Regulator and Industry Co-operation on Safety Research: Challenges and Opportunities

FINAL REPORT AND ANSWERS TO QUESTIONNAIRE

The complete version is only available in pdf format

JT00138716

Document complet disponible sur OLIS dans son format d’origine
Complete document available on OLIS in its original format
ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

Pursuant to Article 1 of the Convention signed in Paris on 14th December 1960, and which came into force on 30th September 1961, the Organisation for Economic Co-operation and Development (OECD) shall promote policies designed:

- to achieve the highest sustainable economic growth and employment and a rising standard of living in Member countries, while maintaining financial stability, and thus to contribute to the development of the world economy;
- to contribute to sound economic expansion in Member as well as non-member countries in the process of economic development; and
- to contribute to the expansion of world trade on a multilateral, non-discriminatory basis in accordance with international obligations.

The original Member countries of the OECD are Austria, Belgium, Canada, Denmark, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. The following countries became Members subsequently through accession at the dates indicated hereafter: Japan (28th April 1964), Finland (28th January 1969), Australia (7th June 1971), New Zealand (29th May 1973), Mexico (18th May 1994), the Czech Republic (21st December 1995), Hungary (7th May 1996), Poland (22nd November 1996), Korea (12th December 1996) and the Slovak Republic (14th December 2000). The Commission of the European Communities takes part in the work of the OECD (Article 13 of the OECD Convention).

NUCLEAR ENERGY AGENCY

The OECD Nuclear Energy Agency (NEA) was established on 1st February 1958 under the name of the OEEC European Nuclear Energy Agency. It received its present designation on 20th April 1972, when Japan became its first non-European full Member. NEA membership today consists of 27 OECD Member countries: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Luxembourg, Mexico, the Netherlands, Norway, Portugal, Republic of Korea, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. The Commission of the European Communities also takes part in the work of the Agency.

The mission of the NEA is:

- to assist its Member countries in maintaining and further developing, through international co-operation, the scientific, technological and legal bases required for a safe, environmentally friendly and economical use of nuclear energy for peaceful purposes, as well as
- to provide authoritative assessments and to forge common understandings on key issues, as input to government decisions on nuclear energy policy and to broader OECD policy analyses in areas such as energy and sustainable development.

Specific areas of competence of the NEA include safety and regulation of nuclear activities, radioactive waste management, radiological protection, nuclear science, economic and technical analyses of the nuclear fuel cycle, nuclear law and liability, and public information. The NEA Data Bank provides nuclear data and computer program services for participating countries.

In these and related tasks, the NEA works in close collaboration with the International Atomic Energy Agency in Vienna, with which it has a Co-operation Agreement, as well as with other international organisations in the nuclear field.

© OECD 2003

Permission to reproduce a portion of this work for non-commercial purposes or classroom use should be obtained through the Centre français d’exploitation du droit de copie (CCF), 20, rue des Grands-Augustins, 75006 Paris, France, Tel. (33-1) 44 07 47 70, Fax (33-1) 46 34 67 19, for every country except the United States. In the United States permission should be obtained through the Copyright Clearance Center, Customer Service, (508)750-8400, 222 Rosewood Drive, Danvers, MA 01923, USA, or CCC Online: http://www.copyright.com/. All other applications for permission to reproduce or translate all or part of this book should be made to OECD Publications, 2, rue André-Pascal, 75775 Paris Cedex 16, France.
COMMITTEE ON THE SAFETY OF NUCLEAR INSTALLATIONS

The NEA Committee on the Safety of Nuclear Installations (CSNI) is an international committee made up of scientists and engineers. It was set up in 1973 to develop and co-ordinate the activities of the Nuclear Energy Agency concerning the technical aspects of the design, construction and operation of nuclear installations insofar as they affect the safety of such installations. The Committee’s purpose is to foster international co-operation in nuclear safety amongst the OECD Member countries.

CSNI constitutes a forum for the exchange of technical information and for collaboration between organisations which can contribute, from their respective backgrounds in research, development, engineering or regulation, to these activities and to the definition of its programme of work. It also reviews the state of knowledge on selected topics of nuclear safety technology and safety assessment, including operating experience. It initiates and conducts programmes identified by these reviews and assessments in order to overcome discrepancies, develop improvements and reach international consensus in different projects and International Standard Problems, and assists in the feedback of the results to participating organisations. Full use is also made of traditional methods of co-operation, such as information exchanges, establishment of working groups and organisation of conferences and specialist meetings.

The greater part of CSNI’s current programme of work is concerned with safety technology of water reactors. The principal areas covered are operating experience and the human factor, reactor coolant system behaviour, various aspects of reactor component integrity, the phenomenology of radioactive releases in reactor accidents and their confinement, containment performance, risk assessment and severe accidents. The Committee also studies the safety of the fuel cycle, conducts periodic surveys of reactor safety research programmes and operates an international mechanism for exchanging reports on nuclear power plant incidents.

In implementing its programme, CSNI establishes co-operative mechanisms with NEA’s Committee on Nuclear Regulatory Activities (CNRA), responsible for the activities of the Agency concerning the regulation, licensing and inspection of nuclear installations with regard to safety. It also co-operates with NEA’s Committee on Radiation Protection and Public Health and NEA’s Radioactive Waste Management Committee on matters of common interest.
Regulator and Industry Co-operation on Safety Research: Challenges and Opportunities

FINAL REPORT AND ANSWERS TO QUESTIONNAIRE

Table of Contents

Executive summary and recommendations .................................................. 7
1. Introduction ......................................................................................... 11
2. Background ....................................................................................... 12
3. Practising collaboration: benefits and impediments ......................... 14
4. Preserving transparency and regulator independence .................... 25
5. Conclusions and recommendations .................................................. 29
Appendix, GRIC mandate and composition ........................................... 33
Answers to the GRIC Questionnaire ...................................................... 37
Executive Summary and Recommendations

During the CNRA/CSNI Workshop on "The Role of Research in a Regulatory Context", which was held in Paris on 19-20 June 2001, a recommendation was made to examine how safety research is organised and carried out in industry and governmental organisations. In particular, it was agreed that a group be set up with the mandate to identify and review the issues which hinder closer co-operation on research between regulators and industry and to propose possible ways for resolving such issues while maintaining regulatory independence in decision-making.

The Group has analysed the potential advantages and disadvantages of regulator-industry collaboration in safety research and has also provided indications on how to overcome possible difficulties that can arise from such collaboration. The Group focused in particular on the issue of regulator independence, on means to preserve it and ways to demonstrate it to the public while undertaking collaboration with industry.

This report is intended to provide research managers in industry, regulatory organisations and research centres with information on current practices on collaborative safety research in OECD member countries, to identify means of establishing effective industry-regulator collaboration and to advise on possible areas of concern.

In its review of strategic considerations relevant to enhanced industry-regulator collaboration in safety research, the Group noted that:

- Research will continue to be needed in future to support a high level of safety, and co-operative efforts between regulators and industry will play an important role in a context where economic pressures on nuclear plant operators are increasing and government funding has been decreasing.

- Independence of judgement is a fundamental principle for regulators, and is highly valued by the public and industry. Industry-regulator collaboration in safety research must maintain this principle and demonstrate independence on an ongoing basis.

- Maintenance of a highly competent technical workforce, and necessary experimental and laboratory facilities is essential if regulators and industry are to continue to address emerging safety issues in a timely and efficient manner.
Based on extensive discussion and information exchange within the Group, and taking into account the results of a survey of collaboration practices in OECD-NEA member countries, the Group identified a number of key benefits of collaboration, for example:

- Enhanced communication, mutual technical understanding and positive up-front engagement of both parties. Collaborative research often provides a non-confrontational environment to permit a better and broader understanding of issues important to each participant.

- Pooling of expertise to permit better exploitation of the breadth and depth of knowledge present in different organizations in the planning and execution of programmes.

- Better program design due to improved access to materials specimens and operational data, and enhanced confidence that the focus of research will be realistic and practical, particularly when it addresses low probability events.

- Increased cost-effectiveness due to sharing of costs, together with reduced risk of unnecessary duplication of effort.

- Improved ability to preserve essential facilities and expertise for safety research and to promote broader use of key national and international facilities via common programmes.

The group also identified a number of potential issues that need to be considered and whose impact needs to be minimized when establishing regulator-industry collaboration.

The following recommendations of the Group are intended to promote effective regulator-industry collaboration, and are based on good practices in OECD countries:

- Industry and regulator should engage in an in-depth discussion of their respective priorities to determine whether such priorities can best be addressed by common or independent research activity.

- At the project definition phase, industry and regulator should clearly specify mutual objectives, anticipate what results are expected from the research, and clearly identify the scope, schedule, deliverables and cost.

- International collaboration in organizing projects with regulator-industry participation should be considered as an effective means of improving confidence in the adequacy of the collaborative programme and the quality of results.

- In planning for a collaborative undertaking, the option of pursuing further research on an independent basis and with independent funds should be maintained by all parties.
• Issues of intellectual property rights, data ownership and information release to the public should be addressed in advance by ensuring flexible provisions on the level of detail necessary for published information and allowing for the possibility of review of the information prior to its release.

• To overcome the potential difficulties that may arise due to the different perspectives of the industry and regulator, well-established good practices in project management and administration should be followed, including clear lines of communication among participants, clear roles and responsibilities and rigorous management. Dispute resolution processes should be identified to address situations in which consensus cannot be reached.

It is recommended that the following principles be employed, where appropriate, to preserve transparency and independence of regulatory decision-making when undertaking industry-regulator collaboration.

• Collaboration should acknowledge the different roles of the regulator and industry and is to be accomplished with openness, providing appropriate public insight into objectives, means and results.

• Consideration should be given to formalizing a general agreement between regulator and industry to establish, in a transparent manner, the motivations and underlying principles of regulator-industry collaboration.

• The regulator should first establish its own research priorities before determining whether there is an opportunity for collaboration with industry.

• Collaboration should, in general, be restricted to obtaining objective data. Interpretation of data should preferably be undertaken independently and the regulator should in all cases draw its own conclusions based on the common research. Care should be taken to maintain adequate independence in the development of models and computer codes.

• To promote transparency, a Project Agreement documenting project background, technical basis, objectives, deliverables, schedule, cost, information dissemination, and project management should be established at time of project initiation.

• Consideration should be given to independent oversight of the collaborative work. Ensuring access to independent advice (eg. independent peer review and publication of results) should be considered as ways of strengthening independence.

• Financial transactions occurring during the course of the project should follow well-defined formal procedures and be fully documented.
1. Introduction

Safety is an essential requirement for the peaceful utilisation of nuclear energy, and considerable efforts have been and continue to be devoted to the safe operation of nuclear power plants. Research is an important contributor to the knowledge base needed to continue to ensure plant safety, and constitutes a means to maintain or develop competence in many technical fields that are relevant to safety. In OECD member countries, industry and/or regulators perform safety research both separately and under a variety of co-operative arrangements.

During the CNRA/CSNI Workshop on "The Role of Research in a Regulatory Context", which was held in Paris on 19-20 June 2001, a recommendation was made to examine how safety research is organised and carried out in industry and governmental organisations. In particular, it was agreed that a group constituted by senior research managers be set up with the mandate to identify and review the issues which hinder closer co-operation on research between regulators and industry and to propose possible ways for resolving such issues while maintaining regulatory independence in decision-making. [1]

On this premise, the Group for Regulator-Industry Co-operation on safety research (GRIC) was established to consider various aspects of industry and government sponsored research, aiming to identify possible means to narrow differences and to facilitate greater co-operation while maintaining an appropriate level of regulator independence. Defining an appropriate level of regulatory independence is a critical consideration. The level of independence and how it is achieved is governed by national regulatory and research frameworks and by public concern. However, there is an underlying principle that the regulator's mandated responsibilities for making independent regulatory decisions, and to demonstrate its independence, should not be compromised.

The GRIC Group included representatives from both industry and regulatory organisations. It met three times at the OECD-NEA headquarters in the period December 2001 - October 2002. It has also had inter-meeting consultations and exchanges of information, and has conducted a survey (by means of a questionnaire) among member countries of the OECD-NEA to collect views, experience and suggestions on safety research collaboration. The Group mandate and composition are given in the Appendix.

The Group has analysed the potential benefits and impediments of regulator-industry collaboration in safety research, taking into account the responses that were received on the GRIC questionnaire. Where appropriate, it has also
provided indications on how to overcome possible difficulties that can arise from such collaboration. In particular, the Group focused on the issue of regulator independence, on means to preserve it and ways to demonstrate it to the public while undertaking collaboration with industry.

The Group was expected to produce a report containing an overview of the issues and considerations that emerged from the Group activities. This report, which is presented in the following, is intended to provide research managers in industry, regulatory organisations and research centres with information on current practices on collaborative safety research in OECD member countries, to identify means for establishing effective collaboration and to advise on possible areas of concern. It contains a section that provides an overview of background and strategic considerations (Section 2), a section on collaboration practices and possible approaches aimed to enhance collaboration (Section 3) and a section on regulator independence and means to preserve it (Section 4).

2. Background

In many OECD member countries, nuclear power plays an important role in the overall production of electricity. As in the past, operational requirements, plant utilisation and fuel designs are expected to continue evolving, even for current generation reactors. Operational experience and plant ageing will also raise new questions. Research will be needed to support a high level of safety, in a context where economic pressures on plant operators are increasing. Well-conceived collaboration between regulators and industry can help fulfill these research needs in a cost-effective manner.

In many countries, electric utilities are faced with intense competition due to de-regulation. In order to compete effectively they are undergoing an extensive process of consolidation, while seeking at the same time means to improve operational economics and flexibility. The drive towards reducing expenditures has, amongst other factors, caused a substantial decrease of industry research budgets, while consolidation has reduced the number of organisations performing research. As a result, in many countries, funding of research has become scarce and more uncertain, while the scope of research has been progressively narrowed down to fewer subjects.

