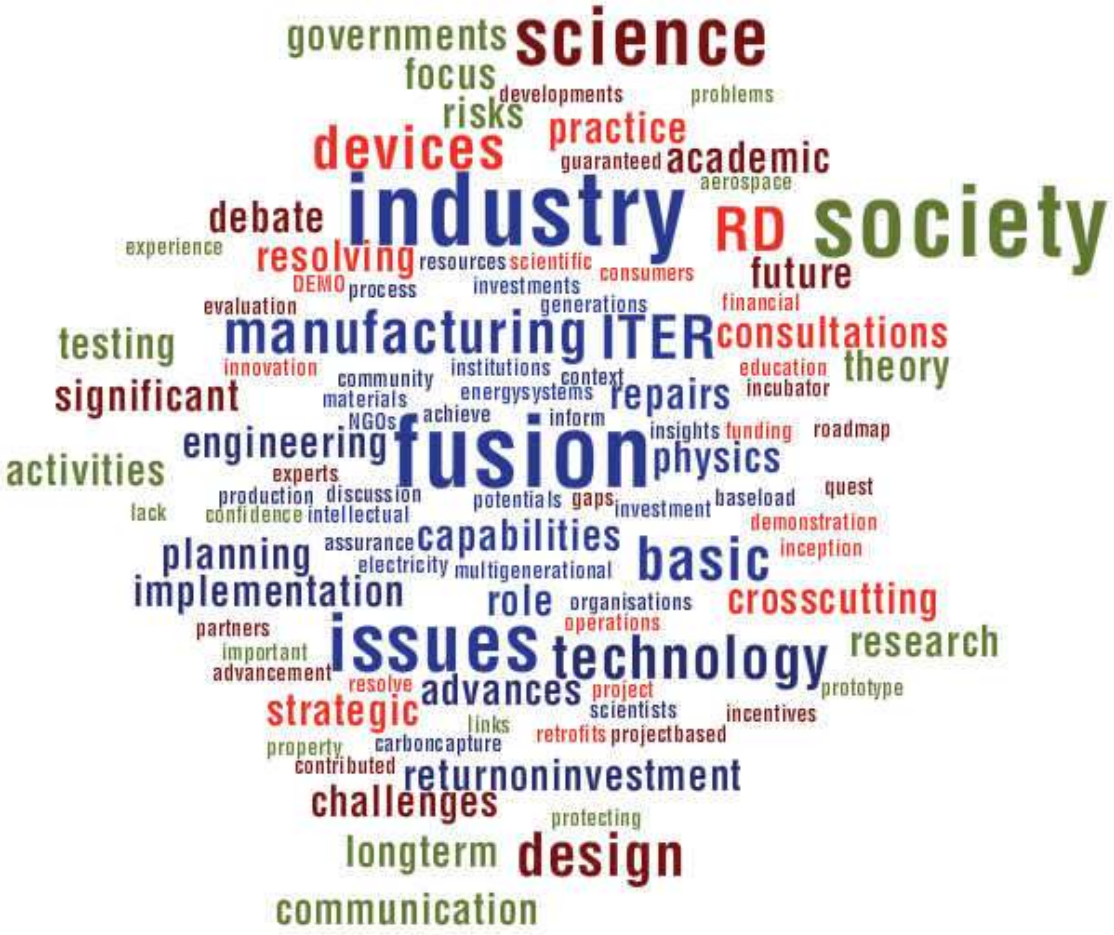
International Energy Agency

STRENGTHENING THE LINKS BETWEEN FUSION AND SOCIETY



A strategic session led by the

Fusion Power Co-ordinating Committee (FPCC)

28-29 January 2014

International Energy Agency
9, rue de la Fédération
75015 Paris

iea Energy Technology Network

International Energy Agency

The International Energy Agency (IEA), an autonomous agency, was established in November 1974. Its mandate is two-fold: to promote energy security amongst its member countries through collective response to physical disruptions in oil supply and to advise member countries on sound energy policy. The IEA carries out a comprehensive programme of energy co-operation among 28 advanced economies[1], each of which is obliged to hold oil stocks equivalent to 90 days of its net imports.

The Agency aims to:

- Secure member countries' access to reliable and ample supplies of all forms of energy; in particular, through maintaining effective emergency response capabilities in case of oil supply disruptions.
- Promote sustainable energy policies that spur economic growth and environmental protection in a global context – particularly in terms of reducing greenhouse-gas emissions that contribute to climate change.
- Improve transparency of international markets through collection and analysis of energy data.
- Support global collaboration on energy technology to secure future energy supplies and mitigate their environmental impact, including through improved energy efficiency and development and deployment of low-carbon technologies.
- Find solutions to global energy challenges through engagement and dialogue with non-member countries, industry, international organisations, and other stakeholders.

Since the 1980s, the IEA has continued to build good working relationships with countries beyond its membership, in particular major energy consuming, producing and transit countries. Countries with which the IEA seeks enhanced engagement, or key Partner countries (Brazil, China, India, Indonesia, Mexico, Russia and South Africa). Co-operation with these and other partner countries cover a wide range of activities, from joint workshops to in-depth surveys of specific energy sectors or data exchange. Combined, the IEA co-operates with more than 69 countries worldwide.

