INCENTIVES TO STRENGTHEN INTERNATIONAL CO-OPERATION IN R&D FOR ADVANCED NUCLEAR POWER TECHNOLOGY

E. Balthesen, Research Centre Jülich KFA, Germany
A.D. Bakunyaev, Minatom, Russian Federation
I.H. Gibson, AEA Technology, United Kingdom
J.P. Hosemann, PSI, Switzerland
R. Tavoni, ENEA, Italy
A.M. Versteegh, ECN, Netherlands

This paper is concerned with the need for International Co-operation in R&D for Advanced Reactors in order to maintain options for the future deployment of nuclear power against the current background of declining R&D capability in Europe.

The ideas expressed here reflect the current situation in Europe where investment in nuclear power is declining partly as a result of public concern about the safety of nuclear power. There has been a very significant reduction in R&D budgets, facilities and staff over the past few years and this trend is continuing. If the significant long-term development potential of nuclear power is to be realised, the R&D effort needed will exceed national and private industrial capabilities and, due to their long-term nature, public financing is necessary. There is also a concern that without a strong development programme, there will be a shortage of young qualified engineers for both reactor development and operational support in the years to come.

In the context of advanced reactor technology, the paper deals with R&D aimed at the long term rather than with short-term improvements to existing reactors. The latter is more a task for vendors, although there will be interactions between the long- and short-term programmes with benefits both ways.

In many countries the further expansion of nuclear power will require the development of new reactor systems which will only be realized as a result of R&D. It is proven by experience that new design features, new systems and new components require extensive R&D to justify them and to decide on their applicability to commercial plants where economy and safety are the key factors. The scale of these R&D tasks, seen against the national decline in R&D, requires a co-operative international effort. The need for such international co-operation has been emphasized by many statements from national and international bodies. A strong collaboration will result in a common view on the assessment and acceptability of new reactor design features.

There are many examples of international co-operation in nuclear R&D. For instance, International Thermonuclear Experimental Reactor (ITER) and various other co-ordinated research programmes (IAEA), Halden Project, Dragon Project and many co-ordinated programmes (OECD), severe accident research (CEC) and multilateral programmes such as the BETHSY collaboration (CEA). These are successful examples of international collaboration but they do not meet the full challenge presented by the recognized potential of new reactor systems. The design criteria for the development of a future generation of advanced nuclear reactors are not fully established on an international basis but show general trends and objectives which can already be identified.

Examples are:

- Use of passive : removal systems which raises issues of natural circulation.
- Prevention of core melt by use of ceramic fuel, for instance.
- Use of low activation constructional materials.
- Minimization of actinides in the waste stream.
- Application of new techniques from other technologies, for instance, informatics.
- Advanced fuel cycles.
- Behaviour and role of the containment in severe accidents.

These examples are appropriate topics for a collaboration R&D programme on advanced reactors.

The conclusions of the paper are:

1. There is a need to continue reactor R&D to ensure that options for future deployment of nuclear power are available.

2. The scale of the R&D required calls for international co-operation.

3. R&D tasks which are not of design-specific nature can be identified as the basis for international collaboration.

4. International organizations such as IAEA, NEA and CEC have an important role in strengthening essential R&D for Advanced Nuclear Power Technology.