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Evaluation of the Joint Research Centre and its Multiannual Research Programme 1992-1994

Opinion of the Board of Governors of the Joint Research Centre on the Evaluation of the Centre and its 1992-1994 Multiannual Research Programme

Introduction

Each of the Council Decisions 92/273/EEC and 92/274/Euratom of 29th April 1992* establishing the 1992-1994 Multiannual Research Programme for the JRC, stipulates in Article 5 that:

"1. Research carried out by the JRC will be evaluated by a group of independent external experts set up by the Commission after consulting the Board of Governors. An evaluation report on the subject shall be established at the end of the programme.

2. The evaluation report referred to in paragraph 1, accompanied by the opinion of the Board of Governors, shall be forwarded by the Commission to the European Parliament, the Council and the Economic and Social Committee."

At the same time, the Supplementary Programme for the Exploitation of the High Flux Reactor, has also been taken into account with a similar evaluation procedure being applied.

Following recommendations made by the Evaluation Panel under the chairmanship of Sir Hermann Bondi, which evaluated the JRC's 1988-1991 programme, the Board of Governors, in consultation with the Director General of the JRC and in agreement with the Commissioner responsible for science, research and development, decided to set up a number of Visiting Groups of independent senior scientists and science managers to examine the JRC on an institute-by-institute basis. The reports arising from these surveys, together with a general analysis by Sir Hermann Bondi which draws together the conclusions of all these reports, are found annexed to this Opinion. These documents comprise the body of evidence of the present state of the JRC and its Institutes as seen by outside observers and, as well as fulfilling its statutory purpose, is an important base for management purposes and a significant input to strategic planning of future JRC scientific and technical activities. Equally important are judgements on research quality and efficiency in JRC Institutes and suggestions on scientific and organisational matters.

The Board wishes to express its thanks to the many eminent scientists and managers who freely gave so much time to the visits and preparation of the Reports, especially the Chairmen of the Visiting Groups. A special vote of thanks is also due to Sir Hermann Bondi for his critical analysis and summing-up.

* Official Journal of the European Communities N° L 141 of 23 May 1992

Opinion

The Board of Governors has examined the Reports and shares Sir Hermann's impressions of continuous improvement of the JRC since its reorganisation in 1988, particularly with respect to the opening up of the JRC to the outside world and to its internal functioning. It is also satisfied with the success of the Visiting Groups, both in their evaluations of Institutes and as a means of providing Directors with helpful and informed advice on scientific and operational matters. However, for future groups, a greater emphasis in their evaluations on the value of results of research and their impact would be desirable.

The Board notes the expressed need for tighter project definition and for improved recruitment procedures which has been the aim of the Board, who shall strive for improvement in these fields. However, the Board has noted considerable progress in the first field and less in the second field in recent years. The Board believe there is a high awareness of the problem at JRC management level and the Board shall continue to support the efforts in this direction.

The Board recognises and upholds the efforts by the Director General and his staff to respond to recommendations made in previous evaluation reports and is happy to see that these efforts are bearing fruit. Renewed efforts will be undertaken by the Board to adapt the organisation to its new and more competitive place in the scientific community and the Board counts on the universal acceptance in and the support of the Commission along that line.

In this respect, it is clear that, there are certain limitations imposed by the Commission's financial and staff regulations which preclude the implementation of some of the recommendations, which are common practice in a free market. The Board recognises these restraints but will continue to encourage and recommend simplification and greater flexibility wherever possible and notes with satisfaction that most of the simpler recommendations are already being put into effect and that serious efforts are being applied to the more difficult JRC-wide problems that have been raised. Experience will show if this is sufficient to keep the JRC competitive and the Board will closely monitor the progress.

After seeing the results of this first experiment, the Board is ready to continue the Visiting Group system for future evaluation and management advice and to press for maximum implementation of forthcoming advice.

Cambridge, 2nd September, 1994

ANALYSIS OF THE REPORTS OF THE VISITING GROUPS TO THE JOINT RESEARCH CENTRE'S INSTITUTES

(JRC MULTIANNUAL RESEARCH PROGRAMME 1992-1994)

Professor Sir Hermann Bondi

Analysis of the Reports of the Visiting Groups to the Joint Research Centre's Institutes *(JRC Multiannual Research Programme 1992-1994)*

Executive Summary

1. The strongest impression one receives from studying the Panel Report of 1991, the nine Visiting Groups' reports of 1993-1994 and my report of June 1994 (together with my letter to the Chairman of the JRC's Board of Governors) is on the continuous positive development and evolution of the external links of the JRC. Under the energetic leadership of the Director General, advice has been accepted and acted upon with impressive speed. This has been of great benefit to many individual scientists, to the JRC, to the Commission and to the general European industrial-academic atmosphere.

2. It is most gratifying that the institution of Visiting Groups has been so successful. In each case, the JRC has established valuable new connections, received constructive advice and made knowledgeable friends. It is also remarkable how similar the Visiting Group reports are to each other. Scientific standards have received nearly universal praise, institutional support to the Commission is judged to be good and improving, but with further development still attainable. The stimulus of having to gain work in a competitive manner is regarded as very positive, but the necessary change of attitudes and indeed culture is, for some Institutes, quite considerable and needs sustained determination. The speedy growths in external links through students, visiting scientists, networking, etc. is universally applauded and further growth is recommended.

3. Internal management of the Institutes is widely praised, but more progress is needed in some places through introducing tighter project definition and control. In particular, a significant strengthening of the management of tasks involving more than one Institute is seen as an urgent need.

4. Almost every Visiting Group is deeply worried about staff recruitment procedures, and several would like to see some improvement in internal staff management, entirely in line with my views as expressed in 1991 and more recently. I cannot say too strongly that one cannot be optimistic about the future quality of the JRC, especially after the retirement bulge of the late nineties, unless there is a major revolution in recruitment methods, yielding a substantial speeding-up and a much greater involvement of local experts. As I have said previously, a posteriori judgment of choices made can meet requirements of excellence and of Member States' wishes far more effectively than the present cumbersome and wasteful procedures.

5. Finally, I must express my concern about pressures for a reduction in nuclear-relevant research. I fully appreciate the political strength of anti-nuclear views in several Member States. It must be realised that there are three powerful reasons for at least maintaining nuclear research:

   (i) even without a single new nuclear power station, Europe will have to deal with nuclear waste for a long time to come;
   (ii) concern about the safety of power stations in Eastern Europe will not go away;
   (iii) worries about nuclear weapon proliferation are growing all the time and Europe should continue to be able to play its part in the required scientific detective work.

Report

Introduction

1. In 1991 I chaired a panel set up by the Board of Governors of the Joint Research Centre to evaluate the Centre and the work performed during the 1988-1991 Multiannual Research Programme under the requirements of the Council Decisions taken in 1988 and establishing that Programme. In the ensuing report, issued on 17th January 1992, the Panel proposed a change in the mechanism to be used for evaluating the JRC in order that the rather diverse activities of the various Institutes could be properly examined in somewhat greater detail by groups of independent, acknowledged experts working in the relevant fields, and to forge closer links with leading European scientific organisations active in related domains.

   Accordingly, during 1993 and 1994, nine expert Visiting Groups have evaluated the eight JRC Institutes, an extra Group examining the reactor HFR, and have drawn up reports of their findings for the Board of Governors.

   During the first half of 1994, the present author met the Board of Governors and visited each of the Institutes and JRC headquarters in Brussels to advise on the development of a strategy. This was in response to the Council Decision to open the JRC to competitive participation in Shared Cost Actions and to competition with external research organisations in providing scientific services to other Directorates General of the Commission.

2. The present report sets out to present an overall snapshot of the JRC through the eyes of Visiting Groups and revealed in their reports, with comments based on the author's past and present perception of the JRC.

   The scope and terms of reference of the Groups is found in Annex I of this report which includes the requirements laid down in Council Decisions and the Resolution on the JRC 1992-1994 Multiannual Research Programme regarding the evaluation of the work carried out. At the same time, Groups were required to review progress in the implementation of recommendations of the above -mentioned Evaluation Panel, to judge the scientific quality, appropriateness, efficiency and impact of Institutes' activities and to examine an Institute's strategy for the future.

General Points

3. The period since 1991 has been one of opening out, to the general benefit of the value of the JRC to the scientific and industrial communities. The Visiting Groups have given the Institutes much better links with the outside world, the growth in numbers of postgraduates, postdoctorates and more senior visitors has been substantial and of great value in many ways, and the increase in external contracts is not only a necessity, but of great benefit to the scientific vitality of the Centre. All this is entirely in line with the recommendations of the 1991 Panel and most gratifying. This approbation seems to be shared by all Visiting Groups, not only for the advantages it brings to the JRC but also for the valuable training it provides. Nevertheless, it is felt that the success of the action warrants the active pursuit of all means of opening the JRC. Networking with peer organisations is strongly

encouraged by all Groups, although the rather limited mobility of staff, both within the JRC and with the outside world requires serious attention. It has been suggested that promotion above a certain level should be dependent on service for a number of years in more than one country. Moreover, my own experience has been that in many cases, staff at about 45 or 50 years of age become more mobile as their children reach university age or become independent. It could also be considered unreasonable to pay a foreign service allowance to staff remaining in one country for longer than ten to fifteen years.

Particularly noted is the near absence of a modern career development strategy with an attendant training plan applicable to all staff.

Another positive sign of the JRC having become a more open and valuable Commission tool, is the way in which activities in support of Commission sectorial policies have grown in recent years. In part, this trend can be ascribed to a response to the suggestion in the Panel Report to endeavour to develop "educated" correspondents in the customer services. The provision, in the Fourth Framework Programme of targeted money to user services which can be bid for on a competitive basis by the Centre should help to alleviate the present insufficient funding in that area in view of the magnitude of well founded requests and allow the JRC to show its mettle.

4. The administrative shortcomings, inherited from the overall Commission system, are pointed out by everyone, especially those concerning recruitment, opaque accountancy, lack of valuation of capital investment and of intellectual property.

Recruitment of staff is found to be slow due to the tortuous and inefficient system imposed on the Commission's scientific services as a whole. The Joint Research Centre is a showcase for the Commission and the maintenance of an irreproachable level of intellectual capacity and competence in its scientific staff is vital. Effective recruitment becomes an even more pressing point on taking into account the retirement bulge that will occur in the late 1990s.

Financial transparency and the demonstration of accountability have become essential pre-requisites of any publicly financed organisation in recent years and Visiting Groups do not seem to be entirely convinced on that score. In the case of the JRC, the matter is complex. Financial management must simultaneously meet the formal requirements of the Commission's budgetary system and permit efficient operation of a research organisation. Although improved as compared to some years ago, further efforts in that direction could not fail to bring rewards through greater perceived openness of the Centre in handling its affairs and thus the removal of one cause of suspicion to the media and public.

Capital depreciation should be included more widely than at present as a routine item in all costing calculations. It could be envisaged to apply an amortisation period of 20 years to new buildings, some 15 years to large equipment with perhaps 5 to 10 years to lesser items with more rapid redundancy. The exclusion of accountancy for intellectual property serves to hide the true value of JRC scientists and leads to undervaluation of the Centre's potential. Both of these latter points carry the implicit criticism of unfairness to the private sector in competitions.

On the scientific side, concern is rightly expressed over instances where Groups feel that scientific staff is used for routine tasks which could be

better performed externally. New work should be rigorously assessed for suitability before being accepted and the establishment of "bureaus" avoided unless their establishment carries with it a substantial contribution from the Centre's laboratories.

The various Reports seem to me to cohere well on these points.

5. The evolution of the JRC towards a more competitive regime has been widely welcomed in the Groups' Reports. This is another step on a path adopted for the reorganisation of the Centre in 1988, following the recommendations of the Panel of Senior Industrialists led by Dr. Harry Beckers. In most countries, competition in research organisations is now considered to be a part of their natural development and the JRC has shown a potential in that direction by making a good start with contract research in a number of its Institutes. It is felt, however, that confidentiality of know-how gained in performing contract research should be in general time-limited, the norm could be some 3 to 5 years except where a longer time span might be of special importance such as in particular defence-related contracts (now within the JRC's remit), when special conditions might apply.

6. Most Visiting Groups comment on the problem of inter-Institute or pan-JRC project management. With the forthcoming enlargement of the European Union, it seems probable that there will have to be a corresponding increase in the number of larger scale problems of concern to the Commission. Environmental research has already seen a considerable broadening of its horizons in the field of EU research activities, and in view of the multidisciplinary nature of that type of problem, projects may well tend to span the competence of more than one Institute. Examples of this already exist with the Centre for Earth Observation or R&D on Nuclear Safeguards, and such projects have an obvious subsidiarity value. The appointment of senior persons with overall responsibility for such projects is important both to ensure their smooth running but also as a clearly identified contact person with the outside world.

7. In addition to the question of inter-Institute coordination, considerable interest is shown in aspects of internal management of Institutes. Members of Groups more concerned with the operation of research organisations subjected to competitive pressures feel uneasy about the lack, here and there, of established milestones or other targets by which group and individual performance can be accurately assessed. In the relatively few cases where adequate systems are operational, the Institute for Safety Technology for instance, the resulting clarity and transparency of presentation were much appreciated. Such a system should be considered to be normal in a centre so much under the public microscope and would simplify *a posteriori* control by management.

8. To summarise, the tenor of the whole set of Visiting Group Reports, when compared to the recommendations of the Panel of Senior Industrialists and those of my own more recent Evaluation Panel, indicates that the Centre is well on the way to becoming a recognised centre of excellence in many of its areas of activity. In some areas, recognition is still lagging behind scientific competence and the doors to the world. must be prised further apart. However, I am extremely gratified to see that previous advice is being effectively followed and that the word "OPENNESS" has entered the JRC vocabulary.

Particular Points from Individual Reports

9. Institute for Reference Materials and Measurements - Geel

The most important remarks here concern the staff which is dedicated and able, the management which is caring and provides a clear lead; however, more freedom to manage resources is recommended. Problems are identified regarding the potential duplication of ongoing work in national laboratories and the need for a more selective approach to try to reduce the excessive number of small items undertaken so that the Institute can concentrate on tasks falling within its field of excellence. Questions of demarcation between chemical analysis tasks undertaken at Geel and at Ispra also arise. Doubts are expressed on the operation of the BCR reference materials sector where management and financial problems are foreseen.

10. Institute for Transuranium Elements - Karlsruhe

The need to maintain the Institute's strong nuclear interest and to remain a centre of excellence was an important theme in the Report. There was particular fear that the recruitment system employed by the Commission might make the maintenance of an adequate staff of high competence difficult to achieve. Attention was drawn to ensuring that exploratory research would be directed towards potential developments of the Institute's core activities where possible. The high scientific level of Institute staff was praised and there were doubts about the use of valuable personnel on other sites to perform routine analysis. In contract research, the Institute's performance is good, although its intellectual property is somewhat undervalued, a point to be considered in setting up future contracts. Commercial secrecy should be limited in time, both in the interest of Member States and to ensure that the high quality of the work will enhance the Institute's reputation to the fullest extent.

This Institute is the recognised centre of European actinide research.

11. Institute for Advanced Materials (Materials) - Petten and Ispra

The Institute has acquired a firm international reputation in its field with good success in carrying out contract work and in network activities with peer research teams in European and worldwide contexts. As with Karlsruhe above, success in gaining research contracts has led to commercial secrecy problems. Central rulings on this point could easily lead to a rigid and stifling system, but the Marketing Adviser should be particularly concerned with giving advice on this question. I am pleased to see that the Visiting Group was able to endorse the Institute's long-term research plan based on the study of interfaces in material. This is likely to continue the valuable contribution made to EU industry by the Institute.

12. Institute for Advanced Materials (The HFR Reactor) - Petten

The Visiting Group gives the plant a clean bill of health and of safety, recognising its excellent operational reliability and availability. However, with the decline in nuclear R&D activities in most Member States, the nettle of financial viability needs grasping. The possible use of a significant part of the reactor for commercial purposes looks promising but implies that tariffs are based on the cost of operation and major efforts to reduce staff and operating costs need to be pursued with vigour. At the same time, it is clear

that priorities would have to change with operating conditions geared more to possible long term industrial clients than to scientific experimentation. Such conditions would also place constraints on the Commission's freedom to close the plant. An early decision is now required. The Report demonstrates that the reactor has been exploited very successfully under its R&D regime and that the quality of those involved is undeniable.

13. Institute for Systems Engineering and Informatics - Ispra

The Report is generally encouraging and demonstrates the great progress achieved since the Panel review. However, the Institute is felt to be hampered by the rules under which it operates, these being over rigid and uncommercial. Most remarks apply equally to the rest of the JRC and some of the more important ones are to be found in section 4. above. Again, the importance of a clear and simple project management system is pointed out and the difficulties of inter-Institute projects and informatics management brought forward. A greater contact with industry is encouraged and the adoption of commercial principles in bidding for third party contracts is recommended.

14. Environment Institute - Ispra

The Report shows an institute producing a very high quality of scientific research and service covering a rather over-extended number of items. A rigorous selection of priorities could help with the problem. Once again, one finds a warning against using highly qualified staff for routine research and it is suggested that analytical services should be grouped together as a separated service unit. The importance of a staff embracing a wide range of disciplines in tackling environmental problems and the growing role of computer modelling and international networks is emphasised and the Institute is moving in those directions.

15. Institute for Safety Engineering - Ispra

It is gratifying to find that the project control and management of the Institute receive considerable praise, demonstrating the advantages of good practice and transparency for the JRC. While recognising the reduction in funding for research on nuclear safety, the Visiting Group was emphatic about the importance of the Commission maintaining a viable activity in an area where public concern was still high in many EU Member States, especially in relation to Central and Eastern Europe. Research into the safe handling of tritium and its waste is also essential if future public fears are to be avoided when the first large-scale fusion power station demonstration plant is undertaken. A further area I consider to be of public importance is the developing research on certain aspects of industrial, particularly chemical, plant safety. The Group pointed towards the development of cooperative actions with other research bodies studying different aspects of these problems to build a generic understanding of safety-relevant factors in chemical manufacture, and to pursue this action further, recomends hiring a few industrial chemists and chemical engineers. Work using the new reaction wall facility to study structural behaviour under dynamic loading is proceeding well and is very promising and the team at Ispra already constitutes an important node in a large international network on the subject. However, again there is a warning on not spreading efforts too thinly over too wide an area of activity.

16. Institute for Remote Sensing Applications - Ispra

Up to the present, about 50% of this Institute's activities has been concerned with providing tools and methods for use by Commission sectorial services responsible for policies concerning agriculture, anti-fraud, environment, fisheries, regional aid and overseas development. The Commission's Statistical Office is also an important client for the Institute's services. In parallel with the above activities, and to improve their capabilities, research is carried out on advanced methods of satellite data interpretation and its integration with geographical data. The Centre for Earth Observation deals with the management of the vast quantities of data emanating from terrestrial satellites. The Institute's "customers". express a high degree of satisfaction with the services rendered. With the development of Large Applications Projects, new networks are being established in which the Institute will play an important role. This relatively young and lively Institute has become an appreciated partner by organisations such as the European Space Agency, the IGBP and national space research centres. The Visiting Group was concerned with the development of a viable strategy for the Institute in harmony with national and international centres and with the transparency of its system for management information.

17. Institute for Prospective Technological Studies - Ispra

The Institute, set up in 1988 to provide scientific and technological forecasts and advice in support of Commission services, is moving to a new site in Seville during the latter part of 1994. The Report points out that the Institute had not been able to meet the objectives originally foreseen for reasons of lack of designated funding, but had evolved a successful role as a scientific and technical advisory unit which should be further developed. Under the Fourth Framework Programme funding is available to pursue the missing "Observatory " function of the Institute. The Visiting Group praised the Institute's small staff and considered the output to be "most satisfactory". However, the problem of secrecy was again to the fore and even hindered the detailed assessment of the unit's output by the Visiting Group, which had to rely on interviews with clients! It is clear that although certain advice to policy-makers might have to be on a need-to-know basis, in general, the same time-restricted confidentiality system could be applied in contracts and agreements as suggested for the rest of the JRC's activities.

Conclusion

18. In general, I perceive a very satisfactory response to the recommendations made in the Panel report in 1991 and see steady progress since 1988 when the JRC structure was changed and the Institutes were established. During this time some of the rules of the game have changed, the introduction of competition for example, and these pressures are making visible inroads into the rigidity of Commission working methods and administrative attitudes: further improvement is to be expected as this evolution continues and is to be strongly encouraged.

