Contribution ID: **509** Type: **Poster**

Overview and status of construction of ST40

Friday, 21 October 2016 08:30 (4 hours)

Recent advances in the development of high temperature superconductors (HTS) and encouraging results on a favourable dependence of confinement on increase in toroidal field (TF) in Spherical Tokamaks (ST) open new prospects for a high field ST as a compact fusion reactor or a powerful neutron source [1]. The combination of the high beta (ratio of the plasma pressure to magnetic pressure), which has been achieved in STs, and high TF that can be produced by HTS TF magnets opens a path to lower volume fusion devices, in accordance with the fusion power scaling proportional to beta^2Bt^4V.
Tokamak Energy Ltd's path to development of Fusion Power is based on the use of compact high field spherical tokamaks. The feasibility of a low power compact ST reactor and the physics and engineering challenges of the ST path to Fusion Power will be outlined. Several advances addressing the main issues on the path to a compact Fusion Reactor include: development of superconducting magnets using 2nd generation HTS; optimisation of the current drive for steady-state operation and heating and revision of requirements for alpha-particle confinement in a compact ST, based on full-orbit simulations; recent results of experiments on small tokamaks ST25 and fully superconducting ST25-HTS in support of the programme; and design of a new device, a high field spherical tokamak ST40 which aims to demonstrate the possibility of achieving burning plasma conditions in a compact device.
This new generation high field spherical tokamak, ST40, (R0=0.4-0.7m, A=1.7-2.0, Ipl=2MA, Bt=3T, k=2.5, pulse duration 1-5sec, Cu LN2 cooled magnets) is under construction with the first plasma expected in early 2017. An overview of the project will be presented. The main objectives of the project, parameters of the tokamak and the physics programme will be described. Physics and engineering challenges (mainly connected with the high toroidal field and high wall and divertor power loads) will be discussed. The device is aimed at demonstrating burning plasma parameters (nTtauE) and also is designed to be suitable for DT operations in future. The present status of the construction and commissioning will be reported. ST40 will be an important step in the commercial development of Fusion Energy as the project is funded mainly by private investments.
[1] M GRYAZNEVICH et al, Fusion Sc & Tech 61 (2012) 89

Paper Number

FIP/P7-19

Country or International Organization

UK

Primary author: Prof. GRYAZNEVICH, Mikhail (Tokamak Energy Ltd)

Co-authors: Mr MCFARLAND, Adrian (Tokamak Energy Ltd); Dr COSTLEY, Alan (Tokamak Energy Ltd); Mr SYKES, Alan (Tokamak Energy Ltd); Dr NICOLAI, Albert (Tokamak Energy Ltd); Dr DNESTROVSKIJ, Alexei (NRC Kurchatov Institute); Dr KINGHAM, David (Tokamak Energy Ltd); Dr LISTER, Jonathan Bryan (Tokamak Energy

Ltd); Mr NOONAN, Paul (Tokamak Energy Ltd); Dr BUXTON, Peter (Tokamak Energy Ltd); Dr SHEVCHENKO, Vladimir (Tokamak Energy Ltd)

Presenter: Prof. GRYAZNEVICH, Mikhail (Tokamak Energy Ltd)

Session Classification: Poster 7

Track Classification: FIP - Fusion Engineering, Integration and Power Plant Design