These changes in the industry have been accompanied by a gradual but significant reduction of government funding in many OECD member countries,
**Reduced public funding**

which has taken place over the last few years. In most cases, this has occurred through direct reductions of the funds available for regulatory research, which has affected those laboratories devoted to carrying-out research in support of regulatory assessments. An inquiry conducted in 2001 showed that, although the data may not always exhibit a consistent trend, the overall public funds in OECD countries having a nuclear power programme decreased by an average ~20% in five years (1997-2001). The decrease has been appreciably larger than that in some countries. [2]

Although funds have decreased, safety has so far been maintained at high standards. However, there is a widespread and well-founded concern as to the continued ability of government safety agencies and industry to fulfill their responsibility in the long term, if funding reductions persist or worsen [3]. Regulators and industry will continue to be confronted with emerging issues in areas such as operating experience at power plants, applications of nuclear materials, new technologies and improved approaches to regulation. It is critical that nuclear safety research provides solid technical bases for regulatory decisions that will support safety in these areas. In order to meet this goal in a timely and efficient manner it is necessary to maintain a highly competent technical workforce and necessary experimental and laboratory facilities.

The evolution of nuclear power technology is dynamic and covers a wide technical range as demonstrated by the many initiatives being pursued by the industry. The Group believes that nuclear safety research should continue to support licensing and regulatory authorities in their endeavour to verify that continued progress takes place without detriment to safety. The Group also believes that increased regulator-industry collaboration can constitute one way to continue carrying out an adequate level of research under current circumstances, through cost-sharing arrangements that would enable regulators and industry to address the economic pressures described above.

The Group shares the CSNI concern that "dwindling budgets and support, as well as stagnant programmes may lead to untimely shutdown of facilities and the breaking up of experienced research teams" [3], and is supportive of initiatives designed to activate research programmes in facilities relevant to safety. Regulator-industry collaboration can help to provide a more solid basis for such initiatives, in terms of more comprehensive technical input, broader utilisation of results and stability of funds.

**Concerns for safety competence**

**Need to keep focus on safety research**

Collaboration between regulators and industry on safety research has always existed in one form or another in many countries, especially in those with smaller nuclear programmes. In recent years, however, it has been extended to those situations where regulator and industry research had previously been conducted on a separate basis and with distinct funding. In this report, the Group has attempted to analyse the advantages that may derive from such
interaction, as well as the challenges and questions that it may pose. The Group has also attempted to outline conditions that might enhance appropriate forms of collaboration between regulator and industry, without impinging on their respective roles.

The concern exists, however, that sharing financial participation in safety research programmes with industry, may pose some questions as to the ability of regulators to maintain their independence, especially when drawing conclusions from such collaborative research. Independence of judgement is a fundamental principle for regulators, which is valued also from an industry perspective, and it should be preserved accordingly. Regulator independence is also highly valued by the public and regulators need to be in a position such that independence of judgement can always be explicitly and objectively demonstrated. Moreover, for some specific issues, demand by the public for total regulatory independence may override the benefits that may normally be derived from a collaborative effort between the regulator and the industry. The issue of maintaining and demonstrating regulatory independence whilst benefiting from the cost-effectiveness of collaborative research with industry has been discussed in depth by the Group and is given particular attention in this report.

Consideration has been given to another circumstance prevailing in the industry, i.e. that there is an increasing tendency to consolidate its business worldwide, which could raise problems related to ownership of data and dissemination of results. In the opinion of this Group, this need not constitute an obstacle to collaboration. Both regulators and industry have been able to establish bilateral as well as international collaboration in the past under a variety of arrangements. Successful agreements can be reached under very different conditions, provided that the objectives of the collaboration are technically sound and that a genuine interest prevails in pursuing them, together with a reasonable measure of flexibility.

3. Practising collaboration: benefits and impediments

In most OECD member countries, both the regulator and the industry have funds set aside for safety research. There can be a difference as to whether the regulator research funds are directly provided by the government or are raised through levy imposed on the industry. However, this difference is
immaterial in the context of the discussions made here. The principle that safety research funds should be available both to regulator and industry acknowledges their respective needs to perform independent research and differences in perspective between the two. Regulators and industry share a common goal of performing research to support safe plant operation. However, differences can exist between industry and regulator viewpoints on the need and purpose of research. While industry recognises the importance of research in assuring safe plant operation, it also performs research to reduce costs and to improve efficiency and reliability of operation. In contrast, regulators, consistent with their mandate, are often interested in performing research in greater depth or for a wider range of conditions, in order to confirm the robustness of the safety case and to provide a higher confidence in the identification and resolution of potential safety issues.

There are a few exceptions, however, where safety research is almost entirely funded and carried out by the industry. This is the case for instance of Canada, where the regulator has a relatively small regulatory research programme, which they use mainly to perform specific independent confirmatory or investigative work on safety issues. The regulator has the power to require that answers to specific safety questions be provided by the industry - through research when necessary - and therefore has a direct influence on the issues addressed in the nuclear safety research programme. Since there is no large-scale regulator funded research performed, opportunities for regulator-industry collaboration involving sharing of funds is limited under these circumstances.

In the most common situation where both industry and regulator perform research, questions on possible unnecessary duplication and on cost-effectiveness of the overall research work may arise, especially when funds for research are generally decreasing. Regulator and industry collaboration can, under appropriate circumstances, be beneficial in enhancing research effectiveness and efficiency. However, there are also potential disadvantages that need to be taken into account. The present section summarises the discussions undertaken within the Group on the potential benefits and impediments of collaborative research, after a brief overview of practices in OECD member countries. The latter is mainly based on the results of the GRIC questionnaire that was circulated amongst CSNI representatives. The questionnaire responses are compiled in a separate report [4].

In some OECD member countries, regulator and industry collaboration on safety research has existed for a long period of time, possibly motivated in some cases by the relatively small amount of funds available. Combining available resources, where appropriate, has been a way for both regulators and industry in these countries to perform safety research in an affordable manner. In Sweden or Switzerland, for instance, it is not uncommon that cooperation between utilities and the regulator are undertaken to investigate a
particular problem. While this occurs mostly on a case-by-case basis, longer-
term cost-sharing approaches are also employed, for instance on joint efforts
aimed to retain technical infrastructure and expertise. In some cases this is
done in relation to funding of academic positions and courses of studies - e.g.
in Sweden and Canada - while in other cases it relates to the financing of
programmes that are carried out at a national laboratory, such as at the Paul
Scherrer Institute in Switzerland.

The Paul Scherrer Institute (PSI) participates in most of the collaborative
research that is performed in Switzerland and is the executive agent for most
research projects carried out on behalf of the Swiss regulator (HSK) or of the
plant operators, and - when appropriate - of both. The Swiss participation in
international projects, such as the OECD projects, offers another opportunity
for collaboration among PSI, HSK and the Swiss utilities.

For some countries, the practice of formalising a structure that facilitates joint
regulator-industry undertaking has become increasingly common in recent
times. An example of this development is represented by the collaboration
between the United States Nuclear Regulatory Commission (USNRC) and
EPRI, which is the electricity industry’s research arm in the United States. The
terms of such collaboration are stated in a so-called Memorandum of
Understanding (MOU), which was set up at the end of the 1990's. The MOU
documents the principles and the procedures for the establishment of joint
projects, which are intended to make the best use of research resources for
obtaining data and technical information, in the interest of both USNRC and
EPRI. For these organisations, the MOU does indeed represent a new way of
performing safety research as compared to the past, when virtually all their
research was performed separately. Such a change was driven by a number of
factors, and cost sharing was one of them.

Similar to the US case, the Spanish regulator CSN and the Spanish electricity
industry association UNESA have entered into a research agreement, which
has been in force since 1998. The scope of this common programme
addresses scientific and technical aspects related to nuclear safety and
radiation protection. In the United Kingdom, collaboration is organised
differently. Here safety research issues are raised by the regulator in
consultation with the industry, which deals with the research needed to resolve
these issues, both at management and at technical level. Approximately 80%
of the safety research is commissioned through the industry, while the
remaining part is commissioned directly by the regulator.

In France, co-operative research agreements between the utility EDF and the
national nuclear safety and radio-protection Institute, IRSN (and its
predecessor IPSN), have existed for more than a decade. Within these
agreements, EDF can participate in the research carried out by IRSN.
Depending on its financial contribution, which normally is in the range of 20 to 50%, EDF can participate in decisions and have access to the detailed results of a programme. In Germany, the budgets provided by the Federal Ministries (BMWi, BMBF, BMU) enable reactor safety and nuclear repository research to be performed independently from industry. In addition to research programmes exclusively funded by the Federal ministries, there are safety research projects performed in co-operation with industry. They are based on cost-sharing and cover themes of common interest for both partners, as well as cases where technical information, unique facilities or special know-how from industry are important for the success of the research. As an example of collaboration, the German participation in the OECD-IRSN CABRI Project is co-funded by the German industry and by the Ministry BMWi.

In Japan there is at present a clear distinction between governmental funding and private industry funding of research. Some forms of collaboration between industry and regulator do exist, although they are mainly in terms of joint discussion of priorities or exchange of information. (Public funds can also be used by industry on contract basis). Collaboration may include practical aspects, for instance to provide the fuel specimens required for the reactivity tests conducted in the JAERI NSRR test reactor to evaluate fuel safety at high burn-up. However, as indicated above, the present practice in Japan is not to combine regulator and industry funding. Although on a smaller scale, the same attitude prevails in, for instance, Belgium and Republic of Korea. Whether this will continue in the future or not may depend in part on the structural changes that safety research is undergoing at the present time, notably in Japan.

Regulator-industry collaboration can improve research effectiveness and, as discussed in the following, can produce other potential benefits with respect to financial or technical aspects. Given the maturity of the nuclear industry, problems tend to become more specialised, with few – and often very few – laboratories being able to offer the type of investigations that current assessments require. Specialised studies might also involve the use of materials samples that are difficult and expensive to retrieve from power plants. The Group finds it reasonable that as long as the investigations do not impair their independence, industry and regulator may find it increasingly useful to join forces, especially when pursuing expensive research. Collaboration will, amongst other benefits, make it possible to utilise unique expertise and valuable test specimens or plant data as efficiently and as broadly as possible.

Joint safety research is a means to avoid situations in which similar investigations are pursued in parallel by the regulator and industry, which could result in unnecessary duplication of effort and inefficient use of resources. Avoiding unnecessary duplication is an issue that does not only apply to one country, but is also of concern to the nuclear community at large. By its nature,
international research is well suited to help in this context, although one should recognise that there can be issues that tend to be country-specific. The Group believes that enhancing the international character of research through the establishment of international projects can help to avoid unnecessary duplication on a broader scale and render research in general more cost effective. It can also facilitate collaboration of regulators and industry, when they jointly participate in international undertakings.

The importance of combining financial resources appears clearly from the responses of OECD member countries to the GRIC questionnaire. Sharing costs makes it affordable for both parties to address research and related industry infrastructure issues that are of common interest, that is to an extent that does not impinge on the regulatory decision making process. Cost sharing can be realised in the context of national projects, and to an even greater degree through international projects, such as EU or OECD-NEA projects. Participation in the OECD-NEA projects in the safety area, for instance, is mentioned in many questionnaire responses as an example of successful cost-sharing arrangements. In fact, it would have been impossible to set up these projects without significant technical and financial participation from industry and regulatory organisations in many countries.

From the response to the questionnaire, it also appears that when feasible, the regulator and industry share the responsibility and costs of maintaining national nuclear safety competence, for instance by favouring the establishments of projects at one or more selected national research laboratories. Research and test centres like Studsvik in Sweden or the PSI in Switzerland base themselves on projects of interest for industry or regulator, as well as on projects jointly sponsored by both parties. Similar situations exist in other countries. Cost sharing can also become important for initiatives that have a more long-term perspective and that may not always have a direct immediate return on investment. Normally, research with uncertain outcome is of lower priority for the industry, which seeks concrete outputs in a reasonably short time frame. However, this is to be balanced with the need to maintain a minimum degree of work continuity for those centres having key research capabilities, especially in periods of sluggish demand. It should be noted that there is in this context a shared responsibility to ensure that adequate competence will be available in the future to deal with operational safety, decommissioning, radioactive waste management and radiological issues in general.

In addition to the benefits deriving from sharing costs, regulator and industry collaboration also has non-financial benefits. For instance, co-operation favours the pooling and exploitation of the know-how and expertise available in the different organisations. This is important especially in the definition phase of a research programme, since it brings-in a basis of broader knowledge and experience. Collaborative research also provides a non-confrontational
environment to permit better and broader understanding of issues important to each participant.

Collaboration implies that both the regulator and industry engage themselves from the very beginning in a more critical review of priorities and of whether such priorities can best be addressed by common or by independent research activity. In France, for instance, EDF and IRSN first define their respective priorities on safety issues that need to be addressed by research, whereas consultations on possible collaboration take place in a subsequent phase. It is in this second phase that priorities and ways to pursue them are discussed and if necessary revised. In any case, regardless of which process is used, collaboration implies a beneficial in-depth discussion, which contributes to a more rigorous definition of research priorities for both parties.

This up-front mutual engagement aids in creating a common basis to address the issues being considered, and in avoiding misunderstandings that can be very costly if they are realised at the end - instead of the beginning - of expensive research programmes. It obliges both parties to clearly specify their objectives, to anticipate what results are expected from a research programme, as well as to define agreed work scope, schedule and budget. In other words collaboration facilitates an up-front involvement of regulators and industry in adopting good practices for the management of a research programme and in doing their best to make it a success, since both parties have a strong stake in the outcome. (Good practices should obviously apply in any case, not only to co-operative research). The Group has also, on behalf of the CSNI, briefly addressed the issue of “closure” of a research subject, recognising however that research, collaborative or not, should adhere to good practice, and defining conditions for closure of a research issue is an integral part of good practice.

