**Executive Summary of**
**the socio-economic research on fusion activities with stakeholders (period 2010 – 2013)**

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## Introduction

In 2010, the Belgian Nuclear Research Centre SCK•CEN took the initiative to launch a research process that focused on the involvement of stakeholders of 'informed civil society' in fusion technology assessment. The aim was to perform a policy-supportive Integrated Sustainability Assessment study (or 'exercise') in the interest of energy governance on the European level, with an additional focus on the implications of the introduction of the fusion energy option in the long term (acronym ISAF). In practice, the research was organised as a reflective and discursive scientific interaction among researchers, policy makers and stakeholders, bringing together parties that tend to belong to rather separated worlds: one dealing with fusion energy on the one hand, and one dealing with other energy technologies on the other hand. The research resulted in a preparatory theoretical study (Schröder et al, 2010), two reflection groups and the synthesis reports of the reflection group discussions (Meskens et al., 2011, 2011, 2012). A review of this process, to be taken up in a broader reflection on the positioning of the fusion research community in the energy research landscape is under preparation (Meskens, 2015, forthcoming).

The following report summarises the main conclusions of the reflections group synthesis reports.

Main conclusions and recommendations from the **Reflection Group meeting on 'The meaning and the possible use of the concept of sustainable development in the context of energy governance'** (Brussels, 22 November 2010)

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**The use of the concept of sustainable development in technology evaluations**

With respect to the use of the concept of sustainable development in technology evaluations, the reflection group discussions showed that participants acknowledge that it is too simple to qualify a specific technology as '(not) sustainable', and that a more careful consideration of the use of the concept in relation to the evaluation of technology options is needed in policy appraisal contexts (focussing on the potential contribution of technology options to sustainable development).

The use of modelling in the context of sustainable energy governance was discussed rather intensely, and the need to balance fundamental and applied research was stressed from all sides (policy, research, private sector participants). It was agreed upon that quantitative data is needed, but that 'the act of opening up' with the aim to seek deeper understandings and common grounds both in the interest of developing shared visions and of defining and operationalizing sustainable development, is actually the more important joint responsibility of the global community of policy, research, civil society and the private sector.

**Implications for socio-economic research on fusion**

*Deliberative approaches to 'reference and method'*

Given the fact that fusion is a developing technology that is still 'hypothetical' in terms of its practical application, it has the opportunity to a priori take the considerations with regard to the 'usability' of the concept of sustainable development into account and to at least try to use the concept of sustainable development in a more cautious and deliberate way in its own motivational discourse. With respect to research methods, the fusion community has traditionally focused on modelling as the main scientific mean to define fusion's role in the energy system. Although the community frequently makes use of the concept of sustainable development to argue for its case, much less effort has been put into treating questions like which normative factors of development in fact support/weaken the prospect for fusion power, and who should develop/make explicit these normative factors? Of course fusion is no exception among other energy technologies in this, and the motivation to go for a more integrated approach in future fusion research can be seen as an attempt to broaden this scope.

*The integrated approach – reaching out, also to the missing link*

Socio-economic research on fusion includes sociological and ethnographic research in 'social worlds of fusion R&D organisations', investigations of social aspects of the ITER construction and information activities such as the ongoing travelling 'Fusion Expo'. From the ISAF scoping study and pilot workshop came the recommendation for fusion research to take into the fact that studying the own research community, addressing local people in a siting case and addressing the general public through questionnaires and expo's can still be seen as too much of 'self-centered' research, avoiding deliberative confrontation with informed actors with different views. In other words, in reaching out to society with the aim to make the case for fusion, the fusion community should not only study itself or try to connect to the general public. It makes no sense to search for public acceptance if at the

same time the debate is not organised in interaction with 'informed civil society'. This informed civil society comprises relevant actors such as the academic world, various organised interest groups (social, ecological), policy advisory councils and research institutes and think-thanks, or thus actors who have a specific informed vision on energy governance already themselves. They represent (and materialise) the connection between the general public on the one hand, and political authorities on the other hand. If the fusion community would want to generate trust for its case, then it would first need to concentrate on interaction with informed civil society level and, based on insights from these deliberations, only in a second phase study itself and reach out to the public.

*The importance of future (support for) socio-economic research on fusion*

This last consideration is the main reason why an 'integrated approach' to socio-economic research on fusion is of prime importance, as it provides the opportunity to gather meaningful groups out of the spectrum of informed civil society into concrete activities with a direct or indirect focus on fusion. The participants of the scoping study reflection group may not particularly have changed their mind with regard to fusion as a technology (whatever their opinion is), but they certainly appreciated this kind of 'outreach' efforts by the fusion community, as these activities show that this community is able and prepared to take a deliberate approach to positioning itself in the societal debate, in the research world and in the politics of energy governance. Therefore socio-economic research should not only continue, but it should also be taken seriously by EUROFUSION itself, not only 'in principle', but also in practice.

Main conclusions and recommendations from the **EFDA-SERF Modelling Assessment Workshop** (Wednesday 19 September 2012, ENEA Rome Headquarters, Roma, Italy)

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With respect to the use and usability of energy scenario modelling in general and of the EFDA-TIMES model in particular, the following issues emerged from the discussions as key issues to take into account in modelling research and policy:

1 The use of the concept of sustainable development as the normative reference base for fusion research and for modelling research in particular
2 The nature and credibility of model input data
3 The use of 2050 as horizon or tipping point
4 Performance of simple versus complex models in research and outreach
5 The meaning of trust, transparency and scientific quality
6 The policy of using 'tailor made' models versus 'generic' models
7 The motivation and usefulness of outreach, participation and cooperation for the ETM team.

