test the administrative, technical, industrial and regulatory procedures that will accompany the procurement of plant and machine components by the ITER Members. In all, eight deliveries of electrical network components were shipped to ITER by the US Domestic Agency in 2014.

As part of activities to plan for the expected rapid scale-up in component deliveries, BSI oversaw the construction of three warehouses on site that will allow sensitive components to be stored in a controlled environment while awaiting transfer to their final location on the ITER platform. A contract for the design and construction of a fourth, much larger facility – a 10,000 m^2 storage centre located on the hill behind the ITER platform – was signed and work got underway to clear land and prepare access roads. The notarial deed that makes land available to ITER (as part of the Site Support Agreement signed with the Host Organization, CEA) was amended to provide an additional 10 hectares of land.

DEPARTMENT FOR SAFETY, QUALITY & SECURITY (SQS)

The Department for Safety, Quality & Security supports the Director-General in all matters related to safety, quality assurance and security, regulatory requirements, and compliance with respect to Host country safety and security regulations.

In 2014, a joint task force formed by SQS, the ITER Buildings & Site Infrastructure directorate, and the European Domestic Agency buildings team was able to demonstrate the robustness of the Tokamak Complex basemat slab ("B2") to the French Nuclear Regulator, ASN. Following months of exchanges with the ASN and its technical experts at the Institute for Radioprotection and Nuclear Safety (IRSN), the hold point on the central part of the slab was lifted on 10 July and concrete pouring was allowed to proceed.

In July, ASN and IRSN representatives travelled to the Efremov Institute in Saint Petersburg, Russia, to inspect fabrication activities on the ITER fast discharge units – specialized components that are designed to protect the superconducting coils in the case of a sudden loss of superconductivity. After examining how the ITER Organization supervises its supply chain and how safety and quality requirements are propagated, ASN noted that the organization implemented by both the operator and the chain of suppliers in this particular procurement was "efficient and rigorous."

ASN also carried out five on-site inspections in Saint Paul-lez-Durance for ongoing civil works. Against the backdrop of accelerating construction and manufacturing activities for ITER, the President of the ASN, Pierre-Franck Chevet, made a presentation to the delegates of the Fifteenth Meeting of the ITER Council in November to explain the mission, responsibilities and expectations of the French Nuclear Authority.

Campaigns for the enhancement of nuclear safety culture throughout the project continued in 2014; as part of this effort a safety culture survey was conducted mid-year. Workshops were organized on the following topics: the ITER safety files and the management of design changes since nuclear licensing; the propagation of safety requirements; the technical implications of nuclear regulation; and external communication on safety-related topics. SQS conducted internal inspections on building construction and on the management of design reviews within the context of the Basic Nuclear Installation (INB) Order.

The ITER Organization Management and Quality Program (MQP) continued to progress in 2014. Documents on procurement quality requirements were updated to provide clarification requested by the Domestic Agencies, the MQP documents policy and management procedure were both revised, and support and training were provided to users in the ITER technical departments, the Domestic Agencies and their suppliers. The Safety and Quality Working Group (SQAWG) was re-activated during the year as the main forum for ITER Organization-Domestic Agency collaboration on safety and quality issues.

During the ITER Itinerary test in April, personnel from ITER logistics provider DAHER monitor every millimetre of progress as the trailer and its mockup load cross onto the barge.

The database developed last year for tracking deviations and non-conformities was fully operational in 2014. The Quality Assurance Division took further steps in supporting the management and resolution of this type of issue by developing a procedure and tracking system for corrective actions, performing statistical analysis on civil work non-conformities, and chairing a root cause analysis group to respond to conformity issues raised by the French nuclear regulator. Division members assisted in the resolution of component manufacturing non-conformities and standards compliance – particularly in the areas of joining processes and non-destructive examination – and provided training in the use of the deviation request procedure so that issues could be closed in a timely manner.

Finally, Quality Assurance continued to provide qualified inspection resources to ITER Organization technical responsible officers for second-level surveillance, contributed expertise in the preparation of Test Blanket Module Arrangements, and developed a quality audit program for 2015.

The Occupational Health & Security Coordination Division concluded a new contract in January for emergency services that includes first-response assistance for emergencies and fires by qualified, on-site firefighters. This contract complements the medical services contract that has been operational since last year and also provides support for risk analysis related to occupational health (prevention plan, work-at-risk fire permits) and for the training of personnel. In the course of the year, 251 staff attended a training session on the use of fire extinguishers in emergency situations.

A database on occupational hazards was created in 2014 to improve organizational safety culture and to

facilitate the analysis process by listing the risks, consequences and mitigation measures associated with each identified hazard. In parallel, a methodology for hazard identification and risk assessment was approved and put into practice. Security Coordination expanded the access control system during the year to include the worksite – a unique badge, offering a higher level of security, was created and put in place and enrolment began in December for all badge holders. Lastly, the security services contract was expanded to include new site activities.

DEPARTMENT FOR ADMINISTRATION (ADM)

The Department for Administration provides services in the fields of human resources, procurement in kind and in cash, finance and budget, information technology, organizational efficiency and document control. It comprises the Directorate for Finance, Budget & Management Systems and the Directorate for General Administration.

DIRECTORATE FOR FINANCE, BUDGET & MANAGEMENT SYSTEMS (FBM)

The Directorate for Finance, Budget & Management Systems is in charge of ensuring sound financial and budget management; preparing the lifecycle resource estimate of ITER; developing and maintaining information tools; and evaluating and improving the efficiency and effectiveness of management systems.

The Finance & Budget Division monitored the execution of the annual commitments and payments budgets throughout the year. Management reports were circulated internally on a monthly basis while reports prepared for external stakeholders, such as MAC and Council, were distributed quarterly and semi-annually. By working with the technical units to identify contractual delays and implement corrective action plans wherever possible, the Division aided in the execution of 87 percent of the commitments and 84 percent of the payments planned for the year.

The Division assisted in the identification and transfer of EUR 8.3 million to the IO Reserve in 2014. Savings resulted from reductions in staff costs in support-type (level-of-effort) activities, favourable contract pricing, and the transfer of funds related to the repayment of the Headquarters extension.

Finance & Budget also worked with the Project Control and Procurement & Contract divisions to improve the quality of the ITER Organization's budgetary planning for 2015 by strengthening the ties between budgets and schedules. All large contracts for 2015 were first planned in the Detailed Work Schedule (DWS) and logically linked with predecessor and successor activities before being incorporated into the budget plan presented to the MAC and Council in November. Approximately 63,000 transactions relating to the registration, verification and execution of commitments and payments were produced, representing an increase of 5 percent over 2013.

An executive benchmarking workshop in March, with the heads of administration, finance, and procurement from eight European science projects (the EIRO forum), was the occasion to share best practices and discuss process improvement opportunities.

The 2013 ITER Organization Financial Statements were produced early in the year and examined by the Financial Audit Board (FAB) in April, which resulted in the certification of the accounts, an unqualified audit report, and a management letter. The seven members of the FAB (one auditor per ITER Member) returned to the site in September to audit the semi-annual trial balance, treasury management, remuneration, budget execution and the detailed testing of cash commitments.

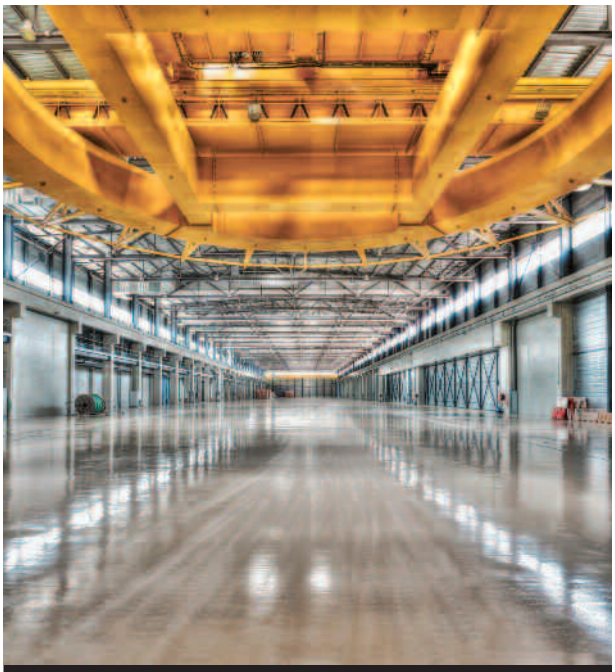
Steps taken last year to aid the Domestic Agencies with their European value added tax (VAT) issues bore fruit in 2014 – the first exemption requests made to the French administration through the electronic web application DEFI were treated successfully and promptly.

> The FBM Division assisted in the identification and transfer of EUR 8.3 million to the IO Reserve in 2014

The Project Information System Section (IT) is active in user support, systems, network (wired and wireless), communications, data management, and business software and development. It fully supported 1,500 users in 2014, centralizing the purchase of IT services and hardware, fielding 18,000 user support and video conferencing tickets, equipping the new Headquarters extension and contractor zones (network, phones, printers), and equipping approximately 200 staff with new phones.

The new ITER Data Centre was fully operational during the year and, despite growing complexity, the network recorded an uptime of 99.99 percent. A professional tape backup solution was introduced with a capacity of 600 TB (extendable), surpassing the previous system. The number of high performance computing users continued to grow.

The construction management tool SmartPlant® Materials was able to support the first in-kind deliveries to the ITER site in September. IT also completed the complex upgrade of the CAD database Enovia (V5 release R23) which now links 400 servers and CAD workstations on site, at the Domestic Agencies, and in 30 sub-sites. Work to integrate key drawing and design applications continues.



