JT-60SA Newsletter
No. 87, 31 March 2017

Headline

TF coil assembly progressing

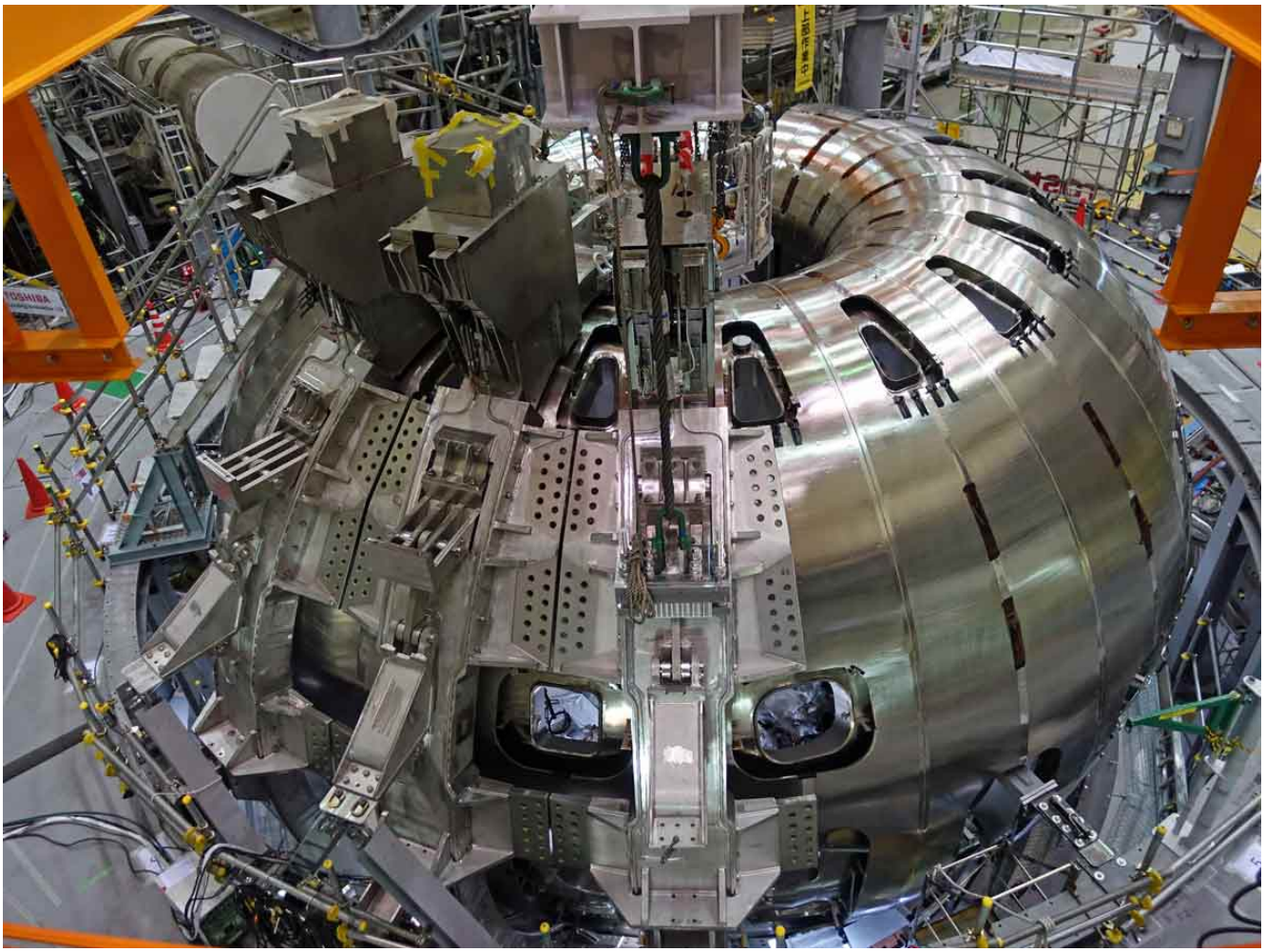


Figure 1: Positioned TF coil number 1 (front) and coil number 10 and 11 (left)

The first Italian toroidal field (TF) coil - "Roberta" - (coil number 1 in the overall TF coil numbering system of JT-60SA) was successfully placed in the appropriate mounting position on 6 March 2017 (Figure 1).

