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Headline

CS SNU Commissioning successfully completed



Figure 1: Group photo commemorating the completion of the SNU installation and commissioning

The commissioning of the 4 <u>switching network units</u> (SNUs) for the <u>central solenoid</u> (CS), procured by ENEA through a contract with OCEM Energy Technology S.r.L. (OCEM) in Italy, was successfully completed on 31 March 2017 (Figure 1).

The project "SNU-CS installation and commissioning at QST, Naka, Japan" by OCEM through a contract with ENEA started officially last autumn on 3 October 2016, just after <u>5 containers holding 52 packages arrived at Yokohama port</u> in Japan from La Spezia, Italy. On 7 October, after the customs formalities, the packages were inspected at the port by 4 parties: OCEM, ENEA, F4E, and QST. Once the inspection was finished, the packages were transported to the QST Naka site.

The installation of the CS SNUs started on 17 October, not long after those boxes were safely received and unboxed at the Naka site. Because the boxes were closed very carefully and tightly in Italy, unpacking them turned out to be rather hard. Despite this, the installation went full steam ahead and finished in 39 days without any additional surprises on 9 December 2016 (Figure 2). Since it was Christmas holiday time when the installation was completed, the parties agreed to have a break and make a start on commissioning in the new year.

The commissioning of the CS SNUs started on 31 January 2017 as planned. The first unit that officially passed the site acceptance test was SNU-CS1. The pace of testing remained the same with the next unit in the pipeline: SNU-CS4 second, then SNU-CS2, and last SNU-CS3. All of the units passed the acceptance tests with flying colours. On 31 March 2017, the commissioning was finally completed after 38 days work without any slips in the schedule.

Thanks to everybody who was involved in the CS SNU installation and commissioning, the JT-60SA project took another step closer to the first plasma.



Figure 2: CS SNUs installed in the rectifier building



Figure 3: SNU testing in-progress



Figure 4: Control panel



Figure 5: Training for CS SNU operation

<u>News</u>

7 TF coils now in Naka



- Figure 1: TF coils "Annie", "Brigitte", "Roberta", "Eleonora" already mounted onto the device (above)
- Figure 2: The TF coil "Cécile" ready for mounting in the assembly hall (right top)
- Figure 3: TF coils "Danièle", "Emmanuele" in acceptance test in the engineering experiment building (right bottom)









A total of 7 (out of 18) toroidal field (TF) coils have already been delivered to the QST Naka site as of the end of March 2017.

Following the first TF coil - "Annie" (coil number 10 in the overall TF coil numbering system of JT-60SA) - <u>delivered</u> on 20 June 2016, the second coil - "Brigitte" (coil number 11) - and the third coil - "Roberta" (coil number 1) - arrived at the site on 25 August and 15 November 2017, respectively.

The fourth coil - "Cécile" (coil number 12) - was delivered on 16 December 2016, and is ready for mounting in the assembly hall (Figure 2).

The fifth coil - "Eleonora" (coil number 3) - arrived on 25 January 2017. It was mounted onto the device prior to "Cécile". Thus, together with the 3 coils - "Annie", "Brigitte", and "Roberta" -, a total of 4 coils have already been mounted around the <u>vacuum</u> <u>vessel thermal shield</u> sector number 6 to 9 (Figure 1).

The sixth - "Danièle" (coil number 13) - and the seventh - "Emmanuele" (coil number 14) - were delivered on 16 March and 30 March 2017, respectively. Acceptance tests are being carried out in the engineering experiment building.

Manufacturing, delivery, and assembly of the TF coils are now progressing almost in accordance with the project schedule.

News

6 valve boxes delivered to Naka site





Figure 1: Transparent view of JT-60SA cryodistribution

Figure 2: Delivered valve boxes at the QST Naka site

A total of 11 valve boxes (VBs) named VB01-11 (Figure 1) will be installed around the JT-60SA <u>cryostat</u>. A total of 6 (out of 11) VBs have already been completed and delivered to the QST Naka site (Figure 2). The remaining 5 VBs are being manufactured.

The superconducting tokamak, JT-60SA, uses supercritical helium to cool the <u>superconducting magnets</u>, <u>thermal shields</u>, and so forth. The VB contains measurement devices and cryogenic valves to monitor and control the cold helium flow in the cooling pipes of those components. A single VB body has a height of 2 m and an outer diameter of 1.4 m. The valve stems and actuators protrude from the head. The VB arm encloses the orifice plates, impulse lines and resistor elements of negative temperature coefficient to measure the flow rate, pressure, and temperature of the helium.

The cryopump valve unit (CPVU) and safety valve units (SU) were delivered as well. The CPVU controls the flow of 3.6 K helium for the <u>diverter cryopumps</u> with 9 cryogenic valves which are directly installed on the bottom of the cryostat. The SUs are placed on the common stages around the cryostat. The pressure relief valves and rupture discs, which are installed in the SU, are operated when an excess helium pressure is observed in the system.

News

First ENEA power supplies arrive at Naka site



Figure 1: Group photo in front of the SCMPS and FPPC coil PS boxes after their arrival at the QST Naka site

In March 2017, the first batch of the ENEA power supply shipment arrived at the QST Naka site. The packages involved the entire <u>fast plasma position control (FPPC) coil</u> power supplies (FPPC coil PSs) including 4 resin-cast transformers, as well as the <u>superconducting magnet power supplies</u> (SCMPSs) for the <u>central solenoid</u> (CS) modules 1 and 4 with 2 bulky oil transformers for the CS modules 2 and 3.

This equipment supply was made possible thanks to the Voluntary Contributor, ENEA, who awarded the engineering and procurement contract to POSEICO-JEMA, the temporary joint venture between Poseico S.p.A. (Italy) and Jema Energy S.A. (Spain).