19. It appears from this first round that the Visiting Group peer review system is well suited to the task of evaluating the Centre on an Institute by Institute basis. Reports show a good degree of coherence in unerringly identifying areas for general improvement. An effort in the directions indicated can

reap large rewards in efficiency and recognition. Concerning the latter point, I have been interested to discover that many members of Groups approached the Joint Research Centre with very little idea of either its function or its capabilities except for a rather vague and invariably negative reputation in national circles. On closer acquaintance, this attitude usually changed to a strong interest in the Institute visited, which in a number of cases has been followed by a proposal for collaboration in a specialised research area. This demonstrates that although the JRC is a much more open organisation than formerly, there is still an enormous potential for progress in that sense.. Well directed efforts will certainly bring benefits to the Centre, the European Union and its Member States.

20. Much has been achieved and the Board of Governors, Director General, Directors and the JRC personnel have brought about a clearly recognisable transformation of the Centre. With the Fourth Framework Programme, a new phase is beginning under which the Joint Research Centre is given the elements to complete this process to emerge as a modern and fully efficient research organisation recognised in scientific and political circles as being an effective and appropriate tool able to meet the needs of the Commission in an evolving European Union.

Annex I

Visiting Group for the Evaluation of the Joint Research Centre

Scope of Visiting Groups

The chief scope of Visiting Groups is to perform evaluations, taking into account the objectives as set out for the 1992-1994 period (in Council documents, relevant papers for the Board of Governors, JRC Annual Workschedules, budget, etc.), to provide recommendations on the proper course to be followed by the Institute visited (or a unit of an Institute) in view of the stated objectives, and to apply in the evaluations, elements of the methodology proposed for research returns and effectiveness.

The Visiting Group should:

- perform an evaluation of all activities of the Institute/Unit against its stated objectives, with particular emphasis on the impact the results of the work has had on the user of this research, and the degree of collaboration established with national research laboratories, as well as with industry;
- assess the scientific quality of the work and the appropriateness of the work and results for the Community;
- judge all aspects of the efficiency and impact of the work, taking into account the particular status of the JRC (its independence in the Community) in comparison with similar national laboratories;
- provide advice on the ongoing work on the basis of the evaluations and assessments performed;
- express recommendations for the future development of the Institute/Unit with regard to the overall strategic plans for development of the JRC in the medium-term and long-term.

Terms of Reference

1. To evaluate progress in performing work in accordance with the objectives set out in Council Resolution 92/C118/03 and Council Decisions 92/273/EEC, 92/274/Euratom and 92/275/Euratom, documents addressed to the Board of Governors, the JRC's Annual Workschedules, budget etc., and to review progress in the implementation of the recommendations of the last Evaluation Panel.

2. To ensure that the Institute/Unit has effective mechanisms to set its local scientific objectives, monitor progress towards those objectives and evaluate outputs.

3. To review the various research activities to assess:

   a) the scientific quality and productivity of the Unit/Institute;

   b) whether full advantage is being taken of scientific opportunities in the light of funding and other constraints;

   c) the relevance of the work with respect to Community needs, including the relevance of work performed for external customers, when applicable.

4. To assess the effectiveness of the scientific management leadership within the Institute/Unit.

5. To advise on whether the Institute/Unit has been making efficient, effective and economical use of resources in carrying out its programmes and management functions. Resources include manpower, money, services, facilities, data and equipment.

6. To review the extent and effectiveness of the Institute's/Unit's external scientific links, including relationships with research organisations, the higher education sector, industry and government departments in the Member States, as well as outside the European Community.

7. To examine the relationship of the Institute's/Unit's work in general, to the mission of the Joint Research Centre and to its forward strategic planning.

8. To make recommendations and report to the Board of Governors of the Joint Research Centre.

Teddington, 2nd September, 1994

REPORT OF THE VISITING GROUP

FOR THE EVALUATION OF THE

JOINT RESEARCH CENTRE'S

INSTITUTE FOR REFERENCE MATERIALS

AND MEASUREMENTS

CONTENTS

Report of the Visiting Group for the Evaluation of the Joint Research Centre's Institute for Reference Materials and Measurements (IRMM), Geel, Belgium

I. Introduction

At the invitation of the Board of Governors of the Joint Research Centre (JRC), members of the Visiting Group (see Annex I) spent 28-29 March 1994 at the Institute for Reference Materials and Measurements (IRMM) (previously called the Central Bureau for Nuclear Measurements) at Geel reviewing the Institute's work and visiting its laboratories.

The objectives for the Institute are to be found in Annex I, "Scientific and Technical Objectives", to Council Decision N° 92/273/EEC of 29th April 1992 published in the Offical Journal N° L141 of 23rd May 1992. The relevant section is as follows:

"The Central Bureau for Nuclear Measurements will continue its activities in both the nuclear and non-nuclear fields of reference materials and measurements, notably in the following areas:

- preparation, characterisation and certification of samples,
- long-lived or stable isotope mass spectrometry,
- nuclear data measurements and evaluation,
- radionuclide metrology,
- applied radiation techniques.

Research also in the growing application of these specialised techniques to non-nuclear areas will capitalise on the existing experimental facilities including the particle accelerators. Activities in support of consumer protection policy will be continued ...".

These general objectives are concurrent with the JRC's mission and are highlighted in the scope of the Visiting Groups. As set out in the terms of reference (see Annex II), the Visiting Group should:

- evaluate all activities of the Institute against its stated objectives, with particular emphasis on the impact the results of the work has had on the users of this research, and the degree of collaboration established with national research organisations, as well as with industry;
- assess the scientific quality of the work and the appropriateness of the work and results for the Community;
- judge all aspects of the efficiency and impact of the work, taking into account the particular status of the JRC (its independence in the Community) in comparison with similar national bodies;
- provide advice on the ongoing work on the basis of the evaluations and assessments performed;
- express recommendations for the future development of the Institute with regard to the overall strategic plans for development of the JRC in the medium-term and long-term.

II. General Observations

During the 1992-1994 programme in course, the name of the Institute was changed to the "Institute for Reference Materials and Measurements".

Activities were carried out under the Specific Programme on Measurement and Testing of the Third Framework Programme for Community Activities in the field of Research and Technological Development, support to other Commission services and a small amount of contract research for external third parties.

Work under the Specific Programme included:

- neutron interaction data for standards, nuclear fission and fusion technology;
- radionuclide data and activities;
- high accuracy in isotope ratio measurements by mass spectrometry;
- development for quality control analysis;
- reference materials for elemental analysis, isotope ratio measurements and reactor neutron dosimetry;
- aerosol and surface reference materials;
- samples and target preparation;
- materials management on behalf of the "Bureau communautaire de référence (BCR).

Support to other Commission services was at present concentrated on:

- DG I (International Affairs - Nuclear Safeguards);
- DG III (Internal Market);
- DG VI (Agriculture);
- DG XIII (Technology Valorisation);
- DG XVII (ECSAM; Nuclear Safeguards);
- Consumer Policy Service: (protection and promotion of consumer interests).

Contract research for third parties:

- This comprised a relatively minor activity at the present time.

The Visiting Group felt that in the time available it was not possible to carry out a detailed audit but an overall appreciation was gained and valid judgments were possible. The objectives of IRMM were generally taken as given. A full assessment could not be made of whether the tasks or organisation were fully justified or the best possible arrangement.

It was noted that the change of institution name represented a major emphasis that had occurred after the Council Decision of 1992 which established the objectives of the Institute. The Group was uncertain about the validity of the name change but felt the new name to be more appropriate to the present IRMM research profile.

The management and staff provided a good level of information to brief the visiting Group, were open, cooperative and tolerant in responding to many questions and requests for more information. The Group would like to thank all those concerned.

In all areas we found dedicated and able staff who displayed a high level of expertise. In some areas world class work was recognised and strong input to international cooperation and networking was evident. The culture was one of technical excellence but there was generally a willingness to respond positively to change including increasing competition.

The management was caring and attentive, providing a clear technical and management lead whilst allowing staff to contribute. Some of the JRC procedures and requirements were unhelpful and contributed to delays in the timely deployment of resources. An example of the difficulty is the slow recruitment procedure and the relative lack of freedom to manage local resources against an agreed corporate plan.

III. Scientific and Technical Activities

III.1 Nuclear Physics and Measurements

In this original core activity area of the Institute, equipment and scientific staff are found to be of a level to be expected in an international institute of high repute. Connections through long-established networks with the few other institutes in the world engaged in these activities were appropriate and the teams were meeting the needs expressed by international committees managing the accumulation of data in relation to present and predicted needs.

At the same time, considerable creativity was being shown in attempting to increase the application of methods and experimental equipment to fulfil other needs. The presence of young post-doctorate fellows was a considerable asset in that respect and the relationship with permanent staff was demonstrably symbiotic.

The Group noted that the Linac GELINA, with its ultra-high resolution, was being overhauled and updated. At present, in terms of resolution, the machine is probably the best in the world. Moreover, in view of the excellence of the very considerable installations such as the Linac and the van de Graff accelerators, it is important that the investments they represent should be utilised to the maximum. This may mean applying a much greater effort towards their application to the advancement of European industry, as well as their use for purely basic scientific ends. This effort will require a much more intensive approach to possible partners or clients and a clearer understanding of commercial and sales considerations. However, this is unlikely to result in more than a 10% use for such purposes.

Some four years after the completion of the refurbishement of the GELINA it would be wise to review its work and situation in scientific, economic and organisational terms.

The quality of ongoing work is not in doubt but in the changing situation, attention must be paid to the potential added value of the intellectual property available. Amongst other things, the development of the use of Van de Graff for Rutherford scattering as an analytical tool seems particularly promising.

The question of subsidiarity does not seem to be of great importance in this area, as such equipment is either unique or rare in member States, particularly if the accompanying expertise is taken into account. At the same time, the work in this field is seen to be important and regulated and monitored externally, although the bodies concerned do not handle the funds and are therefore not really "customers" in the classical sense; this implies that a more critical internal progress review system may be needed in the future.

An area where some members of the Visiting Group had some reservations was in data processing and informatics where it was felt that streamlining and the adoption of a more modern and distributed approach would be more appropriate.

III.2 Reference Materials

This item includes analytical science, mass spectrometry and sample preparation.

Facilities in this area were also found to be excellent, particularly where the clean laboratory and mass spectrometry facilities were concerned which were of world standard and the analytical laboratories which were very well equipped.

Staff were extremely competent and include scientists of international repute. The part played by Geel in the redetermination of the Avogadro number has brought international recognition with implications for the traceability of chemical standards. Apart from the subject of this highly networked activity, there is spin-off into the improvement of isotope dilution techniques, an important technique for analytical purposes.

Chemical metrology is important and more effort should be concentrated on the improvement of separation and extraction techniques, as well as the problems of reliable sampling and homogenisation. This work should also be networked with and support other standards' laboratories in Europe and, where appropriate, elsewhere.

Actinide reference materials are the reference against which fissionable materials are measured for international safeguards. Geel provides an important part of these sources, both in Europe and elsewhere.

The Institute has also initiated and coordinates the International Measurement Evaluation Programme (IMEP). A large worldwide network of laboratories participate in this action and their acceptance of IRMM's role as coordinator stands witness to its reputation as a centre of scientific excellence in that area.

The Group was concerned about the economics of the reference materials action performed on behalf of the Community Reference Bureau (BCR). We understand that the staff involved would be paid from the Institute's budget but that sales will have to provide the funds needed to produce new reference materials and for the provision and re-certification of replacements for time-expired or exhausted stocks of existing materials.

In moving into a competitive situation, a very careful analysis by business experts will be particularly important if the Union is to be provided with a permanent, reliable and cost effective service. To obtain such advice, detailed costing of staff, materials, operational procedures, storage and investments will certainly be needed. Consideration should be given to contracting out the provision of this service to a commercial organisation.

Furthermore, quality assurance under an internationally recognised standard such as ISO 9000 will be essential as many of the organisations using the products are already accredited or are becoming so.
The Group was concerned that Geel should concentrate on its core area of very high quality reference materials and measurements and not use expensive resources of staff and equipment for routine work.

A clearer definition of work carried out at Ispra and that performed at Geel seemed to be needed as was greater selectivity in jobs accepted from other Commission services where cheaper alternatives could sometimes be found.

III.3 Exploratory Research

In examining on going exploratory and discretionary research at Geel, the Visiting Group noted that the two most important projects were linked to the Institutes activities in different ways. The "Radiation Physics" project may well widen the application of GELINA and can lead to more physicists wishing to use the facility. On the other hand, the investigation of protein and peptide components of metallothioneine is more concerned with work falling under Support to the Consumer Policy Service. Further development of such work on applied and basic biochemistry at IRMM has implications on the long-term forward planning of the Institute and should be a matter for very careful review.

IV. Management of Research

IV.1 Staff

With the low rate of staff turnover it was felt to be extremely important to maintain a good flow of postdoctoral and other research fellows and visiting scientists in the Institute.

The level of expertise was considered to be very high at senior staff level and their replacement will require careful planning at retirement time. A more flexible recruitment system able to operate more swiftly and a consistent staff training and career development policy would help to meet the changing situation in research and establish the desired staff profile in the years to come. (Some 5% of available time spent on staff development would be reasonable.)

Members felt that it would also be useful to examine the use of short-term appointments or long-term attachments, of three to five years, with guaranteed return to their institute of origin to increase the throughput of scientists at IRMM and enhance knowledge transfer.

IV.2 Networking

Tasks are well defined in key areas but in those where qualitatively new venture have been initiated definitions are less clear and not yet integrated into strategic orientations.

Further efforts applied to defining the Institute's tasks and its effective boundaries would considerably help with education and training and with maintaining morale and interest at all staff levels.
The nature of the tasks performed at Geel has naturally led to the development of networks and such actions are considered to be an important means of information dissemination, scientific exchange and generally ensuring the Institute's place in the European Union and World at large. This is strongly encouraged.

A better feeling amongst scientific managers for hourly staff costs and real availability would help with planning in a more competitive world.

IV.3 Output

This was seen to take diverse forms such as data, reference materials, certificates, as well as the more traditional ones of articles in learned journals, presentations at conferences etc. Taken overall, the quality and quantity are considered to be satisfactory and in many cases represent significant contributions to their respective fields of endeavour. A share of these has come from the young scientists. However, continuous performance monitoring can help to improve the value of the JRC as perceived by scientists and managers in Member States and efforts to increase output can only result in a wider and improved reputation.

The temptation to demonstrate willingness by taking on work of an unsuitable or routine nature should be resisted.

V. Recommendations

With these recommendations, the Visiting Group would like to contribute to the further evaluation and development of the activities at IRMM. The points indicated should be taken into consideration at the various levels of decision making and management. The Visiting Group notes that some elements indicated in these recommendations are already being employed in some form and it also underlines that in the implementation of such recommendations account has to be taken of the specifics of the various research areas at IRMM.

V.1 General Points

There is a need for greater clarity about the mission of IRMM, having regard for the needs of the EU, the mission of other JRC Institutes, subsidiarity and the special capability at IRMM.

High level performance measures should also be set and monitored.

There is a need for a robust scrutiny of project proposals to ensure they satisfy a priority EU need and that the IRMM is best placed in terms of cost and technical capability to deliver the work. Such scrutiny should take place during the preparatory phase of programme generations. Effective management and value for money depend critically on the existence of independent customers for IRMM work who also have responsibility for an input to the framework programme work commissioned from Member States.

The spread of technologies and techniques at IRMM should be reviewed with a view to reducing the spread and increasing the depth in selected areas. In particular the roles of IRMM and Ispra in the field of chemical analysis should be reviewed and rationalised to achieve greater economy of scale.

The level of laboratory facilities is high compared with staff numbers. This applied to both big facilities such as the linear accelerator and a vast array of smaller pieces of equipment. A more business-like approach is required which starts with knowledge of the true cost of ownership. By a combination of better focussing of work, down sizing, where appropriate, and business growth in selected areas it would be possible to increase the return on capital. It is recommended that a programme to assess true costs be initiated alongside an assessment of market opportunities and business development.

As a more customer orientated programme develops more attention will need to be paid to project management with systems in place for project planning, cost control, milestone setting and monitoring.

The proposed review of QA needs is welcome and consideration needs to be given to ISO 9000, ISO 25, TQM and benchmarking approaches. It is recommended that benchmarking be carried out for selected management and technical functions against other comparable organisations in national government ownership and privately owned. Benchmarking should provide information such as cost of work, cost of facilities, output per scientist, cost per scientist.

Many of the facilities represent major European resources which should be made more widely available to Member States. Work of EU and Member States' interest should be facilitated free of charge against a budget held by DG XII and within current levels of funding.

Some of the work carried out was in competition with that undertaken by Member States and in some instances there is a danger of heavily subsidised IRMM activities being in direct competition with more cost effective commercial work in Member States. Examples of this are the chemical method development and chemical reference materials work carried out in support of EU agricultural, environment and consumer safety policy. It is recommended that review of these activities be carried out to determine whether it is possible to deliver this work in a more cost effective way within Member State institutions and if appropriate to advise on the resolution of competitive and subsidiarity conflicts.

V.2 Particular Points

- The move towards a competitive model for the Institute is applauded both as a means of increasing scientific vitality and awareness of staff, but also as a demonstration of the Institute's ability and usefulness.

- Effort must be applied to increasing, where possible, contract research and services to industry and other clients.

- The cost effectiveness of facilities should be established and those that need to be retained should be marketed in government and industry on an international basis.

- Mechanisms should be put in place to establish the full economic cost of work and comparisons of cost made with similar work in other organisations.

- Independent customers should be established who are responsible for defining the requirements and commissioning work in the most cost effective way. The customers should also be responsible for work commissioned from Member States within the Framework Programme.

- Where possible, two-way temporary staff exchanges should be set up as a means of cross-fertilisation.
- Rigorous selection should be applied to work carried out by the Institute and a clear forward plan adopted. Work division between Geel and other JRC Institutes should be established and recognised.

- The roles of IRMM and Ispra in chemical analysis should be reviewed.

- Chemical method development and associated reference materials development in support of agricultural, environmental and consumer safety policy should be reviewed to determine whether this work could be carried out more effectively within Member State institutions.

- Commercial advice should be sought in a number of areas and particularly for the management of reference materials where doubts about future profitability exist. Contracting out to a commercial organisation should be considered.

- International cooperations on chemical traceability should be continued but work should be extended to include sampling and homogenisation of analytical samples.

- More freedom to manage resources against an agreed corporate plan should be given to the Director. The rigidity of administration procedures should be reduced, especially where delays in recruitment are concerned.

Visiting Group to the Joint Research Centre's Institute for Reference Materials and Measurements (IRMM) - Geel

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Annex II

Visiting Group for the Evaluation of the Joint Research Centre's Institute for Reference Materials and Measurements (IRMM) - Geel

Scope of Visiting Groups

The chief scope of Visiting Groups is to perform evaluations, taking into account the objectives as set out for the 1992-1994 period (in Council documents, relevant papers for the Board of Governors, JRC Annual Workschedules, budget, etc.), to provide recommendations on the proper course to be followed by the Institute visited in view of the stated objectives, and to apply in the evaluations, elements of the methodology proposed for research returns and effectiveness.

The Visiting Group should:

- perform an evaluation of all activities of the Institute against its stated objectives, with particular emphasis on the impact the results of the work has had on the user of this research, and the degree of collaboration established with national research laboratories, as well as with industry;
- assess the scientific quality of the work and the appropriateness of the work and results for the Community;
- judge all aspects of the efficiency and impact of the work, taking into account the particular status of the JRC (its independence in the Community) in comparison with similar national laboratories;
- provide advice on the ongoing work on the basis of the evaluations and assessments performed;
- express recommendations for the future development of the Institute with regard to the overall strategic plans for development of the JRC in the medium-term and long-term.

Terms of Reference

1. To evaluate progress in performing work in accordance with the objectives set out in Council Resolution 92/C118/03 and Council Decisions 92/273/EEC, 92/274/Euratom and 92/275/Euratom, documents addressed to the Board of Governors, the JRC's Annual Workschedules, budget etc., and to review progress in the implementation of the recommendations of the last Evaluation Panel.

2. To ensure that the Institute has effective mechanisms to set its local scientific objectives, monitor progress towards those objectives and evaluate outputs.

3. To review the various research activities to assess:

   a) the scientific quality and productivity of the Institute;

   b) whether full advantage is being taken of scientific opportunities in the light of funding and other constraints;

   c) the relevance of the work with respect to Community needs, including the relevance of work performed for external customers, when applicable.

4. To assess the effectiveness of the scientific management leadership within the Institute.

5. To advise on whether the Institute has been making efficient, effective and economical use of resources in carrying out its programmes and management functions. Resources include manpower, money, services, facilities, data and equipment.

6. To review the extent and effectiveness of the Institute's external scientific links, including relationships with research organisations, the higher education sector, industry and government departments in the Member States, as well as outside the European Community.