Following successful contract signatures for poloidal field coil fabrication (coils 2-5), tooling and equipment installation will start in 2015 in the on-site European winding facility (pictured).

The performance of the ITER Collaborative Platform ICP was improved in 2014 by 40 percent. The document management system IDM continues to evolve to match the needs of users, an in-house IT application now makes the ITER schedule milestones visible on line, and work on an all-new ITER website progressed well. The Section provided full support for the administrative tool SAP, particularly in the areas of finance, human resources and procurement. In the area of business intelligence, 1,200 reports were created or modified.

In its campaign to promote improvement and efficiency throughout the Organization, the System Management Section rolled out a visual deliverable management program with the support of top management. The On-Line Learning Centre remained popular during the year and content doubled to 250 modules. The Section developed robust processes for visas and work permits to accelerate work delivery, analyzed the success of the program to cascade project-level objectives to individual objectives, and sponsored the second annual Recognition Ceremony to celebrate work, effort and commitment at all levels of the project.

Systems Management followed the implementation of management and project reforms launched as part of the ITER Organization action plan in response to the 2013 ITER Management Assessment. As part of efforts to improve project culture, the Section facilitated the first all-staff project culture survey, with 81 percent participation; input from this survey from staff at all levels will be used to formulate an improvement strategy.

DIRECTORATE FOR GENERAL ADMINISTRATION (GEA)

The Directorate for General Administration is in charge of the preparation of in-kind Procurement Arrangements in close collaboration with the Domestic Agencies; the placement of in-cash contracts through competitive way; staffing policy and management (recruitment, training, appraisal, salary, travel, and social insurance); and document management.

In 2014, the signature of six Procurement Arrangements and six amendments for diagnostic systems brought the overall ITER Organizational total to 104 Procurement Arrangements and 20 Complementary Diagnostic Procurement Arrangements. Just over ninety percent of the project's total allocated value (90.5%) has been signed over to the ITER Domestic Agencies; now, more than ever, the project is taking shape in the factories of the ITER Members.

In the case of some of ITER's most highly integrated plant systems, the trend is to transfer in-kind scope or procurement responsibilities back to the ITER Organization wherever clearly demonstrable cost savings and/or efficiency can be gained. Eighteen bilateral or multilateral agreements in 2014 transferred procurement scope to the ITER Organization in areas such as the Tokamak Cooling Water System (TCWS), port plug manufacturing and testing, the Steady State Electrical Network, and the atmosphere detritiation system. In October, an Industrial Info Day was organized to involve industry, at an early stage, in the procurement and manufacturing of the TCWS, auxiliary systems, and piping.

In collaboration with the Domestic Agencies, an important effort was carried out to align all signed Procurement Arrangements with current versions of ITER Organization procedures, plans, and policies. Amendments signed in 2014 updated the applicable documents relative to each work package in areas such as quality assurance, safety, licensing, scheduling and risk management. The web-based Procurement Arrangement tracking system also evolved through the addition of a status dashboard, an automated process for milestone submission, deliverables tracking, a simplified change process, and the electronic submission of credit requests.

The ITER Organization concluded 750 contracts (including Task Orders and amendments), 27 Task Agreements and 979 purchase orders during the year for a total contract value of EUR 170.7 million and a total commitment value of EUR 115.7 million. In collaboration with the technical teams and line management, EUR 5.7 million in cost savings was realized in the negotiation of complex contracts. Contracts for cryostat transport, TCWS and centralized piping, metal valves, Steady State Electrical Network metallic structures, Logistics Platform construction, Type B radwaste processing and treatment equipment,

and design work for the Tokamak Complex and Hot Cell atmosphere detritiation systems were among the largest signed during the year. The Division also assisted in the conclusion of five Test Blanket Module Arrangements and provided support in the definition of the ITER contract strategy for assembly.

A new framework contract was signed in 2014 to enable the continued outsourcing of small-value contracts to a procurement service centre. This solution allows the Division to focus its resources on large and complex contracts and Procurement Arrangements. During the reporting period procedures were simplified for both in-cash and in-kind procurement processes.

In 2014, the Human Resources Division supported the alignment of the Organization to business needs – such as reinforced project management and nuclear safety cultures – and to prepare for the assembly, testing and commissioning phases of the project. A new Directorate was created (Plant System Engineering) and personnel recruited for the newly formed core teams in CAD and systems engineering. Staff performance objectives were cascaded from top-level ITER Organization strategic objectives.

At the end of 2014, 609 people were employed by the ITER Organization

The Division managed 129 appointments and 44 departures. For 148 posted vacancies, 2,880 applications were received through the ITER Domestic Agencies and 540 interviews were conducted. Renewal decisions were also made on approximately 50 contracts based on business and skill-mix needs. At the end of 2014, 609 people were employed by the ITER Organization – a number that includes 6 postdoctoral researchers funded under the Monaco-ITER Partnership Arrangement and 16 staff funded by the US Domestic Agency for work on the TCWS. The Division also managed 30 visiting researchers from the Domestic Agencies, 23 student interns, and 80 expert contracts. Training sessions organized in security, nuclear safety culture, and managerial, scientific or technical skills were attended by 1,270 staff.

The Division led a broad review of employment conditions within the Organization and submitted updated proposals for the Staff Regulations to MAC and the ITER Council. In the context of increasing numbers of staff members, improvements were made to reporting systems and processes for gains in efficiency.

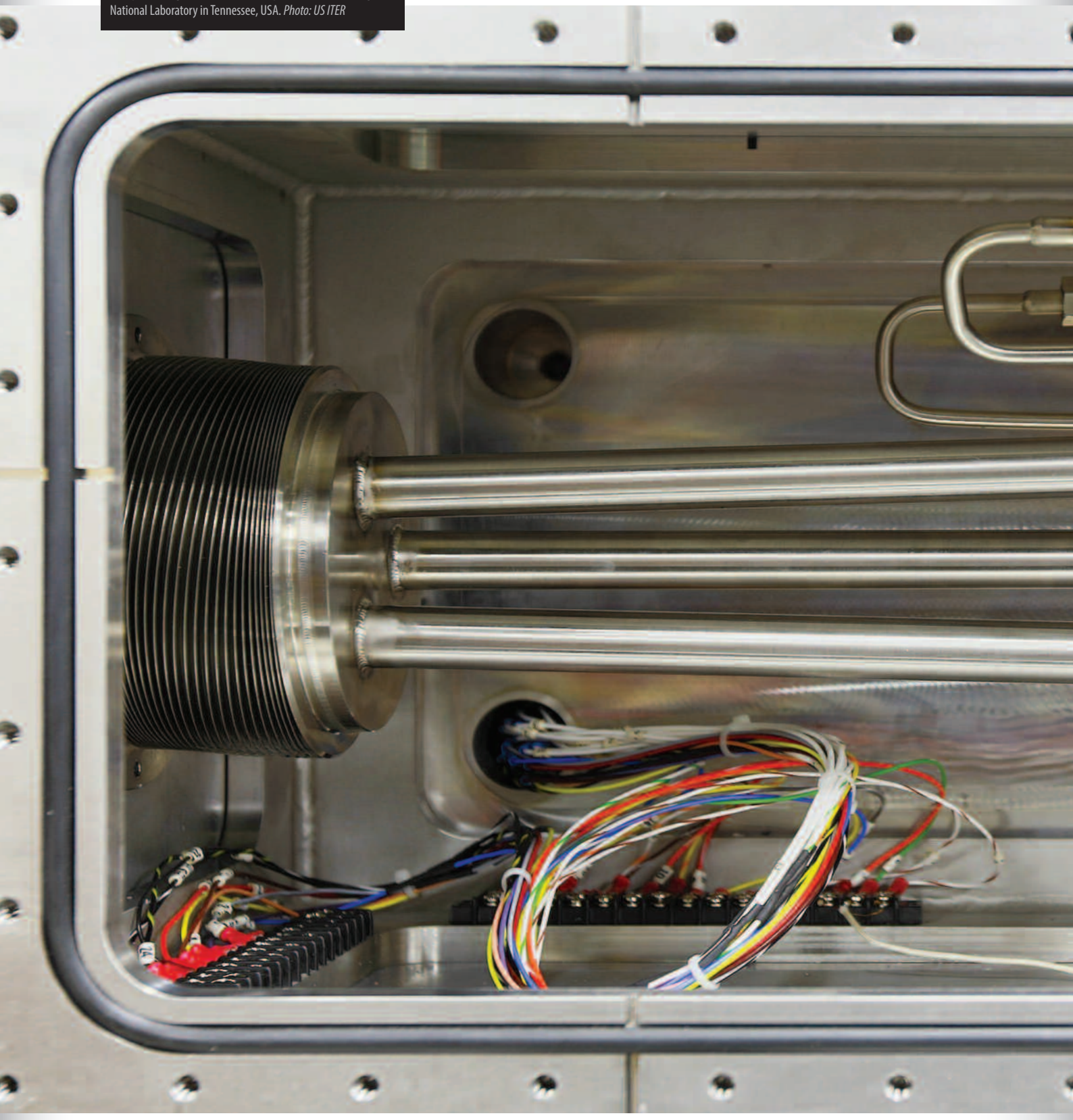
As part of its mission to support social dialogue within the Organization, the Division facilitated the implementation of the ITER Staff Association (ISA), which was officially recognized by the Director-General in a Memorandum of Understanding in September. The Division coordinated the activities of the Ethics Committee, the Advisory Board on Pension and Social Insurance and, where necessary, the Committee for Health and Safety; it also managed, with the Legal Advisor, an increasing number of litigations, including court cases, appeals and mediation requests. Human Resources represented the ITER Organization in its relations with the French administration (labour inspectorate, social security). In December, the Division hosted a day-long workshop on human-resource best practices in international organizations.

