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# Assessing the impact of energy research

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# CONTENTS

<b>EXECUTIVE SUMMARY</b>	<b>5</b>
<b>1. INTRODUCTION</b>	<b>7</b>
1.1 The context	7
1.2 The need for evaluation and impact assessment of energy research	7
1.3 The EREVIA Group	9
1.4 Coverage of this report	10
<b>2. METHODS</b>	<b>11</b>
2.1 Setting the objectives	11
2.2 The evaluation actors	12
2.2.1 <i>Public-sector actors</i>	13
2.2.2 <i>Private-sector actors</i>	13
2.2.3 <i>Consultative committees</i>	14
2.3 Evaluation indicators	14
2.4 Implementation	16
2.4.1 <i>Implementation at European Commission level</i>	17
2.4.2 <i>Implementation at Member State level</i>	18
2.4.2.1 <i>Very advanced</i>	18
2.4.2.2 <i>Advanced but not coordinated</i>	19
2.4.2.3 <i>Centralised</i>	20
2.4.2.4 <i>Emergent</i>	21
2.5 Conclusions on methodology	22
<b>3. RESULTS</b>	<b>23</b>
3.1 Main results and lessons	23
3.2 Use of results by decision-makers	25
3.3 Difficulties in analysing results	26
3.4 Conclusions on results	28
<b>4. RECOMMENDATIONS</b>	<b>29</b>
4.1 Broad recommendations	29
4.2 Methodological recommendations	29
4.3 Policy recommendations	30
<b>SOURCES</b>	<b>32</b>
<b>ABBREVIATIONS USED IN THIS REPORT</b>	<b>34</b>



## EXECUTIVE SUMMARY

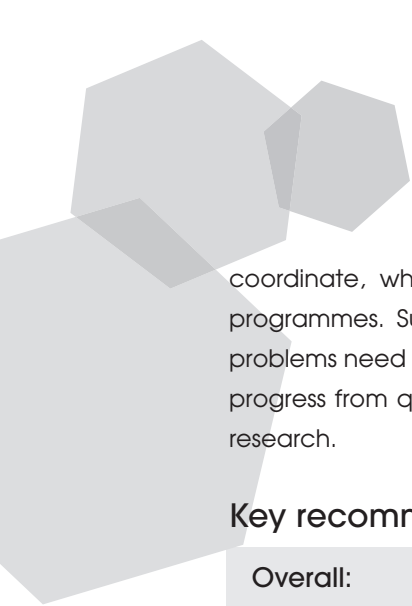
Assessment of the impact of research is of real importance in today's world, partly because research is known to be a key factor in future economic growth and partly because of pressures for public accountability. Aware that, in the field of energy research, Member States were taking different approaches to evaluation and impact assessment, in June 2001 the European Commission brought together an informal group of experts with the aim of gaining an idea of the current status of these activities in the EU and establishing what might be done to improve standards and achieve harmonisation. The Group, known as EREVIA (Energy Research Evaluation and Impact Assessment), held six meetings over a period of 16 months. This report is based on the Group's presentations and discussions. Interim versions were considered at each of the Group's meetings.

### Overview

The earliest evaluations were essentially peer reviews. Procedures have developed over the years so that nowadays evaluations tend to be professional exercises conducted by independent experts. Most Member States – but not all – carry out some sort of evaluation of their national energy research and development programmes. Many of these exercises examine impacts to a greater or lesser extent. The Member States use a variety of approaches for assessing impacts at different levels. However, none of them match the impact assessment carried out by the European Commission on the completed non-nuclear energy projects in the Fourth Framework Programme for Research. Most Member State procedures give priority to qualitative aspects. Quantification of impacts is complicated – and therefore difficult – to achieve at the strategic level. Collecting the relevant information is also an issue. However, it is possible to quantify impacts as long as projects and programmes have well-defined and measurable objectives. Energy research has special characteristics that need to be taken into account in designing and implementing impact assessment exercises.

Evaluation and impact assessment is used for a number of reasons by the Member States, e.g. to take stock of past activities, generate and communicate information on the outcomes and impacts of past activities, ensure transparency and accountability, and obtain inputs for future decision- and policy-making. The use of evaluation and impact results for decision-making has proved problematic. Evaluations need to be organised so that the results meet the needs of decision-makers more easily. In addition, improved ways of using those results need to be found: the process should allow goals to be re-set as a result of what has been learned.

