



Science & Technology and Nuclear Research in the 21st Century: Strategies for research institutes in a changing paradigm of science policy and funding

4-5 June 2007 (Austria Centre L/M Halls)

Chairman's Meeting Summary

Major forces are driving **changes in Science & Technology (S&T)**. As explained in Dr ElBaradei's opening remarks, "Science is changing, in the way it is both funded and managed. Whereas in the past, science R&D was primarily a national agenda item, it has now become a much more a collaborative international activity, reflecting more interdependent and globalized world. In this context, I would emphasize that nuclear science and technology policy is changing as well, as we adapt to the changing needs and realities of the world we live in."

The nuclear sector is, like other sectors in S&T, not immune from the changes happening in economic environment and society. Players in the nuclear sector are beginning to become aware of the changes affecting S&T, and ready to take advantage of the opportunities.

This meeting represents an innovative initiative of the IAEA to **bridge the gap and bring nuclear S&T into the mainstream of S&T discussion**. In particular, the meeting provided information on good practices in S&T, with contributions from leading international organizations in the field, including the Organization for Economic Co-operation and Development (OECD), the World Bank, World Intellectual Property Organization (WIPO), and the European Commission.

We had the privilege of hearing the findings of the Aho working group on creating an innovative Europe, a consulting working group to the European Commission. These findings were summarized by Mr Aho himself. When opportunely leveraged and aligned, the S&T sector provides an impressive engine for economic growth. However, this requires a sustained and coordinated effort by the S&T sector, the government, and society as a whole.

Mr Aho's main points:

- A key advantage of Finland for becoming a knowledge economy and one of the reasons for its success is its relative small size. This suggests that the model could be duplicated in other small countries as well.
- While research and development (R&D) is a process of transforming money into knowledge, innovation is a process of transforming knowledge into money. In a knowledge economy, therefore, R&D and innovation must constantly feed each other.
- Opening the market is a prerequisite for any success.

Particularly important is to have a strong link between science and industry and the continuous engagement of the stakeholders, since their needs are the best indicators for new R&D trends. WIPO stressed the importance for Research & Development Institutions (RDIs) to protect and own intellectual property (IP) in order to fully economically benefit from IP and effectively transfer it to

society. While many countries and institutes are becoming more and more aware of this, Europe is still far from fully benefiting from it.

Venture capital is still in its infant stage in Central and Eastern Europe, but success stories in the US and other countries clearly indicate that venture capital can play an important role in funding innovation projects in this part of the world, as well. However, as indicated in Ernst & Young's presentation, Venture Capital investors are highly demanding and RDIs need to **speak the language of business** in order to tap into this important funding opportunity.

The meeting highlighted the importance of finding a proper balance between the financing from the state budget and the financing from the market.

In the same way, some RDIs are looking for the proper balance between their research activities and engineering services. In particular, some RDIs perform an important role in supporting the regulatory authorities for nuclear safety and/or radiation protection in their country, others support the operator/industry. A recent IAEA Conference on " the Challenges faced by Technical and Scientific Support Organisations in Enhancing Nuclear Safety" provided a framework for discussing challenges and opportunities and recommended an initiative to strengthen networking and cooperation among TSOs. Further information on this conference can be obtained from the IAEA Conference website:

<http://www-pub.iaea.org/MTCD/Meetings/Announcements.asp?ConfID=142>

The meeting's unique combination of speakers and participants from research institutes, academies of sciences and governments from 25 countries, as well as international organizations, NGOs, and the private sector, made clear that a well functioning S&T infrastructure requires that all players act out their roles.

As highlighted by several interventions during this meeting, while the maintenance of national networks is very important, **international cooperation is growing in importance**. A key feature of science nowadays is that no country can perform optimally in isolation. Science infrastructure is becoming more and more expensive and therefore countries feel the need to share infrastructure. This trend should be encouraged not only because infrastructure duplication is inefficient, but also because science by nature requires an exchange of ideas and cooperation that crosses borders.

The European Union is a large source of research funding and has increased the budget for research to more than 50 billion Euros allocated to the 7th Framework Programme and more than 2.5 billion Euros to the EURATOM Programme. One important driving force for the program is to foster collaboration among its member states.