Energy Technology Network

The IEA Energy Technology Network is an ever-expanding, co-operative group of more than 6,000 experts that support and encourage global technology collaboration. At the head of this vast network is the Committee on Energy Research and Technology (CERT). Comprised of senior experts from IEA member countries, the CERT provides leadership and policy guidance based on expertise provided by four sectoral working parties and two cross-cutting experts' groups. The CERT is supported in its work through four topical working parties, including the Fusion Power Co-ordinating Committee.

Fusion Power Co-ordinating Committee

Created by the IEA Governing Board in 1975, the objective of the Fusion Power Co-ordinating Committee (FPCC) is to objective is to enhance fusion research, development, demonstration and deployment (RDD&D) activities with a strategic approach to realising fusion energy in both IEA member countries and key Partner countries. The FPCC accomplishes this objective by promoting, initiating and co-ordinating international co-operation on fusion carried out under the fusion Implementing Agreements.

[1] Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea (Republic of), Luxembourg, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States; The European Commission also participates in the work of the IEA.

ISSUES FOR CONSIDERATION

Fusion as an energy source has significant potential to provide baseload electric power, provided the physics and materials issues can be resolved. As fusion is a multi-generational quest, there is a need to address cross cutting issues in a longer term perspective. The challenge is to design and manufacture a fusion device for the future based on today's knowledge, capabilities and available technologies. This is particularly the case for the International Thermonuclear Experimental Reactor (ITER) prototype. These issues also may lead to gaps between designs for the demonstration plant (DEMO) following ITER operations.

Several stakeholder groups play a role in advancing fusion to the pilot or demonstration phase, including policy makers, government officials, academic or research and development (R&D) institutions, financial institutions, industries, manufacturers, non-governmental organisations and civil society. Given the strategic importance of industry, R&D institutions and society to both ITER and DEMO, these groups will be the focus of the discussions. Experts from each of these sectors will be invited to inform the debate by sharing their experiences and views.

The role of industry

Industries have been involved in fusion activities to date, though on a somewhat modest basis, for example following a specific request from those who manage fusion device research and testing programmes. As the ITER project moves into the engineering and implementation phase, involvement of industrial partners will need to be strengthened. Supply chains will need to be created that will not only allow for design and production, but also allow for repairs and retrofitting as necessary.

However, industries need assurance and incentives to invest in manufacturing capabilities – policy frameworks, secure funding, and clear plans. Without these clear market signals, the value added and return for the investment may not be sufficient to gain industry's interest. Given that no firm and long-standing support has been guaranteed by governments, and given the lack of strategic plans such as a roadmap that sets out concrete, agreed, actions to achieving fusion as a viable energy source, there are no further incentives for industry. In addition, intellectual property could be seen as a way of protecting one's investments, yet at this phase of fusion realisation, it could be a barrier to scientific advancement.

The role of basic research

While the focus in recent years has centred on projects — materials, technologies, and construction — there remain important unresolved physics issues that must also be addressed. Academic institutions carrying out basic research have a role to play in resolving these issues, not only as an incubator for innovation at inception, but also as an ongoing resource to solve problems that may arise as a fusion project advances from theory to practical implementation. This includes, for example, working to resolve a scientific issue, improving on the basic concept of fusion science, taking a leading role in establishing a more sound fusion system, or educating and training the next generation of fusion scientists.

As a result, enhancing interactions between project-based research and academic institutions will accelerate solutions. In this regard, the IEA Implementing Agreements play an important role, as each of them is covering both activities (those relevant to project-type activities like ITER and basic ones). The greater focus among IAs on cross-cutting or horizontal issues encountered in all fusion devices is a significant step in this direction. However, while much-needed resources for project-based R&D activities having increased in recent decades - a development which is to be applauded - these allocations have been at the detriment of funding for basic research. Maintaining closer links between these two areas of research are important to the future of fusion.

The role of society

Compared to fusion, other major technological research efforts such as those relating to aerospace or nuclear fission had relatively short transition periods from research to viable industries. While technological advances and the historical context may have contributed to these developments, civil society also had a significant role to play in supporting these successes. Careful planning, consultations and ongoing communications are known build trust and confidence or technological (e.g. carbon capture and storage) or large scientific projects. Projects such as the Large Hadron Collider must undergo detailed consultations with civil society. Involving consumers and societal stakeholders early on in the process has also been shown to be a key to acceptance. Greater understanding of the role of societal stakeholders in these arenas may provide useful insights to the fusion community.