Because of the different experiences of the Member States, the lack of a common methodology, and the growing awareness of the usefulness of impact assessment in defining best practice in energy research and in implementing and setting energy-related policies, energy research impact assessment practitioners are very interested in exchanging views and comparing existing procedures in order to improve impact assessment techniques. A clear understanding of the limitations of each of the available methods needs to be obtained and, where relevant, harmonisation achieved. The Nice Treaty requires the European Commission to take steps to



coordinate, where possible, Community-specific research programmes with Member States' programmes. Such coordination should fruitfully address evaluation methods. Many common problems need to be addressed, e.g. how to link input indicators with impact assessment, how to progress from qualitative to quantitative analysis, and how to assess outputs/inputs in long-term research.

## Key recommendations arising from this exercise

### Overall:

Make energy research part of a structured and comprehensive energy vision.

### Methodology:

- From the start, establish well-defined objectives, quality targets, and criteria for choices for programme/projects. Make sure there is a link between programme activities and energy and environmental policies. Establish a clear relationship between objectives established before the programme began and the evaluation carried out on completion. Provide programme managers with quantifiable objectives and indicators for impact assessment at programme and project/proposal level. These should enable assessment of impacts on energy systems, impacts on technology systems and socio-economic impacts.
- Establish a common understanding of what constitutes quality and excellence. This will ensure better quality proposals, enable projects to fit better into the overall research scene and ensure that the results can be inserted easily into public policies.
- Improve indicators. A comprehensive set of measurable socio-economic indicators is needed.
- Plan a complete evaluation scheme from the beginning. This should take a broad perspective and include a series of compulsory evaluations to be applied at different stages of the action.
- Arrange for evaluation results to be followed up.

### Policy:

Set up a 'European Evaluation Area' for energy research and development to ensure convergence of evaluation methodologies and procedures for this subject. The main steps in this would be:

- Developing an information system on available indicators, methods, results and expertise.
- Defining energy-specific indicators suitable for common use.
- Exchanging views and benchmarking/learning by comparison.
- Promoting a European approach to impact assessment.
- Improving the use of evaluation results in decision-making by strengthening links with decision-makers and stakeholders and translating evaluation results into operational processes.
- Sharing the responsibility for evaluation with the scientific community.

# 1. INTRODUCTION

## 1.1 The context

Traditionally, research evaluation was the means by which managers found out if the planned scientific outputs of research had been achieved within the allotted time span and budget. In recent years, this concept has been broadened, partly as the result of the need for greater accountability, but also because research is now recognised as a key factor in future economic growth. This is true whether the research is carried out under the aegis of a single company, an industrial sector, a single country's government or a multinational government. In the EU, the importance of research across the whole is underlined by the creation of the European Research Area (ERA) as an essential element of the strategy laid down by the Lisbon European Council in March 2000 to achieve the goal for the EU to become "the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion" by 2010.

It is clear, therefore, that today, effective research evaluation has to include an assessment not only of whether the planned scientific outputs of projects have been achieved but also of the efficiency, cost-effectiveness, transparency and openness of the process and the impact of the outputs on scientific, industrial, national and Community policies and resources. It is a tool for aiding management, benchmarking, accountability, coordination, and policy-making. It can be applied while a programme is in progress, or it can be conducted after it has been completed. It can also be carried out before a programme starts: appropriate forward-looking assessment of the likely future effects of new proposals and policies can aid programme formulation.

Evaluation and impact assessment are integral parts of the Research Framework Programme established to contribute to the ERA. They are also regarded as important – sometimes, indeed, mandatory – in many of the EU Member States' national and private-sector programmes.

## 1.2 The need for evaluation and impact assessment of energy research

In recent years, the energy sector has become increasingly complex. The EU's non-nuclear energy research programmes – and many of the Member States' energy research programmes – were originally established in response to the global oil crisis. If they are to make a real contribution to security of supply, they need to contain an appropriate blend of research, innovation and diffusion activities that take account of changing policies and actors and the availability of – and competition for – funds. The introduction of competitive energy markets has put energy operators under pressure to be more efficient and cost-effective. In some countries, this has resulted in power companies reducing their research and development budgets. They, and other local energy agencies, now compete with private businesses for EU and national government funding. At the same time, there are pressures to reduce the size of the EU and national programmes.

On the other hand, ways of meeting carbon dioxide reduction targets still have to be found. Pressures for accountability, too, are increasing. Energy service companies have to be able to prove to their customers that promised energy savings resulting from their investments have indeed taken place. The need to bring the scientific community closer to the general public is



more widely recognised. Awareness of the far-reaching impacts of research have prompted increased stakeholder involvement in research planning.

In the energy sector, therefore, research evaluation and impact assessment is needed for a number of different policy, legal and managerial reasons.

