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The ITER device is designed to demonstrate the feasibility of magnetic confinement fusion. The machine is being designed to produce 0.5 GW of fusion power from 50 MW of input power. The successful operation of ITER requires the largest, complex vacuum systems yet to be built. The evacuated volumes include the main tokamak (~1400$^3$ base pressure ~10$^{-6}$ Pa), the cryostat super conducting coil insulating vacuum (~8500m$^3$ base pressure ~10$^{-4}$ Pa ), 4 neutral beam injectors (total volume ~600m$^3$ base pressure ~10$^{-7}$ Pa) and a large number of auxiliary vacuums for diagnostic, radio frequency heating systems and cryogenic circuits.

During ITER plasma operations, a number of the vacuum systems are required to pump large quantities of hydrogen isotopes. The tokamak is fuelled at a rate of up to 200Pam$^3$S$^{-1}$ and the main tokamak volume is pumped to balance this fuelling rate and remove the fusion helium exhaust using large cryo-sorption pumps. The neutral beam injection (NBI) systems require large quantities of deuterium to create a neutralisation gas cloud. The NBI gas is pumped by dedicated cryopumps which have a pumping speed in excess of 3x10$^6$ l/s to maintain a low enough pressure to avoid re-ionisation of the beam. The ITER cryo-pumping systems as well as other vacuum system are served by a roughing system requiring unique capabilities and thus it is a new and challenging design. The design considerations and choices to meet the unique and challenging vacuum requirements will be discussed.