

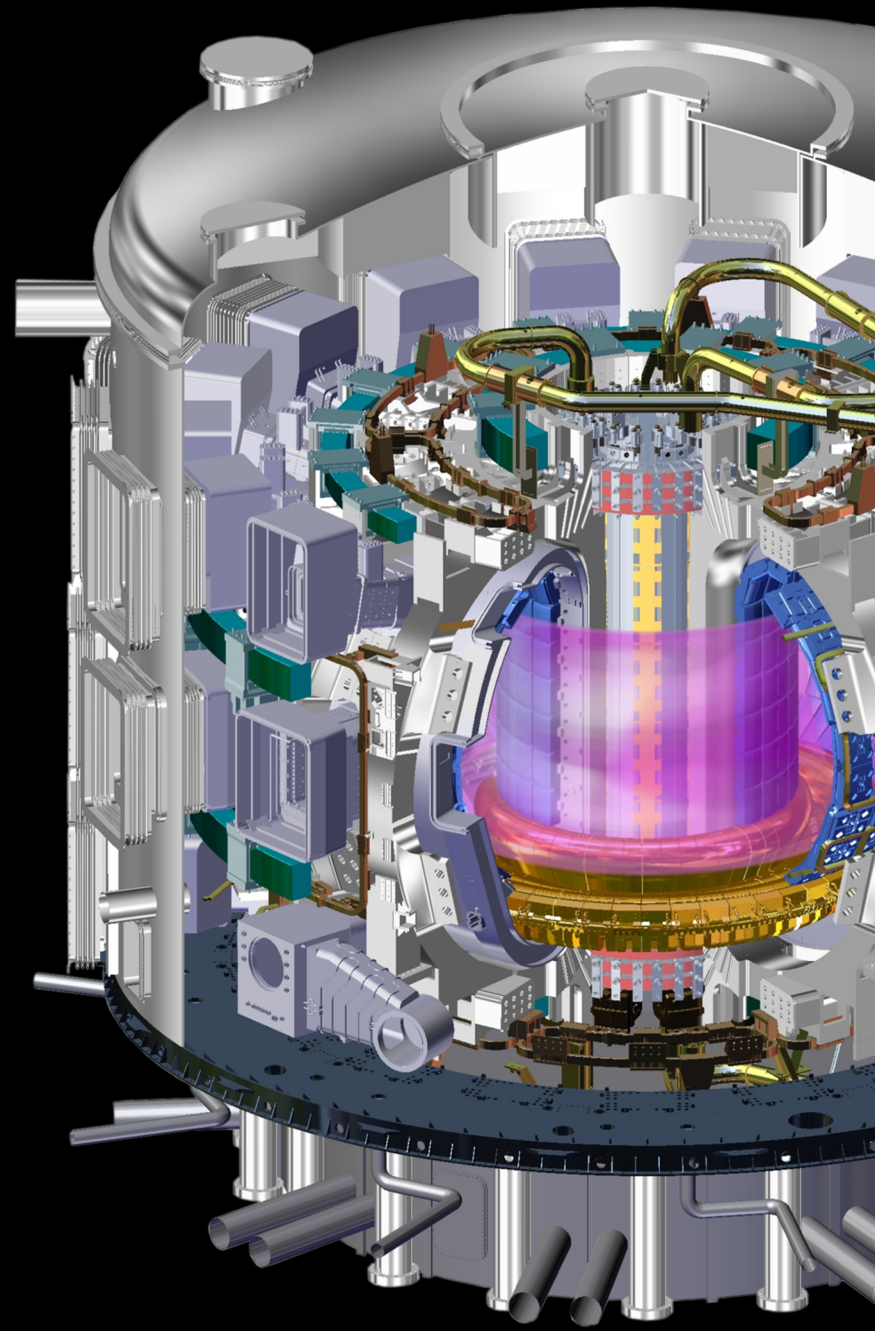
Status of US ITER Contributions

Ned R. Sauthoff

Director, US ITER Project Office

Fusion Power Associates

December 16, 2015



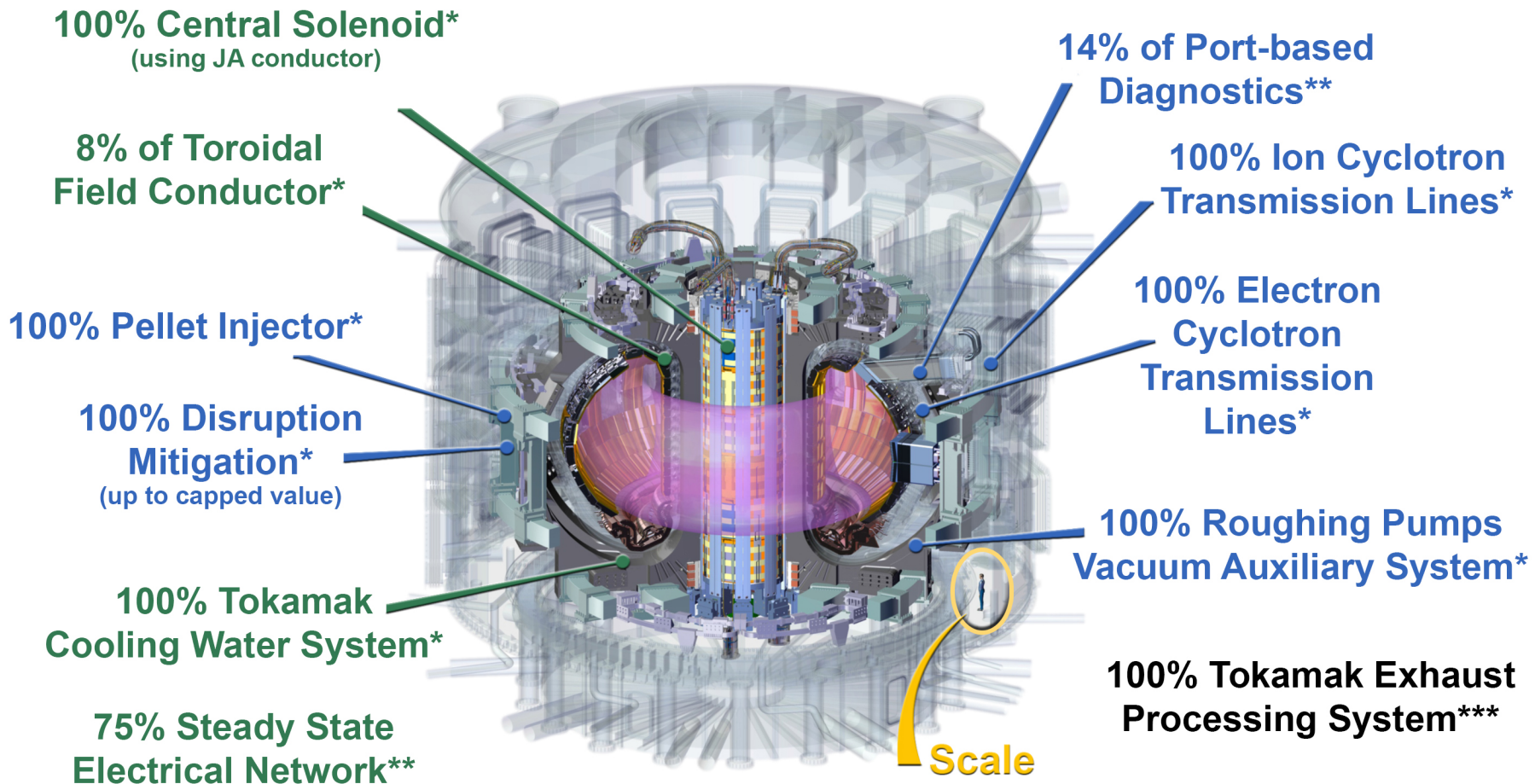
Overview



- US Scope
- Deliveries
- Fabrication Investments and Progress

US Scope

Four Systems in Final Fabrication



■ Prototype Fabrication ■ Final Fabrication

*ORNL **PPPL ***SRNL

Numerous Deliveries in FY 2015



- Tokamak Cooling Water System Drain Tanks
- Steady State Electrical Network Components
- Toroidal Field (TF) Coil Conductor
- Vacuum Test Equipment



Tokamak Cooling Water System

First Nuclear Qualified Hardware Delivered



The first tokamak cooling water system drain tanks were delivered to the ITER Site on May 7, 2015. The remaining tanks were delivered in September 2015.