IEA Fusion Power Co-ordinating Committee (FPCC)

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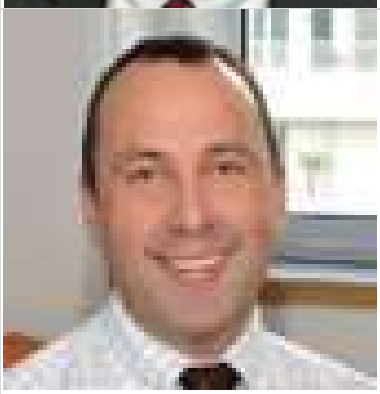
28 January 2014, 14h00 – 18:00

AGENDA

TIME	ITEM
14:00	**Opening remarks** Thomas Vanek, FPCC Chair
14:15	**From research to pilot plants: the factors that led to wide-scale deployment of nuclear energy** *Henri Paillere, Nuclear Energy Agency*
14:45	**Gaining – and maintaining – industry interest in large-scale pilot and demonstration projects** *Daniele Laurini, European Space Agency*
15:15	Coffee break
15:30	**Carbon capture and storage – managing promises and resolving uncertainties through science** *Tim Dixon, Greenhouse Gas Implementing Agreement*
16:00	**Communicating with society: building confidence in the unknown** *Robert Aymar, former Director, CERN, and former Director, CEA*
16:15	**Roundtable Discussion**
17:15	**Wrap-up: lessons learned for the fusion community** *Thomas Vanek, FPCC Chair*
17:30	Close

SPEAKERS AND MODERATORS

Mr. Thomas Vanek is the Senior Policy Advisor for the Office of Fusion Energy Sciences at the U.S. Department of Energy. Mr. Vanek began his government career in 1995 by first serving on the U.S. House of Representatives Science Committee, followed by a post as Senior Advisor in the U.S. Department of Energy, Office of Science. Mr. Vanek has focused on fusion research during his government career, and on ITER since 2002, serving on the ITER Council, ITER Council Preparatory Working Group and ITER Management Advisory Committee. Mr. Vanek holds a Bachelors' Degree in Public Affairs (Bachelors) from the George Washington University and a Masters' Degree in International Affairs from Georgetown University. Mr. Vanek received the Secretary of Energy Exceptional Service Award in 2006.



Dr. Henri Paillere is a Nuclear Energy Analyst for the OECD Nuclear Energy Agency (NEA) in the Nuclear Development Division, which he joined in 2012. Previously, Dr. Paillere managed R&D programmes at Alstom, including programmes on advanced power conversion systems for Generation IV fission reactors and fusion reactors. Prior to this, he held several positions at the French Atomic Energy Commission (CEA), including the European Cooperation Manager for the Nuclear Energy Division, manager of a research laboratory specialised in hydrogen safety and mitigation of severe accidents in fission and fusion reactors as well as hydrogen-fuelled systems. His first posting at CEA examined nuclear safety research issues. he holds degrees in engineering (ENSTA), Aerospace Engineering (University of Michigan) and a PhD in fluid dynamics (Free University of Brussels).

Mr. Tim Dixon is Manager of Carbon Capture and Storage and Regulatory Affairs for the IEAGHG, an international co-operative initiative (Implementing Agreement), where he is responsible for gathering evidence to support the growing regulatory and policy developments for carbon capture and storage (CCS), both within the United Kingdom and as input to international climate change debates. Previously Mr. Dixon was the Senior Policy Advisor on CCS and coal-related issues for the UK Department for Business, Enterprise and Regulatory Reform. He led the government's work on CCS and emissions trading, including amendments of the London Protocol and OSPAR marine conventions and participated in the CCS and cleaner fossil fuel initiatives of the UK's G8 Presidency and the EU-China NZEC Project for the UK's EU-Presidency. He holds an MBA (Oxford Brookes University) and a BSc in Applied Physics (University of Hull).

Mr. Daniele Laurini, European Space Agency, is the Head of the Development and Future Projects for Human Spaceflight and Operations. He leads the sustaining engineering and evolution activities of the infrastructure for the International Space Station (ISS), including responsibility for support of the Columbus laboratory systems and payload facilities, as well as other modules that ESA developed for NASA (e.g. Nodes and Cupola). He oversees the launch and operations of the European Robotics Arm and the development of technologies to be tested at the ISS in support of future human exploration programmes. After joining ESA in 1986, he has focused on supporting various aspects of ISS development and operations. He received an Engineering degree in Aeronautics (University of Pisa) followed by post-thesis work in electric propulsion (University of Pisa).

Dr. Robert Aymar has held noteworthy leadership positions in scientific organisations and more specifically on fusion-related topics for over three decades. As Director General of CERN, Dr. Aymar served on many Councils and Committees at national level and at international level, including as chair of the European Fusion Technology Steering Committee and as a member of the Joint European Torus Scientific Council and of the International Thermonuclear Experimental Reactor (ITER) Technical Advisory Committee. Dr. Aymar also served as Director of the French Atomic Energy Commission (CEA). As Head of the Tore Supra superconducting tokamak project, he oversaw the the conceptual design through to construction and operation in 1988 when the first plasma was produced. He was seconded to the CEA in 1959 after serving in the Corps des Poudres (basic and applied research). Dr. Aymer studied physics at the Ecole Polytechnique.