



AAPPS-DPP 2018 Plenary speaker Name: Prof. Tonny Donne

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Rationale: In 2018, EUROfusion will publish a revised roadmap which outlines how to supply fusion electricity to the grid by 2050. The *roadmap to the realisation of fusion energy* breaks the quest for fusion energy into eight missions. For each mission, it reviews the current status of research, identifies open issues, proposes a research and development programme and estimates the required resources. It points out the needs to intensify industrial involvement and to seek all opportunities for collaboration outside Europe.

Talk Title: Strategy and challenges of the revised European Fusion Roadmap

Short abstract: A long-term perspective on fusion is mandatory to pursue a pragmatic approach to fusion energy. With this objective the present revised roadmap has been elaborated. The roadmap covers three periods: the short term until 2030, the medium term until 2040 and the long term. ITER is the key facility of the roadmap as it is expected to achieve most of the important milestones on the path to fusion power. Thus, the vast majority of resources proposed in the short term are dedicated to ITER and its accompanying experiments. The medium term is focussed on taking ITER into operation and bringing it to full power, as well as on preparing the construction of a demonstration power plant DEMO, which will for the first time supply fusion electricity to the grid. Building and operating DEMO is the subject of the last roadmap phase: the long term. It might be clear that the Fusion Roadmap is tightly connected to the ITER schedule. A number of key milestones are the first operation of ITER (presently foreseen in 2025), the start of the DT operation foreseen in 2035 and reaching the full performance at which the thermal fusion power is 10 times the power put in to the plasma. DEMO will provide first electricity to the grid. The Engineering Design Activity will start a few years after the first ITER plasma, while the start of the construction phase will be a few years after ITER reaches full performance. In this way ITER can give viable input to the design and development of DEMO. Because the neutron fluence in DEMO will be much higher than in ITER (atoms in the plasma facing components of DEMO will undergo 50-100 displacements during the full operational life time, compared to about only 1 displacement in ITER), it is important to develop and validate materials that can handle these very high neutron loads. For the testing of the materials a dedicated 14 MeV neutron source is needed. This DEMO Oriented Neutron Source (DONES) is therefore an important facility to support the fusion roadmap. The presentation will focus on the strategy behind the fusion roadmap and will describe the major challenges and physics issues that need to be tackled on the road towards fusion electricity. Encouraging recent results will be given to demonstrate the outcome of the focused approach in European fusion research.

List of related published papers

- [1] A.J.H. Donné, *Challenges on the road towards fusion electricity*, Europhysics News **47** (2016) 20 – 24
- [2] A.J.H. Donné, G. Federici, X. Litaudon and D.C. McDonald, *Scientific and technical challenges on the road towards fusion electricity*, J. Instrum. **12** (2017) C10008.