For a regulator, collaboration with industry can be useful in that it facilitates access to plant data as well as the availability of materials suitable for a research programme. Plant data such as incidents, human performance information, or component availability and integrity, are key for a large spectrum of safety issues and are very often needed in the database of safety research programmes. It should be noted that the industry does in any case provide the regulator with relevant plant data, if the regulator makes a formal request to obtain such data. However, it is believed that data availability as well as quality of related information and depth of assessments can be significantly increased if they are considered in the context of a collaborative effort.

Equally important is the availability of material specimens. As an example, investigations on loss-of-coolant accidents or on reactivity accidents necessarily require specimens from commercial fuels of different make and burn-up levels. The preparation and utilisation of such fuel specimens requires
careful planning of a rather complex sequence of operation. It includes discharge and retrieval from a power plant, transportation from plant to laboratory site, hot cell work and sometimes testing in a test reactor — i.e. an infrastructure that would not work without positive involvement of the industry. Similarly, plant life extension studies require representative materials specimens for investigations in hot cells or test reactors. Also in this case, the best specimens are those retrieved from power plants, as they have operated at representative conditions throughout their entire in-reactor service time. These fuel or materials specimens are highly valuable for safety research, but their availability is normally limited. Collaboration between regulator and industry is probably the best way to optimise their utilisation both in terms of the number of users and of the quality of the investigation for which the material is used.

The conduct of safety research of high quality requires the availability of adequate facilities and expertise covering a wide range of technical fields. In most cases, these facilities have been and still are supported by governmental funds and have traditionally been performing research required by public organisations, notably regulators. Industry-owned research facilities, which have been relatively few in the past, are becoming increasingly rare, especially those that can be used for safety research. Regulator-industry collaboration permits the most suitable facilities and expertise to remain available for both parties, to the advantage of the quality of the experimental work that needs to be carried out. In some cases there is only one facility available that can do the job, and it may then become essential that two key users such as the regulator and industry share its utilisation in an optimal way, for instance by means of joint undertakings.

There are various examples of this joint regulator-industry utilisation of key resources at national level as well as internationally, and some have already been mentioned. The Argonne National Laboratory, for instance, conducts investigations in its hot cells on the safety limit of high burn-up fuel in loss-of-coolant accident conditions, on behalf of both the USNRC and EPRI. The Spanish CIEMAT performs in its facilities work for both national regulator and industry, and this is often the case for the nuclear research institutes in various OECD member countries. In Japan, however, the national research centre JAERI functions mainly with public funds and reports (on safety matters) mainly to the regulator. At the international level, the examples of Halden and more recently of CABRI are the most relevant ones for specialised facilities having international programmes with mixed regulator and industry funding. This not only has the advantage that unique technical resources are made available to more users, but also that good facilities and expertise have the opportunity of reaching a broader spectrum of customers. It can also help avoid the risk that research might tend to be biased, when funding comes
always from the same sponsor. For key facilities to remain available in the future, it will be very important to have the potential and flexibility to serve both regulator and industry without being drawn into conflicts of interest. The establishment of joint regulator-industry research programmes is probably the best way to achieve this goal.

Adding the industry perspective to regulatory research may help address the concern that safety research is not sufficiently focused on concrete applications and that it can drift into unrealistic scenarios. In many cases, safety research focuses on low probability events, and in this sense it explores hypothetical scenarios, for which precise conditions are difficult to define. It is very important that such scenarios and conditions be set by means of acceptable assumptions and methods, such that the risk of entering into unrealistic domains is minimised. While there are no prescriptions of how this can be done, it is nonetheless expected that a dialogue between regulator and industry would be helpful, especially during the definition phase of a common research project. At the very least, it would help avoid the potential for disagreement on the content of a research programme arising when it is too late, i.e., at or near the end of a research programme, when conditions cannot be readily changed.

Collaboration has also disadvantages and difficulties can first arise when trying to reach alignment on the content of a project, i.e. on objectives and scope. The test matrix of an experimental programme, for instance, is critical in determining the course of the programme and it can sometimes affect the conclusions one can draw from it. One can thus expect that in-depth discussions become necessary in order to find a common position on the research programme to be performed. The difficulties in reaching consensus may originate from a basic difference in objectives between industry and the regulator, which has already been mentioned. [That is, regulators may be interested in researching safety issues in greater depth or for a wider range of conditions, in order to confirm the robustness of the safety case and provide higher confidence in the identification and resolution of potential safety issues].

However, impediments can be met in any collaboration, not only between industry and regulators. Reaching consensus can be difficult, and it is important to ensure that striving for compromise does not impair the programme objectives. As noted in one of the UK responses to the GRIC questionnaire, the risk also exists that “seeking to achieve a consensus on research collaboration on all safety research topics may result in research which does not make an effective contribution to overall nuclear safety”.

Given the differing points of view, one has to expect that initiating a collaborative programme, defining its content and implementing it, may take a longer time than for a programme that is undertaken by only one party. The procedures for administering the project may also become more bureaucratic
and time-consuming, given that reporting occurs on two or more fronts and that the project administration must satisfy a wider range of requirements. One can also expect that it might take longer time to address issues that can arise during the execution of a programme, especially if they have financial implications.

If problems were to emerge, it can be more difficult to re-orient a project if it is run under a collaboration of two or more parties. If unexpected technical phenomena arise, the reaction of the industry and regulator might differ with regard to the scope of required additional work. Under these circumstances, reaching a new consensus may be difficult and time-consuming. As stated in a response to the questionnaire, the risk also exists that discussions may become more and more focused on financial rather than technical aspects. It is thus advisable that, in planning for a collaborative undertaking, the option of pursuing further research on independent basis and with independent funds should be maintained by all parties. Hence, it is important that a regulator has the resources or means to pursue its own research objectives when this becomes necessary.

It is not uncommon that the same data are interpreted differently by different investigators. The area of disagreement may pertain the extent to which data are representative, their uncertainty, degree of conservatism, range of applicability and conditions for extrapolating results to domains not explored in the investigation. Disputes might not be focused on the data as such, which in most cases are what they are, but on how results should be used and on the consequences they entail, especially when one tries to generalise their use to cover a range of conditions which is as broad as possible. In this sense, such disputes can in fact constitute a beneficial data review. Differences in data interpretation can lead to differences in safety calculations and assessments performed with computer codes. In addition to logical sequences of mathematical expressions, codes contain also data processing or sub-models, which are based on assumptions on how certain data are interpreted and used. The assumptions made by the regulator - and the implications they have - may differ, sometimes profoundly, from those made by the industry.

Differences in policies on data ownership and information release could also constitute an obstacle for joint regulator-industry research. On one side, the industry may have commercial interests that require protecting the results from disclosure to other parties. On the other side the regulator has the general obligation to make relevant results available to the public, and at least the results of research performed with public funds. The response to the GRIC questionnaire, however, shows that data release is not a significant concern. In fact, it appears that the parties have no great difficulty in complying with the principle that relevant results from joint research should be made available to the public directly or upon request, or in concurring with the terms and
conditions for data ownership and release. Some flexibility on the level of detail necessary for published information and allowing for the possibility of review of the information prior to release can be of great help in finding acceptable solutions.

In many replies to the GRIC questionnaire, the OECD-NEA projects in the nuclear safety area were mentioned as instances of regulator-industry collaboration. These projects have a pronounced international character, in that many countries (typically 10 to 20) contribute to the project funding and share the results of it. It is common that regulator and industry from one country participate jointly in such undertakings, i.e. they express their respective priorities, provide technical input, obtain results and contribute to cover the costs of participation. The project establishment, implementation and management are regulated by general procedures and by a specific OECD Project Agreement, which contains the technical background, objectives, work scope, expected results, time schedules, project cost and cost sharing arrangements. OECD Agreements also contain detailed provisions for how the project steering bodies shall function, for the dissemination of information, and for rights and responsibility of the project participants. The projects normally operate by consensus, although the Agreement contemplates voting procedures as well as legal provisions in case of disagreement.

Adding the perspective and experience of both regulator and industry enriches considerably the technical input and the basis upon which a project programme is shaped. The OECD Halden Reactor Project is an example of how regulator and industry interests can be combined and harmonised into a valued technical programme. The funding comes from about 100 companies or organisations, being industry or regulators or national laboratories, spread over twenty countries. The OECD Halden Project is thus truly an international network, in that it reflects interests from many components worldwide - and notably from regulators and industry parties.

As the French response to the GRIC questionnaire points out, 'the importance of international collaboration [in organising projects with regulator-industry participation] should be stressed, since it contributes to the quality of the discussions, to the confidence in the adequacy of the programme and to the quality of the results'. It also promotes a broader sharing of experience among many stakeholders while ensuring that resources are more efficiently used and that results reach a wide range of users.

The Group believes that in order to achieve successful regulator-industry collaboration, the parties should be aware of both the potential benefits as well as of the challenges that such collaboration can entail. Since they can vary in importance depending on different situations, some flexibility should be used in trying to maximise benefits and reduce disadvantages on a case by case
basis. Based on the previous discussions, the potential benefits of collaboration that one should try to maximise can be summarised as follows:

- Positive up-front engagement from both parties.
- More rigorous definition and critical review of priorities.
- More systematic specification of objectives, work scope, expected results, time schedule and cost.
- Better exploitation of the knowledge present in different organisations.
- Increase cost-effectiveness due to cost-sharing arrangements.
- Reduced risk of unnecessary duplication.
- Enhanced confidence that research will be kept on a realistic path, especially if it addresses low probability events.
- Facilitated access to and exploitation of plant data and materials specimens necessary to perform research.
- Broader use of key national facilities through common programmes involving both regulator and industry.
- Shared responsibility to maintain essential facilities and expertise available for safety research needs.
- For international projects, enhanced cost-sharing and access to unique facilities, expertise and data.

The potential issues that one should consider and try to minimise when establishing regulator-industry collaboration are the following:

- Difficulties in reaching consensus on work scope, test matrix, method etc.
- Reduced flexibility in re-orienting a programme, if difficulties or new factors emerge during its execution.
- Need to make concessions on qualifying aspects of the research in order to achieve consensus.
- Increased bureaucracy and lengthy discussions in planning and follow-up phases. Disproportion of disputes on finances.
- Contrasting policy on ownership and dissemination of results.
- Disputes on uncertainty, interpretation and applicability of results.
- Conflict of interest, the need to preserve regulator integrity and independence, and the necessity to demonstrate independence to the public.

The Group believes that an open, transparent and up-front approach represents the best way to increase the probability that a collaborative research programme will be successful. Any programme, however, stands on its technical merits and its success will thus primarily derive from its technical grounds, management and, at the end, from the results it produces. The ability to carry out well-administered projects, irrespective of whether they are collaborative or not, is the best way for the regulator to demonstrate to the public that public funds have been well utilised. On this basis, ensuring and demonstrating regulator independence while performing collaborative research will mainly be a matter of extending good practice, as will be discussed in more detail in the next section.
4. Preserving transparency and regulator independence

Collaboration between the regulator and industry takes place in many countries and in different fashions, both on case-by-case basis and in more structured forms. The Group did not enter into a discussion as to when and in which form collaboration should be set up, as this is a matter for national regulators and industry to decide. Rather, the Group focused its attention on regulator independence, given that this is an important principle for the relations the regulator has with licensees, institutions and public. Both the public and licensees are interested in having a strong, technically adept and independent regulator. In this context, “independent” means that the regulator has or can acquire the technical basis and expertise needed to address given regulatory issues and make its own judgement on the safety relevance of such issues. In establishing collaboration with industry, care should be taken that there are no circumstances that can directly or indirectly weaken the independence of the regulator or put its integrity and authority in question.

The Group addressed the consideration that collaboration may obscure the boundary between the regulator and licensees’ role, especially when sharing of funds is involved. However, from the GRIC questionnaire it emerges that in OECD member countries the public has so far expressed no particular concern with regard to regulator independence in the context of collaborative research.

On the contrary, as indicated in the Spanish questionnaire response, “the basis of collaboration is well understood and the benefit widely recognised”. At the same time, it is generally recognised that independence is a very important consideration and that regulators – as well as industry – must be sensitive to it.

Some of the practices followed to preserve independence, as they emerge from the questionnaire responses, are summarised below.

In Finland, a distinction is made between those cases where collaboration should not take place, such as in utility research for safety cases and in regulatory research in support of regulatory decision-making, and those cases where collaboration is encouraged. The latter cases cover the general “midfield” research aimed to ensure long-term scientific development especially in novel areas of safety, and support the availability of technical expertise.

In Sweden, in order to address the regulator concern of being able to demonstrate independence, no collaboration projects that would jeopardise regulator integrity are allowed. In order to be successful, collaboration shall acknowledge the different roles of regulator and industry from the very beginning and shall be accomplished with openness, providing full public
In Switzerland there is full awareness of the need of transparency in executing and financing collaborative research. As stated in the questionnaire response, the independence of HSK, plant operators and PSI is generally well recognised. The public is kept informed about all research activities on reactor safety and waste management through for instance periodical publications, web sites and reports. All HSK research activities are accessible to the public.

In France, preserving the independence of the national safety research institute IRSN, while performing collaborative research with the utility EDF, is a primary concern. As one mean to address this concern, IRSN first determines its own research plans, taking into account the regulator requirements and the past experience, while collaboration is established as a second step. Another mean to preserve independence is that collaboration is restricted to obtaining "objective" data and interpretation is excluded from it.

In Germany, the independence of the regulator is ensured firstly by the fact that there is publicly funded research, which is performed separately from industry. Secondly, the interpretation of the results from collaborative projects is made independently by the technical support organisation of the regulator (e.g., by GRS). The performance of such interpretation task by the regulator's technical support organisation is funded exclusively by government authorities.

In Japan, the establishment of safety research programmes occurs in open discussions within the designated committees, and the results of safety research and evaluation are open to the public except for parts containing commercial know-how or non-proliferation issues.