The Document Control Section, with responsibility for ITER's document management system IDM, continued to optimize the system's capabilities and provide training and support to users. A new version of the Document Management Procedure clarifies document processing workflows in line with system developments, and new tools and features contribute to improving the system for users. In cooperation with technical departments, Document Control investigated the integration of IDM with systems – existing and planned – to track the project schedule as well as the delivery and storage of components.

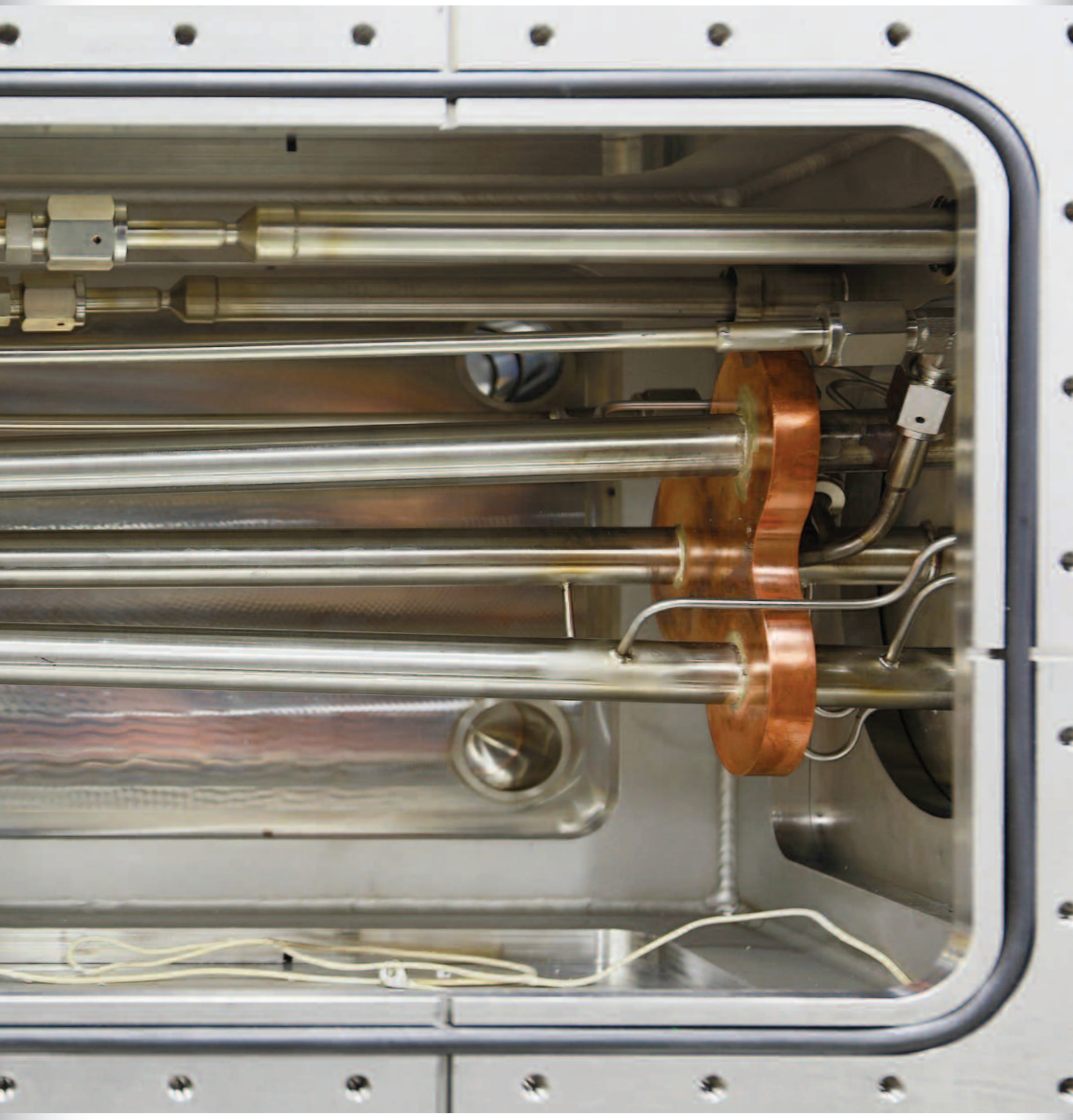
The Section assisted in the organization of all Intellectual Property (IP) Board meetings and maintained the IP database, which now stores more than 400 records relating to intellectual property, inventions, ownership declarations, permission-to-publish forms and non-disclosure agreements. It continued to support the Publication Board by managing the scientific and technical material submitted to 60 conferences. The ITER library, which operated daily for staff, contractors and visitors, introduced a new meeting space during the year for general use. It continued to enrich its collection in the fields of nuclear fusion and plasma physics, and to accumulate regulatory operational records in its on-site archival space. A scan-on-demand service was brought on line in 2014.

In September, ITER celebrated the arrival of the first plant components (crates of electrical equipment shipped by the US).

A three-barrel unit shattered pellet injector prototype for disruption mitigation is under development at the Oak Ridge National Laboratory in Tennessee, USA. *Photo: US ITER*

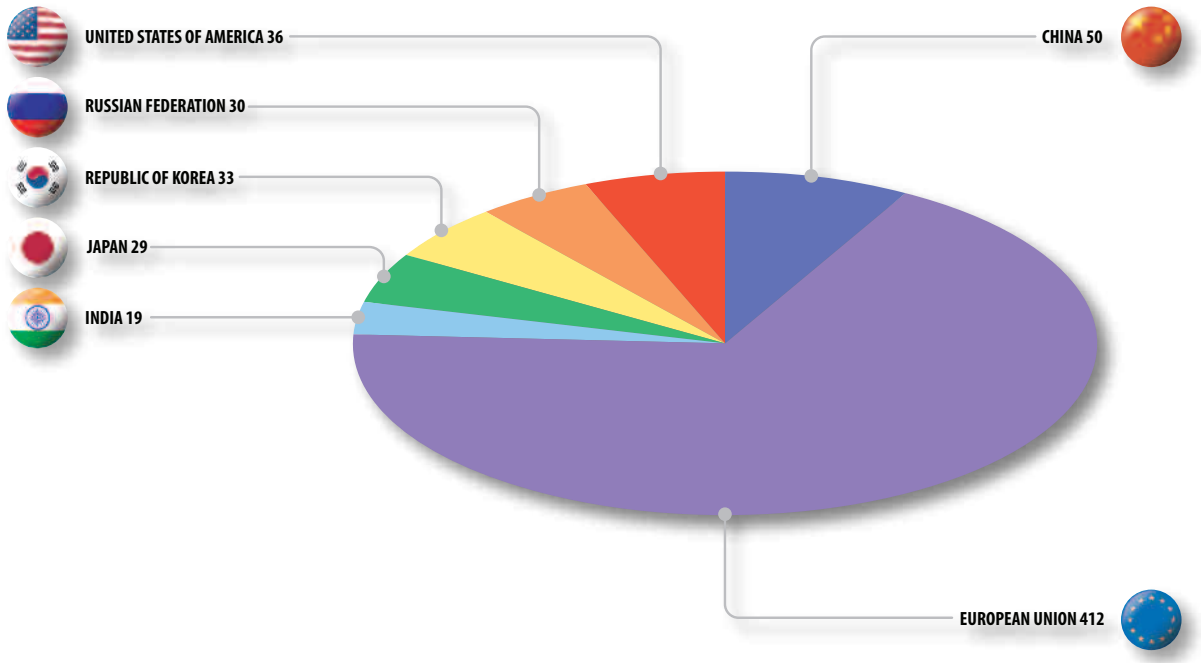


STAFFING & FINANCIAL TABLES



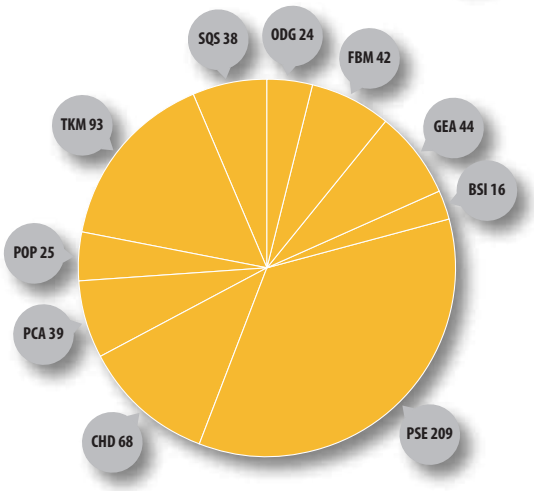
STAFFING TABLES

Staff by Member	31/12/2012	31/12/2013	31/12/2014[1]
China	18	30	50
Euratom	312	339	412
India	30	25	19
Japan	35	33	29
Republic of Korea	30	32	33
Russian Federation	24	28	30
United States of America	28	28	36
Total	**477**	**515**	**609**



STAFF BY DEPARTMENT

as of 31/12/2014[2]	Professional	Support	TOTAL
ODG	**15**	**9**	**24**
ADM[3]	**34**	**54**	**88**
FBM	12	30	42
GEA	21	23	44
DIP[3]	**288**	**171**	**459**
BSI	12	4	16
PSE	107	102	209
CHD	50	18	68
PCA	25	14	39
POP	22	3	25
TKM	66	27	93
SQS	**24**	**14**	**38**
TOTAL	**361**	**248**	**609**