The gap between it and the adjacent French coil was confirmed to be within tolerances. In parallel, the tightening of the first inner intercoil structure (IIS) to connect the 2 French coils already installed (coil number 10 - "Annie" - and coil number 11 - "Bridget" -) was performed (Figure 2). V. Tomarchio, F4E representative, visited the QST Naka site to see and check the tightening procedure for the IIS.

The finer alignment of coil number 1 and IIS tightening are now ongoing.

Figure 2: IIS tightening

News

Preparation for CVBCS pre-assembly

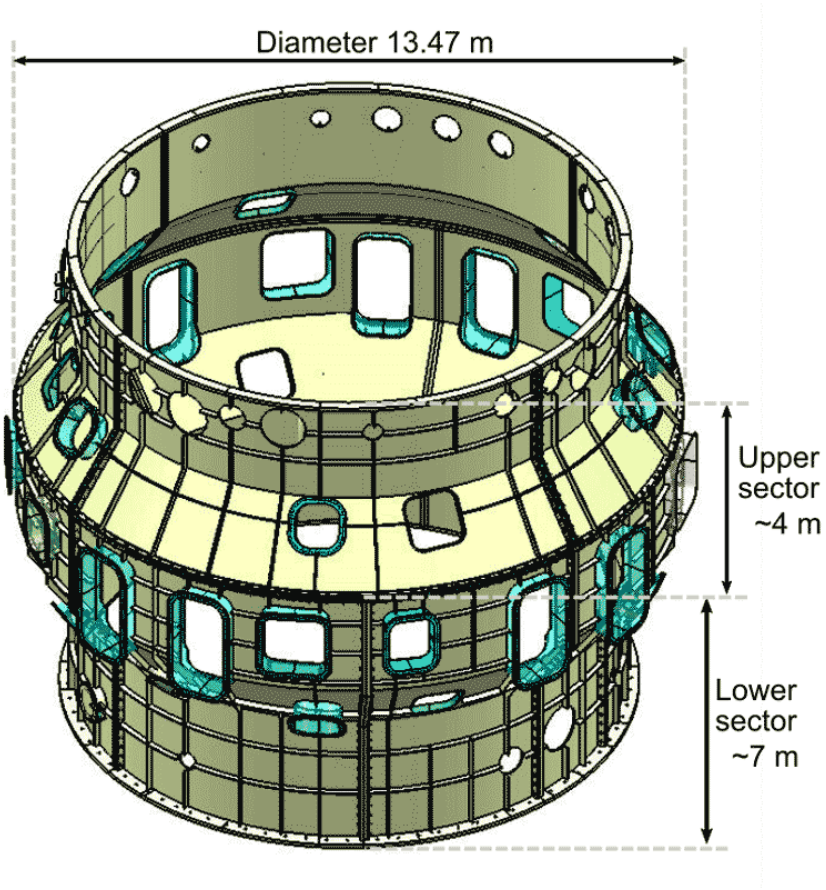


Figure 1: CVBCS bird's-eye view

Figure 2: Group photo in front of the 3 CVBCS lower sectors (from left to right: Y. Shibama (QST), J. Botija (CIEMAT), K. Masaki (QST), A. Cardella (F4E), and A. Gonzalez (ASTURFEITO))

On 27 February 2017, an important technical meeting was held at Asturfeito S.A. (ASTURFEITO) in Aviles, Spain, in preparation for the pre-assembly of the JT-60SA cryostat vessel body cylindrical section (CVBCS), which has an equatorial section diameter of 13.47 m and a height of ~11 m (Figure 1), at ASTURFEITO's factory. QST, F4E and CIEMAT responsible officers participated in the meeting (Figure 2).

ASTURFEITO has already completed 9 of the 12 sectors, and the last 3 sectors are in advanced stages of manufacturing. The participants discussed and defined, in detail, the procedures for the CVBCS pre-assembly at the factory, which is scheduled to begin at the end of March 2017.