From the discussions and the synthesis, it became clear that all these key issues except for number 3 are not specific to fusion alone, but also concern research related to other energy technology options. The following conclusions and recommendations are not to be considered as replacing the synthesis, but as general points of attention for the future ETM research policy of EUROFUSION:

(1) The importance of a continuous care for a broad and deliberate conception of modelling input data, criteria and story lines

With respect to using the concept of sustainable development as an overall criterion for the assessment of energy technology options, it was noted that, in current policy discourse, the understanding of sustainability in relation to energy policy is generally narrowed to the criterion of limiting $CO_2$ emissions. However, the challenge for scenario modelling remains to define and operationalise technology-neutral sustainability criteria and to develop multiple convincing story lines that meaningfully relate to the 'overall' criterion of sustainable development. This implies the necessity to go beyond the narrow conception of 'sustainable energy' as '$CO_2$ low energy' and thus the need to include other technical criteria (such as energy savings, energy production cost, resources availability, technological feasibilities and conversion efficiency) next to 'non-quantifiable factors' such as social and political dynamics.

It was recognised that the EFDA-TIMES modellers undertake serious efforts in this sense, but they were anyway advised to consult with other modellers and with energy policy experts in general not only in the interest of their own modelling research, but also in the general interest of improving the research dialogue on modelling possibilities and pitfalls.

(2) The importance of transparency in modelling as a criterion for scientific quality and credibility

With respect to the credibility of EFDA-TIMES modelling research, it was stated that, rather than striving for 'quantifiable objectivity', it is more important to care for transparency in the way input data, criteria and story lines are 'translated' and implemented in the model. It was stressed that scientific quality rather than modelling results should be seen as the basis for credibility with respect to what the model presents. The care for transparency is thereby seen as an essential element of this scientific quality. However, in terms of scientific quality, transparency does not only

mean to present results in a clear and understandable way or to provide insight in the code of the model, but obviously also to illustrate the uncertainties with regard to input data and parameters and to provide insight in the way these uncertainties are acknowledged and integrated.

(3) The importance of a deliberate use of time horizons in modelling

There remains an apparent difference in perception of what it means for fusion to 'become available' at a given time horizon. For some, the ultimate availability of the technology in the form of 'a fusion reactor capable of putting electricity in the grid in the 2040 to 2050 decade' (as it is envisioned by EUROFUSION) may mean the same as 'being a commercially competitive option for investors' at that date, while for others several decades might still pass from the first to the second situation. Participants recognised that it would anyway be necessary for the fusion community to describe this difference in a more explicit way and to reflect on how this 'gap' between 'technological availability' and 'commercial availability' can be consequently integrated in the model.

Key issue number 3 (The use of 2050 as horizon or tipping point) represents an extra challenge for modelling if one would consider the fusion option in energy foresight research. The fact that the fusion community sees 2050 as a tipping point while researchers from the other energy technology contexts see it as a horizon could be interpreted as a 'pragmatic reason' for these other research communities to abstain from working together with the fusion modellers. In reality however, one can observe a more ideologically inspired reason for researchers from the 'other' energy technology contexts to not reach the hand to the fusion community. That reason is simply a lack of belief in the potential of the technology as such in combination with a confidence in the future potential of renewables and energy savings and efficiency.

It is important to note here that this last claim is an observation, and no evaluation of the validity of that (lack of) belief. The observation was confirmed by communications with potential experts during the invitation and preparation phase prior to the workshop. It was anyway advised that EUROFUSION should take the initiative to reach out to modelling researchers and civil society to invite discussion on the use of the 2050 horizon in modelling and more qualitative energy policy research.

(4) The importance of scientific cooperation in modelling over the importance of using EFDA-TIMES as a communication tool in advocacy for fusion

Referring to the list of key issues presented above, it may be clear that these issues also concern scientific foresight research related to energy technology options other than fusion alone. From the discussions, it became clear that closer interaction between modelling research communities dealing with different energy technologies could improve energy scenario modelling and thus enhance the credibility of energy-related scientific foresight in the context of energy governance.

As a key conclusion, and also in perspective of the previous considerations, the invited experts recognised the high scientific level of the research performed by the EFDA-TIMES Modelling team but stressed on the urgent need for them to break out from their isolated research position and to engage in interaction with the 'outside world': with other modellers, with developers of new modelling methods and, in general, with scientists, civil society representatives and policy makers dealing with other energy technologies. The experts formulated different possibilities in this sense, but emphasized that, in terms of using the EFDA-TIMES Model, the focus should be on cooperation in a research context rather than on using the model to highlight the case of fusion.

References

Meskens G. (2011) Integrated Sustainability Assessment of Energy Systems including Fusion as Energy Option' – General Conclusions and Future Outlook for the ISAF Project, EFDA-SERF internal report, WP10-SER-ACIF-2.

Meskens G., Schröder J. (2011). The Meaning and the Possible Use of the Concept of Sustainable Development in the Context of Energy Governance (Scoping study in the frame of the project 'Integrated Sustainability Assessment of Energy Systems including Fusion as Energy Option'), EFDA-SERF research report, WP10-SER-ACIF-2.

Meskens G., Schröder J. (2012). Synthesis Report of the EFDA-SERF Modelling Assessment Workshop, EFDA-SERF Research Report, WP12-SER-ACIF-2.

Schröder J., Meskens G., (2010). Integrated Sustainability Assessment, EFDA-SERF Research Report, WP10-SER-ACIF-2.