[1] Includes 6 Monaco Postdoctoral Fellows and 16 Tokamak Cooling Water System staff

[2] For the full names of organizational units, see pages 16-37

[3] ADM and DIP totals include a small number of Department-level staff plus the Directorate totals

FINANCIAL TABLES

COMMITMENTS EXECUTION - CASH AND SHORT-TERM IN KIND (TASK AGREEMENTS AND SECONDMENTS)[1]

Amounts in thousands of Euro

		Total Commitment Appropriations 2014	De-commitments and Transfers of previous years' Commitments	Total Commitments 2014	Unused Commitment Appropriations carried forward to 2015
Title I	Direct Investment (Fund)	71,352	1,146	57,708	14,790
Title II	R&D Expenditure	6,840	480	4,976	2,343
Title III	Direct Expenditure	142,080	10,178	138,782	13,476
Total Commitments		**220,272**	**11,804**	**201,466**	**30,610**

[1]Without the IO Reserve

PAYMENTS EXECUTION - CASH AND SHORT-TERM IN KIND (TASK AGREEMENTS AND SECONDMENTS)[1]

Amounts in thousands of Euro

		Total Payment Appropriations 2014	Total Payments 2014	Unused Payment Appropriations carried forward to 2015
Title I	Direct Investment (Fund)	59,176	49,901	9,275
Title II	R&D Expenditure	15,549	10,125	5,424
Title III	Direct Expenditure	159,846	137,073	22,772
Total Payments		**234,570**	**197,099**	**37,472**

[1]Without the IO Reserve

CONTRIBUTIONS FROM MEMBERS

Amounts in thousands of Euro

	Cash and Short-Term In Kind		Procurement Arrangements	Total
Members	**Money**	**Task Agreements and Secondments**		
Euratom	104,011	12,786	32,565	149,362
People's Republic of China	17,846	-	24,012	41,858
Republic of India	2,572	12	5,890	8,474
Japan	16,377	-	32,050	48,427
Republic of Korea	980	1,464	47,746	50,190
Russian Federation	17,469	-	37,366	54,835
United States of America	14,885	1,694	5,690	22,269
Total Contributions	**174,141**	**15,956**	**185,319**	**375,416**

CUMULATIVE IN-KIND PAYMENTS THROUGH 31 DECEMBER 2014

Total in-kind

	Procurement Arrangements	
Total In-Kind Member	**IUA***	**in million EUR**
European Union	87,967	143.34
China	17,999	30.12
India	15,043	24.74
Japan	77,509	125.80
Republic of Korea	54,901	91.52
Russian Federation	31,579	52.80
United States of America	11,730	19.05
Grand Total	**296,729**	**487.36**

These tables show tabulations in million Euros which could cause minor differences due to rounding.

** ITER Unit of Account*

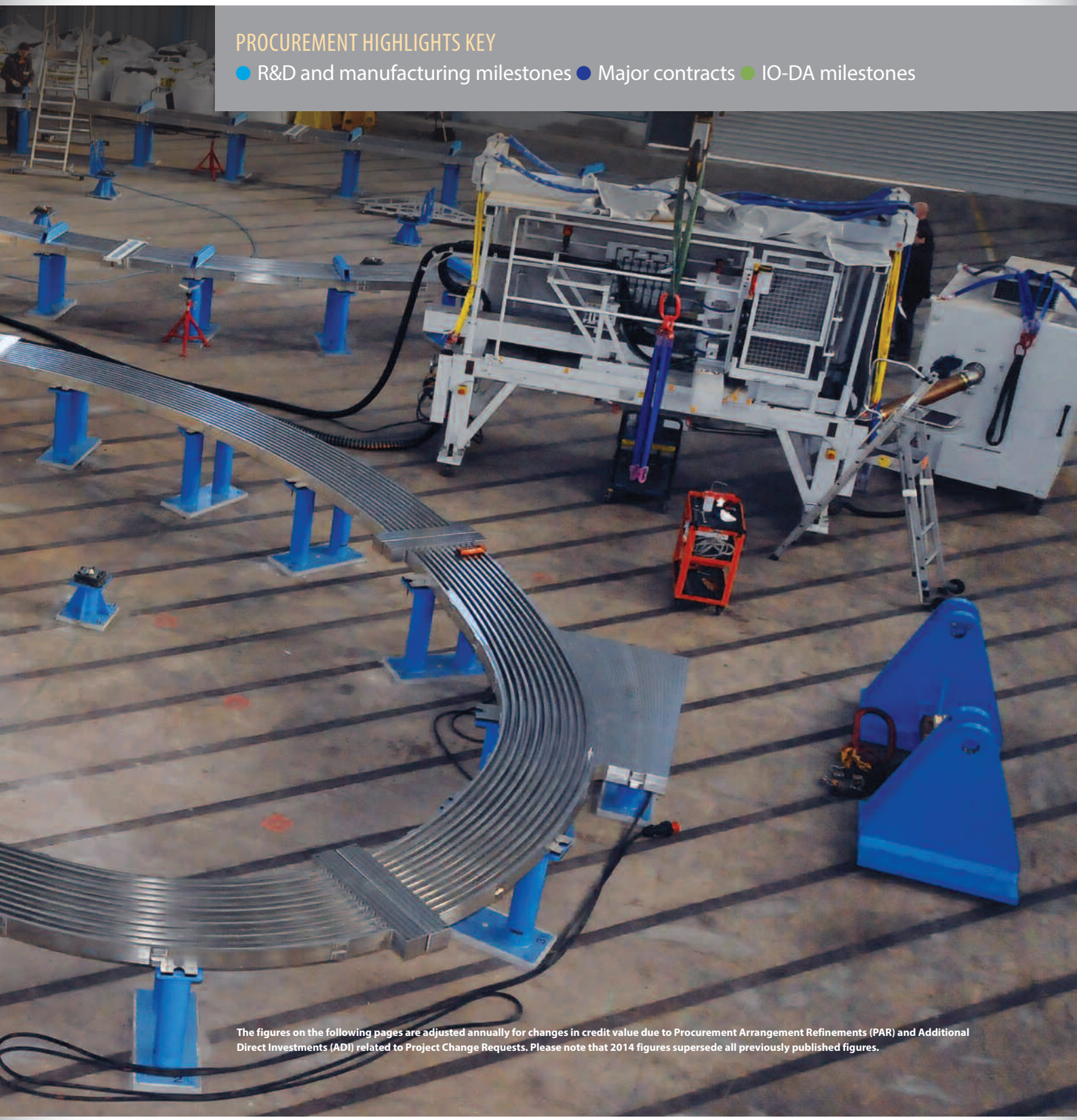
PROCUREMENT HIGHLIGHTS

Seventy giant radial plates (5 m x 16 m, 10 tonnes each) will have the role of supporting toroidal field conductors within their coil cases. Fabrication, underway, is split between two European suppliers. Photo: F4E (CNIM, France)

DOMESTIC AGENCY
PROCUREMENT HIGHLIGHTS

PROCUREMENT HIGHLIGHTS KEY

● R&D and manufacturing milestones ● Major contracts ● IO-DA milestones



The figures on the following pages are adjusted annually for changes in credit value due to Procurement Arrangement Refinements (PAR) and Additional Direct Investments (ADI) related to Project Change Requests. Please note that 2014 figures supersede all previously published figures.

PROCUREMENT HIGHLIGHTS

ITER CHINA (CN-DA)

www.iterchina.cn

PROCUREMENT ARRANGEMENTS*

13 PAs signed since 2007 representing…

93% in number

…and 96% of the total value of CN in-kind contributions.

CN AWARDS

65 design or fabrication contracts related to ITER procurement have been signed with universities, laboratories and industry.

CHINESE PROCUREMENT HIGHLIGHTS IN 2014

% OF ITER SYSTEM PROCURED BY CHINA

MAGNET SYSTEMS

Toroidal Field Conductor — 7.5%
- 3 unit lengths of 11 produced

Poloidal Field Conductor — 62%
- 10 out of 16 PF5 unit lengths produced and prepared for shipping
- 4 out of 12 PF2 unit lengths produced and prepared for shipping

Magnet Supports — 100%
- All qualification work completed and correlative reports approved
- Gravity support mockup fabricated
- Contract placed for series production

Feeders — 80%
- Qualification of full-scale coil terminal box/S-bend box (CTB/SBB) prototype and in-cryostat feeder (ICF) completed
- High Temperature Superconductor prototype current lead successfully manufactured

Correction Coils — 100%
- Significant progress in qualifying helium inlet/outlet and vacuum pressure impregnation (VPI)
- First reduced coil case models manufactured
- Correction coil joint samples manufactured and tested

Correction Coils and Feeder Conductors — 100%
- All conductor unit lengths (6 bottom, 6 top, 2 side) delivered to correction coil manufacturer
- Main busbar (MB) and correction coil busbar (CB) unit lengths delivered to correction coil manufacturer (excepting MB3)

POWER SYSTEMS

Pulsed Power Electrical Network — 100%
- MRR held at three suppliers and files approved by IO
- Factory Acceptance Tests for current transformer group 1 successfully performed

AC/DC Converters — 55%
- All poloidal field AC/DC converter prototypes manufactured and installed at ASIPP test platform
- Joint commissioning test for AC/DC converters successfully conducted
- FDR meeting successfully organized and all FDR documents approved by IO
- Update and optimization of prototype implemented

Reactive Power Compensation — 100%
- Reactive power compensation and harmonic filtering (RPC&HF) prototypes manufactured and installed at ASIPP test platform
- Joint commissioning test for RPC&HF successfully conducted
- FDR meeting held and all documents approved by IO
- MRR milestone passed successfully

BLANKET

Blanket First Wall — 12.6%
- Enhanced heat flux mockup successfully manufactured and tested

Blanket Shield — 50.2%
- Three contracts signed: 316L(N) ESR forgings; shield block manufacture; critical equipment and technical support

FUEL CYCLE

Gas Injection System — 100%
- Interface with building consolidated

Glow Discharge Cleaning — 100%
- Contract signed for preliminary design

DIAGNOSTICS

- FDR held for diagnostic first wall

Diagnostics — 3.22%
- Diagnostic amendment signed for Divertor Langmuir Probes (DLP)
- PDR performed for Neutron Flux Monitor (equatorial port #7)
- Kick-off meetings held for preliminary design of Radial X-ray Camera and Equatorial Port Plug integration (EQ#12)
- Contract signed for remaining Neutron Flux Monitor design

Abbreviations • **ANB** Agreed Notified Body • **CDR** Conceptual Design Review • **DA** Domestic Agency • **FDR** Final Design Review • **I&C** Instrumentation & Control • **IO** ITER Organization • **ITA** ITER Task Agreement • **MIP** Manufacturing & Inspection Plans • **MRR** Manufacturing Readiness Review • **PA** Procurement Arrangement • **PDR** Preliminary Design Review

* Does not include Complementary Diagnostic Arrangements.

