Introduction to the Energy Problem and Fusion Research

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The talk will give an overview of the various aspects of the energy problem in the world. Advantages and disadvantages of the three main options (fossil, nuclear and renewable energy) will be presented.

Because of the emphasis in current energy discussions in EU and the rest of the world, renewable energy options will be highlighted. A scientific critique will be presented on current energy policies that (over)praise the use of the renewable energy and most often totally ignore the underlying (and serious) difficulties of an energy system that is dominated by renewable sources, originating from their inherent intermittency and low energy density. It looks far from simple to satisfy the current plans proposed by the EU Commission to provide nearly ~ 100% of EU electricity by ~ 2050: serious investments in R&D and electricity infrastructure together with a lot of patience will be needed before this can become a reality. A correct definition of such a system is also necessary in order not to arrive at the contrary of what is aimed at: an increase of CO_2 emissions, as is the case in some EU countries with massive investment in renewable energy.

In this context nuclear energy should not be forgotten and discussed. One option is nuclear fission, which is well known, the other option is nuclear fusion. It is a difficult option, but a very promising one: inexhaustible, much better manageable nuclear waste, and inherently safe. In the presentation the basic principles of nuclear fusion will be explained, and its potential clarified. Patience will also be needed with this energy option before it can become a reality, and good young brains with excellent new ideas to further tackle the problems that still lie before us. A life long task for the next generation of enthusiastic young researchers that are fond of physics, engineering, mathematics and chemistry!