Photo: ITER Organization

Tokamak Cooling Water System

All Drain Tanks Delivered



The last three drain tanks for the tokamak cooling water system arrived at the ITER site in September 2015.

Photo: ITER Organization



Steady State Electrical Network

First Highly Exceptional Load to Site



The main body of the first high voltage substation transformer was delivered to the ITER site on January 14, 2015. Photo: ITER Organization



Steady State Electrical Network

First Plant Components Installed



Four US-supplied high voltage transformers were installed by September 2015.

Photo: ITER Organization

Steady State Electrical Network

Deliveries Completed



- 400 kV substation equipment
- 22 kV switchgear
- 6.6 kV switchgear, 1st lot
- Earthing resistors
- HV control and protection



The 22 kV switchgear was delivered to Seville, Spain.
Photo: US ITER



A 400 kV substation transformer during installation. Photo US ITER



Earthing resistors



HV control and protection

Toroidal Field Conductor

Continued Shipments to Europe



- 3 of 9 production conductors (760 m) fabricated and shipped
- All 9 lengths will be completed by early 2017



Close-up view of conductor before packing.

Photo: US ITER



Two 760 m production conductors (Oxford) loaded for shipment.

Photo: US ITER

Completed Shipments

US TF 760 m production conductor (Oxford) – *Delivered to EU winding facility January 2015*

Shipments in Process

(2) US TF 760 m production conductors (Oxford) – *Shipped to EU winding facility November 2015*

US TF 760 m active cable (Luvata) – *Shipped to EU integration facility November 2015*

US TF 100 m active cable (Luvata) – *Shipped to EU integration facility December 2015*

Upcoming Shipments

US TF 760 m active cable (Luvata) – *Will ship to EU integration facility March 2016*

Fabrication Investments and Progress



Central solenoid fabrication facility ramping up at General Atomics in Poway, California

- 10 of 11 tooling stations in place
- 4 of 11 tooling stations in operation
- Production module winding underway

Central Solenoid

Module Tooling Stations Undergoing Installation and Commissioning



1: Conductor Receiving Inspection



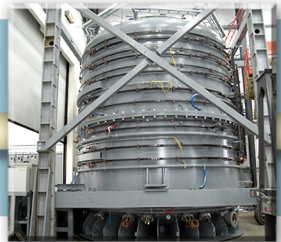
2: Winding (2)