Although no public concern has been expressed in the United Kingdom on regulator independence in the context of this issue, the regulator (NII) is concerned that it should have the appropriate mechanisms in place to ensure independence while performing collaborative research with the industry. To this end, the NII consults an independent safety advisory committee, which advises the Health and Safety Commission. The latter oversees the work of the regulator and approves the regulator commissioned research programme.

The USNRC policy is that it is generally unacceptable for the regulator and industry to collaborate on projects to establish regulatory policy. However, it is perfectly acceptable for the regulator and industry to collaborate on the data-gathering phase that supports resolution of a regulatory issue. Clear definition of objectives, scope, work to be performed, deliverables, schedule and costs is vital to a successful collaboration. Similarly, clear lines of communication among the participants, roles and responsibility of participants and management organisation are key to success.
Regulator integrity, an “evident” value

In the Group's opinion, rather than having arguments to demonstrate independence in case questions are raised, one should aim to establish conditions that ensure regulator integrity is always evident. Adoption of good practices in establishing and running projects is an important means to achieve this aim. A few good practice principles as they emerge from experience in OECD member countries are summarised below.

Up-front process, set regulator priorities first

It is important that the regulator sets its priorities on new research initiatives ahead of discussing any collaboration with the industry. This practice is already used by for instance the French IRSN and by the NII in the United Kingdom. In France, IRSN and EDF determine separately their strategy, including the objectives of possible collaboration and taking into account the requirements of the safety and protection authority. In Germany, an evaluation commission under the chairmanship of the Ministry BMWi (and with BMU/BMBF representation) defines the priorities in the fields of nuclear reactor safety and nuclear repository research. Leading members of German research institutions are members of this commission. In the United Kingdom, issues that the regulator requires to address by research are listed on a nuclear safety research index, which is periodically reviewed. Within the USNRC, priorities are based on the guidance of specific performance goals, which are general criteria that USNRC research shall satisfy. The practice of setting up-front priorities remains valid also if collaboration does not take place, and thus it does not add a bureaucratic burden. It can help set an orderly and transparent course for research programmes, where regulator priorities are well identified and focused.

Up-front process, set principles of collaboration

Motivations and principles of collaboration can constitute part of a general agreement between regulator and industry, such as in the MOU between USNRC and EPRI or in the Agreement between the Spanish CSN and UNESA, which have been referred to earlier. In other cases, there can be underlying principles that joint research projects should not impinge on the regulator function, although they are not formally documented. In order to enhance and demonstrate transparency, the Group considers that formalising the general principles of collaboration in a general document can be very helpful.

Initiating document

The start of a project should be marked by an initiating document agreed upon by all involved parties and containing information such as project objectives, scope, deliverables, schedule and cost. For projects of small size and short duration, an exchange of letters with reference to earlier communications of relevant written material (e.g. technical proposal, meeting summaries, correspondence) can be sufficient. Otherwise, the initiating document should normally consist of a Project Agreement or Contract covering all the relevant technical and non-technical aspects of the project.
In the opinion of the Group, the execution of a collaboration project should be based to the maximum possible extent on a consensus process and to this end mechanisms should be devised that help in reconciling disputes. A senior management group supervising the project technical steering body can under proper circumstances be of great help. However, while favouring consensus, it is advisable that for larger projects the Agreement or Contract contains provisions dealing with resolving disputes if consensus breaks down.

The Project Agreement or Contract document shall in the opinion of the Group contain precise elements dealing with background and technical basis of the research, scope, schedule, reporting, dissemination of information, cost and project management. A mechanism for project review should be in place, aiming to assess the status and value of safety research projects - and in particular collaborative projects - in terms of their contribution to safety and maintenance of safety knowledge.

Reviews can be in the form of periodic self-assessments and on a case-by-case basis through independent advice or peer reviews. Access to independent advice can be considered when appropriate as an instrument available to the regulator that facilitates preserving independence. Depending on circumstances and on how collaboration is structured, attaching an academic to a research project can also be an effective means to provide the regulator with independent advice. Making the results of collaborative research publicly available is an effective means of promoting transparency. As indicated previously, some flexibility in the level of detail necessary for published information, e.g. results versus raw data, can help address commercial concerns regarding information release. Public availability of results also facilitates broader independent peer review by the scientific community, and therefore the overall acceptability of using the results to support independent regulatory decision-making.

The Group believes that collaborative work focusing on data needs and production should be encouraged, whereas the development of computer codes whose outcome depends upon embedded assumptions (e.g. models that are not or cannot be fully validated) should preferably be pursued separately and not be part of regulator-industry collaborations. The reason is that this activity is contiguous to the regulator function of interpreting data and results and of making regulatory decisions, and can touch upon sensitive aspects of such function. However, there can be situations in which collaboration in this area has merits and can be justified provided that motivations are well founded. It should be also considered that the borderline between the areas of data production and data interpretation can at times be diffuse, as there can be aspects pertaining to both areas. Data uncertainty analysis and data validation, for instance, can be considered as data
production attributes, but in fact they can influence the data use and the range of applicability. Whether these aspects should be part of the joint work or not depends on the actual case and would be a matter for the involved parties to clarify based on the context of the work.

It has not been the intention of the Group to set up norms for when joint regulator-industry undertakings are suitable or not. However, in the interest of transparency and to facilitate the demonstration of independence, it is advisable to consider carefully how financial contributions contemplated in the collaboration are to be handled. Finally, the Group emphasises that an orderly book keeping is an important instrument for achieving project transparency. All financial transactions occurring during the course of a project should follow well-defined formal procedures and be properly documented and recorded for a pre-defined period of time beyond project completion.

5. Conclusions and Recommendations

The Group has analysed the potential advantages and disadvantages of regulator-industry collaboration in safety research and concludes that effective collaboration is both feasible and beneficial provided that regulatory independence is maintained.

The Group has identified a number of key benefits of such collaboration, for example:

- Enhanced communication, mutual technical understanding and positive up-front engagement of both parties. Collaborative research often provides a non-confrontational environment to permit a better and broader understanding of issues important to each participant.
- Pooling of expertise to permit better exploitation of the breadth and depth of knowledge present in different organisations in the planning and execution of programmes.
- Better programme design due to improved access to test specimens and operational data, and enhanced confidence that the focus of research will be realistic and practical, particularly when it addresses low probability events.
• Increased cost-effectiveness due to sharing of costs, together with reduced risk of unnecessary duplication of effort.

• Improved ability to preserve essential facilities and expertise for safety research and to promote broader use of key national and international facilities via common programmes.

The following recommendations of the Group are intended to promote effective regulator-industry collaboration, and are based on good practices in OECD countries:

• Industry and regulator should engage in an in-depth discussion of their respective priorities to determine whether such priorities can best be addressed by common or independent research activity.

• At the project definition phase, industry and regulator should clearly specify mutual objectives, anticipate what results are expected from the research, and clearly identify the scope, schedule, deliverables and cost.

• International collaboration in organising projects with regulator-industry participation should be considered as an effective means of improving confidence in the adequacy of the collaborative programme and the quality of results.

• In planning for a collaborative undertaking, the option of pursuing further research on an independent basis and with independent funds should be maintained by all parties.

• Issues of intellectual property rights, data ownership and information release to the public should be addressed in advance by ensuring flexible provisions on the level of detail necessary for published information and allowing for the possibility of review of the information prior to its release.

• To overcome the potential difficulties that may arise due to the different perspectives of the industry and regulator, well-established good practices in project management and administration should be followed, including clear lines of communication among participants, clear roles and responsibilities and rigorous management. Dispute resolution processes should be identified to address situations in which consensus cannot be reached.

It is recommended that the following principles be employed, where appropriate, to preserve transparency and independence of regulatory decision-making when undertaking industry-regulator collaboration.

• Collaboration should acknowledge the different roles of the regulator and industry and is to be accomplished with openness, providing appropriate public insight into objectives, means and results.
• Consideration should be given to formalising a general agreement between regulator and industry to establish, in a transparent manner, the motivations and underlying principles of regulator-industry collaboration.

• The regulator should first establish its own research priorities before determining whether there is an opportunity for collaboration with industry.

• Collaboration should, in general, be restricted to obtaining objective data. Interpretation of data should preferably be undertaken independently and the regulator should in all cases draw its own conclusions based on the common research. Care should be taken to maintain adequate independence in the development of models and computer codes.

• To promote transparency, a Project Agreement documenting project background, technical basis, objectives, deliverables, schedule, cost, information dissemination, and project management should be established at time of project initiation.

• Consideration should be given to independent oversight of the collaborative work. Ensuring access to independent advice (e.g. independent peer review and publication of results) should be considered as ways of strengthening independence.

• Financial transactions occurring during the course of the project should follow well-defined formal procedures and be fully documented.

REFERENCES


Appendix

Mandate of the
Group on Regulators and Industry Co-operation (GRIC)
on Safety Research: Challenges and Opportunities

During the CNRA/CSNI Workshop on "The Role of Research in a Regulatory Context", which was held in Paris on 19-20 June 2001, a recommendation was made to examine how safety research is organised and carried out in industry and governmental organisations. In particular, it was agreed that a group constituted by senior research managers be set up with the objective to identify and review the issues which hinder closer co-operation on research between regulators and industry and propose possible ways for resolving such issues while ensuring regulatory independence.

The Group, denominated Group on Regulators and Industry Co-operation on Safety Research, will analyse differences in strategic goals, funding structure and other aspects of industry and government sponsored research, aiming to identify possible means to narrow these differences and to stimulate greater co-operation when feasible. Among others, it is expected that the Group will in particular address the following issues:

- Resources and funding sources
- Mission/responsibilities for industry and regulators research
- Public availability and utilisation of results
- Industry consolidation/internationalisation, impact on national safety organisations
- Independent decision-making
- Research on very low probability events
- Research on safety margins (beyond expected range of conditions)
- Considerations on infrastructure and availability of expertise
- Mutual interest, priority, flexibility

The Group will include representatives from the four countries having the largest research programme and from one country with "medium" programme. The provisional composition of the Group by country and (when available) by organisation is given below:

- IPSN/DSIN, France
- EDF, France
- GRS, Germany
- NSC, Japan
- HSE-NII, UK
- EPRI, USA
- NRC, USA

The Group is expected to provide recommendations to the CSNI on ways to resolve issues that hinder closer co-operation between industry and regulators on safety research. These recommendations, together with a summary record of the overall Group activities and conclusions, will be contained in the Group final report. A collective opinion paper \(^1\) on conditions to ensure regulatory independence will also be issued by the Group, for CSNI consideration and approval.

Three Group meetings are foreseen, of which one in the autumn of 2001 and two in 2002. The items to be addressed in these meetings are provisionally outlined as follows:
• Meeting 1
  - Identification of issues to be addressed
  - Preliminary discussion of issues
  - Review of case studies
  - Format and table of content of final report
• Meeting 2
  - In-depth discussion of issues
  - Conditions for resolving such issues
  - Preliminary recommendations and initiatives
  - Outline of the collective opinion paper
• Meeting 3
  - Review of recommendations
  - Review and completion of final report
  - Review and completion of the collective opinion paper \(^{(1)}\).

\(^{(1)}\) During the course of the GRIC work, it was agreed to have the GRIC final report with an Executive Summary and Recommendations section.
GRIC GROUP COMPOSITION

CANADA
Mr. Nino OLIVA
Director-Regulatory Affairs and
R&D Program Manager-Safety & Licensing
CANDU Owners Group Inc.
Tel: +1 (416) 595-1888 ext. 119
Eml: nino.oliva@candu.org

FRANCE
Mr. Philippe JAMET,  GRIC Chairman
Conseiller du Directeur
Institut de Radioprotection
et de Sûreté Nucléaire
Tel: +33 1 46 54 9764
Eml: philippe.jamet@ipsn.fr

Mr. Bernard ROCHE
Directeur Adjoint
EDF Pôle Industrie
Tel: +33 1 43 69 04 77
Eml: bernard.roche@edf.fr

GERMANY
Dr. Klaus WOLFERT
Gesellschaft fuer Anlagen und
Reaktorsicherheit, GRS mbH
Tel: +49 (89) 32004 406
Eml: wol@grs.de

JAPAN
Mr. Takeshi TSUJINO
Technical Counselor
Nuclear Safety Commission
Tel: +81 3 3561 9259
Eml: tsujin@op.cao.go.jp

UNITED KINGDOM
Dr. Peter D. STOREY, First and second mtg
Director, Nuclear Safety Research Unit 4A
Health and Safety Executive, NSD
Nuclear Safety Directorate
Tel: +44 (151) 951 4172
Eml: peter.storey@hse.gsi.gov.uk

Dr. Alex MILLER, Third meeting
Health and Safety Executive
Tel: +44 (151) 951 4172
Eml: alex.miller@hse.gsi.gov.uk

UNITED STATES OF AMERICA
Mr. Roy ZIMMERMAN, First meeting
Deputy Director
Office of Nuclear Reactor Regulation
Nuclear Regulatory Commission
Tel: +1 301 415 1272
Eml: rnz@nrc.gov

Mr. Michael MAYFIELD, Second meeting
Director
Division of Engineering Techology
Office of Nuclear Regulatory Research
U.S. Nuclear Regulatory Commission
Tel: +1 (301) 415 5678
Eml: mem2@nrc.gov

Mr. Jack STROSNEIDER, Third meeting
Deputy Director
Office of Nuclear Reactor Regulation
Nuclear Regulatory Commission
Washington, D.C. 20555
Tel: +1 301 415 2795
Eml: jrs2@nrc.gov

Mr. Jean-Pierre SURSOCK
EPRI
182 rue du Faubourg Saint Honoré
75008 PARIS
Tel: +33 (1) 53 96 96 17
Eml: jsursock@epri.com

International Organisations
Dr. Carlo VITANZA
OECD/NEA
Tel: +33 1 45 24 10 62
Eml: carlo.vitanza@oecd.org

Mr. Armund HANEVIK
OECD Halden Reactor Project
Tel: +47 69 21 23 30
Eml: hilde.offenberg@hri.no
RESPONSE TO THE GRIC QUESTIONNAIRE

In performing its activity, the GRIC group produced a questionnaire, which was sent to CSNI members. The questionnaire aimed to gather information on practices in OECD member countries related to co-operation between regulators and industry on nuclear safety research. Totally, 16 answers were received. Of these, Belgium (AVN) and Korea (KINS) replied that they have virtually no industry-regulator co-operative research, except (for Belgium) for some of the OECD projects, and that the questionnaire was not applicable in their case. The remaining 14 answers to the questionnaire are compiled in the following.
**CANADA** *(prepared by the Canadian GRIC member)*

<table>
<thead>
<tr>
<th>1. Is there co-operative regulator-industry research in nuclear safety in your country?</th>
</tr>
</thead>
</table>
| Currently in Canada there are no joint regulator-industry programs for performing Nuclear Safety Research. From the regulatory perspective, it is the industry (i.e. the Nuclear Power Plant operators and the government of Canada, acting through its agent Atomic Energy of Canada Ltd.) that is responsible for performing nuclear safety research. The Canadian Nuclear Safety Commission (CNSC) has a relatively small regulatory R&D program, which they use mainly to perform specific independent confirmatory or investigative work in support of further understanding the status of various potential safety issues and concerns. There is a formal regulatory requirement (under the provisions of regulatory document R-99) for the power reactor licensees to report periodically on their Nuclear Safety R&D. Comprehensive information (R&D Reports, Data Reports and Progress Reports) is provided to the regulator as required in the course of resolving specific outstanding issues. The regulator strongly influences the scope and objectives of the Nuclear Safety R&D program through a number of means, including establishment of regulatory Action Items and by defining closure criteria as part of the Action Item resolution process.