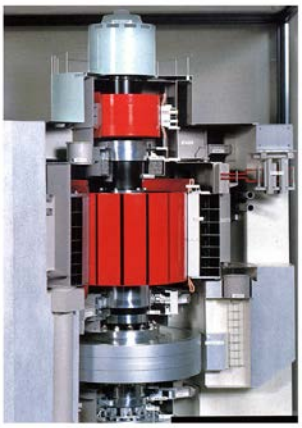
The lower sectors (with a height of ~7 m) will be separately positioned and precisely adjusted and controlled dimensionally on the adjustable supporting devices. If necessary, a final (minor) end machining will be performed in some sectors in order to achieve the required tolerances. Using a similar procedure of control and adjustment, the upper sectors (height ~4 m) will then be positioned on the top of the lower sectors, completing the entire CVBCS.

The CVBCS pre-assembly is planned to be completed in September 2017. It will be disassembled again and delivered to the QST Naka site in January 2018.

News

Motor Generator rotating test successfully finished

The existing flywheel motor generator (MG), which was installed at the QST Naka site and used for the former JT-60U device, will be reused for the AC power supply of JT-60SA without major modification. Because of the Tohoku Earthquake off the Pacific coast of Japan, which hit the Naka site in 2011, its integrity had been in question and has been examined since 2016.



Specifications

Output power	400MVA
Output voltage	18kV
Output current	12,830A
Rated speed	582rpm

Figure 1: Flywheel MG model

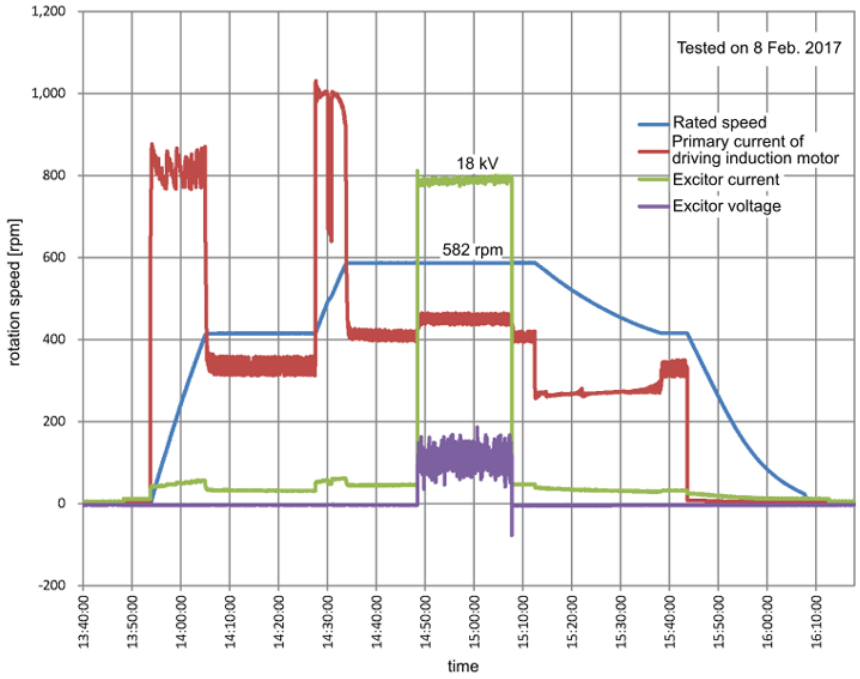


Figure 2: Results of the MG rotation test

In February 2017, a rotation test was carried out after a thorough maintenance and careful inspection for the first time since the JT-60U operation ended in 2008. The successful test results confirmed that the MG was capable of achieving its original specifications without any trouble (see Figure 2).

This marked one of the important milestones of the JT-60SA construction.