PROCUREMENT HIGHLIGHTS

ITER INDIA (IN-DA)

www.iter-india.org

PROCUREMENT ARRANGEMENTS*

Fourteen PAs signed since 2007 representing…

93% in number

… and 96% of the total value of IN in-kind contributions.

IN AWARDS

20 design or fabrication contracts related to ITER procurement have been signed with industry and R&D organizations.

INDIA PROCUREMENT HIGHLIGHTS IN 2014

% OF ITER SYSTEM PROCURED BY INDIA

CRYOSTAT AND VACUUM VESSEL PRESSURE SUPPRESSION SYSTEM

Cryostat — 100%

- Mockup activities progressed for cryostat base section and lower cylinder
- Fabrication of base section segments in progress
- Cryostat Workshop on ITER site completed and inaugurated

CRYOGENIC SYSTEMS

Cryolines & Cryodistribution — 100%

- Contract awarded for group Y cryolines
- Technical bid evaluation for group X cryolines completed
- Preliminary design activities for cryolines in progress
- Manufacturing design of test auxiliary cold box in progress
- Final acceptance and commissioning of prototype cryoline (PTCL) test set-up at ITER India laboratory successfully completed
- MRR of prototype cryoline (Z-group) completed
- Manufacturing for shell structure and dished end of test auxiliary cold box completed
- Casing manufacturing completed for cold circulators

HEATING & CURRENT DRIVE SYSTEMS

Diagnostic Neutral Beam (DNB) Power Supply and Beam Line — 100%

- Manufacturing of beam source underway
- System Integration Review (SIR) of beam line components completed
- MRR for acceleration grid power supply (AGPS) completed
- AGPS components (i.e., transformer and switch power supply modules) under manufacturing and testing

Neutral Beam Test Facility Components — 2%

- MRR for SPIDER acceleration grid power supply completed
- Manufacturing and testing underway on SPIDER AGPS components
- SPIDER beam dump factory acceptance successfully completed
- SPIDER beam delivered to the IO at the Neutral Beam Test Facility site

Ion Cyclotron Radio Frequency Power Sources — 100%

- Factory Acceptance Test (FAT) for R&D equipment on factory test bench completed successfully
- Diacrode-based amplifier system shipped from supplier to ITER-India for final assembly, integration and testing at full performance
- For tetrode-based system, control software deployed to hardware at supplier site and integrated with system; further testing underway
- Final stage of integration in progress for dedicated 3MW/CW test rig to test RF sources

Ion Cyclotron Heating & Current Drive Radio Frequency Power Supply (8 out of 18) — 44%

- Prototype high voltage power supply successfully commissioned

Electron Cyclotron High Voltage Power Supply — 30%

Electron Cyclotron Radio Frequency Gyrotron (2 gyrotrons out of 24) — 8%

- Activities ongoing for test facility development
- Procurement of ITER-relevant test gyrotron initiated for establishing system integration and integrated performance in the test facility

COOLING WATER SYSTEM

Heat Rejection System, Component Cooling Water System, Chilled Water System — 100%

- FDR and MRR of lot-1 piping completed
- Manufacturing/fabrication launched for pipes and fittings
- Final design activities underway for rest of piping and equipment
- Procurement activities started for major equipment

VACUUM VESSEL

In-wall Shielding Block Assemblies — 100%

- Manufacturing of support ribs completed for poloidal segment 1 (sector 6) and poloidal segment 1 (sector 5)
- Welding of support ribs to lower brackets for poloidal segment 1 (sector 6) initiated

DIAGNOSTICS

Diagnostics — 3.1%

- Design and analysis activities ongoing for X-Ray Crystal Spectroscopy (XRCS) PDR
- Design of prototype transmission line waveguide components completed and fabrication of waveguide components in progress for Electron Cyclotron Emission (ECE)
- Detailed design of upper port 09 integration has progressed toward System Integration Review

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* Does not include Complementary Diagnostic Arrangements.

PROCUREMENT
HIGHLIGHTS

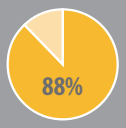
ITER JAPAN (JA-DA)

www.naka.jaea.go.jp/ITER/index.php

PROCUREMENT ARRANGEMENTS*

Twelve PAs signed since 2007 representing…

60% in number



…and 88% of the total value of JA in-kind contributions.

JA AWARDS

Over 800 design or fabrication contracts related to ITER procurement have been signed with industry since 2007.

JAPANESE PROCUREMENT HIGHLIGHTS IN 2014

% OF ITER SYSTEM PROCURED BY JAPAN

MAGNET SYSTEMS

Toroidal Field Conductor — 25%
- 100% strand, 100% cable and 100% conductor completed

Toroidal Field Magnet Windings (9 out of 19) — 47%
- Contract awarded for all toroidal field coil fabrication
- Winding, heat treatment, transfer, conductor insulation and CP welding successfully completed on double pancake prototype
- First series fabrication initiated
- Radial plate series production underway

Toroidal Field Magnet Structures — 100%
- Contract awarded for all coil structure fabrication
- Completion of qualification activities; A1, A2 and B2 segment and A1+A2 sub-assembly prototype fabrication
- Fabrication started on toroidal field coil structures
- Material procurement for series production underway

Central Solenoid Conductor — 100%
- Six conductors (one 613 m and five 918 m) manufactured, corresponding to 12% of all central solenoid unit lengths
- Five conductors shipped to US-DA for module CS3L (one 613 m and four 918 m)

HEATING & CURRENT DRIVE SYSTEMS

ITER & Neutral Beam Test Facility (NBTF) High Voltage Bushing — 100%
and accelerator — 33%
- Manufacturing of large ceramic insulation rings brazed with Kovar plates (1.56 m Ø, large bore) and large fiber reinforced plastic (FRP) rings completed
- Manufacturing of pressure vessel in progress

Neutral Beam Pressure Vessel, Magnetic Shielding — 24%
Neutral Beam Power Supply System for ITER and NBTF — 59%
- Manufacturing of test power supply completed
- Manufacturing of DC generators in progress

Electron Cyclotron Radio Frequency Power Sources (8 gyrotrons out of 24*) — 33%
- Gyrotron operation successfully demonstrated with gyrotron sub-system control unit in compliance with ITER CODAC
- Contract awarded for superconducting magnets, diamond windows and ancillaries for radio frequency power sources

Electron Cyclotron Equatorial Launcher — 71%
- Poloidal steering launcher design and associated mockup tests in progress

REMOTE HANDLING

Blanket Remote Handling System — 100%
- FDR #1 for blanket remote handling system held
- R&D program to develop tools completed

DIVERTOR

Outer Target — 100%
- Manufacturing of full-tungsten prototype plasma-facing units (PFUs) completed; high heat flux testing of units set to begin in RF-DA test facility

TRITIUM PLANT

Atmosphere Detritiation System — 50%
- Supported completion of IO PDR activity
- IO and JA-DA signed joint procurement arrangement

DIAGNOSTICS

Diagnostics — 14.2%
- Contract for Micro-Fission Chamber (MFC) Detectors and Ex Vessel Components preliminary design awarded
- Preliminary design contracts signed for Poloidal Polarimeter (PoPola), Edge Thomson Scattering, Divertor Impurity Monitor and IR Thermography (IRTh)
- IO approval of MFC in-vessel components preliminary design
- IO approval of MFC mineral insulated (MI) cable final design

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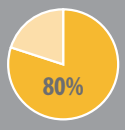
* Includes Complementary Diagnostic Arrangements.

ITER KOREA (KO-DA)

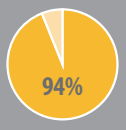
www.iterkorea.org

PROCUREMENT ARRANGEMENTS*

Eight PAs signed since 2007 representing…



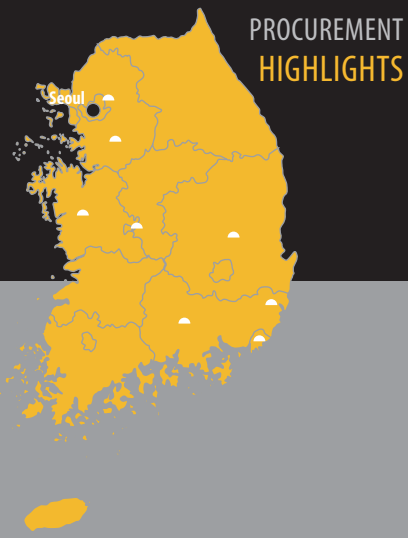
80% in number



…and 94% of the total value of KO in-kind contributions.