7. To examine the relationship of the Institute's work in general, to the mission of the Joint Research Centre and to its forward strategic planning.

8. To make recommendations and report to the Board of Governors of the Joint Research Centre.

Stockholm, 28th January 1994

REPORT OF THE VISITING GROUP

FOR THE EVALUATION OF THE

JOINT RESEARCH CENTRE'S

INSTITUTE FOR ADVANCED MATERIALS

CONTENTS

Report of the Visiting Group for the Evaluation of the Joint Research Centre's Institute for Advanced Materials, Petten (The Netherlands) and Ispra (Italy)

I. Introduction

At the invitation of the Board of Governors of the Joint Research Centre (JRC), members of the Visiting Group (see Annex I) spent the 14-17 December 1993 at the Institute for Advanced Materials (IAM) at Petten and Ispra reviewing the Institute's work and visiting its laboratories.

The objectives for the Institute are to be found in Annex I of Council Decision 92/273(EEC) and 92/274/Euratom of 29 April 1992.

The main objectives are to contribute to enhancing European industrial competitiveness and the safety of components and structures, relevant mainly to the energy, transport, environment and manufacturing sectors, through advances in the understanding of the basic properties, the processability and engineering performance of materials.

These general objectives are concurrent with the JRC's mission and are highlighted in the scope of the Visiting Groups. As set out in the terms of reference (see Annex II), the Visiting Group should:

- evaluate all activities of the Institute against its stated objectives, with particular emphasis on the impact the results of the work has had on the users of this research, and the degree of collaboration established with national research organisations, as well as with industry;
- assess the scientific quality of the work and the appropriateness of the work and results for the Community;
- judge all aspects of the efficiency and impact of the work, taking into account the particular status of the JRC (its independence in the Community) in comparison with similar national bodies;
- provide advice on the ongoing work on the basis of the evaluations and assessments performed;
- express recommendations for the future development of the Institute with regard to the overall strategic plans for development of the JRC in the medium-term and long-term.

II. General Observations

The Institute's functional structure is set out below. The High Flux Reactor (HFR) is not included in this Report, having already been visited by experts in research reactors and the subject of a recent report. The structure of the Institute is as follows:

- High Flux Reactor	Petten **(separate report)**
- Materials Processing and Engineering	Petten
- Materials Characterisation	Petten
- Non-Destructive Testing	Petten (recently transferred from Ispra)

- Functional Materials Development and Cyclotron — Ispra
- Materials Performance and Reliability — Ispra

The Visiting Group examined the Institute in detail and found the work and scientific output to be very good or excellent in most areas and of a truly international standard. The targeting of the work was good and staff showed a clear understanding of objectives.

The Institute is well managed. However, the Visiting Group believes that the Director should be given more responsibility for running the Institute, particularly in the recruitment of staff, and that consideration should be given to exempting the Institute from some internal European Commission procedures.

The Institute is undoubtedly expensive, with high overheads on its research. However, the Visiting Group is convinced of the need for a European institute of this type in the key strategic area of advanced materials. Given this need, the Visiting Group accepts that there are many various reasons for the high overheads, including the need to pay competitive salaries, the inherent expenses of running a high flux reactor and a cyclotron, and so on. The Visiting Group saw no evidence of waste.

The Visiting Group believes that funding of the Institute should move towards a "core plus competitive" funding model. Contract work for third parties, mainly industry, has built up rapidly in the last few years and is at present running at about 8% of the total budget. The Visiting Group believes that the aim should be to increase this to 10% over the next few years. Such contract work is not only useful financially, but it also builds up real links with industries in the Member States. The Visiting Group welcomed the proposal at present under discussion at the political level to allow the JRC to participate in Framework Programme schemes, for example BRITE/EURAM. It is recommended that the aim of the Institute should be to obtain about 20% of its funding competitively from Framework Programme schemes over the next few years. Apart from the increased competitive funding element this would introduce, the Visiting Group believes that bidding for, and participation in, collaborative research through Framework Programme schemes would greatly strengthen the Institute's links with universities, research institutes and industries in the Member States and would be wholly beneficial.

Orientation was greatly aided by the extensive use of colloquia, round table discussions and workshops, with strong industrial representation, when setting up programmes and activities, thus creating a consensus in the materials science community. In the same way, seminars, conferences, expert meetings and publications in relevant international journals ensured that scientists were kept abreast of progress.

The detailed internal annual review of all areas of work and project control were felt to be important factors in demonstrating and maintaining the level of excellence.

The Institute is considered to hold the lead position in the special area of research on High Temperature Materials, particularly for its work on corrosion/mechanical properties interactions both for its expertise and for its equipment. This should be built on to further improve its image and to play key European roles by:

- exchanges of staff;
- network establishment and participation in Framework Programme schemes;
- giving impartial advice on standards;
- encouragement of the introduction of advanced materials to improve competitiveness.

III. Scientific and Technical Areas

III.1 Materials in Extreme Environments

In the study of behaviour of industrial materials in extreme service environments, the Institute at present occupies an internationally-acknowledged leading position.

The Visiting Group considers that the area is still an important one and that this work should continue to be emphasised. The Institute's well deserved reputation should be built on by placing more weight on aspects of stress analysis with the recruitment of an applied mechanics expert as soon as feasible. More emphasis could also be placed on computer modelling and integration with engineering design. Concerning the first aspect, this should preferably be handled by setting up networks with universities and research institutes. With regard to the second, this would profit from close interfacing with engineering design teams.

The study of metallic, ceramic and composite materials for high temperature applications is of considerable importance to industry and networks and joint research programmes with universities, industrial research and government research organisations should be encouraged.

III.2 Reliability of Life Extension

The difficult and expensive experimental activities in this area show good results and some useful spinoffs to industry. However, the core area of this research should concentrate on developing more advanced procedures for assessing operational damage. Other aspects would profit from more intensive collaborations with external research bodies.

III.3 Surface Modification Technology

The Visiting Group was satisfied by the very rapid establishment of this area of activity at the Institute. After a short time useful results are already being obtained and the major equipment is functional. Work should now be focused on contributing to high temperature industrial applications of these techniques and this perspective should be introduced as early as possible to these activities with emphasis on the production of data which will stimulate increased industrial use of the techniques. The Group did not feel that wear studies should be developed in the Institute as the subject was highly researched in many other places and was somewhat out of line with other Institute topics. A networking approach could help to avoid duplication of equipment and scientific effort.

III.4 Fusion Materials

Although a small area of activity, very good and important work had been done up to the present on materials screening and selection in connection with the Community Fusion Programme. The priority given to this work must depend on the needs expressed by the programme managers as the Visiting Group itself felt unable to make a valid judgment on this highly specialised materials application. However, Members would warn the team against entering the field of tritium hermetic ceramic composite structures without adequate industrial, engineering and financial support as the subject was a vast one with strong dependence on proprietary know-how which might not be easily available.

An adequate data base on materials for fusion was in any case of high importance.

III.5 Non-Destructive Testing

This activity had been extremely useful in the past (PISC programme) and was at present being transferred from Ispra to Petten. The Visiting Group considered this to be an advantage as the previous nuclear orientation of the team could now be turned towards high temperature materials applications where a close collaboration with scientists working on the assessment of creep damage and remaining lifetime in high temperature plant could lead to great savings and an improvement in safety. This area should be vigorously pursued and work extended to include ceramics and composites in the future. To advance as rapidly as possible it was essential that the entire team and equipment be reunited at Petten without delay. The task was a very challenging and important one with very considerable industrial applications, both on bulk materials and coatings.

Plant in the energy and process industries was ageing and would come to rely more and more on reliable Non-Destructive Evaluation to assure continued operation and the amount of work on the topic carried out in universities was limited emphasising the work at Petten. The Institute should, however, be encouraged to collaborate in this research with universities and other research bodies.

III.6 The Cyclotron

The main objective of this equipment was the study of damage in materials destined for fusion applications. Unfortunately, there were few other uses in the Institute's other activities and external users had been sought to enable the installation to remain economic. However, use by other research programmes did not appear to be forthcoming and alternative solutions should be examined.

As the remaining work is of high quality and importance to fusion materials research, if the Cyclotron becomes unavailable the possible use of other facilities should be examined.

III.7 Materials Information

The establishment of data for advanced materials is an essential part of their introduction into industrial use. Easy access to comprehensive data is vital for industry.

Due to the developments during the last few years the HTM Databank is now in a very attractive form. To ensure that a much wider use of the databank is achieved, two actions should be taken:

i) most of the information in the system (for example all data which is older than five years) should be declassified to research organisations in the EU and EFTA countries. The confidential data has, to a large extent, been generated in the COST framework and other European programmes with financial contributions from the national governments anyway;

ii) the Institute should participate in European programmes like the European Collaborative Creep Committee where valuable use of the data can be found.

Data banks are not in general commercially viable and often contain confidential and restricted data. The JRC, with its central and neutral position, is in an ideal position to develop and supervise this type of data base which is indeed closely connected to the Institute's research.

A number of new data bases appear to be needed, not only to handle data like the HTM Data Bank, but also to be a source of constitutive equations. There is considerable need to be found for this type of database in thermal fatigue research. To save time and avoid duplication of studies, such a databank could preferably be set up as a network in the sense that participating institutes have their own data banks which they fill with data and this data is then exchanged between the partners to create a true European system. This approach has successfully been utilised for Thermodata Europe.

IV. Prenormative Research

The Institute should develop further prenormative research. Although not at the cutting-edge of science and technology, this type of research ensures that results can really be used in practice. Work should be concentrated in areas where there is a realistic prospect of application. In this respect, the proposed European Prenormative Research Associations (EPRA) and EPRA-M (for Materials) could prove to be a realistic means of assessing European requirements in this kind or research and providing a suitable forum. The Institute has demonstrated its possibilities in this area and this will hopefully lead to appropriate and usable standards. Such work can best be pursued as an international exercise and the Institute, by its nature, is highly suited to such activities. The Institute should be encouraged to have a coordinating role in the development of materials standards in Europe, working closely with national standards laboratories. Work in this area has to be considered of high importance when comparing the situation in Europe with that in the U.S.A., or even increasing prenormative efforts in Japan.

V. Exploratory Research

The Visiting Group was impressed by and strongly supports the exploratory research programmes of the Institute. The Group considers exploratory research to be an important means of stimulating scientists to feed new

ideas into mainline activities and to explore alternative approaches and new techniques suitable for application within the Institute.

Such activities should be frequently reviewed and either transferred to mainline research or terminated. To emphasise its exploratory character, it is expected that many projects would be terminated at an early date to make room for more promising ideas, only the best being retained.

VI. Networking

The Visiting Group was pleased to see a positive attitude to networking in the Institute. In its main fields, the Institute could consider itself to be the natural leader (due to its competence) of networks, but it should be realised that at present, when research funding is limited, resources would have to be provided by the Commission. In that respect, access to compete in Framework Programme Shared Cost Actions might be handled on a collaborative level with other research units, thus forming the basis of a network. In addition, if the Institute was a full partner in BRITE/EURAM programmes it would greatly strengthen collaboration between the Institute and leading laboratories in the Member States.

Members of the Group pointed out that exchanges should be two-way and that mobility must be expected from JRC staff as well as from their partners. This would be of great benefit for knowledge transfer and acquiring and passing-on new laboratory techniques. Visits should include established scientists which would further increase the Institute's visibility in the outside world.

The possibility of PhD students dividing their time more equally between the JRC and their universities should be examined (six months in each per year). JRC staff could aid in the setting-up of materials laboratories elsewhere in Member States.

VII. Publications

The Group was pleased to see a good level of 43 articles published in appropriate international scientific journals during the year, and favourably impressed by the level of 52 papers contributed to international conferences of which 15 were invited. These figures demonstrate the interest shown in the Institute's work in the international arena. There were also some 22 articles in European journals and 28 papers to European conferences.

VIII. Future Scientific Trends

The Visiting Group strongly agreed with the Director's plan for the Institute that interfaces in materials should be the major theme. The structure and properties of interfaces are critical to the performance of a wide range of materials, particularly high temperature materials, and interfaces are not well understood.

IX. Management

The Institute was well managed, with scientific staff enthusiastic and spending a high proportion of their time on scientific and technical tasks.

The systematic use of workshops in assessing new possibilities and the follow up audits of activities was shown to be effective. However, the Institute should not be overburdened with irrelevant committees and in that connection Members of the Group did not feel that the local Scientific Committee served any useful purpose. Scientific or managerial advice could be better obtained from academic and industrial scientists of requisite experience and from proven managerial experts.

Ideas from staff members would seem to be adequately catered for by the possibilities opened by exploratory research activities.

The ratio of support staff to scientists was felt to be rather high in comparison with universities and many industrial laboratories.

The transfer of responsibility to local Directors was recognised and encouraged. In that respect, maximum transparency of overall budget and staff matters was essential. However, much was to be desired in the recruitment of staff which appeared too slow and rigid for a scientific institute.

In view of the relatively high man/year costs, the Institute must concentrate on its core activities where its exceptional results were vital to a successful reaction from potential clients and scientific collaborators.

X. Recommendations

- The Director should be given more managerial responsibility, particularly in staff appointments.
- The Institute should move towards a "core plus competitive" funding model.
- The Institute should aim at obtaining 10% of its funding from external contract work from industry over the next few years.
- The Institute should be allowed to participate fully in Framework Programme schemes such as BRITE/EURAM. It should obtain about 20% of its funding competitively from such schemes over the next few years.
- Work on advanced high temperature materials should continue as the main core activity.
- An applied mechanics expert should be added to the team.
- Transfer of non-destructive testing staff from Ispra to Petten should be completed without delay.
- Surface modification work needs clearer alignment towards industrial needs.

- Computer modelling should be increased where appropriate and maximum use made of networking with other organisations to meet these needs.

- A programme of exchanges of scientists with other organisations should be set up. JRC staff should be included in exchanges.

- The prenormative area should be developed as a typical JRC activity.

- The JRC should be source of impartial advice and expertise on materials standards.
- Publication in the most respected scientific journals should be encouraged.

- An early decision should be taken on the future of the Cyclotron.

- Open access data bases should be set up where possible.

- The long-term research plan of interfaces in materials is a highly suitable path for the Institute to follow.

Visiting Group to the Joint Research Institute for Advanced Materials (IAM-Mat) - Ispra and Petten

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Annex II

Visiting Group for the Evaluation of the Joint Research Centre's Institute for Advanced Materials (IAM) - Petten and Ispra

Scope of Visiting Groups

The chief scope of Visiting Groups is to perform evaluations, taking into account the objectives as set out for the 1992-1994 period (in Council documents, relevant papers for the Board of Governors, JRC Annual Workschedules, budget, etc.), to provide recommendations on the proper course to be followed by the Institute visited in view of the stated objectives, and to apply in the evaluations, elements of the methodology proposed for research returns and effectiveness.

The Visiting Group should:

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- judge all aspects of the efficiency and impact of the work, taking into account the particular status of the JRC (its independence in the Community) in comparison with similar national laboratories;
- provide advice on the ongoing work on the basis of the evaluations and assessments performed;
- express recommendations for the future development of the Institute with regard to the overall strategic plans for development of the JRC in the medium-term and long-term.

Terms of Reference

1. To evaluate progress in performing work in accordance with the objectives set out in Council Resolution 92/C118/03 and Council Decisions 92/273/EEC, 92/274/Euratom and 92/275/Euratom, documents addressed to the Board of Governors, the JRC's Annual Workschedules, budget etc., and to review progress in the implementation of the recommendations of the last Evaluation Panel.

2. To ensure that the Institute has effective mechanisms to set its local scientific objectives, monitor progress towards those objectives and evaluate outputs.

3. To review the various research activities to assess:

   a) the scientific quality and productivity of the Institute;

   b) whether full advantage is being taken of scientific opportunities in the light of funding and other constraints;

   c) the relevance of the work with respect to Community needs, including the relevance of work performed for external customers, when applicable.

4. To assess the effectiveness of the scientific management leadership within the Institute.

5. To advise on whether the Institute has been making efficient, effective and economical use of resources in carrying out its programmes and management functions. Resources include manpower, money, services, facilities, data and equipment.

6. To review the extent and effectiveness of the Institute's external scientific links, including relationships with research organisations, the higher education sector, industry and government departments in the Member States, as well as outside the European Community.

7. To examine the relationship of the Institute's work in general, to the mission of the Joint Research Centre and to its forward strategic planning.

8. To make recommendations and report to the Board of Governors of the Joint Research Centre.

Harwell, 15.11.93

REPORT OF

VISITING GROUP FOR THE EVALUATION OF THE HIGH FLUX REACTOR AT THE JOINT RESEARCH CENTRE'S INSTITUTE FOR ADVANCED MATERIAL (PETTEN)

SUMMARY

The HFR (Petten) is being managed and operated in a competent and professional manner. The main research programmes using the HFR are likely to decline significantly. The JRC management should produce a future strategy for the HFR in collaboration with the sponsors/customers

CONTENTS

VISITING GROUP FOR THE EVALUATION OF THE HIGH FLUX REACTOR AT THE JOINT RESEARCH CENTRE'S INSTITUTE FOR ADVANCED MATERIAL (PETTEN)

I INTRODUCTION

At the invitation of the Board of Governors, JRC, the Visiting Group (for membership see Appendix 1) attended the Institute for Advanced Materials - High Flux Reactor for a number of days during June/July 1993. In total, some 15 man days were expended on the visit.

In that time, a wide range of technical and scientific topics were covered and therefore it must be recognised that comments, conclusions and recommendations from the Visiting Group are made as general supporting, constructive advice rather than specific criticisms of the operations.

The specific scientific and technical objectives for the High Flux Reactor (HFR) are given in Annex 1 to the Council Decision No 92/275/Euratom of 29 April 1992. The principal objectives are:

1 The safe operation of the HFR in Petten. This comprises routine operation of the facility for more than 250 days/year, fuel cycle management and safety and quality management.

2 Efficient utilisation of the reactor in a wide scope of topical sectors: irradiation testing of materials for fission reactors, as well as for future thermonuclear fusion reactors, neutron applications to solid state physics and materials sciences investigations, radioisotope production and related activities, neutron radiography as a non-destructive testing method, and treatment of certain types of cancer with neutrons (BORON Neutron Capture Therapy) and related research.

The more general objectives are concurrent with the Joint Research Centre's (JRC) mission and are highlighted in the scope for the Visiting Groups. The Visiting Group should:

- perform an evaluation of all activities of the Unit against its stated objectives, with particular emphasis on the impact the results of the work has had on the users of this research, and the degree of collaboration established with national research laboratories, as well as with industry;
- assess the scientific quality of the work and the appropriateness of the work and results for the Community;
- judge all aspects of the efficiency and impact of the work, taking into account the particular status of the JRC (its independence in the Community) in comparison with similar national laboratories;

- provide advice on the ongoing work on the basis of the evaluations and assessments performed;

- express recommendations for the future development of the Unit with regard to the overall strategic plans for development of the JRC in the medium-term and long-term.

This report will be organised following the order set out in the Terms of Reference (see Appendix 2) with the Group's recommendations for each point summarised under 'Conclusions'.

II WORK IN ACCORDANCE WITH OBJECTIVES

- The HFR is operated in a safe manner with due attention to safety and quality management. It is operated with a high degree of availability for about 265 days per year with very few unforeseen shutdowns.

- The 'Work and Action Plan' for quality assurance is being implemented at an adequate pace with all essential elements completed and regular reviews of the ongoing activities which follow from the plan.

- The fuel cycle, being dependent on the United States (US), is not currently closed due to the ongoing review of the US' fuel policy.

- Spent fuel elements are stored on the site which has adequate facilities for storage (these can also be increased in increments) for the short and medium term.

- The HFR uses High Enriched Uranium (HEU) fuel and has adequate suppliers for this type of fuel in the medium-term. The technical and economical implications of an eventual conversion to Low Enriched Uranium is being reviewed at present and so far it appears to be technically feasible. The decision to change from HEU to LEU remains a predominantly political one.

- Particular attention was paid to the condition of the plant and its situation vis-a-vis its operational safety. The HFR is found to conform to the requirements of the Netherlands Kernfysische Dienst (KFD), the safety authority concerned. At the same time, a programme of continuous upgrading is pursued to take advantage of technological progress and to conform to the latest evolutions in good practice.

CONCLUSIONS

- The HFR meets the first principal objective.

- The HFR is a multi-purpose Oak Ridge Research-type (ORR-type) light water reactor having a potential use for a wide range of sectors. It has been utilised in all the areas mentioned in the second principal objective.

- As far as the operational efforts are concerned, there has been an efficient utilisation to the satisfaction of the 'customers'.

- The utilisation is dominated by 'customer-controlled' programmes with little overlap and collaboration with JRC programmes, but adequately supported by the HFR Division of the JRC.

