

**EUROSAFE**

**BERLIN 2002**

**TECHNICAL PLENARY PRESENTATION**

**Co-operation, Networking and Priorities for  
European Co-ordinated Nuclear Research**

**by**

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## **INTRODUCTORY REMARKS**

There are important needs for research and development on nuclear fission which will vary according to the different perspectives and outlooks of each European Country which has a nuclear technology. A common theme for all will be to use research to maintain the continued safe operation of existing plant, to manage the decommissioning of plant and to manage and store radioactive waste safely. In addition, some countries are actively considering the building of new power plant, whereas others are considering the designs of new plant but with no clear intentions to build. Whatever is the outlook for European countries all do share the need to assure nuclear competence. The decline in research capacity felt in many countries and the threats to nuclear education in a number of universities puts at risk the ability of countries to realise their plans for nuclear energy whatever they may be. An increased co-operation on these matters between European countries including the Candidate Countries to the European Union will play an important part in addressing research decline and in increasing European competitiveness. With this intention in mind, the European Community's Framework Programme of research (FP6) will provide a better co-ordination of research activities in Europe and could lead to a better access to safety research information which would be of benefit to all countries.

## **COLLABORATION AND CO-ORDINATION**

Research is undertaken for a number of reasons which can be characterised by the following list:

- Provide understanding/knowledge
- Achieve consensus on safety issues
- Support safe operation of plant
- Maintain safe operation through plant and procedures evolutions
- Anticipate future safety challenges
- Assist regulator to make regulatory decisions
- Maintain and develop competence
- Maintain corporate knowledge
- Attract and develop new skills.

There are a number of areas where the industry, the technical support organisation and the Regulator are able to co-operate together:

- Identify safety issues
- Share safety information
- Commission safety research
- Maintain research facilities and competencies
- Provide a repository of safety information.

The degree of co-operation will vary from country to country and this is likely to be conditioned by the approach adopted to nuclear safety research. However, all countries will have a common objective which is to ensure the independence of the regulator is not compromised by co-operation with industry. To achieve this objective the types of

co-operation may need to be confined to the sharing of research data allowing both the industry and the regulator to perform their analysis independently.

Collaboration and co-ordination can occur both nationally and internationally between nuclear companies and between regulators and there are many good examples where this has been achieved effectively. These exchanges can be characterised by some clear outcomes:

- Share cost of expensive research
- Maintain large scale research facility
- Achieve consensus on research safety relevance
- Exchange safety information
- Provide access to important technical competencies.

Co-operation currently takes place through bilateral and multi-lateral agreements; a good example for expertise would be the work which has taken place in the past between Germany and France on the EPR. It can also be seen for research in the Halden Reactor Programme and through projects co-ordinated by the OECD's Nuclear Energy Agency, eg. MASCA, CABRI. Finally, the European Commission's Fission Safety Programme continues to provide a focus and part funding for collaborative programmes of research which means that more can be achieved with less from each individual partner.

However, with research budgets in decline in many countries, research facilities and capabilities being lost and the industry tending to focus on shorter-term safety issues, there is the propensity to lose corporate knowledge and to not provide the technology challenges which will attract young scientists and engineers for the future.

There is the potential to do more than is being done currently and it is for each country to decide what approach should be taken. However, one opportunity arises through new approaches which are proposed through the European Research Area (ERA) initiative of the European Commission (EC). The EC is promoting ideas which would require a closer inter-relationship between countries through the cost sharing and opening up of national research programmes which would lead to large integrated programmes being adopted between many countries. This would be complimented by networks in specific technical areas which would aim to seek common research issues and share research outcomes. If this approach, which is being launched under FP6, is successful, it could lead to a greater inter-relationship between countries and a greater reliance on sharing common expertise which sometimes may lie outside the country where it may be required. This in turn could lead to more cost-effective utilisation of research, the closer harmonisation of approaches and would influence European competitiveness.

## **NUCLEAR COMPETENCE**

An important consideration for those countries which participate in the ERA is initiative in how to maintain nuclear competence in Europe. The EC has already undertaken some groundbreaking work to map the current availability of nuclear competence and research facilities. The next task must be to analyse this map against both the competences which are required now and in the future and to use this to identify areas where competence is both important but also critical and perhaps also in short supply. The outcome of this activity could be the identification of critical areas, where EC support could be used with maximum foreseen efficiency. The work will also help identify where initiatives need to be taken now and in the future to maintain the viability of facilities and competences which are agreed to be essential but may be under threat. The work may provide some important indicators as to whether new research facilities are required in the future.

These centres of competence and/or facilities would take on a certain importance at European level and although they would be funded largely at a national level, they may also focus their activities on collaborative activities which would be funded from more than one country. To achieve this level of recognition, these centres would need to be characterised by the following:

- High level of technical expertise
- Unique or important research facility
- High reputation for delivery
- Adaptability to future challenges
- Responsiveness to stakeholder's needs
- Well-networked with other Centres.

For the centres to maintain this recognition the centres would need to be accessible and responsible to the needs of countries. Sometimes these needs may be urgent and may require an appropriate response.

## **RESEARCH PRIORITIES**

In most countries, the present technologies will continue to operate for 20/30 years, although it is conceivable that in more than one European country new designs of nuclear power plant will be built in response to future energy needs. However, whatever is the future of nuclear energy there is a continuing need to improve safety and where necessary to identify and fill safety gaps. There will be a number of challenges where the present knowledge base is consolidated and extended and, from an industry perspective, research undertaken in order to demonstrate that safety margins can be reduced; in the same time, it is the task of the technical support organisation to check that new operating modes or margin reductions envisaged by the utility do not jeopardize the appropriate safety level of nuclear installations.

In taking a European perspective there are a number of important areas where research co-ordination is essential. They fall into three main topics:

- maintain the safety of existing installations
- support to Candidate Countries to the EU for safety level improvement

- support the safety assessment of industrial evolutions and new plants.

More specifically, European research should continue to research the safety issues, including research on safety critical software, which arise from the intention to extend the life of nuclear plants and this should be a priority for the VVERs. Also research on accident management should continue, with special emphasis on VVERs. More research should be undertaken to help define the safety margin criteria for high burn-up fuel. Finally, how humans contribute to all aspects of plant safety has become an important area for research which would benefit from co-ordination at a European level.

These technical issues need to be complemented by a programme of activities which focus on maintaining and developing an appropriate research infrastructure. To meet this urgent need, European activities should support postgraduate education on nuclear engineering and should assist in maintaining national educational infrastructure through support networks which may lead to the redesigning of courses and the mobility of students. Finally, more innovative ways should be explored in order to attract students into research and perhaps more importantly into the nuclear industry. Such ideas could include attracting students to take part in important international collaborative programmes of research.

## **CONCLUDING REMARKS**

The difficulties the nuclear community is facing are becoming better understood and in many areas solutions are being tried and are meeting with some success. The maintenance of nuclear competence continues to be a challenge and needs to be a continuing focus for action at both the national and international level for some time to come. The research community has a key role to play in helping to maintain this competence and in collaborating on safety issues which are common to more than one country. International organisations such as the Nuclear Energy Agency and the European Commission are well placed to both influence and achieve a higher level of co-operation between regulators, industries and institutes in Europe.