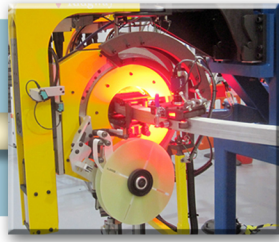
3: Joints & Terminals Preparation



4: Stack & Join/Helium Penetrations



5: Reaction Heat Treatment



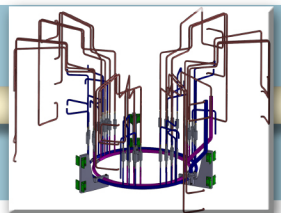
6: Turn Insulation



7: Ground Insulation



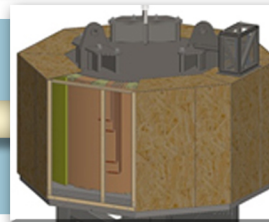
8: Vacuum Pressure Impregnation



9: Helium Piping Measurement



10: Final Test at 50kA, full force

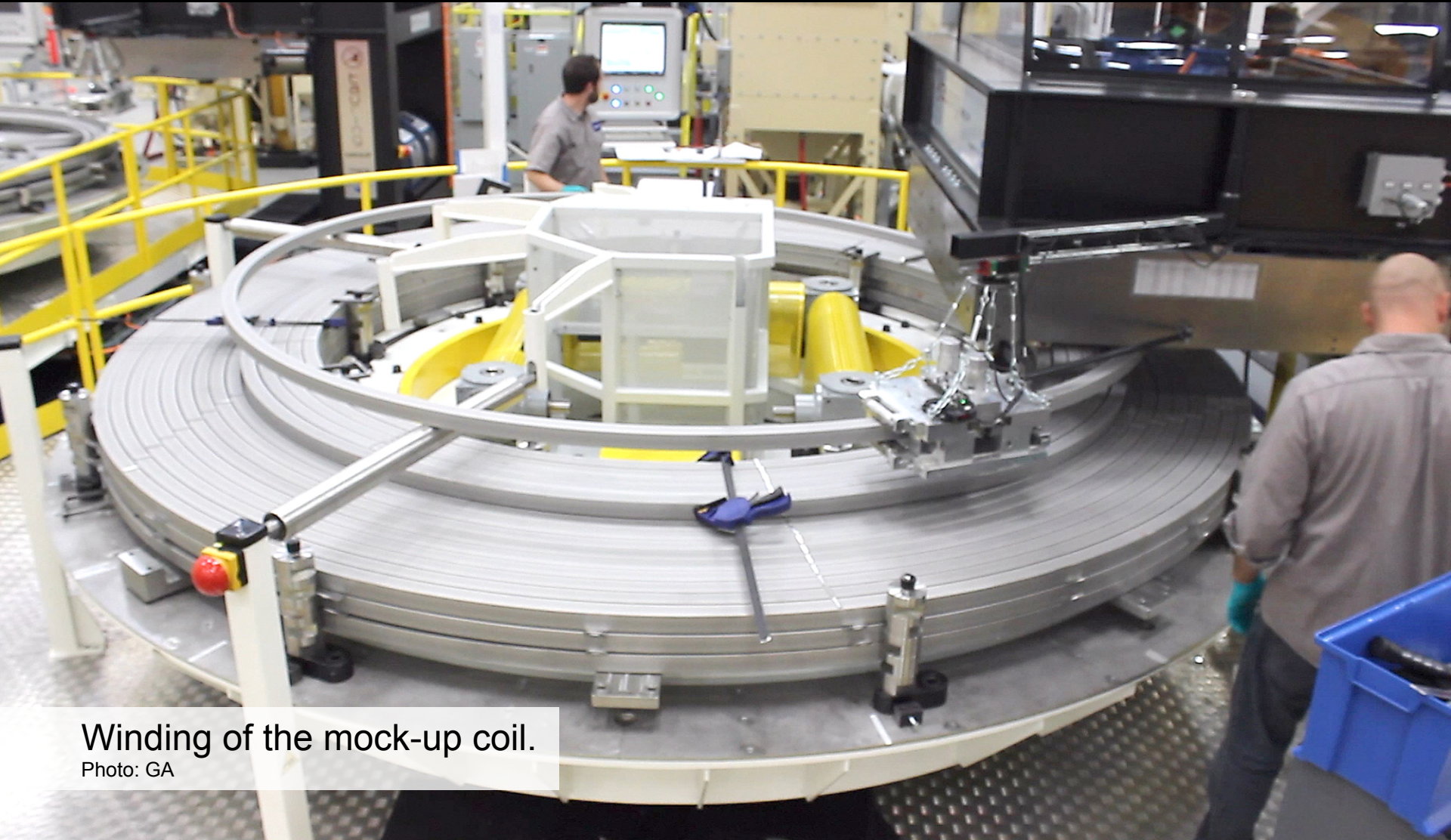


11: Shipping

Transfer Ownership

Central Solenoid

Mock-up Winding Completed

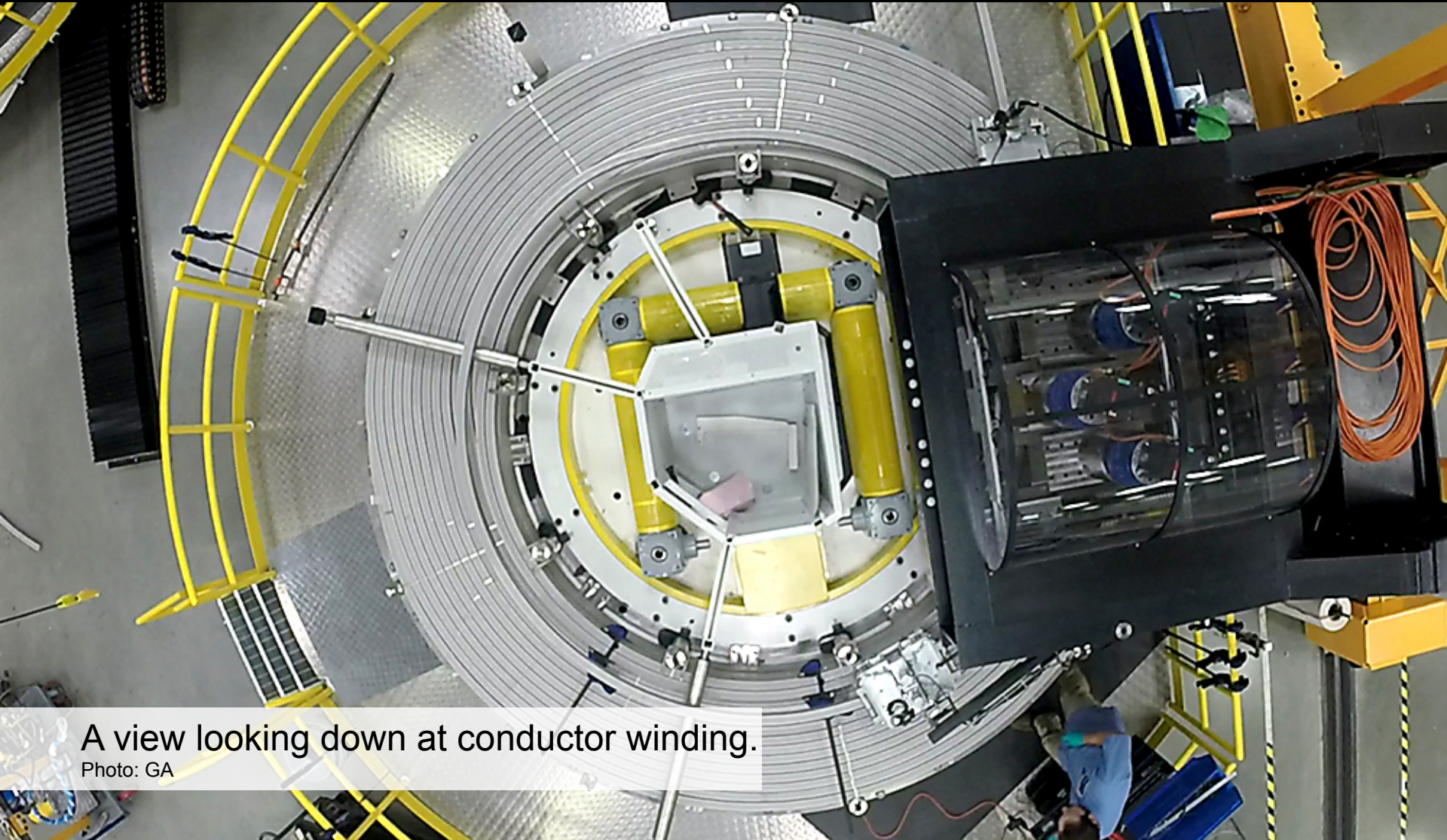


Winding of the mock-up coil.

Photo: GA

Central Solenoid

Winding of First Production Module Underway



A view looking down at conductor winding.

Photo: GA

Central Solenoid

Heat Treatment Furnace Station in Testing



Specifications for heat treatment furnace:

- Height – 7 m
- Diameter – 5.56 m
- Weight – 132 Tonnes (including Module)
- Power – 800 kW
- Medium – Argon
- Pressure – 1×10^{-2} mbar

Central Solenoid Turn Insulation Station in Commissioning



The turn insulation station during commissioning activities.

Photo: GA

Central Solenoid Turn Insulation Station in Commissioning



The turn insulation station will wrap fiberglass insulation tape around the wound conductor coils.