KO AWARDS

119 design or fabrication contracts related to ITER procurement have been signed with universities, laboratories and industry since 2007.



PROCUREMENT HIGHLIGHTS

KOREAN PROCUREMENT HIGHLIGHTS IN 2014

VACUUM VESSEL

Main Vessel (2 of 9 segments)
- Manufacturing of Sector #6 (first sector to be delivered) ongoing

Equatorial Ports

Lower Ports
- Manufacturing of lower ports (stub extension) ongoing
- Contract awarded for vacuum vessel gravity supports

BLANKET

Blanket Shield
- Manufacturing feasibility study completed
- Contract awarded for 36 blanket shield modules (first package)
- Kick-off meetings held for Blanket Shield Procurement Arrangement

POWER SYSTEMS

AC/DC Converters
- Converter transformer for correction coil upper (CCU-1) manufactured
- FDR-2 held for central solenoid and toroidal field converters and master control system and MRR approved

In-Vessel Coils Power Supply (busbars)

MAGNET SYSTEMS

Toroidal Field Conductor
- All 27 toroidal field unit lengths delivered to JA-DA in November for coil manufacturing

THERMAL SHIELD

Vacuum Vessel Thermal Shield and Cryostat Thermal Shield
- 10° section, full-scale prototype of the vacuum vessel thermal shield (VVTS) completed
- VVTS manufacturing initiated

ASSEMBLY TOOLING

Machine Assembly Tooling
- FDR held for first batch of assembly tools
- Manufacturing readiness activities for first-delivery tools underway

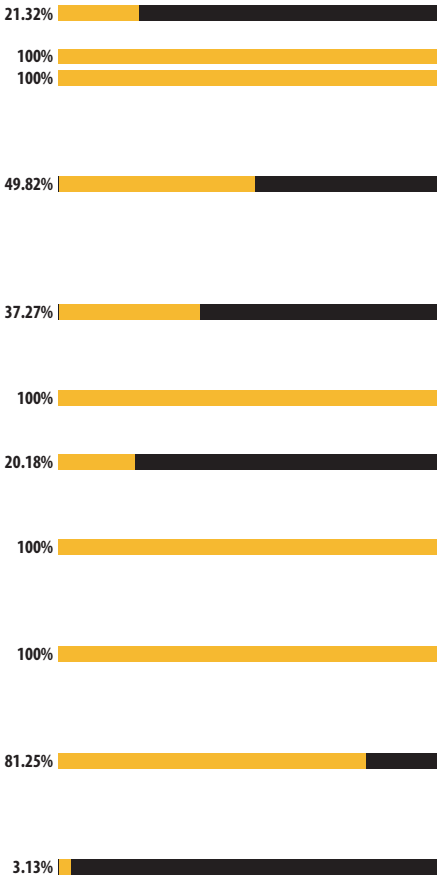
TRITIUM PLANT

Tritium Storage & Delivery
- Storage and delivery system getter bed 1:1 mock-up test performed
- Process feasibility verification test performed for storage and delivery unit

DIAGNOSTICS

Diagnostics
- Preliminary design of vacuum ultra-violet (VUV) spectrometer and Neutron Activation Systems (NAS)
- Preliminary design of Upper Port Plug 18 port integration
- Prototype system performance test run on the KSTAR tokamak

% OF ITER SYSTEM PROCURED BY KOREA



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* Does not include Complementary Diagnostic Arrangements.

PROCUREMENT

HIGHLIGHTS

ITER RUSSIA (RF-DA)

www.iterrf.ru

PROCUREMENT ARRANGEMENTS*

Twelve PAs have been signed since 2007 representing…

100% in number

…and 100% of the total value of RF in-kind contributions.

RF AWARDS

About 30 Russian companies are currently under contract with RF-DA; each of these contracts "pulls" along a chain of contractors and subcontractors.

RUSSIAN PROCUREMENT HIGHLIGHTS IN 2014

% OF ITER SYSTEM PROCURED BY RUSSIA

POWER SYSTEMS

Switching Network, Fast Discharge Units, DC Busbar and Instrumentation — 100%

- Type tests completed for all switching network unit (SNU) and fast discharge unit (FDU) switches
- Prototype FDU resistor manufactured and tested; prototype SNU resistor in progress
- Reliability tests performed on FDU pirobreaker
- Type tests carried out on prototype toroidal field, poloidal field/central solenoid and correction coil busbars
- FDR phase 1 successfully completed on DC busbar
- Materials procured and series manufacturing initiated for DC busbar

MAGNET SYSTEMS

Toroidal Field Conductor — 19.3%

- 100% of strand production (14.7 tonnes) completed
- 7 conductor unit lengths manufactured and successfully tested at SULTAN
- 7 conductor unit lengths shipped to EU-DA winding facility

Poloidal Field Conductor — 20%

- 2 conductor samples produced for SULTAN testing; 1 tested successfully
- 100% of strand production (25.3 tonnes) completed; 11 cables manufactured
- 2 PF1 conductors and 2 PF6 conductors manufactured and prepared for shipping

Poloidal Field Magnet No.1 — 100%

- Design of qualification samples (helium inlet, joint, full size joint, dummy double pancake) agreed
- Insulation qualification samples and 3x3 mockup manufactured and tested successfully
- Tooling (including clean room) finalized
- Dummy double pancake winding initiated

BLANKET

Blanket First Wall — 40%

- PA signed for First Wall Panels (enhanced heat flux) in February
- Working drawings for full-scale prototype developed (based on panel 14A)
- Contracts for full-scale prototype signed
- Manufacturing process fully developed for beryllium tiles (including production of ITER-grade beryllium TGP-56FW)
- Mechanical and thermal tests carried out on central bolt attachment
- Tiles made of two grades beryllium tested at the plasma heat fluxes and thermal cycle; erosion and surface damage found to be identical

Blanket Module Connections — 100%

- PA signed for Blanket Module Connections in December
- R&D, fabrication and tests of the blanket module connectors progressed (flexible supports, pads, E-strap); design optimization and analysis ongoing
- Test equipment fabricated

DIVERTOR

Dome — 100%

- Dome manufacturing technologies/methods optimized
- Plasma-facing unit support structure fabricated for full-scale prototype
- Collector billets for dome prototype manifold units manufacturing were HIPped
- Finalization of full-tungsten divertor dome design underway

Plasma-Facing Component Tests — 100%

- High heat flux testing of outer vertical target full-scale prototype test assembly 2 from Japan completed at ITER Divertor Test Facility, plus additional cycling at 20 MW/m^2 on all-tungsten components
- Qualification test of inner vertical target assembly and dome divertor umbrella plasma-facing unit imitators completed

VACUUM VESSEL

Upper Ports — 100%

- Procedures approved by IO and ANB on upper port austenitic stainless steel plates, austenitic stainless steel forgings, and stainless steel forgings
- Manufacturing initiated on upper port structures

Port Plug Test Facility — 100%

- Gasket test for ITER Port Plug Test Facility carried out
- Heating mockup manufacturing initiated
- FDRs held for Port Plug Test Facility and test facility control system
- Ongoing manufacturing activities on mockup heating system and sealing

DIAGNOSTICS

Diagnostics — 17%

- Diagnostic amendments signed for Vertical Neutron Camera, Edge Charge Exchange Recombination Spectroscopy, H-Alpha Spectroscopy
- Diagnostic amendments signed for Upper Port Plugs 02 and 08
- Preliminary design of Divertor Neutron Flux Monitor (DNFM) ongoing
- Mockup of DNFM I&C registration system, moderator and cooling module designed, manufactured and tested
- R&D progress on Charge Exchange Recombination Spectroscopy, HFS Reflectometer, H-Alpha Spectroscopy, Neutral Particle Analyzer, Divertor Thomson Scattering and Laser Induced Fluorescence
- Port plug integration engineering underway for equatorial port 11 and upper ports 02 and 08

HEATING & CURRENT DRIVE SYSTEMS

Electron Cyclotron Radio Frequency Power Sources (8 gyrotrons out of 24) — 33%

- 3D model of gyrotrons developed
- Qualification of welding/brazing carried out successfully
- Gyrotron prototype set manufactured; factory acceptance test program accepted; resource tests carried out

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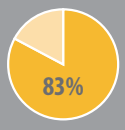
* Does not include Complementary Diagnostic Arrangements.

US ITER (US-DA)

www.usiter.org

PROCUREMENT ARRANGEMENTS*

Fifteen PAs signed since 2007 representing…



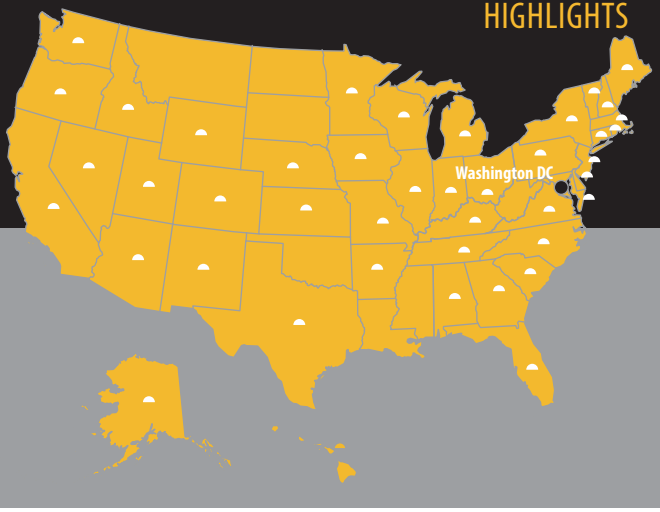
83% in number

…and 96% of the total value of US in-kind contributions.

