Abstract:
The concept design of ITER Glow Discharge Cleaning (GDC) system based on the present ITER baseline is introduced. This presentation lists the over-all description of the requirements, including the main function, GDC parameters, working positions at different states, main interfacing systems. The concept design for implementation is introduced. The near term plan is discussed.

Main function of GDC
- The main function of ITER GDC system is to reduce and control impurity and hydrogenic fuel out-gassing, particularly oxygen, from plasma-facing components.
- The design of the GDC shall provide suitable nuclear shielding for the systems that are behind the electrode during the plasma operation.

GDC parameters
DC GDC is used in the present baseline design, which requires the magnetic fields to be zero.
- Taking 0.15 A/m², and ITER internal area be 1000 m², Total GDC current shall be about 150 A.
- Vacuum conditions: 0.1-0.5 Pa
- Operating temperature: up to 350°C
- Baking temperature: up to 240°C

Integrated with In Vessel Viewing System (IVVS)
- GDC needs to be integrated with IVVS, which similarly requires uniform coverage.
- There are six sets of GDC/IVVS assembly on ITER.

Heat load
- During plasma operation,
  - Nuclear heating
  - Radiation and charge exchange
  - 29 kW each electrode at maximum.
- During GDC, the rejected power at nominal operation is 0.7 kW per electrode, calculated from the anode voltage drop (~20V) times current plus ohmic heating.

Design requirements and design boundary conditions
- Wall conditioning for ITER
  - Limit the outgassing, T inventory in PFCs
  - Baking (superconducting coils between 5 K and 293 K) blankets at about 240°C diverter up to 350°C vacuum vessel and the other in-vessel components at 200°C all other surfaces exposed to the primary vacuum ~180°C
- Lower temperature at or beyond the vessel ports boundary treated on a case-by-case basis.
- DC GDC (Hydrogen, Deuterium, and Helium)
- RF (DC/E) wall conditioning (between pulses)

Plasma operation
- Energy source of the future

Two step deployment
- IVVS deployment will provide the service for moving GDC electrode among different positions.
- Service lines (cooling and electrical)
  - A booster water pump is used for ensuring enough cooling water flow-rate.
  - Connection to the "Drain" is for the depressurization of the high pressure water loop.

Flexible connection:
- Internal pressure~4MPa.
- Tmax~350 degree C.
- Length~7 meters.
- Moving at 10mm/s for ~6 meters. A few times a month.

Open questions
- Nuclear analysis
- Possibility of decoupling the glow and shielding functions.
- Deciding the nuclear shielding position.
- Mechanical design for a lighter electrode head.
- Study for isolation of the port and the main chamber.
- Further research on in vessel space sharing with IVVS.

These need to be answered before the end of 2011.

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