- Therefore, the responsibility for the scientific quality and rate of progress for the programmes utilising the HFR lies mainly with the 'customers'.

III EFFICIENCY

The Visiting Group was able to interview representatives from user organisations.

NETHERLANDS

- Netherlands' users provided most of their own design and manufacturing services for their own experiments. They also assured day-to-day operation of the reactor under contract and were therefore naturally disposed to comment favourably on efficiency.

- It was felt that the Netherlands had received a fair share of the available positions up to the present. However, there was now felt to be some over-capacity, particulary with beam-tube utilisation where the facilities were no longer of international standard and could be closed without serious loss of scientific impact, nevertheless, such work is actively pursued elsewhere in the Netherlands and future requirements should be carefully checked.

GERMANY

- German project leaders from both KFA Jülich and KFK Karlsruhe were present and irradiation programmes concerning light water reactors, high temperature gas-cooled reactors, fast reactors and thermonuclear fusion R&D were discussed.

- All claimed that the service received from Petten staff was outstanding and the HFR highly suitable in its technical characteristics, in its reliability and in the large number of irradiation days per year. Petten engineers participated in project planning and final reporting.

- Unfortunately, due to reductions in government sponsorship, work on fast reactors would be reduced to a small collaborative programme with Cadarache with perhaps two core and one peripheral position in use in the HFR. This continuation was partly due to the unique facility which allowed tests on fuel previously irradiated in Phenix.

- A similar situation existed for HTR projects, where almost no work would be continued. There might still be occasional irradiations on steel and special coatings, but these would not be on a constant basis.

- Concerning light water reactor (LWR) fuel irradiations, the very flexible poolside facility and the ability to employ it for testing power reactor fuels already burned up in power plants would continue to provide some work. It was envisaged to use about three poolside facility positions in the future.

- In the absence of a dedicated 14 MeV neutron source for fusion materials R&D, the HFR was still making valuable contributions in a variety of irradiation projects concerned with 'first wall' materials, breeder materials and in the future some component testing. Complementary work would also be performed in fast reactors. Both types of reactor were needed for irradiation tests by the Fusion Programme at the present time.

- A dip in programme funding was expected in the near future, followed by a later extension to new materials and perhaps components.

- Overall, a reduction in present German activities by at least fifty per cent was indicated.

COMMUNITY

- The Community Fusion Programme also planned to operate a modest programme of materials irradiations on a regular basis to measure creep and other mechanical properties in low activation structural materials. Irradiations on Tritium permeation through breeder blanket component materials were also performed. The size of these programmes was only limited by available funds.

- The JRC's Institute for Transuranium Elements at Karlsruhe hope to begin some collaborative irradiations in a network with CEA and ECN beginning in 1995.

OTHER COUNTRIES

- Apart from Netherlands and Germany, little scientific work or scientists use the HFR. As a Community facility there is a need to encourage wider use of HFR for research and scientific training.

RADIOISOTOPES

- The primary use to which the reactor had been put was materials testing. However, isotope production for medical and industrial purposes has been a 'by-product' of HFR exploitation from the beginning. The Visiting Group received strong signals of increasing interest in these possibilities from representatives of European isotope manufacturers.

  They expected to use up to thirty per cent of the reactor capacity, and realised that in so doing, a commercial price would have to be paid for neutrons. This would

imply an increase in the cost of the final product and such a change in policy could only be introduced to the market at a reasonable rate.

However, with a decline in the materials irradiations' contribution to reactor costs, isotope production could no longer be considered as a by-product of materials testing and a normal tariff would have to be applied.

On the other hand, although the reactor was suitable technically and production facilities were available, a more commercial attitude would have to be adopted by both management and staff if industrial-scale production was attempted. Importance should be given to ensuring maximum compatibility between materials testing schedules and isotope production, taking into account operating schedules of other European reactors producing medical isotopes. A considerably increased demand was foreseen in the future.

BNCT

- Boron Neutron Capture Therapy (BNCT) was being developed at Petten and if successful, could provide facilities to treat patients, initially with gliomas and later perhaps with a number of other intractable tumours. This could provide an important task for the reactor until other more convenient special purpose facilities could be developed.

CONCLUSIONS

- The competence of the staff and the capability of performing difficult irradiation studies using sophisticated techniques is recognised by the clientele.
- The requirements for irradiations from the European nuclear power industry have dwindled and a reorientation of strategy is badly needed.
- An ability to respond more directly to commercial needs might be advantageous.

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IV OVERALL CONCLUSIONS

1 To date, the operation of the HFR has been carried out in a satisfactory manner with:

- high technological standards;
- good operational performance;
- high degree of customer satisfaction;
- excellent safety record.

2 The JRC-HFR operation has been input-driven with no incentive to cut the cost of the operation.

3 Utilisation to date has mainly focused on programmes originating in the sponsoring countries both of which signal declining needs for the forthcoming programme period. Only a small part of the utilisation has been on a Community basis.

4 The Fourth Framework Programme proposal, as already discussed in the Council, does not indicate an increased Community need.

5 The HFR is facing a rapidly changing situation:

- some German programmes have ceased, some are declining;
- the Fourth Framework Programme proposal foresees further reduction in the nuclear area (fission);
- the needs of the future fusion programme have not been clarified at this stage;
- the beam research at the HFR is no longer supported by the ECN and the possibility of a complete closing down of such research must be foreseen;
- the demand for radioisotopes is rising, however, the situation of NTD silicon is uncertain and there seems to be limited additional European industrial need;
- BNCT project is promising but is still at a speculative stage as a basis for a potential customer programme.

6 All of the above means that the overall use will fall unless vigorous actions are taken to bring in new customers.

7 The HFR operation has been demand-driven with management focus on operations, safety and technological improvements.

8 There is a need for an output oriented strategy to ensure the continued efficient utilisation of the HFR and its facilities.

9 The strategy should identify the future core-customer base and the optimal organisation structure.

10 The core customer base could be:

- the fusion programme - well-established European programme;
- production of radioisotopes - catering to European industry on a commercial basis;

- a fission programme concerning the fuel cycle and nuclear safety - transition from national programmes to a Community-based programme.
- BNCT - a European project with perspectives for a public service medical programme.

11 The pursuit of these diverse needs and opportunities in a successful manner requires proactive planning and constructive interactions between the HFR management and the customers.

12 The organisation must be adapted to customer requirements with clearly defined responsibilities for developing each of the core business areas.

13 An output-oriented approach will require sustained attention to cost-effectiveness.

14 If vigorous actions are taken now, a smooth transition from the present input-driven programme (1992-1995), to a new output-oriented programme for the next multiannual period could be achieved.

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V RECOMMENDATIONS

1 As owner of the facility, the Commission should actively pursue the identification of future requirements for the HFR.

2 JRC management should generate a draft strategy (result - and output - oriented) for the HFR in collaboration with the customers.

3 Aim to achieve consensus from sponsors on the above strategy as a basis for a new multiannual programme.

4 On the basis of the above, decide optimal organisation structure and modus operandi to implement strategy.

5 Clearly identify responsibility for implementation of the strategy.

6 The fuel cycle liabilities must be covered financially.

7 The issue of responsibility for funding decommissioning must be resolved.

8 In view of increasing commercial usage of the HFR reactor, there is a need to develop a more autonomous financial and management structure to become output-oriented.

9 A vigorous and lateral approach needs to be taken to review all aspects of the cost structure.

The Visiting Group are indebted to Professor E Hondros, and the JRC Directorate at Petten, the ECN HFR staff who provided the detailed information and guided tours around HFR, and the customers who were willing to come to Petten to be interviewed by the Visiting Group.

Appendix I

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Appendix II

TERMS OF REFERENCE

1. To evaluate progress in performing work in accordance with the objectives set out in Council Resolution 92/C118/03 and Council Decisions 92/273/EEC, 92/274/Euratom and 92/275/Euratom, documents addressed to the Board of Governors, the JRC's Annual Work Schedules, budget etc, and to review progress in the implementation of the recommendations of the last Evaluation Panel.

2. To ensure that the Institute/Unit has effective mechanisms to set its local scientific objectives, monitor progress towards those objectives and evaluate outputs.

3. To review the various research activities to assess:

   a) the scientific quality and productivity of the Unit/Institute;

   b) whether full advantage is being taken of scientific opportunities in the light of funding and other constraints;

   c) the relevance of the work with respect to Community needs, including the relevance of work performed for external customers, when applicable.

4. To assess the effectiveness of the scientific management leadership within the Institute/Unit.

5. To advise on whether the Institute/Unit has been making efficient, effective and economical use of resources in carrying out its programmes and management functions. Resources include manpower, money, services, facilities, data and equipment.

6. To review the extent and effectiveness of the Institute's/Unit's external scientific links, including relationships with research organisations, the higher education sector, industry and government departments in the Member States, as well as outside the European Community.

7. To examine the relationship of the Institute's/Unit's work in general, to the mission of the Joint Research Centre and to its forward strategic planning.

8. To make recommendations and report to the Board of Governors of the Joint Research Centre.

Roskilde, 14th June 1994

REPORT OF THE VISITING GROUP

FOR THE EVALUATION OF THE

JOINT RESEARCH CENTRE'S

INSTITUTE FOR

TRANSURANIUM ELEMENTS

CONTENTS

14 June 1994

REPORT OF THE GROUP FOR THE EVALUATION OF THE JOINT RESEARCH CENTRE'S INSTITUTE FOR TRANSURANIUM ELEMENTS (ITE) IN KARLSRUHE

I. INTRODUCTION

A group of scientists experienced in various aspects of nuclear fuel and actinide research and development (R & D) was invited by the Board of Governors of the Joint Research Centre (JRC) to evaluate the work of the JRC's Institute for Transuranium Elements (ITE) in Karlsruhe. Members (see Annex I) visited the Institute on 21 and 22 February and assessed the Institute and its activities on the basis of the Terms of References set out in Annex II.

The visit comprised a presentation of the Institute and its programmes by the Director and presentations by senior scientists on the following activities:

- nuclear fuel safety;
- spent fuel characterization;
- nuclear chemistry;
- basic actinide research.

Discussions were held with staff responsible for organization, finance and management of the institute, future scientific perspectives were examined and a number of laboratories were visited.

Finally, members of the Group were able to meet representatives from clients for whom third party contracts are being performed (e.g. Siemens and Alpha-Medical (AKZO).

II ACTIVITIES AT ITE

The Institute's programmes and projects during the 1990-1994 programme period are distributed as follows:

- Specific Programmes

  - Basic Safety Research on Nuclear Fuels
  - Safety Aspects of Fuel Operation and Handling
  - Actinide Determination and Recycling
  - Characterization of Waste Forms and High Burn-up Fuel
  - Actinide Research

- Exploratory Research

  - Acoustic Aerosol Scavenging with Ultra and Infrasound
  - Study of Advanced Fuel Cycles
  - Thermal Imaging of Irradiated Fuel Rod Sections

- Scientific - Technical Support to Community Policies

  - Development and Testing Methods; Execution of Safeguards Analysis;
  - Installation and Operation of On-Site Laboratories for Safeguards Analyses

- Work for Third Parties (major contracts)

  - Post Irradiation Examination of LWR fuel rods
  - Post Irradiation Examination PHEBUS
  - Interaction Fuel-Cladding
  - Preparation, Irradiation and PIE of Minor Actinide Containing Fuels
  - Fuel Analysis and Characterization
  - Preparation of Radionucleides for Therapeutical Application

III SPECIFIC PROGRAMMES

These areas comprise work performed under the Third Framework Programme and they are part of the following JRC-programmes:

- Reactor safety
- Radioactive waste management
- Actinides in nuclear fuel cycle safety

The specific programmes of the Institute as a whole depend on its expertise and equipment in the field of transuranium elements, especially the actinides. Although the specific programmes cover quite a large scientific and technical area a common feature is the highly specialized hot cells sealed against escape of alpha particle contamination and shielded against high energy gamma radiation. These very expensive installations in combination with the experienced staff give the Institute a unique position in European and international nuclear research. This position is recognized worldwide and should be maintained even if the interest in nuclear energy at present is declining in Europe. This recommendation is based on the merit of a number of individual research programmes which will be described shortly in the following.

1. Basic safety research in nuclear fuels covers a number of projects mainly concerned with fuels for light water reactors (LWR's). In parallel to experimental studies a fuel performance code TRANSURANUS is developed and validated. This work is important in the light of the many LWR's operating in Europe as it ensures continuity in European research on both basic and applied problems

with impact on safety and economy. The activities within this programme related to a number of projects carried out for third parties, especially the post irradiation examination (PIE) work. However, due to commercial restrictions the research activities cannot fully benefit from the results from such PIE work. This has a drawback and a solution should be sought when future contracts are negotiated.

2. Safety aspects of fuel operation and handling deal with investigations of advanced fuels and with transport and dispersion of radioactive aerosol particles in nuclear facilities. Individual projects within this programme have important safety aspects for different parts of the fuel cycle. However, the overall objective of this programme could be defined more stringently.

3. Actinide Determination and recycling activities are mainly concerned with the transmutation of long lived nuclear waste constituents (minor actinides) into shorter-lived fission products. This programme is an excellent example of the special expertise of the Institute being applied to a problem of high relevance to society in dealing with waste from past and present nuclear facilities. It is also within this area that the work for third parties has been economically most successful.

4. Characterization of waste forms and of high burn-up fuel covers efforts to model the consequences of water intrusion into an underground fuel deposit. As is the case for programme III 3 this programme aims at reducing the risk of storing nuclear waste. It is a good example of the uniqueness of the Institute in combining specialized experimental work with high level theoretical work including computer modelling.

5. Actinide research covers basic research of the physical and chemical properties of the actinide group of elements. Within this area the Institute has an internationally acknowledged expertise both theoretically and experimentally. These in-depth studies of actinides are important to extend our knowledge of this important group of materials but the research is also necessary to understand a number of technological problems related to the fuel cycle. This research on actinides should be continued but its uniqueness in the European framework could be more emphasized. One possibility is to promote the facilities and expertise as a European laboratory of excellence open for scientists from the member states in parallel to laboratories and installations participating in EU's Large Installation Programme (LIP). It is realized that such a status as a user-oriented facility will require extra resources, especially new staff. However, in all cases a consideration of the staff situation in this area is urgent in order to ensure continuity as senior staff is now near retirement.

IV WORK FOR COMMISSION SERVICES

The safeguarding of nuclear materials is an important task of the Commission (DG I and DG XVII) and of the International Atomic Energy Agency (IAEA). The

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Institute is able to contribute effectively to this important task. The Institute's chemical expertise is exploited in specialized chemical analyses of samples taken from nuclear installations by safeguards inspectors. An automated in-cell analytical machine has been developed at ITE to improve accuracy and convenience and has been widely adopted elsewhere.

As a further development of this service, the Institute is providing analytical on-site laboratories at Sellafield and Cap la Hague which will perform the bulk of these analysis.

In the area of nuclear safeguarding in Europe the Group must point to the essential part now being played by the Institute, its success being attributed to its expertise in a number of disciplines.

V WORK FOR THIRD PARTIES

The group applauded the Institute' success in winning contracts - some of them of very long duration. From 1990 up to the end of January 1994 orders have been placed for work worth about 18 MECU. In total 23 contracts have been received and it is noticed that two large contracts received in 1990 and 1991 amount to 85% of the total contract volume. The remaining 21 contracts are all below 0.5 MECU with an average about 0.1 MECU. In the period 1992 - 1994 (per 15/2) the Institute has received 18 contracts amounting to about 2 MECU. About 60% of this volume (9 contracts) falls within the area of nuclear chemistry.

The discussion of the relationships behind the Institute and its clients included two interviews summarized in the following:

- A representative from Siemens (Dr. Manzel) was appreciative of the Institute's activities under contract on high burn-up fuels for LWR's. Siemens' hot cells had been closed some years previously and the transfer of work to ITE has proved to be very satisfactory. Client/contractor relations were excellent and at present it was expected that the association would continue in future. The Institute's staff, equipment and service provided were felt to be excellent in quality and administrative procedures relatively light. Scientific collaboration with the staff of the Institute worked well in certain areas, whereas other fields, for example fuel performance code activities were excluded for proprietary reasons.

- A representative of Alpha Medical (Dr. Geerlings) was also appreciative of the Institute's work on a contract concerning the separation of certain radioactive actinide isotopes in the production of a radiopharmaceutical agent for the treatment of certain cancers. The Institute's skills and installations were being used to develop suitable separation chemistry and Alpha Medical hoped to launch clinical trials in some months in collaboration with an institute in New York.

The group discussed in general the Institute's work for third parties and noted that the contracts received fitted well with the core programmes, thus in many cases a synergetic effect can be expected. The Group was also pleased to see the facilities of the Institute being applied on projects of commercial interest. It was realized that in such cases full openness of the work cannot be expected, but it was emphasized that results from third party work, whenever possible, should be made available for the Institute's own research possibly with certain restrictions on publication.

VI EXPLORATORY RESEARCH

The Visiting Group welcomes the 5 - 6% exploratory research carried out at the Institute. This was seen both as a means of exploring possible new areas of activity for the Institute and of trying out ideas for later incorporation into core activities.

However, attention is drawn to acoustic agglomeration techniques which have been subject for some years of repeated studies covering various possible methods or applications. When a technique or discovery is proven by an exploratory activity, it should either be exploited by commercial development or, if of a suitable nature, incorporated into the mainstream of the Institute's scientific activities. This will then release funds for new exploratory research which should not be pursued further than proof of the principle.

The group discussed specifically the project "Evaluation of Potentialities of Alternative Fuel Cycles" and it was felt that this activity at present should be limited to theoretical work and should not include planning of irradiation experiments. The reason for this recommendation by the group is the lack of European accord on the problems proposed to be investigated.

VII COLLABORATION

The group acknowledged the widespread international collaboration in practically all research areas of the Institute. The group was, however, surprised to learn about the very limited exchange of scientists taking place for longer periods between the Institute and its collaborators.

VIII ORGANIZATIONAL MATTERS

1. The group inquired about the Institute's organization vis a vis the administrative structure of the JRC. Of special interest to the Group was the technical and administrative responsibilities on the different levels at the Institute. The Director explained how the system worked which was more or less according to tradition as detailed written procedures had not been worked out. The group did not pursue this point but suggests it for

future consideration.

2. In order to evaluate the activities of the Institute against its stated objectives the Group asked for a description of such objectives. Such a description was given verbally by the Director but written documentation was not available. It is, however, the general impression that overall objectives are adhered to in the various programmes. However, the lack of well-defined written objectives makes it impossible for the group in more detail to evaluate activities against objectives.

3. The project/programme management system at the Institute appears to operate effectively and to make good use of the time available on the various installations. Also the general administration at the Institute appears to be satisfactory. In general, the Group noted that the organization of the Institute in units with almost a constant number of staff over the years may lead to a too rigid planning and some lack of freedom in the formulation of new projects.

4. The staff situation was discussed and the Group expressed its concern at the age structure of the institute. Much of the Institute's experience and expertise is concentrated in staff in charge of units and laboratories who will be retiring in the relatively near future. Future planning would have to take into account the need to transfer knowledge and know-how to successors who would have to be chosen well in advance. Recruitment to the JRC presents many difficulties, both in the selection system used in the Commission (difficulties in the specification of requirements) and in the length of the process. A positive trend has been the increase in post doctoral fellows which has increased from 2 in 1991 to 17 in 1994, mainly sponsored by the Mobility Programme. This was considered highly satisfactory as young scientists now can qualify and hopefully present themselves as candidates for future positions at the Institute.

IX OUTPUT

The number of articles published in scientific journals increased from 35 in 1990 to 40 in 1993, together with a similar trend in contributions to conferences which increased from 72 to 106 respectively. This is considered to be a good output of high scientific quality for such an institute considering that much of its product is issued in the form of data, analytical results, etc.

X RECOMMENDATIONS

1. The application of present and future knowledge and expertise existing at ITE to the problems of the safe management of nuclear energy, particularly in dealing with the sensitive area of nuclear waste is an important objective. This mission will remain of high significance in the

foreseeable future for Union Member States, whatever the outcome of debates on the use of nuclear fission energy and must remain the focus of development at the Institute. In such development nuclear chemistry appears to be an important growth area contributing to a large number of research projects.

2. In view of the continuing need for research and information on the actinide elements and their behaviour, together with the very restricted number of institutes where such work can be carried out, the Group strongly recommends that efforts be made to continue and develop the ITE core activities with emphasis on the basic understanding of actinide chemistry and physics. To accomplish this task effectively it is essential that the level of staff excellence is maintained. It is suggested that facilities and staff within this area are expanded in order to establish a "user facility" for European scientists similar to those within the "Large Installation Programme".