In the last three years, regulator-industry collaboration has occurred in two areas

1. Independent Expert Panels to provide independent international peer review of R&D performed to resolve specific nuclear safety issues.
2. Establishing and funding a number of new chairs at Canadian Universities to support the technical infrastructure of the domestic CANDU industry|

<table>
<thead>
<tr>
<th>2. If so</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) How is it organised?</td>
</tr>
<tr>
<td>b) How is it financed?</td>
</tr>
<tr>
<td>c) How are the research items defined</td>
</tr>
<tr>
<td>a) Regulator and industry members participate jointly in steering committees to provide direction to the collaborative activity. These committees operate on a consensus basis.</td>
</tr>
<tr>
<td>b) Costs are shared based on an agreed funding formula that differs from project to project, depending upon the priorities of the participating organizations.</td>
</tr>
<tr>
<td>c) Industry and Regulator establish their own priorities. Opportunities for collaboration are identified on an ad-hoc basis.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3.</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) What are the factors that argue for collaboration?</td>
</tr>
<tr>
<td>b) What are the difficulties?</td>
</tr>
<tr>
<td>c) Describe lessons learned</td>
</tr>
<tr>
<td>a) Leveraging scarce funding is a key benefit. Collaboration also increases the breadth and depth of technical input to these initiatives.</td>
</tr>
<tr>
<td>b) Can be time consuming.</td>
</tr>
<tr>
<td>c) Scope and objectives of collaboration need to be clearly defined in advance. Collaboration should be managed and administered formally. Decisions taken by the regulator should take into account the results of collaborative activity, but should nonetheless be made independently. Where appropriate, dispute resolution processes should be defined up front in the event that consensus cannot be reached between industry and regulatory participants.</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>4. Comment on the public availability of results</td>
</tr>
<tr>
<td>5. How do you organise collaboration to avoid the risk of loss of regulator independence?</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>6 Is it a concern to demonstrate to the public that collaboration does not affect independence, and if so, how is this concern dealt with?</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>7 Examples (option)</td>
</tr>
</tbody>
</table>
**ČECH REPUBLIC** *(Prepared by NRI)*

<table>
<thead>
<tr>
<th>1. Is there co-operative regulator-industry research in nuclear safety in your country?</th>
<th>Co-operation exists, but in rather limited extend, only in cases of both side interest</th>
</tr>
</thead>
</table>
| 2. If so a) How is it organised? b) How is it financed? c) How are the research items defined | Several main possibilities of research initiation and financing exists:  
- regulatory research by SÚJB, which has such authority from the Atomic law  
- research financed by Ministry of Trade and Industry (MTI) in support of operating organisation  
- research financed by Grant Agency of Czech republic  
- research required and financed by NPP operators  
For the first and second option the topics of research are declared annually by tenders and they reflect the interest of financing organisation i.e. in case of SÚJB they reflect the needs and interest of regulatory body. The research granted by SÚJB and MTI are financed 50% by governmental budget. |
| 3. a) What are the factors that argue for collaboration? b) What are the difficulties? c) Describe lessons learned | a) concentration of existing limited financial resources  
b) possible conflict of interest between regulatory body and operating organisation  
c) justification of benefit of such co-operation is easier for urgent safety cases where the solution is required in the short time |
| 4. Comment on the public availability of results | The results of results are not normally available for public. |
| 5. How do you organise collaboration to avoid the risk of loss of regulator independence? | Since the regulatory body—SÚJB has its own independent financial chapter in the governmental budget, its independence has not been challenged. SÚJB has been also using the independent sources of expertise or collaboration with foreign expert organisations (GRS, IRSN) or international organisations (IAEA, OECD/NEA). |
| 6 Is it a concern to demonstrate to the public that collaboration does not affect independence, and if so, how is this concern dealt with? | This concern has not been raised yet. |
| 7 Option | Provide 1-2 examples of collaboration for clarification, if possible |
**FINLAND (prepared by the Finnish CSNI members)**

<table>
<thead>
<tr>
<th>1. Is there co-operative regulator-industry research in nuclear safety in your country?</th>
<th>Yes, though quite limited so far (e.g., participation in international projects such as those of OECD/NEA). Concerning the next national research programme of Finland (beyond 2003), some new areas may be found where both the utility and the regulator may fund a certain activity; with the constraints explained for the questions below. In this respect, the results of this questionnaire survey are of great interest also to Finland.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. If so a) How is it organised? b) How is it financed? c) How are the research items defined</td>
<td>a) Usually through the national research programme, the steering group and support groups of which involve participants from all organisations b) The cost split is agreed upon between Finnish organisations, in connection with the national research programme. c) Based on ideas that come up internationally, and if suitab'e, also domestically as part of the national research programme</td>
</tr>
<tr>
<td>3. a) What are the factors that argue for collaboration? b) What are the difficulties? c) Describe lessons learned</td>
<td>a) Wide national interest, yet not a direct part of the licensing material of the utility, nor of the independent studies supporting the regulatory decisions. b) Although not necessarily a great difficulty, care has to be taken to stick to the constraints of collaboration explained for the other questions below. c) Benefits have been clear for novel areas that require long-term research.</td>
</tr>
<tr>
<td>4. Comment on the public availability of results</td>
<td>Common collaboration is handled through international research projects, with the relevant rules for the publicity of results: it is usually enough if the results are openly available to all Finnish organisations involved; national research programme, the results of which are public [the national programme is funded by the Ministry of Trade and Industry (MIT), the research organisation VTT, the regulator STUK, and the utilities; the MIT funding is not recovered through licensee fees, while STUK funding is].</td>
</tr>
<tr>
<td>5. How do you organise collaboration to avoid the risk of loss of regulator independence?</td>
<td>No common collaboration in a research activity is ensued if the activity aims to produce licensing material for the utility or if the activity aims to produce an independent study to support regulatory decisions. Upon these conditions, the most important asset is the capability of the regulator to assess the results (data and methods) obtained, should such results be used, in long term, also in safety assessments. In addition, because these types of research activities are conducted by researchers outside the utility and the regulatory organisations, the results are those of the researchers and do not tie the hands of those funding the research; even if comments are received during the work from experts of different organisations, including utilities and regulators. As always, also the impartial role of the researcher(s) conducting the work, is important.</td>
</tr>
<tr>
<td>6</td>
<td>Is it a concern to demonstrate to the public that collaboration does not affect independence, and if so, how is this concern dealt with?</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>This has not been a concern, because the principles described for the above questions are clearly adhered to, i.e., a clear separation is made between utility research used to present the safety case of a specific matter; general &quot;mid-field&quot; research ensuring long-term scientific development (especially in novel areas of safety) and availability of national expertise; regulatory research supporting regulatory decisions on a specific matter; and the independent capability of the regulator, to assess any matter, is maintained. [Any regulatory research ordered to support a regulatory decision on a specific matter, shall be performed by expert(s) who have not participated in producing the utility safety case in question.]</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Participation in international research programmes (e.g., OECD/NEA). (2) Research related to the development of risk analysis (PRA/PSA) methodology.</td>
<td></td>
</tr>
</tbody>
</table>
**FRANCE  (prepared by IRSN and EdF)**

<table>
<thead>
<tr>
<th>1. Is there co-operative regulator-industry research in nuclear safety in your country?</th>
<th>In France, collaborative research is performed between industry and IRSN, which is the technical support of the French regulators for all national nuclear installations, except nuclear weapons. In the following, only the case of the collaboration between EdF and IRSN will be described. This cooperation is the most important one involving IRSN and the French industry. Its organization is generally representative of the other cases.</th>
</tr>
</thead>
</table>
| 2. If so a) How is it organised? b) How is it financed? c) How are the research items defined? | EdF and IRSN both have research programs and capabilities. The collaboration between EdF and IRSN is in fact concerned with participation of EdF to research programs performed by IRSN. There are some examples of participation of IRSN to research programs performed by EdF, but such participations are not frequent and they are treated on a case by case basis. The basic principles applying to research collaboration between EdF and IRSN are the followings: 
- EdF and IRSN are research partners on a mutual agreement basis. 
- When interested by a program performed by IRSN, EdF provides a financial contribution to the program. 
- Depending upon its financial contribution, which ranges from 20% to 50%, EdF can have access to the detailed results of the program or participates to the decisions and closely follows up actions. 
- All the results obtained by IRSN have to be available for the regulators and for the public. In case of a cooperative program, EdF has access to draft reports and publications and can make comments on them. The follow-up of the collaboration is essentially performed by an executive committee and five technical committees, which cover the following subjects: 
- Fuel behaviour under accidental conditions 
- Severe accident/Containment 
- Severe accidents/fission products 
- Environment 
- Radioprotection. 
There are basically five steps each year in the collaboration management: 
- EdF and IRSN determine separately their own strategy, including objectives for collaboration. At this stage, the requirements of the safety and protection authority are taken into account both by EdF and IRSN. IRSN also takes into account the needs resulting from the safety and protection evaluations it has to perform. 
- The executive committee reviews the general propositions for collaboration issued by EdF and IRSN, determines a general financial and technical frame for the annual collaboration and transmits it to the technical committees. 
- The technical committees prepare technical propositions and transmit them |
to the executive committee.
- The executive committee decides which propositions are accepted.
- The executive committee and the technical committees follow up the execution of the selected actions.

3. a) What are the factors that argue for collaboration?  
b) What are the difficulties?  
c) Describe lessons learned

The experience of EdF/IRSN research collaboration has proven to be largely beneficial. It first allows significant money saving through cost sharing. It contributes to focus research on the proper issues, through in-depth discussions between representatives of EdF and IRSN. The collaboration allows the researchers from IRSN to have access to plant data. It provides access to EdF to the most up-to-date knowledge on subjects handled by IRSN. Finally, the research collaboration contributes to better and faster appropriation of results by EdF.

Difficulties may also be encountered in the frame of the collaboration. In some cases, very significant time and energy need to be spent, before an agreement can be reached on the definition of a program. Indeed, a compromise has often to be found between EdF, which primary concern is to demonstrate compliance with safety requirements, while IRSN can be more interested into investigating margins and checking unexpected phenomena. Unexpected difficulties in program execution are also potential sources of conflicts, especially in case of a strong industrial pressure to obtain results within a specific time frame.

The past experience has also shown that maintaining a proper equilibrium between technical and budget discussions should be a concern, since the budget discussions tend to take a greater and greater place, if not properly monitored. Similarly, maintaining proper equilibrium between the number of actions and their volume needs some care to avoid an excessive multiplication of small actions.

4. Comment on the public availability of results

The results of the research programs performed by IRSN are available to the regulators and the public. Scientific and technical publications are the most common means to make these results available. IRSN also has a web site where information on research programs and results is available.

Proprietary information is protected.

In case of collaborative research, EdF participates to the technical review of the reports and publications, but the final decision on the content of the documents belongs to IRSN.

5. How do you organise collaboration to avoid the risk of loss of regulator independence?

Preserving the independence of IRSN while performing collaborative research with EdF is a primary concern.

With that respect, it is important to note that research plans and propositions are initially determined by IRSN independently from EdF, and that the discussions aimed at defining actions for collaboration are only performed in a second step, after determination of IRSN own objectives.

The collaborative research is also restricted to actions aimed at obtaining "objective" results which can be verified. No interpretation work enters into the
<table>
<thead>
<tr>
<th>6</th>
<th>Is it a concern to demonstrate to the public that collaboration does not affect independence, and if so, how is this concern dealt with?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>It is very important for IRSN and DGSNR to demonstrate that they preserve their independence, while collaboration research is performed between EdF and IRSN. Public availability of results and transparency in collaborative programs largely contribute to demonstrating the independence of IRSN. The choice of collaborative programs aiming at obtaining data and not involving interpretation work is also essential. From another point of view, the internal organization of IRSN is structured in order to clearly separate the units performing collaborative research with EdF, from the ones performing safety and protection evaluation, as a technical support of the regulators. International collaboration also contributes to demonstrate that the definition of the research programs results from a proper equilibrium between the influences of the different stakeholders.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7</th>
<th>Examples of collaboration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The CABRI water loop program is a typical example of a collaborative program where international collaboration and OECD play an essential role. On the other hand, collaborative research programs are also performed with EdF on the effect of high-level radiation on health. These programs are aimed at developing the necessary knowledge to take care of important accidental irradiations. These programs are performed within the frame of the principles and organization described above.</td>
</tr>
</tbody>
</table>
| 1. | Is there co-operative regulator-industry research in nuclear safety in your country? | Research in nuclear safety is supported by the Federal Government in Germany through the Federal Ministry for Economics and Technology (BMWi), the Federal Ministry of Education and Research (BMFT) and the Federal Ministry for the Environment, Nature Conservation and Reactor Safety (BMU). BMWi is supporting reactor safety and nuclear repository research based on project funding. BMFT is supporting reactor safety and nuclear repository research at the research centres, based on institutional funding. BMU is supporting investigations regarding regulatory competencies. The budgets provided by the Federal Ministries guarantee reactor safety and nuclear repository research independently from industry interests. The governmental budgets allow to investigate unlike events and phenomena beyond the range of plant operation conditions, which is not the primary interest of the industry.