Photo: GA

Central Solenoid Vacuum Pressure Impregnation Station in Testing

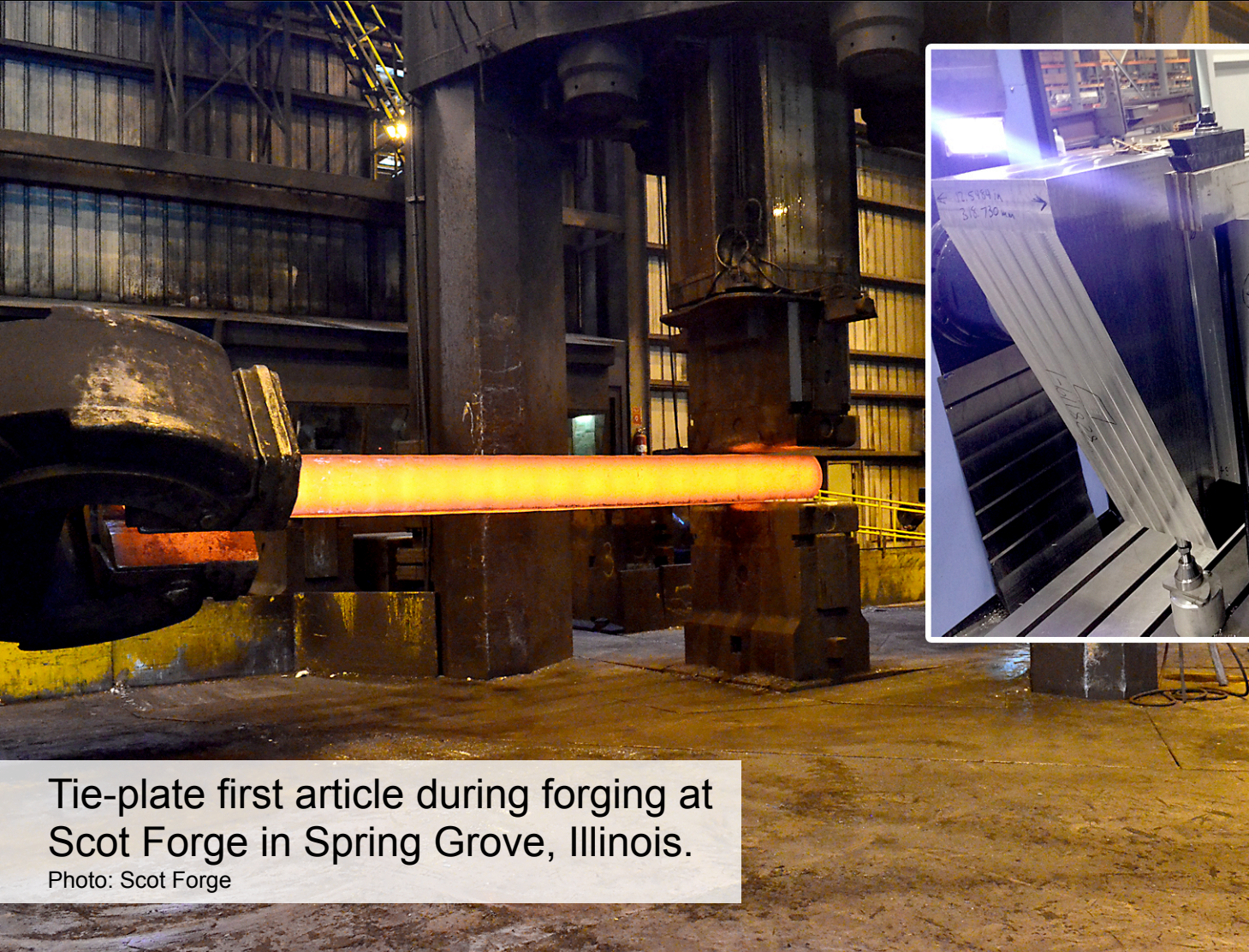


The red vacuum chamber of the vacuum pressure impregnation station is surrounded by resin reservoirs.

Photo: GA

Central Solenoid Structures

Fabrication Underway, 3 / 7 Contracts Placed



Tie-plate first article during forging at Scot Forge in Spring Grove, Illinois.