3. Work in support of other DGs is clearly an essential role of the JRC and the Institute, as its specialists can provide important help in a number of areas. The Group welcomes the use made of the ITE by DG I (IAEA) and DG XVII (Euratom) for the analysis (both on-site and in the Institute) of samples taken by safeguards' inspectors from nuclear plant and facilities. The contribution by the Institute is very considerable and must continue.

4. Making available services and facilities to the outside world under contracts is an important aspect of the Institute's activities and is to be strongly encouraged. At present this activity is on a satisfactory level but a certain increase should be planned for taking the following points into consideration: (i) The work for third parties should as far as possible support the Institute's own research and the results should be made open at least to the scientists at the Institute for their own use. (ii) In the promotion of work for third parties it must be assured that the staff distribution at the Institute is so flexible that successful units can get the necessary support. (iii) The amount of contract work should not be allowed to increase to a level where core activities might be jeopardized.

5. Attention should be focused on exploratory research to make certain that it really is "exploratory" in nature rather than repetitive and where possible, points to potential new developments in the Institute's core activities in science and technology. New work on alternate fuel cycles is not encouraged as it does not appear to fulfil the above requirements.

6. The project/programme management system appears to operate efficiently and to make good use of the time available on the various installations. However, the manpower distribution into units of almost constant size over the years appears to be too rigid both in establishing new research priorities and in promoting work for third parties.

7. Serious consideration has to be given to ensuring that staff replacements will be of exceptional quality if the Institute is to maintain its position in the scientific world. The present system does not appear to be either adaptable enough nor rapid enough to meet that end and the exact specification of requirements for scientific posts must lie with the Institute rather than centrally.

8. If resources can be found, the fruits of the work at the Institute could be best disseminated by further increasing the numbers of post graduate and post doctoral fellows in the Institute. At present levels of scientific A staff, some 15 Postgraduates and 25 Post Doctoral fellows might be foreseen. In this connection the exchange for longer periods of scientists is encouraged to establish more firm and vivid contacts between the Institute and the universities and national laboratories with which it collaborates.

Annex I

Visiting Group to the Joint Research Centre's Institute for Transuranium Elements (ITE) - Karlsruhe

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Annex II

Visiting Group for the Evaluation of the Joint Research Centre's Institute for Transuranium Elements (ITE) - Karlsruhe

Scope of Visiting Groups

The chief scope of Visiting Groups is to perform evaluations, taking into account the objectives as set out for the 1992-1994 period (in Council documents, relevant papers for the Board of Governors, JRC Annual Workschedules, budget, etc.), to provide recommendations on the proper course to be followed by the Institute visited in view of the stated objectives, and to apply in the evaluations, elements of the methodology proposed for research returns and effectiveness.

The Visiting Group should:

- perform an evaluation of all activities of the Institute against its stated objectives, with particular emphasis on the impact the results of the work has had on the user of this research, and the degree of collaboration established with national research laboratories, as well as with industry;
- assess the scientific quality of the work and the appropriateness of the work and results for the Community;
- judge all aspects of the efficiency and impact of the work, taking into account the particular status of the JRC (its independence in the Community) in comparison with similar national laboratories;
- provide advice on the ongoing work on the basis of the evaluations and assessments performed;
- express recommendations for the future development of the Institute with regard to the overall strategic plans for development of the JRC in the medium-term and long-term.

Terms of Reference

1. To evaluate progress in performing work in accordance with the objectives set out in Council Resolution 92/C118/03 and Council Decisions 92/273/EEC, 92/274/Euratom and 92/275/Euratom, documents addressed to the Board of Governors, the JRC's Annual Workschedules, budget etc., and to review progress in the implementation of the recommendations of the last Evaluation Panel.

2. To ensure that the Institute has effective mechanisms to set its local scientific objectives, monitor progress towards those objectives and evaluate outputs.

3. To review the various research activities to assess:

   a) the scientific quality and productivity of the Institute;

   b) whether full advantage is being taken of scientific opportunities in the light of funding and other constraints;

   c) the relevance of the work with respect to Community needs, including the relevance of work performed for external customers, when applicable.

4. To assess the effectiveness of the scientific management leadership within the Institute.

5. To advise on whether the Institute has been making efficient, effective and economical use of resources in carrying out its programmes and management functions. Resources include manpower, money, services, facilities, data and equipment.

6. To review the extent and effectiveness of the Institute's external scientific links, including relationships with research organisations, the higher education sector, industry and government departments in the Member States, as well as outside the European Community.

7. To examine the relationship of the institute's work in general, to the mission of the Joint Research Centre and to its forward strategic planning.

8. To make recommendations and report to the Board of Governors of the Joint Research Centre.

London, 2nd December 1993

REPORT OF THE VISITING GROUP

FOR THE EVALUATION OF THE

JOINT RESEARCH CENTRE'S

INSTITUTE FOR SYSTEMS ENGINEERING

AND INFORMATICS

CONTENTS

Report of the Visiting Group for the Evaluation of the Joint Research Centre's Institute for Systems Engineering and Informatics, Ispra, Italy

I. Introduction

At the invitation of the Board of Governors of the Joint Research Centre (JRC), members of the Visiting Group (see Annex I) spent the week of 11-15 October 1993 at the Institute for Systems Engineering and Informatics (ISEI) at Ispra reviewing the Institute's work and visiting its laboratories.

The objectives for the Institute are to be found in the Technical Annex to the JRC Programme Proposal 1992-1994 (COM (91)281 final). These are:

"to be the European centre of excellence in the field of 'complex systems' engineering, focussing on the evaluation and development of methods addressing the safety, standards and performance of systems which involve industrial, social and environmental issues on a pan-European scale.

In particular, to take the broad 'systems approach' to the understanding of the human, societal and environmental implications of scientific, technological and industrial developments in order to provide technical advice for the balanced social and industrial development of European society.

The Institute for Systems Engineering and Informatics will shortly be launching new initiatives in the areas of Environmental Accident Management, Safety at Work and later, Safety Critical Computer Systems and a contribution to the proposed Centre for Earth Observation. This work will build on the Institute's existing strengths in systems engineering and informatics". (These initiatives have since been implemented.)

These general objectives are concurrent with the JRC's mission and are highlighted in the paper defining the scope of the Visiting Groups. As set out in the terms of reference (see Annex II), the Visiting Group should:

- evaluate all activities of the Institute against its stated objectives, with particular emphasis on the impact the results of the work has had on the users of this research, and the degree of collaboration established with national research organisations, as well as with industry;
- assess the scientific quality of the work and the appropriateness of the work and results for the Community;
- judge all aspects of the efficiency and impact of the work, taking into account the particular status of the JRC (its independence in the Community) in comparison with similar national bodies;
- provide advice on the ongoing work on the basis of the evaluations and assessments performed;
- express recommendations for the future development of the Institute with regard to the overall strategic plans for development of the JRC in the medium-term and long-term.

II. General Observations

For the purposes of this report, scientific and technical activities of the Institute are organised into four blocks following the scheme adopted for their presentation.

These are:

1. Environment Hazards, Industrial Environment;
2. Renewable Energies;
3. Nuclear Energy;
4. Information Technologies.

The Visiting Group recognises the five-part purpose of the Institute:

- to serve the European Community by performing work for Framework Programme specific activities;
- to render support to other Directorates General;
- to serve the JRC by providing informatics services and advice to Institutes and Headquarters;
- to perform work under contract for third parties, making available expertise and facilities to European industry;
- to carry out exploratory research in order to maintain scientific vitality in the Institute's staff and to develop tools for the future.

Members were impressed by the diligent dispatch of routine, albeit important, tasks by the Institute (for implementing the MARS project - Major Accident Reporting System - for example) but also noted considerable creative work (e.g. development of new measurement techniques for European Solar Testing Installation (ESTI) etc., and in techniques for non-intrusive surveillance).

Within the constraints of time, the Group applied three tests in reviewing each scientific and technical activity:

- *mission* - is the mission appropriate? Is it adequately described? Is it sound? Is it followed ?
- *transfer* - how well do relevant facts, skills and ideas travel upstream, downstream and between parallel bodies both within and without the JRC ? What are the products ?
- *quality* - is the work rigorous, fresh and relevant ? Is the value of results commensurate with resources consumed ? Are management methods appropriate ?

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III. Scientific and Technical Activities

III.1 Block 1 - Environment Hazards, Industrial Environment

The following activities are encompassed:

- industrial hazards (plant safety and reliability, safety critical computer systems);
- aircraft incident reporting system;
- working environment;
- accident prevention;
- reliability modelling of structures;
- industrial hazards (environmental planning);
- support to DG XI - Directorate General for Environment, Nuclear Safety and Civil Protection - (directives on major hazards, biotechnology, environmental impact assessment, civil protection);
- optical and holographic technologies applied to diagnostics and information processing;
- Centre for Earth Observation (CEO).

Comments

- The extension of techniques developed for the safe operation of nuclear plants (where this has been the norm), to complex installations in other industrialised activities was welcomed.

- Members of the group were pleased to note the efforts to take human factors into account when considering industrial safety. Psychology-sociology disciplines were used rigorously in association with physical science and engineering.

- In projects such as the FORMENTOR project (EUREKA project No. 19) and STARS (Software Tools for the Analysis of Reliability and Safety), the practical implications for the safe and economic operation of process plant were appreciated. The close interest shown by industry was noted (installation of a system by British Petroleum). Attention to the modification of plants over time would show benefits over the whole life of complex installations.

- Concerning the sub-project investigating stress among air traffic controllers, it was felt that such information might already be obtainable from Eurocontrol or the U.S. authorities, and that the study might only reinvent existing techniques. It was, however, sound to take this highly stressed working environment as a model for human stress in other working situations.

- The work on safety in complex systems and the interaction of human beings with such systems was considered to be useful in stimulating work outside the Institute and in supporting EC policy in the field. The concepts could well be extended to non-lethal systems such as funds transfer, trading and telecommunication applications.

- The studies on optical and holographic applications to non-intrusive surveillance of surfaces and solids were felt to be of high quality with valuable future applications still to be explored.

- Concerning the Centre for Earth Observation (CEO), the Group saw an important role for the JRC in converting the volume of currently unintelligible satellite data into user-friendly input for diverse applications. In analogy, thirsty people need help, if they are to drink from a fire hydrant. This role seems particularly appropriate to the JRC, which will be seen as neutral and unbiased by eventual users of the data.

III.2 Block 2 - Renewable Energies

This block comprises:

- photovoltaic systems;
- transfer of solar technology;
- thin film photovoltaic devices in buildings;
- solar energy and saving;
- solar regional programmes.

Comments

- The Visiting Group recognised the relevance of this work to developing the photovoltaic industry in Europe. It was impressed by the urgency created by close service contacts with numerous manufacturers, several with rapidly changing technologies. Response to requests for service and mastery of the techniques involved were impressive;

- knowledge of industrial costs and understanding state-of-the-art technology were essential to the success of these activities and for fruitful relations with industry;

- the expected accreditation of the ESTI laboratory to ISO 9000/CEN 29000 standards and the formal status of Calibration and Type Approval certificates for this leading-edge activity were welcomed;

- the Systems Analysis and Monitoring of Projects (ESAS) activity was found to provide important support to a range of DG XVII (Energy) policy actions and demonstrations. However, Members of the Visiting Group were not satisfied that the whole economic envelope was being addressed in the work on energy saving. Full, whole life economic consequences should be included in decision support systems if they are to be respected in the commercial world;

- norms and standards which reflect leading-edge technology were clearly crucial to the efficient working of the European market in photovoltaic and energy saving products and processes.

III.3 Block 3 - Nuclear Energy

This block comprises:

- fission safety;
- safeguards and fissile materials management;
  - nuclear safeguards support including collaboration with the IAEA;
  - instrument and data evaluation for nuclear safeguards, seals and tags;

- expert systems for energy auditing, reliability and risk evaluation;
- support to the harmonisation of nuclear safety for thermonuclear fusion;
- operational safety, accident analysis and environmental studies;
- neural networks for navigation of a teleoperated vehicle.

Comments

- Work on nuclear safeguards and safety of nuclear plants is a traditional JRC core function, operating in a highly disciplined environment. Research & Development is needed to meet new requirements and to improve established methods. The development of tamper-proof sealing bolts, upgrading of instruments and the introduction of advanced management techniques for fissile materials were noteworthy examples.

- In the interests of non-proliferation of military nuclear materials and their possible conversion to civil applications, it was felt that the JRC should also be allowed to contribute to aspects of nuclear safeguards relating to decommissioned military material.

- The further development of Probabilistic Safety Assessment (PSA) techniques in monitoring and controlling safety throughout the lifetime of nuclear plants was of clear importance.

- The Group was concerned that current informal project management would prove inadequate where a number of JRC Institutes located on several geographically separated sites are involved in connected programmes. The work on nuclear safeguards is a case in point.

- Work on safety standards and engineering codes of practice for fusion engineers was clearly important in supporting the practical implementation of a thermonuclear fusion reactor.

- The Community Fusion programme is fully integrated and tightly managed (led by DG XII), and the JRC's contribution of some twenty years standing is a small but important group of activities. The role of ISEI as a test and validation centre for robotic blanket handling devices, was felt to be appropriate to the Institute and should be preserved. The practical experience gained will no doubt influence design of fusion blanket elements in the ITER project.

III.4 Block 4 - Information Technologies

The Institute is required to provide informatics services to the JRC and to other Commission Directorates General, while its budget for exploratory research is minimal.

The in-house service function is in transition from a monopolistic main-frame-based computing centre to a distributed user-friendly network, with the Institute providing the communications backbone and some advice to the user Institutes.

- The Group became aware that some difficulties are arising in the necessary balance between freedom of choice by user Institutes and network integrity.

- Some network disciplines had to be universally recognised, in the interests of inter-operability and network security; the latter appeared to receive inadequate attention at present. The Unit should be responsible for:

  - network architecture at communication and data formatting levels;

  - evaluation of new tools, so as to advise researchers throughout the JRC on value for money and best practice;
  - Information Technology auditing and transfer of good practice throughout the JRC by training and other means.

However, Institutes should be encouraged to acquire freely informatics and advanced computing tools to meet their specific needs, drawing on experience elsewhere in their scientific fields where appropriate. The role of ISEI should be to encourage best practice, and maintain essential network discipline.

- The corporate informatics service has an important role to play in the long overdue reform of the infrastructural and administrative services (ADIN) so as to rationalise management and financial systems, and to make better use of available manpower.

- Several examples of excellence and innovation were observed, but more emphasis should be placed on fail-safe systems.

- Use should be encouraged of informatics packages and advanced computing tools developed outside the Institute.

IV. Management of Research

IV.1 Mission

- Objectives were found to be appropriate to the JRC and ISEI; however, they are rarely defined in the detail necessary for effective project control. (Exceptions are DG XVII and IAEA projects and DG XII fusion projects). Milestones are lacking and there appears to be little formal project management, except in some individual cases, often in response to external pressure.

- A clear need is evident for a JRC-defined project management system for pan-JRC programmes such as nuclear safeguards. Those projects where more than one Institute is required to contribute might better carry "JRC status". While one Institute might well be assigned the leadership role, it should be exercised on behalf of the JRC, with authority to manage project resources within defined limits.

IV.2 Transfer

- Problems were perceived at working level in promoting best practice across Institute boundaries. However, transfer both inward and outward with the rest of the JRC and the outside world was improving.

- In certain areas, the Institute remained introverted and more use should be made of external experience and tools, rather than solving problems from scratch.

- In areas such as FORMENTOR, the Fusion activities and ESTI, among others, great benefit was derived from contacts with industry, and several advanced techniques likely to be of value to industry existed in the Institute.

- Obviously, in the case of third party contract research, transfer was inherent.

IV.3 Quality

- While much of the technical work is routine, such activities are performed dutifully and to a good standard and level of expertise.

- Several areas of excellence demonstrate creative scientific and engineering work, for example:
  - ESTI;
  - holographics and optical systems;
  - robotics;
  - failure analysis (in fusion and elsewhere).

- Much of ISEI does not employ rigorous project management, with clear milestones,time schedules and control . Experience elsewhere shows that pressure for results generates peer pressure which allows little latitude to freeloaders.

IV.4 Areas of Concern

The Visiting Group identified a number of areas where improvements would lead to the better management and operation of ISEI. In some cases, problems arise from elsewhere in the JRC, and not infrequently from the requirements of the European Commission itself.

IV.4.1 ADIN: Administrative services at Ispra do not support management of the Institute effectively or economically.

- Overheads are excessive by external criteria; over 25% of manpower on the Ispra site is employed in administrative and infrastructural activities, including 22 managers and administrators in the Institute itself.

- Financial and budget information is complex and confusing.

- Overhead allocation and pricing rules are rigid and uncommercial.

- Personnel management practices are inflexible and slow in recruitment, appointment, promotion, transfer and dismissal of staff.

IV.4.2 Coordination within the JRC gave grounds for concern, as Institutes have accepted encouragement to act with more self-reliance. Where coordination is imposed by external clients, cooperation seems to be effective:

- In the safeguards project, management is only effective because the previous programme manager is still actively engaged. However, Fusion activities are well coordinated among the Institute for Advanced Materials (IAM) and the Institute for Safety Technology (IST) as well as ISEI.
- ISEI has problems at working level with the Institute for Remote Sensing Applications and the Environment Institute.
- where lead Institutes are identified, project management is hampered by the strict separation of Institute funds and by virement rules.

IV.4.3 Mechanisms for exerting scientific leadership were not impressive. There is a clear opportunity to foster improved transfer of scientific knowledge and the development of professional scientific and management skills. This could be encouraged by weekly seminars, on scientific subjects or organisation given by local staff or visitors. The Group was pleased to hear that seminars on project management had recently been held at ISEI.

- The local Scientific Committee is a staff representation body inappropriate for scientific leadership.
- There is patchy transfer of best practice, both into and out of the Institute.
- An undue proportion of students and grantholders in some ISEI projects, hampers continuity.
- Central library facilities at Ispra are inadequate with
  - fragmentation among many locations;
  - poor reference section;
  - inadequate information service.

IV.4.4 Ability to Compete: while ISEI clearly has scientific skills and knowledge of considerable commercial value, its ability to compete for research business is hampered.

- Current CEC rules prevent JRC Institutes from receiving any EC funds other than those specifically allocated to the JRC in the Framework Programme. This effectively prevents ISEI from collaborating in many European scientific programmes.
- Pricing rules are uncommercial: the value of intellectual property is largely ignored, and discounted exploratory work is precluded.
- Rigid staff and virement rules impair ability to man and fund project teams for third party work.
- There is an overwhelming concern for politics and procedures within the JRC.

V. Executive Summary

The Visiting Group was satisfied that the work undertaken by the Institute is appropriate to its functions, and generally of high quality. However objectives, while understood, were only rarely stated in a form that would allow effective project management - except where outside bodies had so stipulated. For those projects that required cooperation among Institutes, sometimes only informal means of coordination were apparent. It was felt that clear objectives and efficient project management would stimulate performance, generating peer pressure on individuals and improving value for money.

The Institute is clearly hampered in its work by the procedures and requirements stipulated by the European Commission. ISEI is not well served by the administrative infrastructure, and financial information is too complex for easy comprehension. Constraints on staff appointments, virement of funds between budget lines, and pricing, undoubtedly impair effective bidding for competitive business - and indeed operational control generally. The bar to receiving EC funds, other than those particularly allocated, prevents the Institute from participating in many Community projects to which it might well bring valuable skills. Paradoxically there is no such ban on receiving fees from third parties outside the European Community.

The informatics work of the Institute is not currently supported by research funds. However, the Visiting Group believes that ISEI has a valuable role to play in maintaining essential discipline in the JRC's communications network, and in promoting best practice in advanced computing and informatics techniques throughout the JRC. Some research funds should be allocated to enable these tasks to be carried out at the state of the art.

VI. Recommendations

VI.1 Infrastructure

- Information and reports to management should be reformed to meet operational needs. Fixed and variable costs for each project should, in particular, be regularly reported. Virement rules should be relaxed.

- The Director should have greater flexibility in selecting, appointing, promoting and removing scientific staff.

VI.2 Management

- Systematic project control should be applied throughout the Institute's work. Objectives should be stated in clear terms, and milestones set to mark progress, defining cost and time parameters.

- For projects involving more than one Institute, the Director General of the JRC should nominate a Project Manager within one engaged Institute, and assign appropriate powers to adjust personnel assignments and funds.

- Training in project management skills should be regularly provided, and be extended to all scientific staff.

- The Director should set in place mechanisms for stimulating scientific excellence, and disseminating best practice.

- Connections with other scientists working in parallel fields should be further stimulated.