In addition to research programmes exclusively funded by the Federal Ministries there exist nuclear safety research projects performed in co-operation with the industry. |

| 2. If so | a) How is it organised?  
|          | b) How is it financed?  
|          | c) How are the research items defined | a) Research is based on contracts with clear assignment of tasks and responsibilities, supported and controlled by Advisory Committees, Steering Committees and Support Groups.  
b) Research costs are shared between the government and industry with different percentages, e.g. German contribution to the CÅBRI project: 80% industry, 20% BMWi.  
c) Research items are defined by advisory committees of the ministries, technical support organisations, research organisations, or industry. An Evaluation Commission under the chairmanship of the BMWi, including representatives from the BMU, BMFT and leading members of the research institutions, has prepared a list of priorities for reactor safety and nuclear repository research (the report is available in the internet, www.GRS.de). |

| 3. | a) What are the factors that argue for collaboration?  
|     | b) What are the difficulties?  
|     | c) Describe lessons learned | a) Factors that argue for collaboration:  
- the advantage resulting from clustering and exploitation of the know-how and experiences available in the different organisations  
- the efficient use of funding by cost sharing.  
b) Difficulties may arise  
- from different interests of the organisations involved,  
- from unclear definition of objective, scope, tasks, deliverables, publication policy, schedule, and costs,  
- from unclear assignment of responsibilities,  
- from unclear lines of communications.  
c) Clear definitions of the project with clear assignment of responsibilities (see b) are indispensable. |
<table>
<thead>
<tr>
<th><strong>4.</strong> Comment on the public availability of results</th>
<th>Results of nuclear safety research publicly funded are in general freely available. Limitations on the public availability of results may arise from industrial proprietary information involved</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>5.</strong> How do you organise collaboration to avoid the risk of loss of regulator independence?</td>
<td>For jointly performed research projects the evaluation of the results is done independently by the technical support organisation of the regulator on the one hand, and the industry on the other hand, which may result in discrepancies. High transparency in the collaboration is indispensable for the demonstration of independence.</td>
</tr>
</tbody>
</table>
| **6.** Is it a concern to demonstrate to the public that collaboration does not affect independence, and if so, how is this concern dealt with? | No concern expressed due to  
- independent evaluation of project results by technical support organisations of the regulator and by the industry,  
- high transparency with respect to research policies and research programmes. |
| **7.** Examples | Co-operative nuclear safety research with cost-sharing between Federal Ministries and industry are being carried out in the frame of national projects, e.g. PKL, and in the frame of international projects, e.g. OECD/CSNI project CABRI.  
National project PKL  
- investigation of cool-down procedures and preventive AM measures;  
- funding of experimental investigations by cost sharing between BMWi and industry;  
- common interests by industry and GRS: improved knowledge on thermal-hydraulic phenomena and plant behaviour; special interest of industry: optimisation of cool-down procedures and AM measures; special interest of GRS: extended data base for code development and code validation,  
- the independence of the regulator is guaranteed through the independent evaluation of results by GRS (main technical support organisation of the BMU), the evaluation work by GRS is funded exclusively by BMWi  
International OECD/CSNI project CABRI  
- investigation of high burn-up fuel behaviour under RIA and LOCA conditions  
- funding of experimental investigations: same as in the case of PKL by cost sharing between BMWi and industry;  
- the independence of the regulator is guaranteed through the independent evaluation of results by GRS, the evaluation work by GRS is, as in the case of PKL, funded exclusively by BMWi |
**HUNGARY (prepared by HAEA)**

| 1. | Is there co-operative regulator-industry research in nuclear safety in your country? | Only in very specific cases, where the extent of necessary financing is justified and no conflict of interests is perceived. Such is the case of the investigation of reactor vessel ageing process. |
| 2. If so | a) How is it organised?  
b) How is it financed?  
c) How are the research items defined | By bilateral discussions and agreement. |
| 3. | a) What are the factors that argue for collaboration?  
b) What are the difficulties?  
c) Describe lessons learned | a) Adding up financial resources.  
b) Possibility of conflict of interests of regulator and licensee, possible conflict with the independence of regulators. |
<p>| 4. | Comment on the public availability of results | The results are normally available for the participating parties only. |
| 5. | How do you organise collaboration to avoid the risk of loss of regulator independence? | Not applicable |
| 6 | Is it a concern to demonstrate to the public that collaboration does not affect independence, and if so, how is this concern dealt with? | Such collaboration is still very occasional, no such concern has yet arisen. |
| 7 | Examples (option) | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ITALY</strong> <em>(prepared by ANPA)</em></td>
<td>Also in order to avoid any possible problem of independence in the Safety Authority evaluations, contractual agreements with transfer of funds have never been performed neither common research management panels have been established between Industry and Safety Authority. Nevertheless, quite good exchange of information took place when any national Organisation decided to perform research activities in nuclear safety. Many of such researches were promoted, financed and managed by ENEA (the Italian research organisation in nuclear matters) and involved also Industry. The views of the Safety Authority were considered by ENEA in identifying priorities. Some more direct co-operation between Industry and Safety Authority was devoted to the study of the safety performances of innovative, inherently safe plants. In that case, the contribution from the Safety Authority was provided in terms of direct participation of some experts to the performance of studies with specific safety implications. On the basis of the information made available, the Safety Authority performed additional studies by its own. At the moment, no licensing activity of nuclear power plants is foreseen and, in such area, each Organisation is taking its own initiatives; mutual information takes place in various scientific contexts.</td>
</tr>
<tr>
<td>1. Is there co-operative regulator-industry research in nuclear safety in your country?</td>
<td>See previous answer</td>
</tr>
</tbody>
</table>
| 2. If so  
  a) How is it organised?  
  b) How is it financed?  
  c) How are the research items defined |   |
| 3.  
  a) What are the factors that argue for collaboration?  
  b) What are the difficulties?  
  c) Describe lessons learned. | a) In the Italian context, where national nuclear programs are limited to decommissioning and waste management, common researches on nuclear power plant safety might be beneficial with the purpose of maintaining national competence and capabilities. In areas (decommissioning/waste management) where still authorisation activities can take place, the roles and the initiatives of Industry and Safety Authority are distinct.  
  b) Little financial resources are available for initiatives addressed to nuclear power plant safety research aimed at maintaining competences and capabilities.  
  c) The general contribution coming from having national technical institutions (including industry) involved in researches in nuclear safety, has proven to be valuable in improving general level of competence. Debate on scientific items outside the licensing context has contributed to the spread of safety culture and to make the communication easier. |
<p>| 4. Comment on the public availability of results | The results of research activities performed by research organisations in Italy were open to the public, unless any property right on data was raised by patents’ owners. |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>5.</strong></td>
<td>Much attention has always been given to the independence. In our experience, when national capabilities were not sufficient, and no research activities were available, it was possible to resolve some safety issues by independent consultation of International Industrial/Utility Organisations and of Safety Authorities of other Countries.</td>
</tr>
<tr>
<td><strong>6.</strong> Is it a concern to demonstrate to the public that collaboration does not affect independence, and if so, how is this concern dealt with?</td>
<td>Certainly, demonstrating the independence when co-operative efforts are in place may be a difficult task. In the forms in which research co-operation has been carried out in Italy, independence was never jeopardised.</td>
</tr>
<tr>
<td><strong>7.</strong> Option</td>
<td>At the moment, some limited co-operation are in place, mainly in the area of T/H codes development and in other areas of international co-operation.</td>
</tr>
</tbody>
</table>
1. Is there co-operative regulator-industry research in nuclear safety in your country?

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>
| 1. | There are co-operative safety researches, which are organised based on the view and needs of regulator and industry. The co-operation between industry and research institutes or foundations, which are implementing regulatory researches and tests, is made case by case.

2. If so
   a) How is it organised?
   b) How is it financed?
   c) How are the research items defined

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>
| 2. | a) The co-operation between regulatory and industry takes generally place through technical exchange in special committee or in technical conferences. The practical co-operation between industry and organisations implementing regulatory research occurs case by case on some of important and pressing topics, through technical information exchange, joint research and/or on contract basis.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>
|   | b) The regulatory research and tests, are financed with public funds (Governmental General & Special Accounts) and the utility own research are financed with Own money. The special budget reflects strongly the needs from electricity developments.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>
|   | c) All safety research and tests, implemented with public funds, are defined through needs inquired and discussed about in special committees (such as the Nuclear Safety Commission (NSC)), which consist of members from regulatory body, research institute, foundation, university and industry. The Nuclear Safety Commission (NSC) co-ordinates the “five-year safety research program” for safety regulation and safety improvements. Based on the program, practical co-operative research items are defined through the discussion between research implements organisation and industry.

3. a) What are the factors that argue for collaboration?
   b) What are the difficulties?
   c) Describe lessons learned

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>
| 3. | a) Such major factors are discussed as effective utilisation for the results, budget sharing and independence of regulatory decision.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>
|   | b) There are essentially no big difficulties, however concrete object of research, and budget sharing, have to be clarified and the much negotiation time would be necessary. Depending upon the co-operation items, independence of regulatory position needs to be explained to the public.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>
|   | c) Safety research and tests are well oriented and evaluated, and the results are utilised for their respective objectives. It would be necessary to enhance mutual cooperation and to discuss “needs & road maps” on the important and pressing topics. The managing system of research results is to be improved for better utilisation as, handbook or guidebook. It would be appropriate to such promote international cooperation as subjective manner, based upon facility.

The budget sharing system is expected in the future, introducing mutually industrial money to regulatory research and public money to reliability improvements or safety establishment in industrial research.
<table>
<thead>
<tr>
<th>4. Comment on the public availability of results</th>
<th>All research results obtained with public funds are essentially available to the public. Some results from utility own research are also reported on reliability or public acceptance. These results have to be explained by brochure or in special conference for better public understanding.</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. How do you organise collaboration to avoid the risk of loss of regulator independence?</td>
<td>The regulator-industry co-operation would be possible limiting the research area as data-base exchange and evaluation of methodology, and as facility base joint research, maintaining independence in technical evaluation and decision-making. The results obtained by the co-operation are to be open as much as possible, except for concern with commercial know-how and nuclear proliferation.</td>
</tr>
<tr>
<td>6. Is it a concern to demonstrate to the public that collaboration does not affect independence, and if so, how is this concern dealt with?</td>
<td>In the field of basic research, data-base, the co-operation may not affect independence. And, in the field of methodology development and, proving tests, independent technical evaluation has to be undertaken before a decision-making. The results of technical evaluation have to be open to the public, which will avoid the risk of loss of regulation independence.</td>
</tr>
</tbody>
</table>
| 7. Examples of collaboration | (1) **Special budget for safety proving tests**  
The special budget, which is one of the public funds, is used for the such safety proving tests as reliability of fuels and welding, and evaluation of seismic and accidents. In organising these topics, extensive discussions are undertaken between regulatory and industry along with the direction of electrical developments. The results obtained are essentially available to the public.  

(2) **Facility base joint research**  
In the NSSR (JAERI), safety research is being conducted to clarify fuel performance under rapid reactivity change. JAERI is making a joint research with electricity producer companies, using the NSSR for the purpose of investigate the behaviour of high burn-up fuels. The database obtained in the joint research is used not only regulatory use in technical criteria but also reliability confirmation in industrial use. These data are analysed for respective objectives and the results are reported to the public. |
<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Is there co-operative regulator industry research in nuclear safety</td>
<td>The Nuclear Safety Council (Spanish Regulatory Body, hereafter called the “CSN”) and the Spanish Electricity Industry Association (hereafter called the “UNESA”) signed in September 1997 a Research and Development collaboration agreement. The scope of this common R+D programme is the scientific, experimental and technical aspects related to the Nuclear Safety and Radiation Protection. Its overall aim is to provide a national focal point in order to develop a common understanding about important Nuclear Safety and Radiation Protection issues. This cooperative effort offers already to CSN a four full years of experience in joint research and development projects with the Nuclear Industry.</td>
</tr>
<tr>
<td>2. If so:</td>
<td>a) How is it organised?</td>
</tr>
<tr>
<td></td>
<td>The structure of the common Research and Development programme consists of a Co-ordinating Committee and two Technical Committees (see Figure at end of questionnaire). The Steering Committee is responsible for the overall co-ordination of the programme and for all decisions in the establishment of research areas, projects and their objectives. It is continuously reviewing the overall progress of the programme and is the lead for all the dealings associated with the R+D projects. It is also responsible for all decisions on publications associated with the agreement. The Steering Committee is made up of the representatives from both organisations. The Technical Committees are responsible for the organization of the R+D projects and the provision of Scientific Secretariat support in their respective working areas. The Technical Committees are undertaking continuous review of projects progress. These Committees are made up of experts/scientists from both organisations. Their functions are:</td>
</tr>
</tbody>
</table>
|                                                                        | (1) To advise the Steering Committee in order to identify key common safety and radiation protection issues.  
(2) To identify and define R+D projects in their respective areas. To monitor their implementation and evaluate final results.  
(3) To assist in the practical arrangements of the projects (technical specifications, contractual agreements, duration, responsibilities of each party to the contract, appointment of duties, cost and payments, financial contribution of each organisations, other legal conditions, etc.  
The implementing organisations carry out the R+D projects, performs tasks assigned to them and report progress regularly. |
|                                                                        | b) How is it financed?                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                                                        | - The funds allocated to the common Research and Development Programme are 1.7 M $ per year (50% from UNESA and 50% from CSN).  
- It is programme’s policy to share equally projects costs, with exceptions. |
|                                                                        | c) How are the research items defined?                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 3. a) What are the factors that argue for collaboration? | a) **What are the factors that argue for collaboration?**  
- To develop a common understanding about relevant Nuclear Safety and Radiation Protection issues.  
- To provide a national scientific forum to exchange knowledge and experiences on Nuclear Safety and Radiation Protection.  
- To have a more efficient R+D programme promoting synergy, avoiding duplications and sharing costs.  
- To develop consensus, where appropriate, on advanced Nuclear Safety and Radiation Protection topics.  