US AWARDS

The US has awarded over 540 design or fabrication contracts to US industry, universities, and national laboratories in 43 states plus the District of Columbia.

PROCUREMENT HIGHLIGHTS



US PROCUREMENT HIGHLIGHTS IN 2014

% OF ITER SYSTEM PROCURED BY THE US

COOLING WATER SYSTEM

Tokamak Cooling Water System — 100%

- Completed fabrication of two "normal" drain tanks

MAGNET SYSTEMS

Central Solenoid Modules, Structure and Assembly Tooling — 100%

- Module R&D completed
- Winding initiated on mockup module
- Tooling station installation and commissioning underway
- 4K test facility under construction
- Contract awarded for lower key block manufacturing (central solenoid structure)
- FDR held for assembly tooling (early items)

Toroidal Field Conductor — 8%

- 800 m dummy conductor delivered to EU winding facility
- 100 m active conductor delivered to EU winding facility
- First production conductor completed and spooled

DIAGNOSTICS

Port-Based Diagnostic Systems — 14%

- Contracts awarded for Low Field-Side Reflectometer physics design; Electron Cyclotron Emission design; Upper Camera design; and Toroidal Interferometer and Polarimeter design
- FDR held for Residual Gas Analyzer
- PA signed for Core Imaging X-ray Spectrometer
- PA signed for Equatorial Port Plug 3 / Motional Stark Effect

HEATING & CURRENT DRIVE SYSTEMS

Ion Cyclotron Transmission Lines — 88%

- Hybrid splitter component qualification testing completed
- Gas-cooled gas barrier R&D completed
- FDR held for 50 ohm gallery components

Electron Cyclotron Transmission Lines — 88%

- Waveguide interior inspection tool developed

FUEL CYCLE

Vacuum Auxiliary and Roughing Pump Stations — 100%

- Vacuum test stand component delivered
- Fabrication and testing of roots and screw pumps completed
- Fabrication of cryoviscous compressor prototype completed
- PDR held for vacuum auxiliary system

Pellet Injection System — 100%

- Fabrication of guide tube selector prototype completed
- Contract awarded for dual pellet gun nozzle test unit

Disruption Mitigation System — 100%

- Successful testing of shattered pellet technology on DIII-D tokamak
- Design and testing of massive gas injection electronics completed
- Systems Design Review selected shattered pellet injection as preferred technology, with a second technology (massive gas injection) for non-nuclear operation only

TRITIUM PLANT

Tokamak Exhaust Processing System — 88%

- Preliminary design support per the IO Task Agreement initiated

POWER SYSTEMS

Steady State Electrical Network — 75%

- First plant component delivered to ITER site (HV surge arresters)
- Additional components delivered to ITER site: potential transformers, HV substation hardware, HV switches, HV circuit breakers and earthing switches, HV current transformers, UPS batteries, HV control and protection hardware, earthing resistors
- Awarded contract for HV substation hardware
- 11 of 16 contracts have been signed

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* Includes Complementary Diagnostic Arrangements.

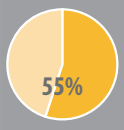
PROCUREMENT HIGHLIGHTS

FUSION FOR ENERGY (EU-DA)

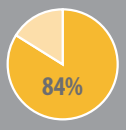
www.fusionforenergy.europa.eu

PROCUREMENT ARRANGEMENTS*

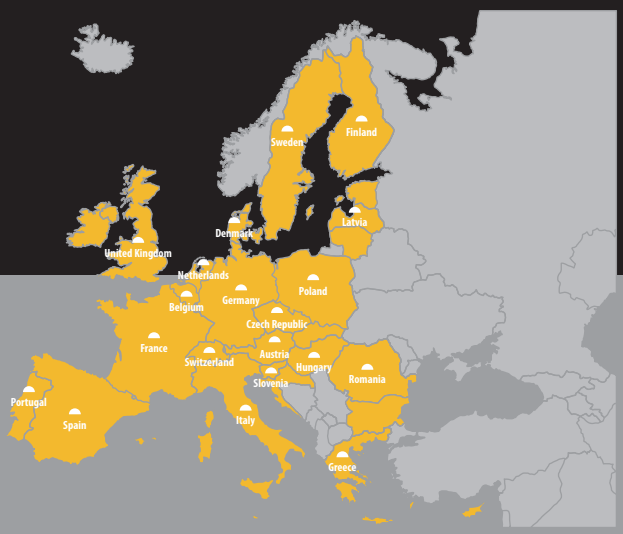
Twenty-eight PAs signed since 2007 representing…



55% in number



… and 84% of the total value of EU in-kind contributions.



EU AWARDS

The EU has awarded 410 design or fabrication contracts related to ITER procurement to universities, laboratories and industry since 2007 (80 in 2014).

EU PROCUREMENT HIGHLIGHTS IN 2014

% OF ITER SYSTEM PROCURED BY THE EU

BUILDINGS

Building Construction, Tokamak Pit Excavation and Drainage, Ground Support Structure, Seismic Isolation Pads — 100%
- Tokamak Complex basemat slab (B2) completed in August, following release from French nuclear safety authority (ASN)
- Tokamak galleries, drainage and site adaptation work finalized
- Start of work on Tokamak Complex walls (B2 level)
- Progress on Assembly Building and Site Services building
- Contract signed for high voltage electrical equipment

Architect Engineer Services — 45%
- Construction Design Review for the Tokamak Complex steel frame buildings started
- FDR for cranes and cargo lift approved

ITER Headquarters — 53.5%
- On-site preparation agreement signed between Agence ITER France and EU-DA

MAGNET SYSTEMS

Toroidal Field Conductor — 20.18%
- Qualification of one new jacket supplier
- 18 production lengths and 7 qualification lengths fabricated

Toroidal Field Magnet Windings (10 out of 19) — 53%
- Contract signed for cold testing and insertion
- Successful completion of first full-size superconducting double pancake
- Series production underway for 70 radial plates and 70 double pancakes: 8 completed radial plates delivered to winding pack supplier; 17 double pancakes wound, 12 heat treated, 7 inserted; 3 turn insulated, 1 laser welded

Pre-Compression Rings — 100%
- Qualification strategy redefined with IO

Poloidal Field Conductor — 18%
- Qualification phase completed
- 3 qualification conductor lengths completed: two 400 m (PF1) and two 720 m (PF6)

Poloidal Field Magnets No. 2-5 — 100%
- Contract signed for winding tooling
- FDR completed for winding tooling
- Site and infrastructure contract signed and started

HEATING & CURRENT DRIVE SYSTEMS

Ex-Vessel Neutral Beam Remote Handling — 100%

Power Supply Heating Neutral Beam — 35%
- Factory acceptance tests for SPIDER ion source and extraction power supplies successfully completed
- Manufacturing and factory testing of high voltage (HV) deck successfully completed
- Contract signed for procurement of 1MV HV Deck and HV bushing for MITICA and ITER injectors

Neutral Beam Test Facility (NBTF) — 64%
- NBTF on-site installation activities started; health and safety organization established

NBTF Components — 56%
- SPIDER vacuum vessel completed
- Contract signed for MITICA vessel
- FDR closed on MITICA beam source and beam line components

Neutral Beam Assembly, Testing, Active Compensation & Correction Coils — 100%

Neutral Beam Source and High Voltage Bushing — 41%

Neutral Beam Pressure Vessel, Magnetic Shielding — 76%
- ITA/grant to finalize design of beam line and beam source vessels etc. signed

Ex-Vessel Neutral Beam Remote Handling System — 100%

Ion Cyclotron Antenna — 60%
- Framework contract signed for the final design of the ion cyclotron heating antenna
- Testing of Faraday screen mockups successfully completed

Electron Cyclotron Control System — 100%
- PA signed for Electron Cyclotron Plant Controller

Electron Cyclotron High Voltage Power Supply — 62%
- FDR held for electron cyclotron power supplies

Electron Cyclotron Upper Launchers — 76%
- Qualification of components with nuclear safety/protection functions (PIC) underway

Electron Cyclotron Radio Frequency Power Sources (6 gyrotrons out of 24) — 25%
- Short pulse 1 MW gyrotron fabricated and first test sessions successfully completed
- Manufacturing design of 1 MW continuous wave prototype completed