Photo: Scot Forge



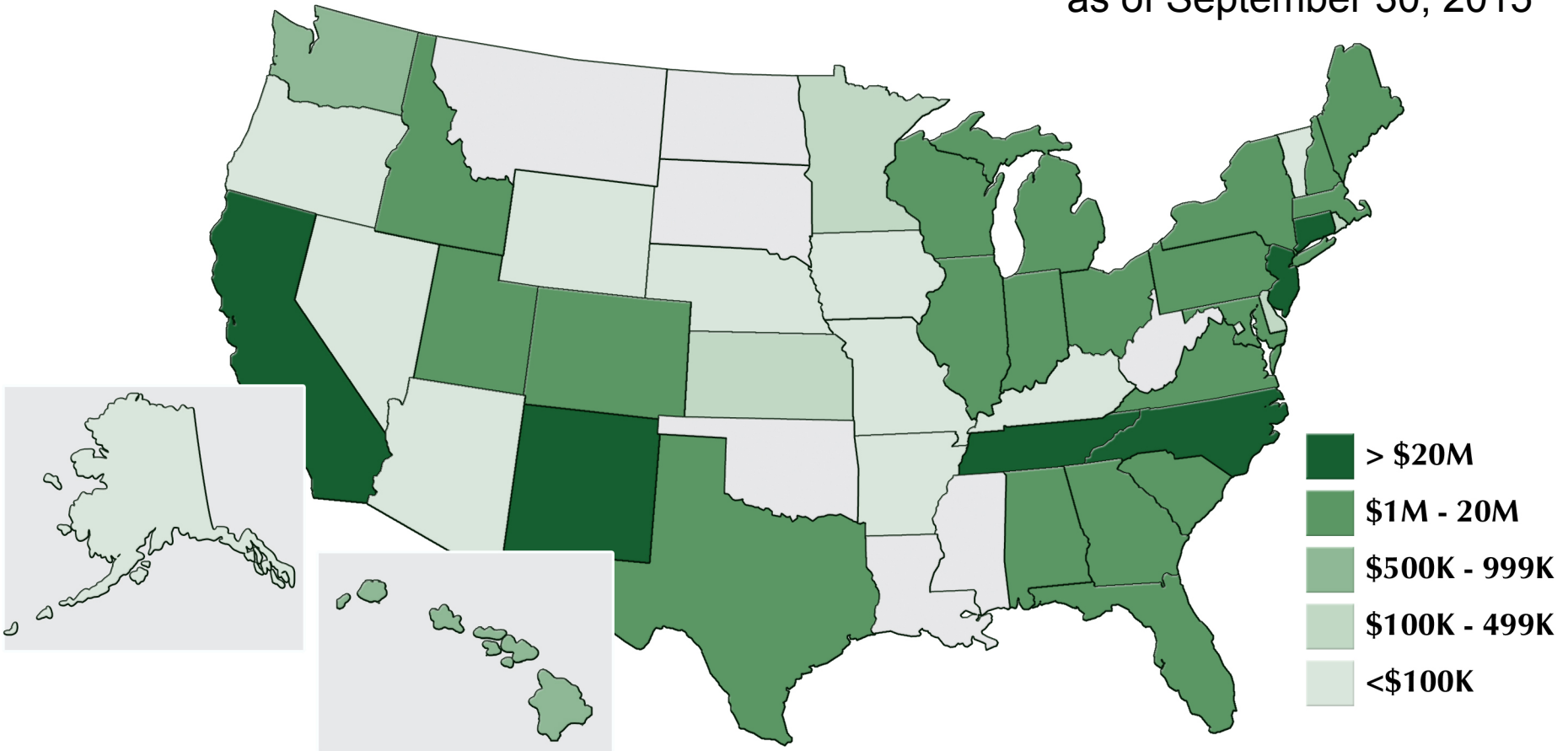
Lower key block during set-up for finish machining at Peterson, Inc. in Ogden, Utah.

Photo: Peterson

Over \$794M in Awards and Obligations



US Industry and University Awards, and DOE Lab Funding: ~\$794M
as of September 30, 2015



Note: Data above does not reflect contracts awarded to US industry by the EU (>\$55M)