b) **What are the difficulties?**  

Special emphasis is being placed on the subjects and issues of common interest of both organisations, utilities and regulatory authority. The CSN and the utilities were created for different purposes. The utilities are aiming to produce electricity and the CSN to ensure that it is produced in a safe manner. Utilities tends to identify research topics related to the improvement of the performance of the nuclear power plants in order to optimise electricity production, but CSN tends to concentrate on pure safety issues (e.g. research on consequences of severe accidents). This fact made not easy to find out common R+D objectives and priorities. Therefore, the definition of joint R+D projects is not always straightforward, and it is usually needed a long process for defining their scope, objectives and activities.  

| c) Describe lessons learned | c) **Describe lessons learned**  
- This co-operative effort allows carrying out more ambitious R+D projects, expanding their scope and managing the resources in a more efficient manner.  
- The programme is an excellent forum for exchange of information and good practices on Nuclear Safety and Radiation Protection. |

| 4. Comment on the public availability of results | The result of the R+D projects are published by UNESA after been reviewed by the CSN. These reports are broadly spread. One-day seminar, open to the public, is held every year and the conclusions are taking into the programs for the following year. |

| 5. How do you organise collaboration to avoid risk of loss of regulator independence? | The project results provide a better technical understanding of the bases on which generic regulatory actions are based on, and this is a benefit for both, but the technical content of any specific licensee process is never object of a research project. Many often, the results of the research projects are the technical basis for Regulatory Guide. |

| 6 Is it a concern to demonstrate to the public that collaboration does not affect independence, and if so, how is this concern dealt with? | Nobody has questioned the independence of the regulatory body because of this collaboration. The bases for that are well understood and the benefit of this agreement are recognised. Transparency is always kept in any phase of this collaboration. |
Many projects concerning structural issues (CRP - V; CIR II), high burn-up fuel, Probabilistic Risk Analysis, Human factors, MACE, MCCl, MASCA and also projects related with Radiation Protection such models for internal dosimetry, dosimetric devices, etc.

Fig 1. Programme organisation

STEERING COMMITTEE (CSN, UNESCO)

TECHNICAL COMMITTEE A (NUCLEAR SAFETY)

RESEARCH AND DEVELOPMENT PROJECTS ON NUCLEAR SAFETY

TECHNICAL COMMITTEE B (RADIATION PROTECTION)

RESEARCH AND DEVELOPMENT PROJECTS ON RADIATION PROTECTION

IMPLEMENTING ORGANISATIONS: ELECTRICITY UTILITIES, CSN, ENGINEERING AND CONSULTING COMPANIES, UNIVERSITIES AND RESEARCH AND DEVELOPMENT CENTERS
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.</strong> Is there co-operative regulator-industry research in nuclear safety in your country?</td>
<td>There is a co-operative regulator-industry research in Sweden.</td>
</tr>
</tbody>
</table>
| **2.** If so  
  a) How is it organised?  
  b) How is it financed?  
  c) How are the research items defined | a) The organisation of such projects may differ. For some projects there may be a co-operation between SKI and one or more utilities in order to investigate a particular problem. Other co-operative efforts between SKI and the industry are in the funding of education in subjects related to nuclear power. This also includes funding of PhD-studies in the field.  
  b) The projects are funded jointly so that a part comes from the industry and a part from the authority  
  c) The subjects of research projects are defined by discussions on the basis of the needs of the partners. |
| **3.**  
  a) What are the factors that argue for collaboration?  
  b) What are the difficulties?  
  c) Describe lessons learned | a) The most important factor is the possibility of shared funding and the need to produce the specified information. A wide involvement from authority and industry may also be an important factor.  
  b) One difficulty is to reach agreement about the contents of the projects. SKI has to consider participation from an integrity standpoint. Also the industry would consider carefully the appropriateness to carry out a project in co-operation with the authority. Differences in publishing policy in industry and authority may also be an obstacle.  
  c) Projects that have the objective to develop a knowledge base within specific areas have been successful. Also joint efforts to develop and maintain competence at the universities have been successful. Projects with more diffuse focus, such as “follow-up” of certain areas, have been less successful. |
<p>| <strong>4.</strong> Comment on the public availability of results | The results of authority research are openly published and available to the public. |
| <strong>5.</strong> How do you organise collaboration to avoid the risk of loss of regulator independence? | In collaboration the different roles of authority and industry has to be recognised from the very beginning. No collaboration projects that would jeopardise regulator integrity would be allowed. |</p>
<table>
<thead>
<tr>
<th>6 Is it a concern to demonstrate to the public that collaboration does not affect independence, and if so, how is this concern dealt with?</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is a concern to demonstrate integrity. This is accomplished by openness that gives full public insight in objectives and results. For a sensitive area as nuclear waste research hardly any collaboration exists.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7 Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide 1-2 examples of collaboration for clarification, if possible.</td>
</tr>
<tr>
<td>a) SKI and the industry have a common project to identify risk significant phenomena during core melt accidents (APRI: Accident Phenomena of Risk Importance). This project follows in a series of projects with objective to develop information that addresses the Swedish strategy for prevention of release in case of a core melt accident. The project is focussed on BWRs of Swedish design and include areas like:</td>
</tr>
<tr>
<td>• Melt coolability in the reactor vessel and containment</td>
</tr>
<tr>
<td>• Chemical conditions in the reactor vessel and containment</td>
</tr>
<tr>
<td>• Swedish participation in the CSARP and Phebus projects</td>
</tr>
<tr>
<td>• Accident management</td>
</tr>
<tr>
<td>• Steam explosions</td>
</tr>
<tr>
<td>The costs for the project are shared nearly equally between SKI and the industry. This is an example of collaboration between regulator and industry for more basic research, which is not controversial.</td>
</tr>
<tr>
<td>b) SKI and the industry has joined in the Swedish Nuclear Technology Centre. The objective is to secure university education and to support PhD-studies in the nuclear field. The objective is to have 10 ongoing PhD-projects. One third of the costs of the Centre is funded by SKI and the rest comes from the industry.</td>
</tr>
</tbody>
</table>
SWITZERLAND  (prepared HSK and PSI)

1. Is there co-operative regulator-industry research in nuclear safety in your country?

   The major part of the collaboration between the Swiss Nuclear Safety Inspectorate (HSK) and the NPP operators is structured rather as an interaction between the three institutions HSK, Paul Scherrer Institute (PSI) and the NPP operators. Depending on the specific issue and its sensitivity, PSI is executive agent for research projects of the HSK or the NPP operators or – in some cases – of both. The results of such research are discussed trilaterally. A second kind of collaboration consists in the participation of HSK (and in some cases PSI) in international programmes (e.g. CABRI-WL, Phoebus-FP, Halden), where PSI provides in-kind-contributions and the NPP operators cover (at least a part of) the costs connected to these contracts and to PSI’s work. The NPP operators also delegate own staff to actively work in such international programmes. As a rule, PSI invites on a periodic basis all interested parties in Switzerland for a presentation and discussion of the insights gained in such programmes. Finally, there are international programmes launched by and performed at PSI where both HSK and the NPP operators participate (e.g. the ARTIST project, financed by an international consortium, which includes the HSK and the Gösgen and Beznau NPPs).

2. If so
   a) How is it organised?

   When PSI reports to HSK on results from regulatory research projects financed by the HSK, representatives of the NPP operators are being invited. Similarly, when PSI reports to the NPP operators on research projects financed by them, these can invite representatives of the HSK. In any case this happens for projects jointly financed by the HSK and the NPPs (see above). A high-level representative of the NPP operators is member of the extended Research Committee of the HSK, and both the HSK and the NPP operators are represented at Director level in the Scientific Committee of PSI’s Nuclear Energy and Safety Research Department (NES).

   b) How is it financed?

   The largest part of research on reactor safety and waste management issues takes place at PSI. The main financing sources are public funding (Board of the Federal Institutes of Technology, Federal Office of Energy through HSK), the NPP operators (~40 %) and the EU (currently still through the Federal Office for Education and Science). The funding provided by the NPP operators includes money made available directly to the HSK, which then uses these funds independently for regulatory safety research, for expert’s activities and for consultancies.

   c) How are the research items defined

   The research issues are usually initiated bilaterally between client and PSI. They are then discussed in the relevant thematic advisory committees of NES. Finally, detailed proposals are submitted to PSI’s Research Commission. This is also valid for projects within the EU FWPs. This procedure guarantees in an optimum way the independence and quality of research.

59
3. What are the factors that argue for collaboration?

- Being a small county with a large share of nuclear power, Switzerland has to substantially participate in international research activities. For PSI as practically sole executive agent to maintain its independence, a large amount of consensus between the parties involved in this research is needed. Competing double-track activities cannot be afforded in Switzerland. The collaboration of HSK and NPP operators in the research domain allows optimising personnel and financial resources.

- There are no difficulties worth-mentioning in the system described above. The fact that PSI and HSK are located on the same site and the four NPPs are within a short distance facilitates harmonisation.

- The interactions during the research collaboration between HSK, PSI and the NPP operators, but also the fact that many NPP and HSK staff members have received their nuclear training at PSI make easier in Switzerland to put research aspects in the foreground. This allows avoiding unnecessary work and saving money. Inclusion of researchers in the technical discussions has proven to be very beneficial to the scientific climate. However, it should always be kept in mind that regulatory decisions and the use of the results of regulatory research will remain in the responsibility of the HSK alone and that the safe use of an NPP to generate electricity will always remain the responsibility of its operator. PSI concentrates on providing high-quality and scientifically proven results.

4. Comment on the public availability of results

- The public is periodically informed about all research activities on reactor safety and waste management at PSI (specialized periodicals, in-house magazine, websites, PSI-reports, colloquia). HSK also makes all its research activities accessible to the public. The only exceptions are results of scientific services (expertises) containing proprietary information. As the publication of the results in the framework of international projects has to follow specific contractual regulations, it can sometimes be some delay, before these can be made available to the public.

5. How do you organise collaboration to avoid the risk of loss of regulator independence?

- PSI is the Technical Support Organisation in Switzerland for HSK; PSI on the other hand provides also scientific support to the NPP operators. Because of the scarcity of resources there is no alternative solution possible. The only possibility to maintain the independence of all parties involved, i.e. also of the HSK, is, therefore, to strive for a maximum transparency in the execution and the financing of collaborative research work. The aforementioned Scientific Committees do substantially contribute to this.

6. Is it a concern to demonstrate to the public that collaboration does not affect independence, and if so, how is this concern dealt with?

- The transparency in executing and financing of collaborative research work is an imperative also with regard to the public. The independence of HSK, NPP operators and PSI has been acknowledged in Switzerland by the politics. However, it is impossible to completely avoid slandering by opponents to nuclear power.
1. Is there co-operative regulator-industry research in nuclear safety in your country?

Yes with the regulator and across nuclear generating licenses within the UK and via involvement with various multi country initiatives e.g EU 5FP and Halden

2. If so
   a) How is it organised?
   b) How is it financed?
   c) How are the research items defined

The organisation of nuclear safety research described relates to the UK nuclear generating licensees and regulator

a) Involves the Nuclear Generating licensees and the regulator currently under prescribed arrangements which requires a research programme to be managed separately from other nuclear safety work (see note 1). The regulator has powers to carry out research that they judge is required and recover costs form the nuclear generator licensees, including the ability to do research that a licensee decline to do.

b) Wholly financed by the nuclear generating industry including the research carried out directly by the regulator.

c) Research needs arise from a variety of sources, including interaction with the regulator. Issues that the regulator judge require to be addressed by research are listed on a nuclear safety research index (NRI)

Note 1 there is currently a review of the arrangements underway and an Industry / regulator agreed proposal to move from the current prescriptive research arrangements to one which defines responsibilities objective and principles to be achieved by research and research arrangements. The objective is to improve the integration of research within licensee’s work in order to improve the contribution that any research has on maintenance and/or improvement in overall nuclear safety, and eliminate unnecessary bureaucracy. The beneficial elements of the existing arrangements will be retained within the new arrangements, including collaboration with the regulator and across licensees where beneficial.

3. a) What are the factors that argue for collaboration?
   b) What are the difficulties?
   c) Describe lessons learned

a) The research programme originally addressed generic issues at a time when it was judged there was likely to be a significant amount of collaboration across the nuclear generating licensees and with the regulator on all topic areas. Over time the generic areas for collaboration have reduced as the safety cases are mature. The announcement of closure of stations by one of the nuclear generating licensees is increasing the divergence of issues for cross licensee collaborative research in all topic areas. An early and ongoing involvement of the regulator on research topics is beneficial provided it is proportionate to the significance of the research and its contribution to overall nuclear safety i.e. similar to other non research nuclear safety work interaction between licensees and the regulator.

b) The difficulties include
   • that by seeking to achieve consensus on research collaborate on all nuclear
safety research issues and topics, with other licensees and the regulator resulted in research which did not make an effective contribution to overall nuclear safety

- There is a significant bureaucracy involved
- Research is only one way of addressing the issues identified by the regulator on the NRI thus consideration within a wholly research framework is not necessarily appropriate
- Research being pursued which does not make an effective contribution to overall nuclear safety or which could have been more effectively been addressed by non research means

c) The primary lesson learned is that it is maintenance and improvement of overall nuclear safety that is important. Research is only one of many means of addressing an overall nuclear safety issue. Thus research is not an end in itself and the value of any research proposal needs to be considered in relation to the contribution that it makes to maintain and improve overall nuclear safety. Therefore the value of the research proposals need to be considered along with the other non research activities. This will help ensure that the work pursued is that which makes the most effective contribution to overall nuclear safety, whether research or not. It should therefore be incumbent on the licensees, the regulator and other bodies overseeing research to ensure that unnecessary research or research that does not make an effective contribution to overall nuclear safety is not pursued. Otherwise resources (money and expertise) are diverted away from work which makes a more effective contribution to maintain and improve overall nuclear safety.