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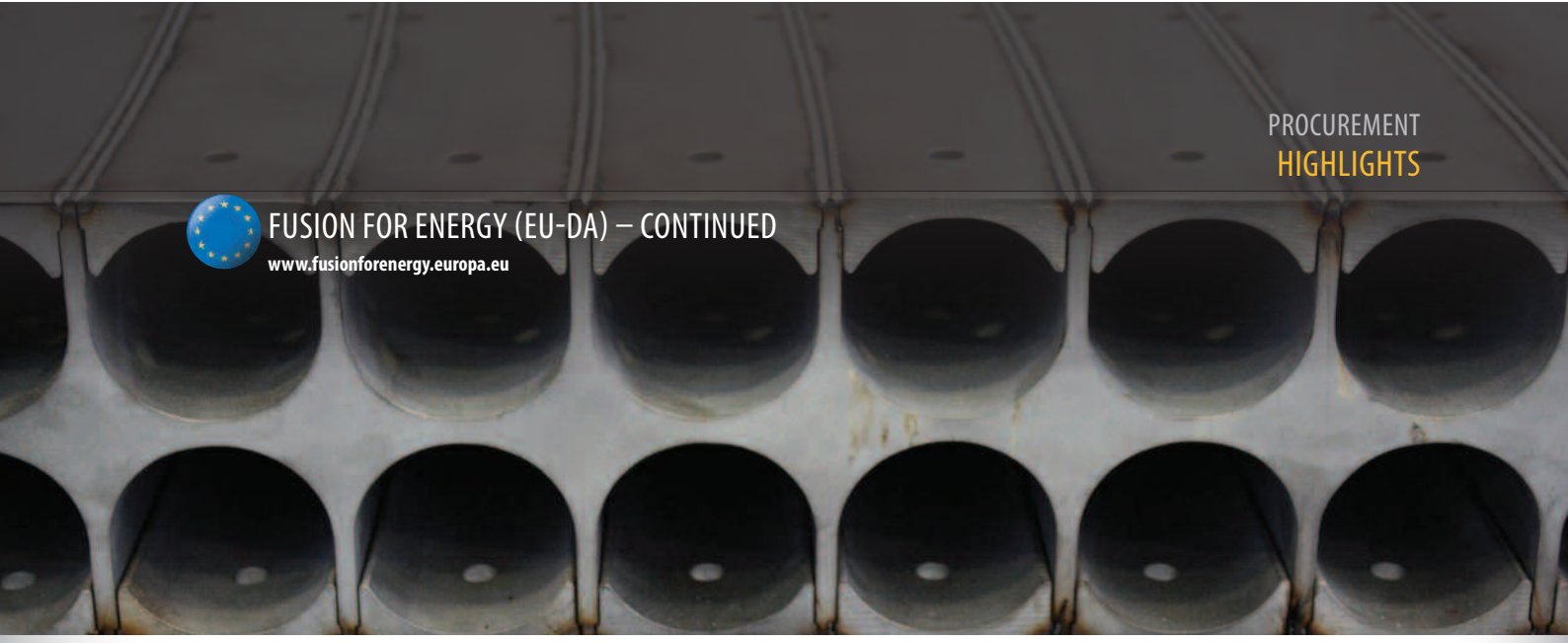

FUSION FOR ENERGY (EU-DA) – CONTINUED

www.fusionforenergy.europa.eu

EU PROCUREMENT HIGHLIGHTS IN 2014

% OF ITER SYSTEM PROCURED BY THE EU

VACUUM VESSEL

Main Vessel (7 of 9 segments) — 80%

- Completion of manufacturing mockups
- Simulations finalized on segment welding distortions; stress analyses completed on structural assessment (sector 3)
- Manufacturing strategy finalized for sector 5
- Completion of in-wall shielding blocks and rib design for segments PS1 and 2 (sector 5)
- Material suppliers qualified for plates, forgings and filter material
- Technical specifications approved for qualifying welding techniques

Ex-Vessel Remote Handling Transfer Cask System — 100%

In-Vessel Remote Handling Viewing and Metrology — 100%

DIVERTOR

Inner Vertical Targets — 100%

- Successful fabrication and testing of high heat flux all-tungsten semi-prototype

Cassette Body and Assembly — 100%

- Signature of third framework contract for fabrication of divertor cassette bodies

In-Vessel Divertor Remote Handling Equipment — 100%

- Contract signed for divertor remote handling system
- Licence contract concluded for GENERIS robotics control software (common to other remote handling procurements)

Divertor Rail — 100%

BLANKET

Blanket First Wall — 47.4%

- Three contracts signed for the manufacture of normal heat flux, full-scale prototype first wall panels
- Completion of the second blanket first wall qualification prototype; successful high heat flux testing (first phase)

Blanket Cooling Manifolds — 100%

POWER SYSTEMS

Steady State Electrical Network (SSEN) and Pulsed Power Electrical Network (PPEN): Detailed System Engineering Design and Installation — 100%

Emergency Power Supply — 100%

SSEN Components — 25%

FUEL CYCLE

Front End Cryo-Distribution: Warm Regeneration Lines — 100%

- Contract for final design and manufacturing of warm regeneration lines started

Front End Cryo-Distribution: Front End Cryopump Distribution — 100%

- Preliminary design of cold valve boxes and warm regeneration box completed

Cryopumps, Torus (6) and Cryostat (2) — 100%

- Pre-production cryopump manufacturing underway

Cryopumps, Neutral Beam — 100%

Leak Detection — 100%

TRITIUM PLANT

Water Detritiation System — 100%

- Large tank manufacturing initiated
- Isotope separation system conceptual design advanced

Hydrogen Isotope Separation System — 100%

CRYOPLANT

Cryoplant: LN2 Plant and Auxiliary Systems — 50%

- PDR held for liquid nitrogen (LN2) plant
- Procurement of long-lead items (compressors, heat exchangers, quench tanks, liquid helium tank, liquid nitrogen tank) launched

DIAGNOSTICS

Diagnostics — 25%

- Contracts or agreements signed for design of Charge Exchange Recombination Spectrometry; port plug design, testing and diagnostic integration; Low Field Side Collective Thomson Scattering
- Contract signed for Continuous External Rogowski sensor series manufacturing

In-Vessel Remote Handling Viewing and Metrology — 100%

- PA signed for In-Vessel Viewing System (following successful CDR)

RADIOACTIVE MATERIALS

Waste Treatment and Storage — 100%

Radiological Protection — 100%

- Design of radiological and environmental monitoring system initiated
- Task order partially implementing the radiological and environmental monitoring system (REMS) design procurement arrangement signed
- Preliminary list of REMS defined requirements agreed with IO and provided to supplier

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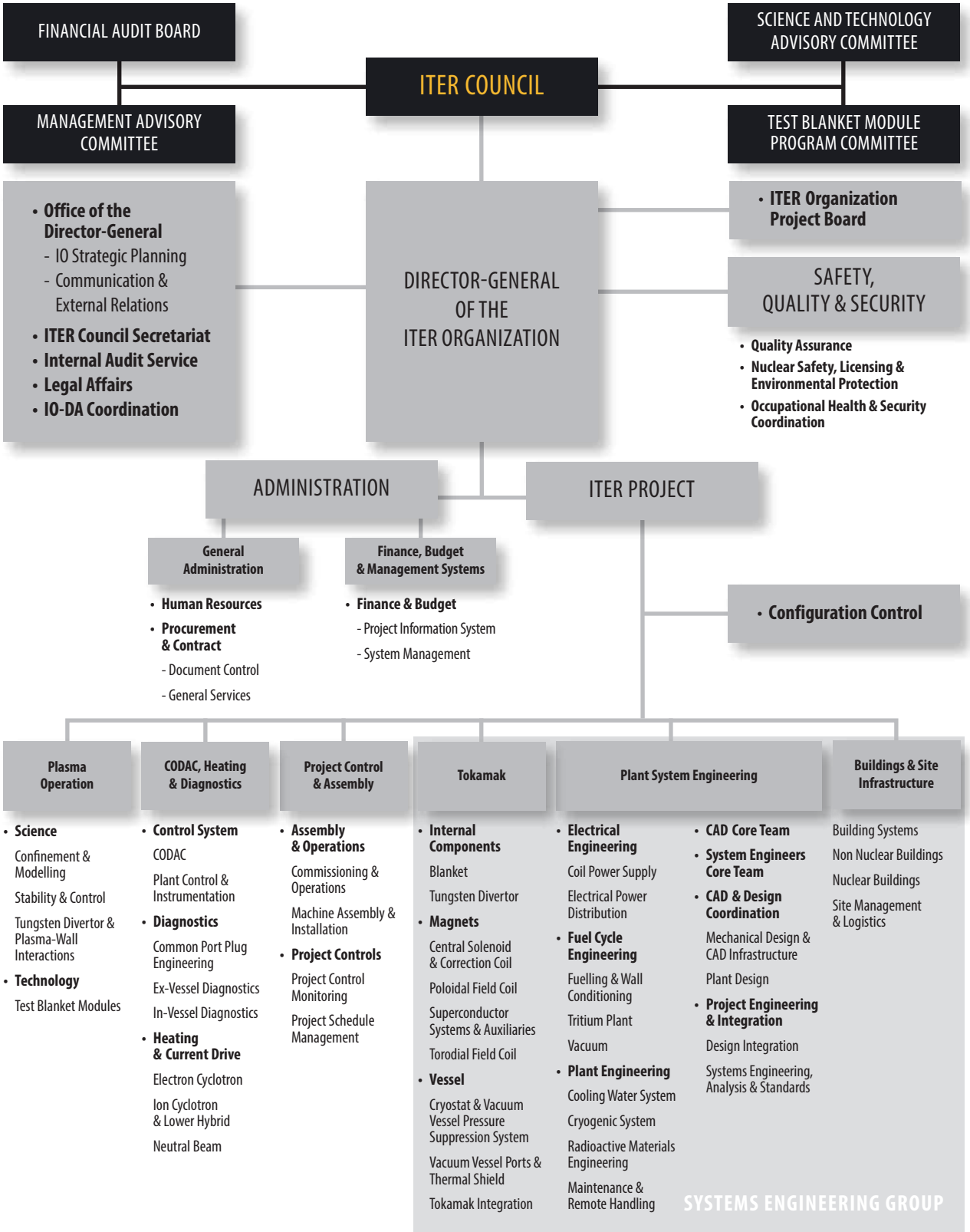
ORGANIZATIONAL
STRUCTURE



The most significant construction milestone in 2014 was the completion of the Tokamak Complex "B2" basemat on 27 August. The realization of this heavily reinforced concrete slab, designed to support an estimated 400,000 tonnes of building and equipment, was the last in a series of steps undertaken since 2010 to create the ground support structure and foundations for the ITER Tokamak.

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