

Regulator and Industry Co-operation on Nuclear Safety Research

Challenges and Opportunities

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ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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FOREWORD

During an NEA workshop on “The Role of Research in a Regulatory Context” held in Paris on 19-20 June 2001, a recommendation was made to examine how nuclear safety research is organised and carried out in industry and governmental organisations. In particular, it was agreed that a group composed of senior research managers should 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 that was established – denominated Group on Regulators and Industry Co-operation (GRIC) on Safety Research – analysed differences in strategic goals, funding structure and other aspects of industry- and government-sponsored research, with the aim of identifying possible means to narrow these differences and to stimulate greater co-operation when feasible.

The Group included representatives from the four OECD member countries having the largest research programmes and from one country with a medium-sized programme. This publication has been prepared on the basis of discussions and input provided by the members of the Group given below:

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EXECUTIVE SUMMARY AND RECOMMENDATIONS

During the Committee on Nuclear Regulatory Activities/Committee on the Safety of Nuclear Installations 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 organisations 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 minimised 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 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 a way 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 fulfil these research needs in a cost-effective manner.

Perspective for nuclear power

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.

Reduced industry budgets

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

Reduced public funding

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 fulfil 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

Concerns for safety competence

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.

Need to keep focus on safety research

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.

Need to keep key facilities

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.

Rise of collaboration

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.

Need to preserve regulator independence

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 world-wide, 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.

Need to deal with a global industry

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.

Regulator access to funds for safety research

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.

Cases where access to funds is limited

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

Collaboration has benefits but also disadvantages

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].

Case-by-case collaboration

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 co-operation 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.

Collaboration 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.

Structured collaboration, MOU in the US

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 1990s. 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.

The cases of Spain and of the UK

In France, co-operative research agreements between the utility EDF and the national nuclear safety and radioprotection 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 (BMW, 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 BMW.

Collaboration in France and Germany

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.

Cases of limited collaboration, 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

Benefits of joint research

– 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.

Avoiding unnecessary duplication

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.

Sharing costs

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.

Maintaining competence

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,

Exploitation of broader know-how

In-depth discussion of priorities

Up-front, mutual engagement

collaborative or not, should adhere to good practice, and defining conditions for closure of a research issue is an integral part of good practice.

Facilitated access to plant data

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.

Facilitated access to and broader use of test specimens

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 fuels 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.

Broader use of qualified facilities

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.

Supporting key safety facilities

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.

Avoiding unrealistic scenarios

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

Disadvantages of collaboration

Difficulty to reach consensus

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”.

Lengthy process

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.

Difficulty to introduce corrective actions

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.

Disputes on result interpretation

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

Disputes on data ownership

Regulator-industry collaboration internationally

Regulator-industry collaboration in the Halden Project

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.

Role of international projects

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.

Conditions for success and good practice

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.

**Need to avoid impairing
regulator independence**

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.

**Trust on regulator
integrity**

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

**Practices to assure
independence**

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 “mid-field” research aimed to ensure long-term scientific development especially in novel areas of safety, and support the availability of technical expertise.

Finland

Sweden

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 insight on objectives, means and results.

Switzerland

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.

France

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.

Germany

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.

Japan

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.

United Kingdom

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.

United States

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.

Regulator integrity, an "evident" value

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 regulator priorities first

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.

Up-front process, set principles of collaboration

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.
Aim for a consensus process	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.
Project Agreement or Contract	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.
Mechanism for project review	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.
Caution on data interpretation	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.

Caution on financial transactions

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.

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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 government 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; and
- 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, United Kingdom.

- EPRI, USA; and
- 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* 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*.

* During the course of the GRIC work, it was agreed to have the GRIC final report with an Executive Summary and Recommendations section.

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