- Involvement of industry in the Institute's work should be extended. Regular relationships - perhaps at the JRC level - with senior industrial scientists would help to form objectives, develop management skills and facilitate technology transfer.

VI.3 Informatics

- ISEI should be assigned authority for system architecture in JRC communication networks.

- ISEI should be encouraged to advise other JRC Institutes on "best practice" in advanced computing and informatics.

- The Director General of the JRC should require ISEI to audit from time to time, informatics and advanced computing applications throughout the JRC, against best practice standards.

VI.4 Competition

- ISEI should be further encouraged to secure third party work.

- The rules restraining the Institute - and indeed the JRC - from securing funds for participation in other CEC projects should be relaxed.

- The Institute should be encouraged to adopt commercial principles in bidding for third party contracts and managing such work.

Visiting Group to the Joint Research Centre's Institute for Systems Engineering and Informatics (ISEI) - Ispra

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Annex II

Visiting Group for the Evaluation of the Joint Research Centre's Institute for Systems Engineering and Informatics (ISEI) - Ispra

Scope of Visiting Groups

The chief scope of Visiting Groups is to perform evaluations, taking into account the objectives as set out for the 1992-1994 period (in Council documents, relevant papers for the Board of Governors, JRC Annual Workschedules, budget, etc.), to provide recommendations on the proper course to be followed by the Institute visited in view of the stated objectives, and to apply in the evaluations, elements of the methodology proposed for research returns and effectiveness.

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6. To review the extent and effectiveness of the Institute's external scientific links, including relationships with research organisations, the higher education sector, industry and government departments in the Member States, as well as outside the European Community.

7. To examine the relationship of the Institute's work in general, to the mission of the Joint Research Centre and to its forward strategic planning.

8. To make recommendations and report to the Board of Governors of the Joint Research Centre.

Aveiro, 22nd August 1994

REPORT OF THE VISITING GROUP

FOR THE EVALUATION OF THE

JOINT RESEARCH CENTRE'S

ENVIRONMENT INSTITUTE

CONTENTS

Report of the Visiting Group for the Evaluation of the Joint Research Centre's Environment Institute (EI), Ispra, Italy

I. Introduction

At the invitation of the Board of Governors of the Joint Research Centre (JRC), members of the Visiting Group (see Annex I) spent 26-28 April 1994 at the Environment Institute at Ispra reviewing the Institute's work and visiting its laboratories.

The objectives for the Institute are set out in Annex I of Council Decision 92/273/(EEC) of 29th April 1992 as follows:

"The objective is to provide a contribution to the scientific knowledge, technical know-how and data needed by the Community, in particular to carry out its role with regard to the environment, as spelled out in Title VII of the Treaty, and with particular emphasis on prenormative work.

Special emphasis will be placed on, in addition to the evaluation of the effects of pollution from industrial and other sources, the assessment of environmental degradation caused by the use of energy in the home, transport and industry.

The JRC will contribute to the implementation of Community environment policy in three areas:

- participation in global change programmes;
- technologies and engineering for the environment;
- research on industrial hazards.

In the global change area, emphasis will be placed on strong cooperation with laboratories and institutes in the Member States and at international level. The JRC contribution will concern mainly:

- modelling and air pollution transport;
- air chemistry linked notably to the fate of biogenic and anthropogenic emissions;
- biosphere-atmosphere interaction;
- related applications of remote sensing, which will focus on the interactions between land and ocean surface parameters and climate. It is furthermore aimed at the development of remote sensing methods applied to critical components of global change.

Activities under the heading of technologies and engineering for the environment will concern mainly:

- environmental chemicals (migration and transformation in soil and their impact on ground water, harmonization of analytical methods for waste analysis, development of a mobile laboratory for in-field analysis of contaminants in soil and water, characterization of algal

blooms, biomonitoring of environmental chemicals,trace metal exposures and human diseases, risk evaluation of environmental chemicals); these activities will notably be aligned towards chemical waste problems ..."

"... In addition to research, development and support, the programme would provide education and training in each of the above areas and establish data collection, interpretation and distribution facilities where necessary.

These activities could become the point of contact and common interface for national organizations, in particular public authorities and industries, and for support to other Commission services, including DGs V and XI."

These general objectives are concurrent with the JRC's mission and are highlighted in the scope of the Visiting Groups. As set out in the terms of reference (see Annex II), the Visiting Group should:

- evaluate all activities of the Institute against its stated objectives, with particular emphasis on the impact the results of the work has had on the users of this research, and the degree of collaboration established with national research organisations, as well as with industry;
- assess the scientific quality of the work and the appropriateness of the work and results for the Community;
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- provide advice on the ongoing work on the basis of the evaluations and assessments performed;
- express recommendations for the future development of the Institute with regard to the overall strategic plans for development of the JRC in the medium-term and long-term.

II. General Observations

In the three days available to review the Institute and its work, the Group was impressed by the good quality of Institute management, by the efforts made by staff and management to prepare clear presentations and documentation and to respond to questions that arose during the visit. In reviewing an institute with so great a spread of activities, some selection had to be made where personal visits to laboratories were concerned. All activities were reviewed but only some 60% were actually visited.

For purposes of clarity activities were grouped into four categories:

- Specific Programme research activities;
- Scientific and technical activities in support of Commission policies;
- Exploratory research work;
- Contractual work for third parties.

For each activity, the scope, results obtained to date and likely future developments were summarised in a document prepared for the visit. Members of the Group appreciated this form of presentation. Members were impressed by the overall quality of the science performed in the Institute and of the staff who presented the various items. However, it was felt that a critical process should be applied to the rather extensive field covered, to identify and benefit the higher priority projects and actions.

A characteristic of the Institute is the relatively high proportion of chemists working there. It was recognised that in certain areas, recruitment was concentrated on obtaining other disciplines and the Director was strongly encouraged to continue with the estblishment of a more multidisciplinary staff in the future development of the Institute. It was agreed, however, that the present staff were competent and very productive.

Another characteristic noted by the Group was the high degree of geographical dispersion of the Institute throughout the Ispra site. The historical reasons for this dispersion were understood and the management was encouraged to pursue, with vigour, its intention to regroup the Institute into a more manageable area. This would encourage maximum synergy between the various units in the Institute and thus a more systems-based approach with more extensive teamwork, valuable because environmental problems are so diverse and cover the vast range of human activities.

Following enlargement of the Union, a very strong environmental research capability will be needed to respond to the growing awareness of the environmental impacts of human activities and the consequent evolution towards higher standards.

III. Scientific and Technical Experimental Activities

III.1 Air Quality

The Visiting Group considered the European Reference Laboratory on Air Pollution (ERLAP) to be well-managed and after ten years of operation to be of proven value.

Emissions were still an urgent matter and the work on bio-emissions could well be extented to include emission/absorption by soils. The burden of pesticides, polycyclic aromatic hydrocarbons etc. in rainwater was another area of relevance and work on the harmonization of parameters measured and measurement methodology was of concern to everyone.

The Evaluation Monitoring European Pollution (EMEP) station operated by the Institute was competently operated and the Group was pleased to see that Ispra had an assured place in this international network.

A close cooperation with universities was encouraged, particularly in highly specialised areas such as molecular biology and plant physiology in order to establish a sound basis for the explanation of the observed phenomenon on the "Biogenic Emissions in the Mediterranean Area", (BEMA) for example. There is a general lack of field research institutes in Europe and the work is important.

The group was impressed by the degree of cooperation with Member States achieved in the provision of a suite of complementary mobile laboratories for on-site measurements and sampling and strongly encouraged common actions to provide joint facilities for large-scale experiments. For example, large-scale dispersion experiments were of vital interest in understanding and predicting the probable spread of contamination following industrial-scale accidents and the Institute's leadership in this international cooperative network was warmly applauded. Much effort had to be applied to all aspects of modelling in an area where even relatively short-term meteorological predictions were shown to be unreliable.

Experimental work on the behaviour of sulphur-bearing aerosols in the atmosphere was under development with the commissioning of a new facility and the approach of combining modelling with experimental verification was sound. It appeared that in this instance, the good physics should be closely linked to a more extensive chemical support to fully exploit the experimental possibilities. The international networking undertaken on these large-scale problems was appreciated and should help to ensure that maximum benefit was obtained from the projet and its quality assured.

It was felt that, in general, a closer cooperation between Units responsible for atmospheric chemistry and physics and for biospheric-atomospheric interactions would bring considerable benefits to both parties.

Indoor air quality was still of concern as high concentrations of many products were found in domestic, public and industrial buildings. JRC contributions using the INDOORTRON were significant, particularly in the validation of measurement methods. Work in that area might be completed in about 3 to 4 years which could liberate the facility for use by universities and industry under contract. Round robin quality assessment campaigns would be of great value for the harmonization of measuring methods in Europe, and improvement of their quality.

III.2 Toxicology

III.2.1 European Centre for the Validation of Alternative Methods (ECVAM)

Ths Centre was being set-up to meet a requirement in Directive 86/609/EEC that the Commission and Member States should encourage research for the replacement , where possible, of animal tests by other appropriate procedures. ECVAM has its own scientific advisory committee which has defined the tasks as : "ECVAM will promote the scientific and regulatory acceptance of alternative methods which are of importance to the biosciences and which reduce, refine or replace the use of laboratory animals".

A Head of Unit has been appointed, staff recruitment is under way, the proceedings of a series of recently held workshops on current problems are in press and ECVAM is at present involved in six validation studies with European laboratories and with Japan and the USA.

The Visiting Group whilst appreciating the strong scientific guidance and coordination of efforts through the Scientific Advisory Committee, felt that every effort should be made to streamline administrative and recruitment procedures to bring the unit up to full strength as soon as possible. The Environment Institute was felt to be the most appropriate EU location for ECVAM.

III.2.2 Toxicology Laboratory

The Group pointed out the importance of determining background values of trace metals and metal species in the general population in the European Union. Such values are of importance for the evaluation of risks arising from occupational exposures and those resulting from accidents to chemical plant, etc... In addition, total diet studies are needed to complement the above, especially in cases where vegetables are home-grown whilst epidemiological and statistical investigations are also required if results are to be applicable in practice.

A very important requirement lies in the standardization of all analytical steps: sampling, sample preparation; separation; trace analysis, all of which must follow agreed standard operating procedures. For parts of this work, clean-room conditions and regulations are required. After visiting the toxicological laboratories, the Group had the impression that a redefinition of goals as well as a reconstitution of the Unit is necessary. The present and continuing importance of chlorinated and polycyclic aromatic hydrocarbons should be taken into account at that time. A close connection with water and soil analysis would benefit both analytical services and users alike, and should be examined at an early date.

III.3 Chemicals

III.3.1 European Chemicals Bureau

This activity is typical of actions to support EU legislation and operates in the area of the control of chemicals. Its mission is seen to be of importance for the establishment of viable regulations and directives and their implementation.

III.3.2 Data Banks Euclid and Ecphin

The data banks demonstrated to the Group appeared to be efficiently conceived with attention to user-friendly interfaces and giving customer satisfaction. However, the question arose as to whether, once a system was developed, it should be continued by valuable institute staff. Where possible, it should be passed to other private or public organizations and this needed periodic review on a case-by-case basis.

III.3.3 Food chemistry

European Office of Wine, Spirits and Spirit Drinks (BEVAPS).

Wine Laboratory

This relatively small activity provides the Commission with analytical services for prevention of fraud and determination of origins of products. Analytical methods are evaluated in cooperation with national laboratories. The work appears to be competently performed. Chemical and microbiological laboratories for food analysis were also visited and found to be well equipped and competently staffed. With EU enlargement, this could be a growth area.

III.3.4 Water and Waste

This is a particularly important area and it is gratifying to see the JRC playing its part in a range of international projects where the Institute's contributions have been significant. Even so, the available resources do not appear to fully reflect the importance given to these subjects in the European Union. Water quality, recycling, treatment and similar processes are matters likely to be raised by upcoming directives. Water and waste management studies are urgently needed and waste water and solid waste should be included.

III.3.5 Analytical Laboratories

To conclude this section, the Group encourages the Institutes' management to study the regrouping of its analytical services into a more compact form: if possible, as a single unit. This would help to make the most efficient use of specialized instruments and equipment and ensure maximum pooling of expertise and also help to prevent possible duplication.

IV. Management of Research

IV.1. General

The environment Institute is larger than other Institutes at Ispra with a wide spread of research and service activities. With minor exceptions, it is well managed by keen and enthusiastic staff but suffers from the inevitable disadvantages of being widely dispersed over the Ispra site. However, it is understood that relocation is planned for the coming years.

Evidence of networking and collaboration with other organizations in Europe and elsewhere was found in each of the units visited. This is clearly an important function of a Commission institute working in a field as universal as the environment and the visiting group wishes to emphasize the importance of trans-frontier cross-linking.

As noted before in this report, the visiting group considers that in view of the importance given to environmental problems in the European Union, especially after enlargement, a much more even balance of disciplines will be needed in the Institute. Until that can be achieved, the further development of interinstitute collaborative projects can be one method of improving the spread of competences. In that respect, networking with the outside world and maximising the number of post-doctoral fellows and visiting scientists in the Institute assume an even greater significance.

The Group realizes that apart from specific programme research, the Environment Institute has to provide expertise and services to a wide range of Commission services responsible for developing and implementing policies in many sectors. These tasks are essentially those of the "Commission's own laboratory" but since some of this work will in future be of a competitive nature, it is important that the most appropriate tasks are selected relative to the policies concerned and to available competences and facilities. Interviews with representatives from customer DG's show a high degree of customer satisfaction and the Group appreciates the efforts being made by Institute scientists to meet these challenges.

Contract research is likely to remain a very small part of the Institute's activities but is both an important stimulation to research staff, encourages contact with the outside world and is a visible demonstration of competence.

IV.2 Staff Matters

To accelerate the adjustment of the balance of competences in the Institute, measures should be sought to encourage mobility. Movement between customer DGs and the Institute would form closer links between "contractor and client" and attention must be directed to obtaining the most appropriate young recruits. The predicted growth in the Institute and the age profile shown in the strategic plan for the coming years, present opportunities for disciplinary diversification.

Concerning long-and short-term visitors to the Institute such as post-doctoral researchers, visiting scientists etc, the Group welcomes the steady increase in numbers over the last three years and the future intentions. Maximum effectiveness of recruitment procedures is highly desirable and research fellowships could provide a reliable means of selection. Flexibility is very important in trying to avoid early, narrow specialisation.

IV.3 The Future

The visiting group feels that the indicative breakdown of activity areas by percentage proposed by the Director and given below, represents a reasonable target to aim for over the coming years.

60% Support to the Commission (essentially 2nd generation)
20 % Large cooperative research projects (Global change, air, water, soil)
10% Data organisation and communication (like CEO, ECPHIN, aerosols etc.)
3% Free (ars-pro-arte) research
7% Work for third parties

Predictions regarding the size of the Institute are clearly dependent on available finance and overall JRC policy and therefore somewhat uncertain. However, the target of a complement of about 300 by the year 2000 does not seem unreasonable in what can be considered to be an area still growing in importance.

The above information is outlined in the Institute's strategy document which is a useful tool for the development of the Institute, but is likely to require some detailed revision following the present Report.

V. Recommendations

- The primary task of the Institute should be to provide the scientific support needed to underpin the preparation and implementation of EU policy in the field of protection of the environment.

- Specific research activities should preferably be performed in close collaboration with others with the aim of adding to the understanding of the mechanisms of large scale environmental phenomena.

- Where appropriate, computer modelling should supplement experimental activities and where possible, in Union-wide networks.

- Within the JRC and the Institute itself, a greater degree of synergy between units should be established. A multidisciplinary teamwork approach to large-scale problems is often the most effective one.

- Greater diversity of staff disciplines is strongly favoured.

- Analytical services should be reorganized to include the toxicology laboratory and radioactive assay should be confined to specific needs. Neutron activation analysis can often be substituted by more modern techniques of equal or superior sensitivity.

- Research on water and waste processing/recycling is likely to increase in importance. Attention should be directed to these aspects, particularly with regard to harmonization of methods.

- Work on indoor air pollution should continue for some years focussed on verification of standard operating procedures and sampling.

- Intermixing of staff with that of outside organizations is encouraged and networking should be yet more strongly developed.

- Data-bases should be examined for operation by outside agents, only retaining those for which there are strong reasons for operation by the Institute.

- The selection of tasks and setting of priorities within the institute is important. A more transparent project management system would help to ensure that these are maintained, and reassure the outside world of the Institute's efficiency. It should be possible to achieve this without creating a top-heavy management or diverting scientists from their tasks.

Visiting Group to the Joint Research Centre's Environment Institute (EI) - Ispra

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Annex II

Visiting Group for the Evaluation of the Joint Research Centre's Environment Institute (EI) - Ispra

Scope of Visiting Groups

The chief scope of Visiting Groups is to perform evaluations, taking into account the objectives as set out for the 1992-1994 period (in Council documents, relevant papers for the Board of Governors, JRC Annual Workschedules, budget, etc.), to provide recommendations on the proper course to be followed by the Institute visited in view of the stated objectives, and to apply in the evaluations, elements of the methodology proposed for research returns and effectiveness.

The Visiting Group should:

- perform an evaluation of all activities of the Institute against its stated objectives, with particular emphasis on the impact the results of the work has had on the user of this research, and the degree of collaboration established with national research laboratories, as well as with industry;
- assess the scientific quality of the work and the appropriateness of the work and results for the Community;
- judge all aspects of the efficiency and impact of the work, taking into account the particular status of the JRC (its independence in the Community) in comparison with similar national laboratories;
- provide advice on the ongoing work on the basis of the evaluations and assessments performed;
- express recommendations for the future development of the Institute with regard to the overall strategic plans for development of the JRC in the medium-term and long-term.

Terms of Reference

1. To evaluate progress in performing work in accordance with the objectives set out in Council Resolution 92/C118/03 and Council Decisions 92/273/EEC, 92/274/Euratom and 92/275/Euratom, documents addressed to the Board of Governors, the JRC's Annual Workschedules, budget etc., and to review progress in the implementation of the recommendations of the last Evaluation Panel.

2. To ensure that the Institute has effective mechanisms to set its local scientific objectives, monitor progress towards those objectives and evaluate outputs.

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3. To review the various research activities to assess:

   a) the scientific quality and productivity of the Institute;

   b) whether full advantage is being taken of scientific opportunities in the light of funding and other constraints;

   c) the relevance of the work with respect to Community needs, including the relevance of work performed for external customers, when applicable.

4. To assess the effectiveness of the scientific management leadership within the Institute.

5. To advise on whether the Institute has been making efficient, effective and economical use of resources in carrying out its programmes and management functions. Resources include manpower, money, services, facilities, data and equipment.

6. To review the extent and effectiveness of the Institute's external scientific links, including relationships with research organisations, the higher education sector, industry and government departments in the Member States, as well as outside the European Community.

7. To examine the relationship of the Institute's work in general, to the mission of the Joint Research Centre and to its forward strategic planning.

8. To make recommendations and report to the Board of Governors of the Joint Research Centre.

Enschede, 10th December 1993

REPORT OF THE VISITING GROUP

FOR THE EVALUATION OF THE

JOINT RESEARCH CENTRE'S

INSTITUTE FOR

SAFETY TECHNOLOGY

CONTENTS

Report of the Visiting Group for the Evaluation of the Joint Research Centre's Institute for Safety Technology, Ispra, Italy

I. Introduction

At the invitation of the Board of Governors of the Joint Research Centre (JRC), members of the Visiting Group (see Annex I) spent the 25th, 26th and 27th October 1993 at the Institute for Safety Technology (IST) at Ispra reviewing the Institute's work and visiting its laboratories.

The objectives for the Institute are to be found in Annex I of Council Decision 92/273(EEC) and 92/274/Euratom of 29 April 1992.

A. The main objectives concern:

- prenormative research on the reliability of structures;
- research on industrial hazards;
- nuclear fission safety including reactor safety, safeguards and fissile materials and radioactive waste management;
- tritium technology and fusion safety.

These general objectives are concurrent with the JRC's mission and are highlighted in the scope of the Visiting Groups. As set out in the terms of reference (see Annex II), the Visiting Group should:

- evaluate all activities of the Institute against its stated objectives, with particular emphasis on the impact the results of the work has had on the users of this research, and the degree of collaboration established with national research organisations, as well as with industry;
- assess the scientific quality of the work and the appropriateness of the work and results for the Community;
- judge all aspects of the efficiency and impact of the work, taking into account the particular status of the JRC (its independence in the Community) in comparison with similar national bodies;
- provide advice on the ongoing work on the basis of the evaluations and assessments performed;
- express recommendations for the future development of the Institute with regard to the overall strategic plans for development of the JRC in the medium-term and long-term.