The World Bank has invested more than 5 billion US Dollars in projects to assist countries all over the world in improving their S&T infrastructure.

For nuclear research in particular it is essential that international networks help in funding and establishing large scale common research infrastructure. International collaboration will also be necessary to ensure that each country has access to the infrastructure required to sustain a nuclear power program.

The IAEA is an important player in the S&T field. It is the world's main focal point for nuclear related technologies, with an important role in fostering cross boundary cooperation and providing access to technology to countries that wish to develop their nuclear S&T infrastructure for peaceful purposes. The IAEA is more and more active as a facilitator for infrastructure sharing, as in the case of the research reactor coalition initiative to improve utilization of research reactors.

As presented, there are many funding opportunities available at the national and international levels. In order to be able to profit from them, RDIs need to **take the initiative** to equip themselves with the necessary business skills. The meeting presented the example of the Rudjer Bošković Institute and how it managed to increase its share of EU funded R&D by a factor of ten. The research institute REZ in Czech Republic explained how they managed to overcome a deep financial crisis and become successful.

The meeting also presented the results of a survey performed by the IAEA to evaluate RDIs involved in nuclear technologies. The survey covered 23 institutes from 14 countries in Central and Eastern Europe, ranging from RDIs fully devoted to nuclear power R&D to interdisciplinary RDIs using nuclear techniques in different fields, such as human health, environment, and cultural heritage. The survey looked at legislation, institute policies and key performance indicators, with the objective of identifying the main success factors. The survey showed that there is not just one possible model for RDIs: there are several, all successful in their own way. The survey showed that key success factors **do not vary significantly** between nuclear RDIs and RDIs involved in other disciplines. The main key for success is to have good RDIs that align themselves, their internal policies, and their strategies to their capacities, the environment and the needs of their country.

Many countries in Central and Eastern Europe are still in transition; life for RDIs is neither easy nor smooth, and it is understandable that institute scientists and managers may feel discouraged. The survey showed that some RDIs are struggling with inconsistent policies, lack of a clear vision and old habits that are not adapted to the new environment. Moreover, the academies of sciences, formerly a pillar of the S&T infrastructure in their countries, are now redefining their role and purpose. However, this meeting brings a positive message and a wealth of lessons learned. A few institutes, such as the ones that gave presentations at the meeting, have managed to complete the transition with great success, boosting economic growth and becoming a source of pride for their countries.

While some lessons apply to most of the countries, the next step would be for each institute and country to plan its way forward.

Conclusions

- 1) Lessons learned from other S&T sectors are to a great extent applicable to the nuclear sector. The nuclear sector is becoming aware of the changes and is ready to take advantage of the opportunities.
- 2) Science has become more and more a regional and global endeavour. This cannot occur effectively without conscious effort, careful strategies and more political will for cooperation.
- 3) Governments are becoming aware of changes and there are many initiatives for aligning policies of research and development to the new situation.
- 4) Institutions focused on applied R&D should take ownership and initiative in exploring niche markets, developing business planning capabilities, and creating innovation. In order to move from merely generating knowledge to the transfer of knowledge into consumer products, a change of mindset may be needed. A balanced approach is needed: while governments have an important role in S&T, some part of the research and development should be driven by the needs of the users.

- 5) Successful research and development institutions have demonstrated the importance of mobilizing and motivating research staff using the right incentives in term of human resource policies.
- 6) RDIs need to have good technology infrastructure including technology transfer managers able to determine the potential commercial value of the research and assist in commercializing the research results.
- 7) RDIs should develop institutional policies concerning key strategic elements such as intellectual property ownership, incentives for scientists, benefit sharing and conflict of interest.
- 8) The IAEA has an important role as the world's main focal point for nuclear science and technology. Working with other international organizations it should continue to foster cross border cooperation, facilitate access to technology to countries that wish to develop their nuclear S&T infrastructure for peaceful purposes and support research and development institutions in facing the challenges of the new funding environment through partnership and networking.
- 9) Some participants from outside Europe expressed the wish to organize a similar event in their region; while every region has its own specificities, some of the lessons learned may be applicable. The IAEA should consider how to best support these initiatives.