News

Large current feeders installed in JT-60 main building

PF coil feeders installed on the north wall penatration of the torus hall

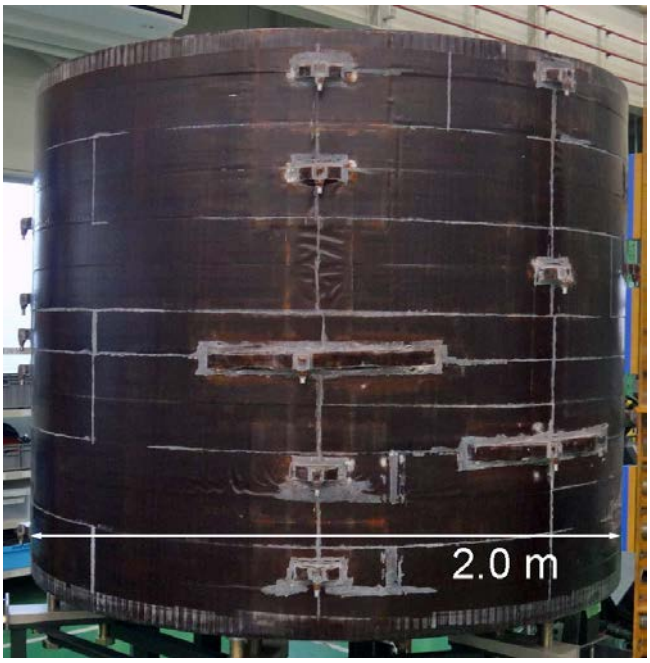
The large current feeders for the superconducting coils were successfully installed in the JT-60 main building, where the tokamak device is now being assembled.

Because those DC feeders go through penetrations in the building walls, they are copper and water-cooled in contrast to the other aluminium natural air-cooled busbars. The toroidal field (TF) coil feeder, with a nominal current of 25.7 kA, enters and leaves the building through the west wall penetration, and the poloidal field (PF) coil feeders, with a nominal current of 20.0 kA, enter and leave the building through the north wall penetration.

The installation of the TF and PF coil feeders was successfully completed on the west and north catwalks, respectively, in the torus hall of the JT-60SA main building (see figure for the PF coil feeders).

News

Central solenoid module 2 completed



Completed CS2 module

The JT-60SA central solenoid (CS) consists of 4 modules: CS1, CS2, CS3, and CS4. Each module is composed of a four-layer pancake (quadra-pancake) and 6 eight-layer pancakes (octa-pancakes). The production status of each module is as follows:

- CS1 module:
  The manufacturing was finished in September 2016. In the subsequent cold test, the cooling characteristics, joint resistance, AC loss and so forth were inspected. The test results demonstrated the expected performance of this module.
- CS2 module:
  The completion tests, including the high voltage test, helium leak test and so forth, were successfully performed in February 2017. Thus, the manufacturing of this module has now been finished (see figure).
- CS3 module (the forth module in manufacturing):
  The manufacturing of the second pancake has begun.
- CS4 module (the third module in manufacturing):
  The ground insulation (the final manufacturing process) is now being carried out. The manufacturing of this module will be finished at the end of March 2017.