II. General Observations

This report is arranged by Mission area following the internal organisation of the Institute as follows:

- Fission Reactor Safety (including waste management);
- Safeguards;
- Industrial Hazards;
- Structural Mechanics;
- Tritium Technology.

The Visiting Group examined each of these areas in turn and was impressed by the leadership shown by the Institute's management team which had clearly succeeded in transferring its enthusiasm to its collaborators. This effect was seen to have permeated to everyone interviewed during visits to laboratories and demonstrations, and was particularly evident in younger staff and grantholders. This was manifested in an evident team spirit visible at all levels. In this connection, the presence of junior staff at meetings was much appreciated by members of the group.

A large measure of this success could be attributable to the highly organised and efficient system of project control exercised at all levels. The detailed definition of objectives, setting of milestones, analysis of strong and weak points with subsequent follow-up and reporting, were important elements in securing a high level of motivation and consequent cost-effectiveness.

The re-orientation of scientists previously engaged in nuclear research and the redeployment of equipment to other significant fields of R&D, was considered to be clear evidence of successful management.

III. Scientific and Technical Areas

III.1 Fission Reactor Safety

The Visiting Group considered that in view of uncertainties related to national decision-making on energy policy, it would be reasonable to maintain a certain nominal minimum of R&D on nuclear energy at a Community level. It was pointed out that regardless of future policy, the environmental implications of former and existing nuclear activities would remain into the far future, both in the E.C. and in Eastern European countries, with obvious implications to the Community as a whole.

The Visiting Group therefore, recommends that, in view of the lack of a clear vision of the future, serious consideration be given to ensure that work be maintained at a viable level: in some areas resources may already have been reduced too far.

Particular comments

- The combination of modelling, code development with international partners, experimental verification followed by publication, was considered to be a valid prenormative approach to widespread coordination of high acceptability, likely to produce a maximum of useful products for a minimum overall outlay in times of universal financial stringency. The JRC is the best placed organisation to motivate such networks by practical example and the activities are felt to be of high importance.

- Facilities such as FARO in Ispra and PHEBUS (in Cadarache) and the future STORM were of real importance in the area. Members were pleased to see that doubts expressed in the report issued by the 1991 Evaluation Panel, chaired by Sir Hermann Bondi, about a long-term future for FARO had been dispelled by outside support for the projects being performed there.

- The Group regretted that the PETRA facility could not be brought into operation, feeling that such a facility could be of great help in aiding common waste treatment problems. However, in view of restricted funds and the present lack of national interest in research on reprocessing, the decision to proceed slowly was understood. In nuclear fission safety, the general lack of on-site projects necessitating the handling of radioactive substances was noted.

- No evidence was seen of work leading to inherently safe nuclear plants, a subject of world interest in which JRC expertise could contribute usefully.

III.2 Industrial Hazards

Comments

- Since experimental and theoretical work on dispersions of heavy gas clouds is carried on in many places worldwide, the members felt that there was no special place for the IST in that area. However, if the Institute endeavoured to include chemical reactions in dispersion models, so as to incorporate ignition of fires, explodable deflagrations and detonations in a sound way, this would represent a difficult and major step forward in science, and enable a valid judgement to be made of the environmental and safety aspects of certain measures taken by local, national or international authorities.

- In the chemical industry most accidents occur under dynamic conditions, such as those experienced during start-up and shut-down of large continuously operated plants and in batch or semi-batch processing of chemical reactions. On the basis of the IST's long experience in dynamic studies and multiphase fluid flow, the selection of safety in chemical plants and the environmental impact of accidents as a new research project was a wise and useful choice.

- The combination of the study and growing know-how in the experimental and theoretical evaluation of venting facilities, pressure relief, handling of severe accidents and dispersion of toxic chemicals in the environment is unique. The developing collaboration with industrial partners concerning pressure relief and venting is highly relevant and should be pursued vigorously.

- The experimental installation (FIRES) for studying dangerous reactions is fully up to an international standard and the IST is very well equipped for the collection of generic, fundamental know-how applicable to all chemical plants.

- Knowledge of chemical reactions and chemical reactors themselves is still at an initial stage in the institute. We strongly recommend hiring a few experienced chemical engineers or industrial chemists to build up that knowledge as quickly as possible and to provide adequate sparring partners for industry.

- Industrial enterprises will only study reactions appropriate to their own processes and consequently there is a great lack of fundamental knowledge on chemical plant dynamics. Universities find it impossible to maintain groups with requisite experience on a permanent basis and the institute should fill this gap.

- The IST should strengthen its contacts with other institutes in Europe also working in the area of batch reactors, to set up fruitful cooperations and thus establish its own niche in research in this field. This should be fundamental technological research of a generic nature which can help all industrial companies and simultaneously provide the European Commission with a sound technological background for developing directives.

III.3 Structural Mechanics

The activity centres around experiment design and model development using numerical and visualisation techniques, followed by experimental verification using the recently commissioned European Laboratory for Structural Assessment (ELSA) and the Large Dynamic Testing Facility (LDTF).

Comments

- The Group noted with satisfaction the excellent progress made with the development of activities in the Unit and the enthusiasm and developing competence of the staff. First tests in ELSA have been very satisfactory.

- A potential study of considerable interest exists in the investigation of the connections between pre-cast concrete elements together with the diaphragmatic behaviour of slabs and reinforced masonry under seismic conditions.

- While recognising the importance of a common computer environment, the Visiting Group considers that the Unit should resist the temptation to disperse its activities in too many fields of application and concentrate its talent on fewer selected topics where an in-depth approach would bring greater rewards.

III.4 Tritium Technology

In the use of tritium for civil purposes it must be emphasised that due to its nature, the behaviour of the element is very different from that experienced with fission products. This has important implications, at a European level, on protection and safety. It is therefore necessary to gain experience in the handling of large quantities of tritium before fixing the engineering design of future thermonuclear fusion reactors and further large-scale experiments incorporating tritium.

Comments

- The Group visited the European Tritium Handling Laboratory ETHEL, at present being commissioned, and was impressed by the progress made so far towards the practical implementation of a working laboratory.

- Initial pilot experiments are progressing well and the experimental programme is sound.

- Members were pleased to find a close collaboration with the installation at Karlsruhe and noted the complementarity between the work carried out in the two laboratories..

- Excellent progress is being made overall on these very important activities

III.5 Safeguards

This JRC activity is not only an important link in the worldwide nuclear safeguards network and the implementation of non-proliferation policy, but provides the essential technical support required by the Commission in fulfilling its statutory obligations under Chapter VII of the EURATOM Treaty.

Comments

- The Visiting Group was pleased by the efficiency and care apparent in the performance of the work and its management. However, Members were concerned at the lack of a clear management structure to operate the programme which is spread over a number of JRC Institutes. They believed that although no adverse effects had appeared up to the present, attention should be paid to this point.

- The long standing training programme for Safeguards inspectors carried out in the PERLA facility was particularly impressive and an important contribution to the effective safeguarding of nuclear materials in Europe.

- The steady development of field instrumentation to improve accuracy, portability, means of standardisation and user-friendliness was considered to be of importance and to be performed to a high standard.

  In view of recent events demonstrating the need for an accurate and convenient means of assaying the quality of the contents of waste containers, the Visiting Group welcomed the response made by the JRC in developing rapid and highly sensitive equipment for waste container monitoring. The equipment appeared to be precise and largely automatic in use.

- The Visiting Group was pleased to see that support was also provided to inspectors from the IAEA, Vienna and that the JRC took the lead in the European Safeguards Research and Development Association (ESARDA) and had worldwide connections in the matter of safeguarding nuclear materials.

IV. Management of Personnel

IV.1 Mission

- Objectives were found to be generally clear and appropriate to the JRC and the project structure installed in the Institute defined activities in all mission areas and fixed mission targets and time scales.

- The evolution of current Community research policy in the energy field is a cause for concern in avoiding that the effort is not decreased below a critical mass due to reductions in resources.

IV.2 Relations

- Information transfer, inward and outward, appeared to be good in all sectors covered by the Institute, largely due to the Institute's involvement with other organisations in Member States and outside by means of working parties, collaborations and initiating workshops, as well as a number of joint projects.

- It was noted that the volume of contract work undertaken for third parties had doubled in the last year and the Visiting Group would encourage further efforts in this respect. Such contracts were a valuable means of demonstrating the Institute's vitality and competence to industry and would help in securing IST's place in the scientific world.

IV.3 Quality

- The Institute has been able to maintain a generally high standard in most areas of work, in spite of a steady conversion process of staff moving from mainly nuclear to other tasks. This was due to the quality and flexibility of a motivated staff.

V. Recommendations

- The Institute should continue to follow and develop the lines being pursued at present paying attention to avoid too rapid a diversification beyond the areas of existing competences.

- Attention should be paid to the maintenance of a suitable level of resources in the nuclear safety area. Possible needs arising from Eastern European developments should not be neglected.

- The feasibility of the Institute's involvement in work on inherently safe nuclear reactors should be examined.

- The embryonic Industrial Hazards activities are worth pursuing vigorously and should be supplemented with an injection of experienced industrial chemical engineers or chemists.

- The structural mechanics team should be careful not to spoil an excellent start by too wide a dispersion of activities. This applies particularly to analytical modelling.

- The already close cooperation in tritium technology with other laboratories active in the world should be maintained to ensure that best use is made of this important Community facility.

- The Group feels that exploratory research could be a management tool for finding new and relevant activities to further enhance the future standing of the institute. Such programmes should not require prior approval but should be judged *a posteriori* as to whether management has spent this money diligently.

- The excellent system of project control employed by the Institute could well be extended to embrace pan-JRC projects such as nuclear safeguards which spans several institutes.

Visiting Group to the Joint Research Centre's Institute for Safety Technology (IST) - Ispra

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Annex II

Visiting Group for the Evaluation of the Joint Research Centre's Institute for Safety Technology (IST) - Ispra

Scope of Visiting Groups

The chief scope of Visiting Groups is to perform evaluations, taking into account the objectives as set out for the 1992-1994 period (in Council documents, relevant papers for the Board of Governors, JRC Annual Workschedules, budget, etc.), to provide recommendations on the proper course to be followed by the Institute visited in view of the stated objectives, and to apply in the evaluations, elements of the methodology proposed for research returns and effectiveness.

The Visiting Group should:

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- express recommendations for the future development of the Institute with regard to the overall strategic plans for development of the JRC in the medium-term and long-term.

Terms of Reference

1. To evaluate progress in performing work in accordance with the objectives set out in Council Resolution 92/C118/03 and Council Decisions 92/273/EEC, 92/274/Euratom and 92/275/Euratom, documents addressed to the Board of Governors, the JRC's Annual Workschedules, budget etc., and to review progress in the implementation of the recommendations of the last Evaluation Panel.

2. To ensure that the Institute has effective mechanisms to set its local scientific objectives, monitor progress towards those objectives and evaluate outputs.

3. To review the various research activities to assess:

   a) the scientific quality and productivity of the Institute;

   b) whether full advantage is being taken of scientific opportunities in the light of funding and other constraints;

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4. To assess the effectiveness of the scientific management leadership within the Institute.

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6. To review the extent and effectiveness of the Institute's external scientific links, including relationships with research organisations, the higher education sector, industry and government departments in the Member States, as well as outside the European Community.

7. To examine the relationship of the Institute's work in general, to the mission of the Joint Research Centre and to its forward strategic planning.

8. To make recommendations and report to the Board of Governors of the Joint Research Centre.

Bonn, 2nd September, 1994

REPORT OF THE VISITING GROUP

FOR THE EVALUATION OF THE

JOINT RESEARCH CENTRE'S

INSTITUTE FOR REMOTE

SENSING APPLICATIONS

CONTENTS

Report of the Visiting Group for the Evaluation of the Joint Research Centre's Institute for Remote Sensing Applications (IRSA), Ispra, Italy

I. Introduction

At the invitation of the Board of Governors of the Joint Research Centre (JRC), members of the Visiting Group (see Annex I) spent 23-24 August 1994 at the Institute for Remote Sensing Applications (IRSA) at Ispra reviewing the Institute's work. The composition of and Terms of Reference for the Visiting Group are given in Annexes I and II. The objectives for the Institute are listed in Annex III. The Visiting Group considers these objectives outdated and recommends a revision along the lines given in Chapter II (in italics). **(Recommendations are highlighted in bold type in the Report).**

IRSA conducts research and pre-operational system development in the fields of:

- Agricultural Information Systems (AIS);
- Environmental Mapping and Modelling (EMAP);
- Monitoring Tropical Vegetation (MTV);
- Marine Environment (ME);
- Advanced Techniques (AT);

as well as in the area of data pre-processing and dissemination through a project called "Centre for Earth Observation (CEO)" which was recently transferred to the Institute.

II. General Observations

The Visiting Group had the opportunity to listen to several presentations by IRSA senior staff on the major topics of work and was able to visit a number of laboratories and facilities.

The presentations were generally of good standard evidencing the professionalism and good success of the Institute in the few years since its creation in 1988. There seems to be a good level of motivation amongst the approximately 90 permanent and 50 non-permanent staff.

II.1 Future Strategy

The Institute's **draft strategic plan** of 18th March 1994 seems to reflect a general uncertainty about the proper way forward. The plan must be revised and restructured towards realistic and concrete long term goals. **These goals must in priority represent the thematic orientation of the Institute's activities and be described in measurable goals such that implementation plans can be drawn up against these goals.** The indiscernible mixture of strategic, tactical and operative aspects of the present draft plan should be eliminated.

The Visiting Group took the opportunity to analyse the present **objectives of the Institute** and found them outdated. It recommends reformulations along the following lines which should on the one hand help to better focus the Institute's activities and (on the other) pay tribute to the important and further growing role of the Institute within the JRC:

(i) to evaluate and demonstrate applications of remote sensing techniques in support of the sectorial policies of the European Union in areas such as agriculture, environment, aid to development, regional aid ...

(ii) to contribute towards the support of the European scientific and application communities in the utilisation of earth observation satellite data.

Note: This objective is complementary to those of the European and national space agencies, international scientific programmes and those of other institutions;

(iii) to conduct research and support the development of methods and advanced techniques for the interpretation and application of satellite derived data.

The strategic plan should further clarify the goals and policy in the following fields:

- roles and relationships with national, European and international organisations - where a clear understanding should be the baseline of the Institute's activities. The subsidiarity of the Institute's contribution is an important consideration in establishing an unambiguous position in this respect. At the same time, attention must be focused on fixing priorities and the development of a policy on work that should, respecting subsidiarity, be performed in-house and what tasks can be better placed *extra-muros*. This should help towards clarifying IRSA's policy on third party activities and its competitive role *vis-à-vis* national research organisations and industry;

- data processing and dissemination - where the Institute should make additional contributions towards the **promotion and furtherance of earth observation** in the different communities;

- **education and training** - where the activities of the Institute should **be strengthened** by e.g. further enlarging the number of visiting scientists or cooperation with academia, young graduate trainee programmes and the like.

There is an urgent need to further clarify the **Institute's strategic and operational roles and share of activity in the EC's Fourth Framework Programme**. The results of these ongoing efforts will have an important effect on the Institute's orientation and activities for the next four to six years and must be reflected in the updated strategic plan.

II.2 Quality

The quality and the dedication of the **acting Director and senior staff** are recognised by the Visiting Group. It is recommended that a decision on the appointment of a Director to lead the Institute is taken in the shortest possible time. This should be coupled with a requirement to improve the **application of generally accepted academic standards** to the activities and the external presentation of the Institute.

The Group felt that although the Institute enjoys considerable success, efforts should be made to improve its impact by greater attention to detail and verification of information in both oral and written presentations.

It should be also evaluated whether the setting up of **additional advisory groups**, representing the user communities, would be the appropriate step to enhance guidance and acceptance of the Institute's work.

II.3 Methods for the Dissemination of the Institute's Activities' Results

In general, the Institute develops and verifies methods for the interpretation of aerospace data for application in a number of fields by organisations responsible for policy implementation as mentioned above. The product in that case is passed to the organisation concerned and a follow-up service is provided. This service is particularly appreciated by the relevant Commission Directorates General and services.

There is also a steady contribution of articles in journals, presentations to international meetings, however, the Group was concerned to find a number of papers listed as "submitted" which do not appear in subsequent publication lists. This practice is felt to be **misleading and likely to engender misunderstandings in the academic world**.

Dissemination by direct transfer to students, post graduate and post doctorate research fellows is a growing feature at IRSA. Participation in large projects with other organisations by networking is an important and developing means of two-way information transfer. At the same time, a **more active approach to third party contract research**, particularly in the Advanced Techniques area, should also help with information dissemination and the development of techniques in Europe.

III. Scientific and Technical Activities

III.1 Agricultural Information System (AIS)

The main objectives of the Agricultural Information Systems Unit are to provide scientific and technical support to the services of the community in charge of the execution of the Common Agricultural Policy (CAP). The central core of the activities of the AIS are the Monitoring Agriculture with Remote Sensing (MARS) project and the Register and Control of Agricultural Surfaces project, both taking the form of a technical and scientific support provided to the Directorate General VI (Agriculture).

This unit has shown its deep understanding of the issues in agriculture information problems and a remarkable scientific maturity in its approach to the use of space remote sensing in this field. In undertaking and conducting the corresponding activities it followed the appropriate strategy:

- support to research in order to establish the methods;
- validation of the scientific methodology and clear statement of the limits and accuracy of the method imposed by the physics of the measurements;
- transfer of the scientific method and its adaptation as an operational method;
- validation of the operational method;
- industrial transfer in order to develop the operational tool and implement it;
- transfer of the operational tool under the responsibility of the user (DG VI).

The AIS Unit is well managed and is characterised by a good scientific and technical guidance. It is effective in establishing innovative operational tools in agricultural information for the benefit of the Community Policies and requiring familiarity with modern techniques in data acquisition process and physical analysis of data. The Visiting Group noted with satisfaction the quality of cooperation reached with scientific and industrial teams of the Member States during the development of the project.

In view of the importance of the agriculture information issue both from the political and economical sides, the Visiting Group encourages the unit:

(a) **to extend the method** it developed for statistics in agriculture in the European Union **to other regions** (Central and Eastern Europe, North Africa ...);

(b) **to develop the methodologies** for the control of agricultural surfaces;

(c) to expand the programme towards the **assessment of agricultural productivity** and crop estimations for Europe and in the long term for other parts of the world.

III.2 Environmental Mapping and Modelling (EMAP)

The research in EMAP concerns the mapping of various components of the European landscape and the development of methods for using remotely sensed data together with other geocoded information for the management and protection of the European environment. During 1993, the mapping and monitoring activities of the Unit were conducted along two main thematic lines:

(i) forest grassland and natural vegetation;

(ii) Mediterranean land degradation.

Parallel activities in image understanding were pursued, aimed at continuing the development of methodologies for automatic classification, mapping and map generation from remote sensing data.

The continued cooperation with Central and Eastern European countries (through the PHARE regional programme) should go on a par with the **development of an interest for remote sensing data from a larger range of satellites (e.g. Russian).**

The Unit has the project of extending its work to "coastal ecosystem monitoring". It should be ensured **how this will be coordinated with the Marine Environment Unit and integrated in the Land Ocean Interaction system in the Coastal Zone (LOICZ) and the European Land Ocean Interaction StudiEs (ELOISE) Programme.**

The Visiting Group noted with surprise the **lack of clear goals and objectives from the Commission's environmental programmes and recommends the clarification of such goals and the interaction of the EMAP Unit with the Environmental Agency and DG XI.**

III.3 Monitoring Tropical Vegetation (MTV)

The objectives of the Monitoring Tropical Vegetation (MTV) Unit, closely connected to the objectives of the International Biosphere Geosphere Programme (IGBP), concern the study of vegetation at the surface of the continents using satellite based earth observations (development of methods for monitoring vegetation dynamics, derivation of physical characteristics of land surfaces and interface this information with climate models). The emphasis is put on the study of the tropical belt as containing the most actively changing world ecosystems, and the phenomena and processes are considered at global scales.

The subject studies concern the land cover and land use characterisation (Mercator Project), the monitoring of forest and biomass burning (TREES/FIRE), surface-atmosphere interactions and biosphere modelling (TEAM project).

The activities of this Unit are carried out under a good scientific guidance, a specific and successful effort to associate European scientists and to link the subject study to the objectives of the international scientific programmes on global change.

The members of the Unit often participate in international research groups and maintain a regular dialogue with the main space agencies which provide space systems or instruments dedicated to vegetation monitoring. It is well worth noting that the MTV Unit, in the frame of its programme devoted to scientific research and methodological developments, had the opportunity to contribute directly to the DG I and DG VIII actions for the benefit of developing countries.