The first shipment left the port of Genoa (Italy) on 31 January 2017, and, after a long journey, reached the port of Yokohama on 10 March 2017 (Figure 2).



Figure 2: Itinerary of the ENEA power supplies from Italy to Japan

Reception and inspection of the packages were performed successfully by ENEA/F4E/QST representatives on 17 March (Figure 3). During the inspection one of the wooden boxes containing a resin transformer was found to have been damaged during the transport, but a further detailed inspection confirmed no evident damage to the contents, giving reassurance of the good status of the transformer. Additional checks will be performed at the time of box opening in Naka under POSEICO's responsibility.

The packages were delivered to the QST Naka site on 21 March (Figure 1). Thanks to the preparation of the foundations by a good cooperation between F4E and QST, the 2 oil transformers were installed immediately after the delivery without any temporary storage use. All of the other packages were unloaded and inspected again in the rooms where the components would be installed at a later stage.

F4E is currently finalising the contract negotiation for the installation and commissioning of the ENEA converters, with the aim of starting those activities as soon as possible.

The first delivery was successfully completed. However, ENEA's activity for the SCMPSs is not finished yet. The second and last shipments are expected by this autumn, and all look forward to completing these deliveries to Naka.



Figure 3: Participants in the box reception at Yokohama port

<u>News</u>

Evaluation of VVTS installation

After the 340° vacuum vessel thermal shields (VVTSs) were completed, their actual shapes were measured in the absolute coordinate system (the reference for the overall assembly).

The comparison between those measurements and the design values showed that the actual shapes were vertically longer than expected. However, the actual clearance between the VVTSs installed and the <u>toroidal field (TF) coils</u> in design was calculated and found to satisfy the requirement (\geq 30 mm): vertically 57 mm at the top and 40 mm at the bottom, and radially 32 mm at the inboard equatorial plane (the narrowest point), although the overall VVTSs are slightly shifted toward the device centre.

This evaluation demonstrated that the current VVTS position would not cause any problems in the TF coil assembly and the future operation.



Bird's eye view of the VVTS (red points: measurement points by laser tracker, grey circles and figures: differences between the design and actual clearances

Meeting

20th STP Project Committee Meeting



The 20th meeting of the <u>Satellite Tokamak Programme Project Committee</u> (STP-PC) was held on 21 March 2017. A total of 31 participants joined the meeting also by videoconference. There were 6 members from the STP-PC, the Project Leader (PL), 4 experts from the Project Team, and 20 experts from the EU and JA Home Teams.

At the meeting, the PL reviewed the project status and presented the "Annual Report 2016" and "Project Plan". The latest status of procurement and assembly was also reported in detail by the Project Managers of the EU and JA Home Teams.

The STP-PC expressed satisfaction with the achievements and the progress in both EU and JA procurements as well as the installation, commissioning and assembly since the last STP-PC. Those included fabrication of the central solenoid modules and cryostat vessel body cylindrical section, fabrication and delivery of the high temperature superconductor current leads for the poloidal field coils, installation and commissioning of the power supply systems, completion of the 340° vacuum vessel thermal shield (VVTS) assembly around the vacuum vessel, and start of the toroidal field (TF) coil assembly. The STP-PC welcomed the fact that 3 TF coils had already been mounted around the VVTSs, and that the whole process of the TF coil fabrication, testing, pre-assembly and delivery were on track. The STP-PC also applauded the signing of the Procurement Arrangements of the cryostat top lid and electron cyclotron range of frequency system components.

The STP-PC recommended submitting the "Project Plan", including the update of the overall schedule, to the 20th meeting of the Broader Approach Steering Committee (BASC-20) held on 27 April 2017.

Before the meeting, one of the PC members inspected the JT-60SA torus hall where the TF coil assembly was being carried out actively.

The STP-PC decided that the next STP-PC meeting (PC-21) would be held on 17 October 2017.

<u>Local</u>

Coil mock-up on display



A mock-up of the double pancakes (DPs) for the JT-60SA toroidal field (TF) coil was donated by F4E to QST. It was the one actually used to verify the winding work procedures during the coil manufacture before the actual TF coil production. It was divided into 2 pieces at the equatorial plane, and mounted over the upper half of the 20° vacuum vessel sector model, which has been displayed in the front yard of the JT-60 control building at the QST Naka site since 2016.

The D-shaped mock-up is the same size as the stacked 6 DPs enclosed in the casing of the production TF coils (a maximum half-height of \sim 3.5 m and a maximum radial width of \sim 4 m at inside, a thickness of 14.4 cm (inner) and 15 cm (outer), and a toroidal width of 34.7 cm).

The mock-up of a single DP for the equilibrium field (EF) coil No.5 has also been displayed next to them. This monument is a good photo spot for visitors (VIPs, researchers, students, and so forth) to the Naka site to help them appreciate the magnitude of the JT-60SA construction.

Calendar

14 – 18 May 2017 25th International Conference on Nuclear Engineering (ICONE 2017) Shanghai, China

22 – 26 May 2017 6th Research Coordination Meeting (RCM-6) Naka, Japan

4 – 8 June 2017 27th IEEE Symposium on Fusion Engineering (SOFE 2017) Shanghai, China

26 – 30 June 2017 <u>44th European Physical Society Conference on Plasma Physics</u> (EPS 2017) Belfast, UK

5 – 6 July 2017 28th Technical Coordination Meeting (TCM-28) Naka, Japan

Contact Us

The JT-60 Newsletter is released monthly by the JT-60SA Project Team.

Suggestions and comments are welcome and can be sent to newsletter@jt60sa.org.

For more information, please visit the website: http://www.jt60sa.org/.