News

ECRF system component PA signed

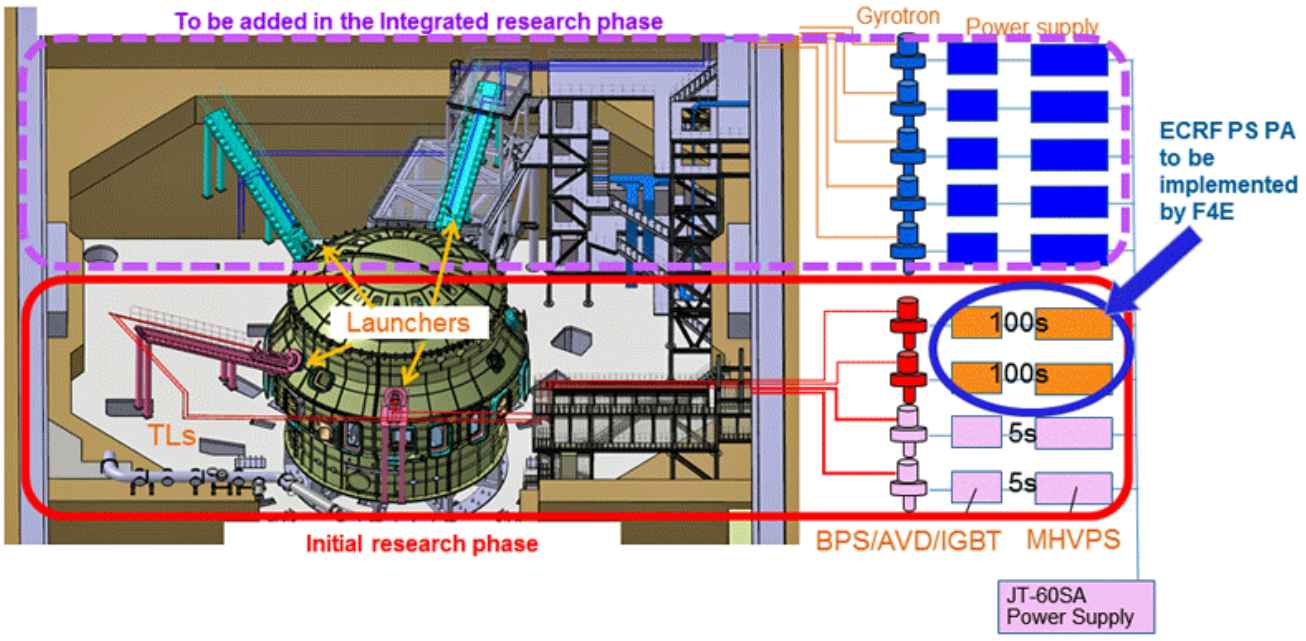


Figure 1: ECRF system arrangement

The electron cyclotron range of frequency (ECRF) system for JT-60SA (Figure 1) will be used for a variety of purposes: (a) generation and sustainment of the high performance plasmas through localised electron cyclotron heating and current drive, (b) reduction of the loop voltage required for plasma start-up through pre-ionisation, and (c) electron cyclotron resonance (ECR) discharge cleaning of the first wall in the vacuum vessel.

The ECRF system mainly consists of the high voltage power supplies, high power gyrotron sets, transmission lines (TLs), launcher (antenna) systems, vacuum systems, and cooling systems.

In the initial research phase, the ECRF system will comprise 2 sets of gyrotrons for a pulse duration of 5 s and another 2 sets for 100 s. The injection power of those gyrotron sets is expected to be 3 MW for < 5 s for the plasma start-up and 1.5 MW for 100 s for the current drive or heating. The frequency of those 2 sets for 5 s is 110 GHz and the other 2 sets for 100 s is 110/138 GHz. Eventually, 5 extra sets of gyrotrons will be added in the integrated research phase. Ultimately therefore, the total number of gyrotron sets will be 9 and the total injection power will be 7 MW.