The Visiting Group appreciates the quality of the products developed by the Unit and the efforts aimed at maintaining a high degree of external collaboration. It considers that one of the important achievements is the development of a comprehensive forest information system in support of the research community modelling the tropical deforestation dynamics.

The Visiting Group encourages the Unit to work towards the setting up of **an operational information system and entity to monitor in the long term the global vegetation dynamics.**

III.4 Marine Environment (ME)

The scope of the Marine Environment Unit is to develop, demonstrate and validate methodologies for the use of data from space and airborne observations in both operational applications and scientific investigations related to the marine environment.

The Unit is basically involved in the study of two main remotely sensed parameters:

(i) the ocean colour as an expression of the substances in the near surface water layers and the biological activity in the euphotic zone;

(ii) the sea surface temperature as an indication of the heat energy budget at the air-sea interface as an element of the general hydrodynamic processes.

Several publications in international journals with referees testify to the Unit's activity.

The Unit has developed a unique finalised product and it should be recommended that **methods and means be found to make it available, on a routine basis, to the oceanographic community**.

Under a formal inter institute agreement the Unit is responsible for the development of hydrodynamic models with the aim of assimilating remote sensing data in process studies and of contributing to global models. Although this is a natural development of the remote sensing studies, **one can not help wondering whether the Institute - even with the reinforcement from other Institutes of the JRC - has a staff of sufficient size or expertise to pursue successfully such an ambitious project**.

It is recommended that the Unit adopt as one of their long term thematic goals the development of **an operational tool for regional planners for the application of coastal ocean management**.

III.5 Advanced Techniques (AT)

The Advanced Techniques Unit is the biggest inside the IRSA, staff 40 persons. The Unit is responsible for development of techniques and methods needed in scientific and application oriented use of remote sensing. This includes e.g. the investigation of the principles of measurements in the different spectral bands, investigation of the feasibility of different techniques, development of data analysis methods and tools, and development of information extraction methods.

The main elements of the activities are research on optical remote sensing systems, development of signal processing techniques, use of the European Microwave Signature Laboratory (EMSL), and use of the European Airborne Remote Sensing Capabilities (EARSEC).

The AT Unit is well managed and the Visiting Group got the impression that the staff is very well qualified and motivated in their work. The Group was impressed with the high quality of the equipment and installations. Especially the European Microwave Signature Laboratory is an installation which permits remarkable contributions to the science and to the development of practical applications of remote sensing (signature research).

The AT Unit has an Advisory Group to follow and make recommendations on the work of the Unit. The Visiting Group found this good practice.

The Visiting Group draws the Institute's attention to the need to further **promote the excellent capabilities of the Unit and to encourage the acquisition of third party financing and work for its facilities.**

III.6 Centre for Earth Observation (CEO)

The Visiting Group was exposed to a concise presentation of the objectives of and plans for the Centre for Earth Observation (CEO). It was based on documents previously presented to the JRC's Board of Governors and discussed in the Steering Committee of the Pathfinder phase of the CEO, nominated by this Board. This presentation started with an overview of the situation in the field of space-based earth observations by the end of the century (provision of very important volumes of data, addressing the needs of a variety of end users in the scientific and applications fields), recalled the roles of the major actors in the field of data processing, distribution and use (EC, ESA, Member States and other European relevant organisations) and presented the CEO main objectives:

- provide user oriented services;
- be constructed on existing facilities and projects;
- be designed to be flexible;
- be designed to promote earth observations in Europe.

The CEO schedule and workplan were also presented and in particular its Pathfinder Phase, covering the period 1993-1995. The Pathfinder Phase is composed of five main activities leading to the detailed definition and cost estimates of the CEO, in preparation of the decision on its design and implementation.

The Visiting Group expressed its satisfaction to see the positive evolution of this extremely important project for the user of earth observation space data in the European Union. The CEO will play a major role in the promotion and dissemination of data and information, in stimulating applications and creating new products.

The Visiting Group stressed the fact that the **CEO should be a really decentralised system, designed for the end users, taking into account existing European and national facilities**. The Pathfinder Phase should in particular aim at clarifying the objectives and roles of the CEO with respect to research and development of new applications in support, among others, of the policy of the EU. The Visiting Group is confident in the success of the endeavour undertaken under the responsibility of the IRSA, with the cooperation and advice of European scientists, engineers and managers.

It is recommended that a more suitable name be found for this activity.

IV. Management Aspects

IV.1 Staff

The Institute is favoured with a relatively young staff with an average age of 44. However, it is clear that in a rapidly evolving field such as remote sensing, there will be a need for a career planning particularly at the younger end of the age spectrum. At the same time, temporary attachment of staff to customer DGs can help to give a certain number of people a clear understanding of user need as well as bringing notions of remote sensing capabilities to the organisation concerned.

Staff recruitment appears to leave much to be desired with a top heavy bureaucratic system bogged down with complicated procedures and long delays. **Simplification should be made wherever possible.**

IV.2 Visitors

The presence of a fairly high number of post doctoral and post-graduate research fellows is an important element in bringing scientific vitality to Institute permanent staff, as well as the future advantage of a corps of scientists throughout Europe with an intimate knowledge of the IRSA and advanced techniques of modern earth observation. Training young scientists is in itself an important activity in such an Institute. **This activity should be expanded.**

IV.3 Finance

The Visiting Group noted with satisfaction the generally good situation with respect to the future years' financing of the Institute's staff but noted with some concern the difficulties that the Institute is faced with in respect of maintaining an adequate budget for financing external activities. Under the system of competitive research via Shared Cost Actions and competitive bidding for contracts to provide support to DGs a number of difficulties will have to be overcome. **Some income from these sources will be needed if the Institute is not to shrink.**

Furthermore, there is a perceived conflict between the subsidiarity requirement and the need to compete for further work with national institutes and research organisations. **Careful attention must be given to this matter if actual conflict is to be avoided.**

IV.4 Management Information Tools

As a consequence of the above and of the need for a greater perceived transparency, **a more formalised project management information system should be established for the whole Institute**, compatible with other JRC Institutes.

Visiting Group to the Joint Research Centre's Institute for Remote Sensing Applications (IRSA) - Ispra

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Annex II

Visiting Group for the Evaluation of the Joint Research Centre's Institute for Remote Sensing Applications (IRSA) - Ispra

Scope of Visiting Groups

The chief scope of Visiting Groups is to perform evaluations, taking into account the objectives as set out for the 1992-1994 period (in Council documents, relevant papers for the Board of Governors, JRC Annual Workschedules, budget, etc.), to provide recommendations on the proper course to be followed by the Institute visited in view of the stated objectives, and to apply in the evaluations, elements of the methodology proposed for research returns and effectiveness.

The Visiting Group should:

- perform an evaluation of all activities of the Institute against its stated objectives, with particular emphasis on the impact the results of the work has had on the user of this research, and the degree of collaboration established with national research laboratories, as well as with industry;
- assess the scientific quality of the work and the appropriateness of the work and results for the Community;
- judge all aspects of the efficiency and impact of the work, taking into account the particular status of the JRC (its independence in the Community) in comparison with similar national laboratories;
- provide advice on the ongoing work on the basis of the evaluations and assessments performed;
- express recommendations for the future development of the Institute with regard to the overall strategic plans for development of the JRC in the medium-term and long-term.

Terms of Reference

1. To evaluate progress in performing work in accordance with the objectives set out in Council Resolution 92/C118/03 and Council Decisions 92/273/EEC, 92/274/Euratom and 92/275/Euratom, documents addressed to the Board of Governors, the JRC's Annual Workschedules, budget etc., and to review progress in the implementation of the recommendations of the last Evaluation Panel.

2. To ensure that the Institute has effective mechanisms to set its local scientific objectives, monitor progress towards those objectives and evaluate outputs.

3. To review the various research activities to assess:

   a) the scientific quality and productivity of the Institute;

   b) whether full advantage is being taken of scientific opportunities in the light of funding and other constraints;

   c) the relevance of the work with respect to Community needs, including the relevance of work performed for external customers, when applicable.

4. To assess the effectiveness of the scientific management leadership within the Institute.

5. To advise on whether the Institute has been making efficient, effective and economical use of resources in carrying out its programmes and management functions. Resources include manpower, money, services, facilities, data and equipment.

6. To review the extent and effectiveness of the Institute's external scientific links, including relationships with research organisations, the higher education sector, industry and government departments in the Member States, as well as outside the European Community.

7. To examine the relationship of the Institute's work in general, to the mission of the Joint Research Centre and to its forward strategic planning.

8. To make recommendations and report to the Board of Governors of the Joint Research Centre.

Annex III

INSTITUTE OBJECTIVES

The Institute has four main objectives:

1. To evaluate and demonstrate possible applications of remote sensing techniques in support of the sectorial policies of the European Community in areas such as:

   - agriculture;
   - environment;
   - aid to development;
   - regional aid.

2. To prepare the scientific community for the utilisation of earth observation satellites such as:

   - ERS-1;
   - SPOT;
   - Landsat;
   - NOAA AVHRR;
   - Polar Orbiting Platforms.

   This objective is complementary to that of the European Space Agency.

3. To undertake research in order to develop methods for the interpretation of satellite derived data.

4. To develop advanced techniques of earth observation for application in the mapping and monitoring of continental and marine ecosystems.

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London, 19th November 1993

REPORT OF THE VISITING GROUP

FOR THE EVALUATION OF THE

JOINT RESEARCH CENTRE'S

INSTITUTE FOR PROSPECTIVE

TECHNOLOGICAL STUDIES

CONTENTS

Report of the Visiting Group for the Evaluation of the Joint Research Centre's Institute for Prospective Technological Studies, Ispra, Italy

I. Introduction

At the invitation of the Board of Governors of the Joint Research Centre (JRC), the Visiting Group (see Annex I for Members) spent 8th and 9th September 1993 at the Institute for Prospective Technological Studies at Ispra. The Group met again in Brussels on 22nd October 1993 to examine its findings and meet with further clients from the Commission's services.

The objectives for the Institute are to be found in the Technical Annex to the JRC Programme Proposal 1992-1994 (COM(91)281 final). The principal tasks are:

1. The acquisition, treatment and analysis of information concerning the state and trends of science and technology.

2. The execution of prospective studies in targeted scientific and technical (S & T) areas.

To perform these tasks, the Institute has two main functions. The first of these is the observatory function in which the Institute endeavours to:

- collect information on trends in technological innovation;
- analyse, process and present the information in order to help determine research and technological development strategies;
- develop and use specialised databases of the information collected by the Institute;
- describe the state of science and technology in selected areas of interest to the Community.

The second function is to execute prospective technological studies. This involves preparing S & T assessments, forecasts and scenarios, as an aid to the formulation of research and development strategies, including analyses of economic, social and environmental impacts.

In pursuit of both functions, the Institute will make the best possible use of existing national bodies active in the same area, organising European networks of S & T observatories and prospective studies units.

These general objectives are concurrent with the Joint Research Centre's mission and are highlighted in the scope for the Visiting Groups. The Visiting Group should:

- perform an evaluation of all activities of the Institute against its stated objectives, with particular emphasis on the impact the results of the work has had on the users of this research, and the degree of collaboration established with national research organisations, as well as with industry;
- assess the scientific quality of the work and the appropriateness of the work and results for the Community;

- judge all aspects of the efficiency and impact of the work, taking into account the particular status of the JRC (its independence in the Community) in comparison with similar national bodies;

- provide advice on the ongoing work on the basis of the evaluations and assessments performed;

- express recommendations for the future development of the Institute with regard to the overall strategic plans for development of the JRC in the medium-term and long-term;

This report will be organised following the order set out in the Terms of Reference (see Annex II) with the Group's recommendations for each point summarised under "Conclusions".

II. Work in Accordance with Objectives

- Owing to the structure of JRC funding under the Framework Programme, specific research programme funds could not be made available to the Institute's activities. As a consequence, the Institute has had to rely on customer demand for its resources and little money has been allocated for the development of the "Observatory" as a unit. However, some of the functions of an observatory are found associated with the supply of information for other projects and activities such as Global Change and the CO_2 issue, and Best Available Technology (BAT) fall into this category;

- for the same reasons, work in the technological forecasting area is related to customer requirements and largely comprises state-of-the-art extrapolations;

- following demand, a different role has developed, that of Scientific and Technological Advisory Unit: the principal customers being the Secretariat General's Forward Studies Unit (CDP), DG III (Industry), DG XI (Environment, Nuclear Safety and Civil Protection), DG XVII (Energy) and DG XII's aeronautical programme;

- 90% of the Institute's work is in support of the Commission.

Conclusions

- The Institute has not met the objectives originally foreseen for it; but,

- it has evolved an important role of Scientific and Technological Advisory Unit which should be developed;

- the observatory function has lagged behind for reasons linked with financing, but could now develop;

- the role of the Institute needs to be further formalised so that its work can be fully integrated with policy formation.

III. Efficiency

The Visiting Group was able to examine the output in reports and other publications but was not allowed to remove these for detailed perusal for reasons of confidentiality. Output was also assessed from documentary evidence provided by clients and by interviewing representatives of Commission services which use the Institute.

- At the time of the visit, 40 documents had been produced for the Commission and 2 for external third parties;
- scientific and technical staff totalled 14, including 11 JRC officials (10 university and one technical grade), 2 seconded experts and one visiting scientist, together with 8 grantholders, of which 3 are post doctorate, 3 are preparing PhDs and 2 are pursuing post graduate specialisation;
- the Group was impressed by the commitment and enthusiasm of the staff.

Conclusions

- Considering the number of staff, funds available and the very positive reactions from the clientele where the science and technology advisory function is concerned, the output is considered to be most satisfactory;
- unavailability of the output for expert evaluation, particularly in cases where this represented compilations of existing information in the public domain, was considered to be a barrier to making the Institute better known and obtaining maximum public benefit from the Institute's results;
- quality was not evaluated in detail although this area of work had been assessed by *ad hoc* expert groups chosen for each project.

IV. Overall Conclusions

- The main activities of the Institute were fulfilling an important function as a Science and Technology Advisory Unit;
- in general, the Institute was not yet filling its designated role of technological forecasting and the "Observatory" function was only developing slowly;
- the quality of output could not be assessed from documents shown to the Visiting Group as they were not made available for more study or peer review off-site;
- customer reactions, both verbal and written, were appreciative of the Institute's contribution to their own work. The convenience of working with an in-house team acquainted with Commission culture and practice was considered to be a positive factor. For certain clients such as the Forward Studies Unit, the confidentiality assurance of working with a Commission group was also important, as was the impartiality of the advice given;

- present core activities concerned scientific and technological aspects of energy, environment and transport, and their interactions;

- accountability within the JRC parent organisation was unclear to the Visiting Group;

- the Visiting Group noted that the Institute would be transferred to Seville in the near future and expressed concern about retaining efficient working relationships and the necessary day-to-day contacts with the Commission in Brussels. The S & T Advisory Unit should be located in Brussels;

- work undertaken up to the present was felt to be appropriate for meeting the Commission's needs. Work for outside clients was judged to fall within the Institute's competence, more effort should be applied to the development of these activities and building collaborative arrangements with third parties. There had been little work for industrial clients so far;

- there was a clear distinction between the work carried out by the Institute and that undertaken by other Commission bodies involved in the field such as the Forward Studies Unit, SAST, SPEAR and forward looking technology units in other Directorates General, however, in the case of FAST some redefinition of the interface should be made;

- it was noted that all important studies are submitted to review panels;

- in most cases, the value added by the work lies in integrating, collating and interpreting complex S & T information rather than adding knowledge.

V. Recommendations

- The JRC, in view of its flexibility and in-house competences, appears to be the most suitable organisation to house such an institute;

- accountability within the JRC management as the parent organisation should be clarified to ensure maximum transparency of operations since the Institute is financed mainly from public funds and much of the Institute's output can be considered to fall within the public domain. This would help to create a healthy attitude inside the Institute and a better understanding of the Institute's purpose and achievements in the outside world;

- the tasks of the Institute should consist of four basic activities which provide:

  - Research and Development (R & D) in Focused and Specific Fields and Operation of an Information Infrastructure (Observatory):

    The R & D activity should be focused on a small number of fields in which the Commission has policy interests. These fields are likely to comprise activities bridging the interests of more than one policy sector, such as transport, energy, environment and informatics, where inter-relationships need to be better understood. The information infrastructure should establish well-focused data based on available technologies and "best practices" in well-selected technology fields.

- Training

  The Institute should pay particular attention to training activities which are considered to be very important, both to train analysts and researchers, and to set up "natural" networks in the future;

- Commercial and Regional Services

  The Institute should also undertake regional tasks as they arise, and work under contract for third parties should be developed as a substantial and meaningful part of the activity;

- Scientific and Technological Advice

  Science and Technology (S & T) are important factors to be considered in many areas of policy. A focus for S & T advice should be provided by a small, but competent, Unit of the Institute. To be effective, this Unit should be located in Brussels. The role of the Unit should be to respond and interact with the policy formation process and to be aware of current policy issues and give advice as appropriate. A real and ongoing need has been identified for this support.

  To accomplish this task, the Brussels Unit of the Institute should draw on the best expertise available from a wide spectrum of interests including the other parts of the Institute. The Unit should be closely and flexibly linked with "think thanks" in the Commission.

  The Institute's S & T Advisory Unit should not only respond on request, but also advise on S & T matters where this can usefully inform Commission policy makers. A level of about 6 staff in Brussels is felt to be appropriate.

- it is considered essential to maintain a clear distinction between the Institute's work and the responsibilities of other Commission think tanks and forward studies groups. Nevertheless, strong links should be forged with these units;

- in view of its important advisory tasks, the whole Institute must employ staff of the highest quality. Where practical, recruitments rather than transfers of other JRC staff should prevail when setting up the Institute in Seville. Some 50% of the scientific manpower could consist of non-JRC staff;

- to achieve credibility in the scientific world and ensure accountability, the research findings should be published wherever possible;

- annual progress reports should include a section on the implementation of these recommendations and a further evaluation by a Visiting Group should be envisaged during 1997 to monitor progress. In the meantime, the detailed implementation plans for the whole Institute should be approved by the Board of Governors of the Joint Research Centre.

Visiting Group to the Joint Research Centre's Institute for Prospective Technological Studies (IPTS) - Ispra

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Annex II

Visiting Group for the Evaluation of the Joint Research Centre's Institute for Prospective Technological Studies (IPTS) - Ispra

Scope of Visiting Groups

The chief scope of Visiting Groups is to perform evaluations, taking into account the objectives as set out for the 1992-1994 period (in Council documents, relevant papers for the Board of Governors, JRC Annual Workschedules, budget, etc.), to provide recommendations on the proper course to be followed by the Institute visited in view of the stated objectives, and to apply in the evaluations, elements of the methodology proposed for research returns and effectiveness.

The Visiting Group should:

- perform an evaluation of all activities of the Institute against its stated objectives, with particular emphasis on the impact the results of the work has had on the user of this research, and the degree of collaboration established with national research laboratories, as well as with industry;
- assess the scientific quality of the work and the appropriateness of the work and results for the Community;
- judge all aspects of the efficiency and impact of the work, taking into account the particular status of the JRC (its independence in the Community) in comparison with similar national laboratories;
- provide advice on the ongoing work on the basis of the evaluations and assessments performed;
- express recommendations for the future development of the Institute with regard to the overall strategic plans for development of the JRC in the medium-term and long-term.

Terms of Reference

1. To evaluate progress in performing work in accordance with the objectives set out in Council Resolution 92/C118/03 and Council Decisions 92/273/EEC, 92/274/Euratom and 92/275/Euratom, documents addressed to the Board of Governors, the JRC's Annual Workschedules, budget etc., and to review progress in the implementation of the recommendations of the last Evaluation Panel.

2. To ensure that the Institute has effective mechanisms to set its local scientific objectives, monitor progress towards those objectives and evaluate outputs.

3. To review the various research activities to assess:

   a) the scientific quality and productivity of the Institute;

   b) whether full advantage is being taken of scientific opportunities in the light of funding and other constraints;

   c) the relevance of the work with respect to Community needs, including the relevance of work performed for external customers, when applicable.

4. To assess the effectiveness of the scientific management leadership within the Institute.

5. To advise on whether the Institute has been making efficient, effective and economical use of resources in carrying out its programmes and management functions. Resources include manpower, money, services, facilities, data and equipment.

6. To review the extent and effectiveness of the Institute's external scientific links, including relationships with research organisations, the higher education sector, industry and government departments in the Member States, as well as outside the European Community.

7. To examine the relationship of the Institute's work in general, to the mission of the Joint Research Centre and to its forward strategic planning.

8. To make recommendations and report to the Board of Governors of the Joint Research Centre.

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