Nuclear Fusion: from Science Fiction to Science Fact

**‘Nuclear Fusion: an eternal promise’ or ‘Nuclear Fusion, always 30 years away’ are texts one can read regularly in newspapers and journals. For the layman it is difficult put a finger behind the progress in the field of fusion research. This is especially because, after many years of research, still not even a milliwatt of electricity has been delivered to the grid. But are the abovementioned slogans correct?**

Since the start of fusion research many different challenges had to be overcome. For example: how can a plasma (i.e. an ionized gas) be confined at temperatures that are 10 times higher than in the centre of the sun and how can we isolate this hot plasma from the walls of the reactor vessel, such that they will not melt. Many of the original challenges have been overcome in the global fusion research. But still much research needs to be done to tackle the remaining challenges. To prioritize the research in Europe, a Fusion Roadmap has been developed with the international fusion reactor ITER and the International Fusion Materials Irradiation Facility (IFMIF) as main research facilities.

In his presentation, Tony Donné will first shortly explain the principle behind nuclear fusion. Subsequently, he will take the audience through several of the challenges which have been overcome in magnetic confinement fusion. He will present an overview of the challenges that are still remaining, along with a strategy to find adequate solutions. The focus of the presentation will be on the international ITER tokamak. This device which is being erected in Cadarache in Southern-France is one of the world’s largest scientific experiments and is designed to get 10 times more fusion power as input power.

He will explain how fusion research is organised in Europe, with two main actors: Fusion for Energy, which is the European Domestic Agency for ITER and essentially a procurement agency, and EUROfusion, which is coordinating research and development in the field of fusion research in 28 European countries.

*Tony Donné worked from 1985-2014 for the Dutch FOM-Institute DIFFER (Dutch Institute for Fundamental Energy Research). He started as post-doc, and slowly moved up the ladder via group leader, deputy division head to head of fusion research of the Association EURATOM-FOM. From 2009 – 2014 he coordinated the Dutch research activities in the field of fusion research. He established and directed the Dutch-Russian Centre of Excellence for Fusion Physics and Technology and he was Programme Director of the ITER-NL consortium. Since June 2014 he is Programme Manager of EUROfusion; one of the largest scientific research organizations in Europe. Almost his whole scientific career he has worked in the field of plasma diagnostics at a great range of fusion devices. During almost 20 years he was closely involved in the design and developments of diagnostics for ITER.*