US Contribution
The US will fabricate 8% of the toroidal field (TF) coil conductors. The ITER Organization is responsible for the conductor design released for fabrication. Japan, the European Union, the Russian Federation, Korea, and China are also contributing TF conductor.

Overview
The 18 toroidal field coils produce a magnetic field of 5.3 T around the ITER tokamak torus to confine the plasma particles. The TF coils have a total magnetic energy of 41 gigajoules and a maximum magnetic field of 11.8 tesla. The US is responsible for enough conductor to wind slightly over one TF coil, which is equivalent to over 4 miles of conductor constructed from 40 tons and over 4000 miles of niobium-tin superconducting strand. The coils will be made of cable-in-conduit superconductors, which are composed of superconducting strands cabled together, compacted into a stainless steel conduit, and cooled by supercritical helium. The US toroidal field contribution includes: 9 active double-pancake lengths (about 765 meters each), with 3 using Oxford Superconductor Technology (OST) strand and 6 using Luvata strand; 1 dummy length of 765 meters for winding trials; and, 2 active lengths of 100 meters each for qualification.

1st Plasma Scope
The toroidal field magnet system is necessary for first plasma operation. The US will complete its contribution of toroidal field conductor for first plasma, specifically procurement, testing and delivery of 8% of the conductor needed for the toroidal field magnets.

Status
Toroidal Field Coil Conductor

Key Vendors
- Luvata Waterbury, Inc. (Waterbury, CT)
- Oxford Superconducting Technologies (Carteret, NJ)
- New England Wire Technologies (Lisbon, NH)
- High Performance Magnetics (Tallahassee, FL)
- Criotec (Chivasso, Italy)

Technical Description
- Toroidal Field Coil Height: 16.5 m
- Toroidal Field Coil Width: 9 m
- Single TF Coil Weight: 310 t
- Total TF Coil Weight: 6540 t
- Number of Coils: 18
- Peak Field Strength: 11.8 T
- Operating Voltage: 7 kV
- Operating Current: 68 kA
- Operating Temperature: 5 K
- Current in 1 TF Coil: 9.11 MA
- Maximum Magnetic Field: 11.8 T
- Total Magnetic Energy of All TF Coils: 41 GJ
- Number of Turns in 1 TF Coil: 134

Jacketing material at the conductor integrator High Performance Magnetics. Photo: US ITER

A close-up view of conductor shows the density of compacted strand around a helium cooling channel. Photo: US ITER

Cabled conductor at New England Wire Technologies. Photo: NEWT

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