Note The future arrangements will facilitate collaboration across licenses and with the regulator where appropriate

<table>
<thead>
<tr>
<th>4. Comment on the public availability of results</th>
</tr>
</thead>
<tbody>
<tr>
<td>The research carried out directly by the regulator is subject to freedom of information legislation. The research carried out by the nuclear generating licensees is available to the regulator and made transparent to the public by publication of a list of research topics and a mechanism to gain access to the research reports. This has been established as the nuclear generating licensees own the IPR and therefore wish to control its release, primarily so that they can seek quid pro quo return by gaining access to information from others. If those carrying out the work wish to publish papers this is facilitated by a process for obtaining release of information, while protecting any IPR. It is agreed with the regulator that any research which is found to present a challenge to current safety standards or nuclear safety case assumptions will be released to those affected parties.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5. How do you organise collaboration to avoid the risk of loss of regulator independence?</th>
</tr>
</thead>
<tbody>
<tr>
<td>There is an annual review of essential research capability (ERC) covering facilities and expertise. Discussions on the need for regulatory access to independent advice are part of this process. Proactive support of capability required by the industry or to maintain independent advice to the regulator is also part of this process. It is noted that there is a difference between the expertise that research capability provides and the type of expertise that the regulator may need in support of technical assessment of safety cases. It is important to note that separate research capability is not the only way to maintain regulator access to their independent advice. For example:</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>---</td>
</tr>
</tbody>
</table>
|   | If the regulator needs independent advice on research activities then research expertise is appropriate and this may be achieved in a variety of ways; including attaching an academic to a research project or projects specifically to provide the regulator with independent advice on the research.  
- If the regulator needs advice on nuclear safety assessment of safety cases then research expertise may not be appropriate as it may be better provided by the scientific and engineering community form the appropriate disciplines e.g. from contractors and technical consultants. Thus maintaining research expertise is only a sub set of the necessary capability and the research community should not be seen as the only source of maintaining independent advice to the regulator. |
| 6 | Is it a concern to demonstrate to the public that collaboration does not affect independence, and if so, how is this concern dealt with? |
|   | This is not a concern that we are aware of that the public has expressed in relation to the nuclear industry and research capability. It appears that the public has general concerns about the authority of advice from scientific and engineering expertise with regard to their perceptions of safety from any official body, whether acting on behalf of the regulator or industry. However, the concern is dealt with by:  
- The output from the annual essential research capability review and the regulator’s independence review being reviewed by an independent nuclear safety advisory body (NuSAC SCR) which provides advice to the UK Health and Safety Commission and Government.  
- It is the responsibility of the regulator to ensure that their involvement in collaboration on research, facilitates their understanding without jeopardising their independence in assessing safety cases that may be based on the output from the research. The proposed new arrangements, which no longer require the regulator to be part of the research commissioning process should improve their ability to retain their independence. |
<p>| 7 | Examples of co-operation |
|   | There are 14 technical areas on the research programme with collaboration across nuclear generating licensees and with the regulator. The proposed new arrangements will facilitate collaboration where this is beneficial. |</p>
<table>
<thead>
<tr>
<th>1. Is there co-operative regulator-industry research in nuclear safety in your country?</th>
<th>Yes, between the regulator and the power generators (British Energy and BNFL).</th>
</tr>
</thead>
</table>
| 2. | a) There is an Industry Management Committee (BE/BNFL) which meets with HSE/NII at a management level and at a technical level (with 14 Technical Working Groups). About 80% of the projects are commissioned by the IMC. For international collaboration, access to independent advice or topics where the industry declines to commission projects, the regulator commissions projects. The whole organisation of the programme is under a complete review currently.  
  b) Financed by the industry (the cost of regulator commissioned projects is levied on the industry).  
  c) Safety research issues are raised by the regulator in consultation with the industry. The IMC commissions research projects to address these issues, in consultation with the regulator. |
| 3. | a) The government used to commission general nuclear safety research, but it transferred the responsibility to the regulator. After a transitional phase, it was decided that as the industry had the primary responsibility for safety, it should have the primary responsibility for safety research. The safety research programme benefits from discussions between the regulator and the utilities, bringing a wider input. The regulator has an overseeing role, and a responsibility to assure the government and its advisors that an adequate and balanced programme of nuclear safety research is carried out.  
  b) - Although there was formerly a single nuclear generator, this was split at privatisation, and the successor company interests are diverging.  
  - There is a need to ensure that research is integrated into the overall operations and regulation.  
  - There is a need to have a mechanism to cope with disputes between the regulator and generators when consensus breaks down.  
  - The regulator sees a need to improve collaboration with other licensees, such as BNFL nuclear chemical plant and UKAEA decommissioning projects.  
  c) Overall the research programme is better focussed than when the generators were not involved. Also both sides benefit from discussion outside the immediate regulatory forum, and they have the opportunity of coming to a common technical position on issues before a regulatory problem arises.  
  - The regulator has a more positive view of the current system than the industry. |
| 4. Comment on the public availability of results | The Freedom Of Information act does not affect HSE until 2005, but it is government policy to publish research information. The list of issues and information on current projects and past reports is put on the regulator website. However, as even the regulator commissioned research may use proprietary |
| 5. How do you organise collaboration to avoid the risk of loss of regulator independence? | - The regulator carries out an annual review on access to independent advice, and has the power to levy the industry to pay for supporting independent sources of advice. 
- There is also a separate technical support programme (also paid for by the licensee) for independent advice on safety case submissions. 
- Independent advice is available from engineering consultancies who do not necessarily do research. 
- It is possible for the industry and the regulator to use the same research results, if they are interpreted independently. |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6 Is it a concern to demonstrate to the public that collaboration does not affect independence, and if so, how is this concern dealt with?</td>
<td>Although we are not aware of public concern being expressed, NII is concerned that it should have appropriate mechanisms in place. It is notoriously difficult to identify the public. NII consults an independent nuclear safety advisory committee, which has a sub committee on research. This advises the Health and Safety Commission, which oversees the work of the regulator and approves the regulator commissioned research programme. NII is seeking to increase the peer review element of the programme.</td>
</tr>
<tr>
<td>7 Examples</td>
<td>Details of the issues addressed are available at <a href="http://www.hse.gov.uk/nsd/nsres2.htm#3">http://www.hse.gov.uk/nsd/nsres2.htm#3</a></td>
</tr>
</tbody>
</table>
**UNITED STATES** *(prepared by the USNRC)*

1. **Is there co-operative regulator-industry research in nuclear safety in your country?**
   - Yes, there is collaboration with industry, and in particular with EPRI, which is the research arm of the industry in The United States

2. **If so**
   - a) **How is it organised?**
   - b) **How is it financed?**
   - c) **How are the research items defined?**
   - a) Collaborative research programs involve a single management organisation, with technical oversight and input from representatives of the participating organisations. In some instances, technical experts may be involved to provide advice to the management organisation or oversight group on specific topics.
   - b) Depending on the type of agreement, participant contributions can be financial or ‘research in kind’. The in-kind contributions can be data, research materials (hardware, software, test specimens, etc.) or some combination of these. Agreements can involve solely financial contributions, solely research-in-kind, or a combination.
   - c) Programs are identified and priorities established taking into consideration factors such as mutual interest, usefulness of end product, contribution to risk reduction, cost effectiveness, and timeliness. Cost sharing for large, complex programs is often a major consideration.

3. **a) What are the factors that argue for collaboration?**
   - **b) What are the difficulties?**
   - **c) Describe lessons learned**
   - More research co-operation is important due to shrinking research budgets. Both collaboration with industry and international collaboration are important. In regulator-industry collaboration, both parties must see benefits. Communication is important, discussions are better if done at the front end, and periodic meetings should take place during the project execution. Method, management and formal means are important, the MOU between NRC and EPRI is an example of it. It addresses scope, goal, cost and schedule and there are 8 groups dealing with the different research subjects, which the MOU encompasses. The focus of collaboration is on data collection, whereas the interpretation is done separately.
<table>
<thead>
<tr>
<th>4.</th>
<th>Comment on the public availability of results</th>
<th>The use of public funds generally dictates research results are available to the public once they have been reviewed for completeness and accuracy by the funding organisations. Proprietary data are not disclosed. Intellectual property may be protected depending on the specific situation. Dissemination of the results by the participating organisation may be controlled by the terms of the agreement.</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.</td>
<td>How do you organise collaboration to avoid the risk of loss of regulator independence?</td>
<td>It is generally unacceptable for the regulator and industry to collaborate on projects to establish regulatory policy. However, it is perfectly acceptable for the regulator and industry to collaborate on the data-gathering phase that supports resolution of a regulatory issue, even issue resolutions that establish new policy. The regulatory research organisation (or office) and the industry research collaborators must define the scope of their collaboration to ensure that their efforts are directed to defining the research products, design of experiments and selection of facility for needed research, establishment of quality assurance process, collecting the data, and reviewing the data for completeness and accuracy – as required to provide the scientific input to resolve an issue or establish a policy. These data are then turned over by the research collaborators to the decision-making and policy-setting organisations within the regulatory body, (and to corresponding industry decision and policy organisations) for appropriate interactions and issue resolution. Clear definition of the objective, scope, work to be performed, deliverables, schedule, and costs is vital to a successful collaboration. Similarly, clear lines of communication among the participants and the roles and responsibilities of participants and management organisation are key to success.</td>
</tr>
<tr>
<td>6.</td>
<td>Is it a concern to demonstrate to the public that collaboration does not affect independence, and if so, how is this concern dealt with?</td>
<td>Transparency in collaborative programs is essential to avoid public perception problems. Research efforts that emphasise developing data with independent regulatory interpretation and decision-making are typically not a problem. A demonstration that collaboration does not affect independence is not needed if appropriate consideration of conflict of interest issues is given as the program is developed.</td>
</tr>
</tbody>
</table>
| 7. | Example of industry-regulator collaboration | USNRC STEAM GENERATOR INTEGRITY RESEARCH PROJECT

**HOW FINANCED** The NRC International Steam Generator Project (Project) has been financed with Participant payments entirely in cash for the full cost of participation, or the Participant may propose and conduct research to replace, complement, or augment the base research being conducted in the Project with additional research; i.e., "in kind research, or a combination of in kind research and cash. A Participant in the Project can consist of (a) a single government agency, (b) a single organisation, or (c) a group of organisations and/or agencies within a single country; however, a group must designate a single organisation or representative that is contractually connected to the Project.

**HOW ORGANIZED** The Project is structured such that NRC manages the overall activity and assures that the Contractor provides necessary management, personnel, materials, equipment, facilities and services to carry out the NRC Project. The NRC appoints a representative who has the authority and is solely responsible for approving, scheduling, managing and supervising the execution of the work to be performed under the
Project, including the financial contributions from the Participants.
The NRC representative is assisted with regard to research program review, evaluation, and co-ordination by a Technical Co-ordination Group (TCG). The members of the TCG are appointed by the Project Participants. The TCG is chaired by the NRC representative. The TCG meets semi-annually to review results of experimental work and future planned work and to review and co-ordinate all research projects that are part of the overall Project. Although one meeting per yr. is held in the U.S., other meeting locations are selected to be periodically local to each of the Participants.

The Participant has access to all of the experimental data, results, and analyses generated by the Project prior to and during the period of the agreement. The Participant may send representatives to visit the NRC Contractor test facilities and, on a case by case basis, may assign a mutually agreed upon technical specialist for participation in the performance and analysis of the Project experiments, subject to approval by the NRC and NRC Contractor. The Participant agrees to provide NRC Contractor, NRC and other Participants in the Project access to all results obtained from the Participants analyses of information and experimentation from the NRC Project and access to experimental data, results, and analyses from the Participants research conducted as part of its collaboration.

**HOW DEFINED** The steam generator research program was designed to address common interests among the participants in resolving technical issues related to steam generator tube integrity. The project is directed to the development of experimental data and predictive correlations and models needed for the independent evaluation of the integrity of the steam generator tubes as plants age and degradation proceeds, as new forms of degradation appear, and as new defect-specific management schemes are implemented. A project plan was developed by NRC and discussed with potential Participants. Their input was factored into a final program plan and Statement of Work for the Contractor.

**PUBLIC AVAILABILITY OF RESULTS** The Project is structured to support the wide public dissemination of information, subject to the protection of that which is considered proprietary, confidential, or privileged. Monthly progress reports from the NRC project, which are not published, are submitted by the Contractor to NRC and other participants without prior review by NRC or the participants. Other progress and topical reports from the NRC project are reviewed by the NRC project manager before publication. Similarly, other participants review their own reports before submitting them to the NRC and other program participants. These reports can be made available to the public if requested, subject to proprietary information constraints.

**PARTICIPANT REGULATOR INDEPENDENCE MAINTAINED** Independence of Participant regulators in the NRC Project is maintained because the Project is structured to avoid any conflict of interest among the participants. This is accomplished by maintaining the Project focus on basic data needs and analyses and not on application to specific regulations of any Participant country. The NRC conducts its own independent analyses of the data as can other participating organizations. This approach has been used successfully on other NRC collaborative projects, and has been accepted by legal counsel as acceptable for avoiding conflict of interest.