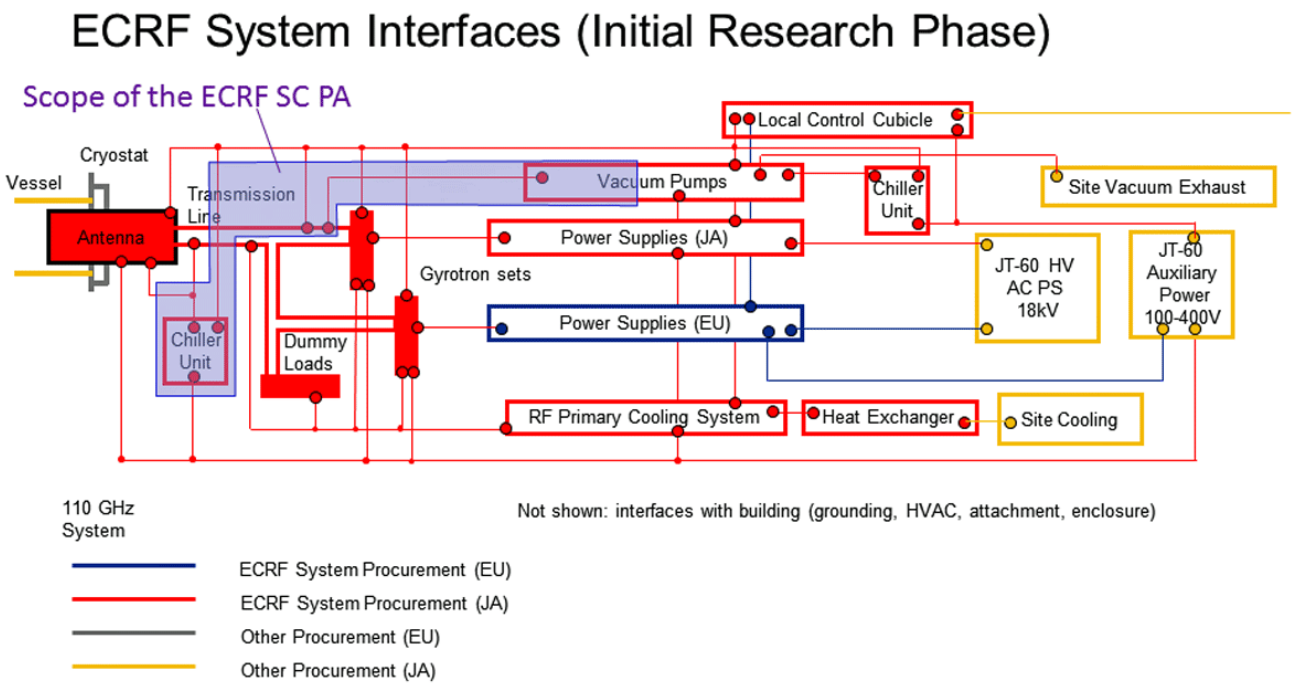


Figure 2: ECRF SC PA's scope and the interfaces with other procurements

The main deliverables of this procurement arrangement (PA) are the TL components, and the cooling system and vacuum pumping system for both TL and launcher. The scope of this PA and the interfaces with the components procured in other PAs are shown in the lilac region of Figure 2. The components to be procured in this PA are a part of the "ECRF System Procurement (JA)", and there is no interface with the components Europe procures or the other sub-systems of JT-60SA.

As a result of the design review meeting for ECRF system components (ECRF SC) in October 2016, the PA was signed in January 2017. QST has now just started a call for tender process for the ECRF SC in order to meet the assembly schedule.

Meeting

27th Technical Coordination Meeting held in Karlsruhe

The 27th Technical Coordination Meeting (TCM-27) took place on 22 and 23 February 2017 at Karlsruhe Institute of Technology (KIT) in Germany. A total of 63 experts attended the meeting in person or via videoconference: 31 from the EU Home Team (France, Germany, Italy, and Spain), 25 from the JA Home Team, 6 from the Project Team, and 1 invited from Japan.

At the beginning of the meeting, H. Shirai, the Project Leader (PL) of the Satellite Tokamak Programme, made an opening presentation including the results of the latest meeting of the Broader Approach Steering Committee (BASC-19) held in December 2016. He explained that the SC had expressed its satisfaction with the achievements and progress in both EU and JA procurements as well as the assembly, installation and commissioning activities since the BASC-18, in particular, the delivery of 3 toroidal field (TF) coils to the QST Naka site, the progress of vacuum vessel thermal shield (VVTS) assembly onto the 340° vacuum vessel (VV), and the completion of the cryogenic system commissioning after more than 1 year's on-site work.

During the meeting, the status and actions in the following areas were reported and discussed: completion of the VV and VVTS assembly, manufacturing of the TF coils, cryostat, central solenoid, in-vessel components, high temperature superconductor current leads (HTS CLs), and power supply systems, assembly of the TF coils, integrated commissioning and initial operation of the JT-60SA device. The Plant Integration Document, Configuration Control Models and Action List were reviewed and discussed for updates as well.

A technical tour was organized by KIT to visit the testing facility - "CuLTKa" - and the manufacturing area of the HTS CLs (see figures).

The PL announced that the next meeting, TCM-28, would be held in Naka, Japan on 5 and 6 July 2017, and the TCM-29 would be held in Saclay, France on 17 and 18 January 2018.

TCM-27 attendees visiting the CuLTKa test facility

Calendar

27 April 2017
20th Meeting of the BA Steering Committee (SC-20)
Rokkasho, Japan

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
44th European Physical Society Conference on Plasma Physics (EPS 2017)
Belfast, UK

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/.