At the EU level, the legal requirement to monitor and evaluate the Framework Programmes applies as much to the energy components as to the other parts. At the macro level, the exercise is needed to give the EU an idea of progress made towards achieving the Lisbon European Council goal of a knowledge-based economy. It is also necessary to determine the added value of supporting research at Union level. It meets the need for transparency and enables the EU to assess whether the research is being planned and carried out efficiently. Truthful information on the impact of past projects is vital if ongoing work is to be improved and future research and policies planned correctly. For maximum visibility and impact, diffusion of results is necessary both within the EU institutions and to organisations and stakeholders of all types, including the public, in the Member States.

The reasons for conducting evaluation and impact assessment of Member States' national energy research programmes are similar to those for the EU programmes.

Public authorities and private-sector companies throughout the Member States also need to carry out regular research evaluation and impact assessment to ensure visibility and to conduct their programmes effectively. In some Member States (notably those in northern Europe), public-sector organisations are legally obliged to conduct and publish the results of such exercises. In the case of private-sector organisations, customers and investors alike would benefit from the information.

Therefore, the need for effective energy research evaluation and impact assessment is clear. However, the extent to which these techniques are actually used, and the approaches to them, varies across the Member States. Development of harmonised evaluation and, in particular, impact assessment guidelines would therefore seem to be a logical step towards strengthening EU efforts to meet carbon dioxide reduction targets, limit energy consumption and increase security of supply.

### 1.3 The EREVIA Group

In June 2001, the European Commission brought together an informal group of experts from the Member States with the aim of gaining an idea of the current status of energy research impact assessment in the EU and establishing what might be done to improve standards and achieve harmonisation. The group came to be known as EREVIA – Energy Research Evaluation and Impact Assessment. Its membership was as follows: (The full names of members’ affiliations are given in the list of abbreviations at the end of this report.)

- Jacques Cheron, MENRT, France
- Nicholas Chrystochoides, AUA, Greece
- Bernard Equer, MENRT, France
- Ugo Farinelli, ANVAST, Italy
- Carlos García Barquero, IDEA, Spain
- Herbert Greisberger, ÖGUT, Austria
- Robin Gustafsson, Tekes, Finland
- Harald Haegermark, Elforsk, Sweden
- John Hoy, DTI, UK
- Eamonn Kinsella, CIRCA, Ireland
- Eugen Kokin, EAU, Estonia
- Margarita Salve, ESCAN, Spain
- Inge Sofie Sørensen, DEA, Denmark
- Peter Van Luyt, NOVEM, The Netherlands
- Michel Poireau, DG Research (Chairman)
- Jérôme Poussielgue, DG Research (Secretary)

The Group held six meetings over a period of 16 months to hear presentations on some of the specific research evaluation and impact assessment exercises that had taken place in their Member States. The exercises were as follows:

*Denmark:* assessment of the need for research and development on biomass for CHP

*Denmark:* evaluation of the wind power projects supported between 1990-1994 by the Danish Energy Agency development programme for renewable energy

*Finland:* evaluation and impact assessment of the energy technology programmes

*France:* meta-evaluation (i.e. evaluation synthesis) of ADEME’s non-nuclear energy research programme 1985-1995



*France:* mid-term (1998) and final (2001) evaluation of the inter-ministerial land transport research programme, Predit

*The Netherlands:* evaluation of Dutch participation in the IEA Implementing Agreements (IAs) for non-nuclear energy research using a methodology developed by the IEA CERT

*Spain:* evaluation and impact assessment of the science and technology research projects (including those on rational use of energy, renewable energy, etc.) carried out through the Programme for the Promotion of Technology Research (the PROFIT programme) funded by the Ministry of Science and Technology

*Spain:* assessment of the impact on employment of the energy efficiency demonstration programme

*Spain:* assessment of the impact on employment of the renewable energy demonstration programme

*Sweden:* examples of energy research and development evaluation, including that of the government energy policy and energy research and development programmes and Swedish participation in international programmes

*UK:* evaluation and impact assessment of some oil and gas, renewables and other energy-related research, innovation and market stimulation programmes funded by the DTI.

*The exercises were diverse:* the programmes evaluated were very different, with some exercises covering evaluation in the broadest sense while others focused on impact assessment. As a result, direct comparison was not meaningful. However, together they formed a snapshot of the type of work being carried out in the EU at that time, and provided a good basis for the Group's discussions on needs and recommendations. The European Commission is greatly indebted to the EREVIA Group members for all their contributions.

## 1.4 Coverage of this report

This report is based on the EREVIA Group's presentations and discussions. Interim versions were considered at each of the Group's meetings. **The report reviews:**

- The way in which evaluation and impact assessment of energy research has been carried out in the Member States – the different types of objectives, the categories of actors involved, the indicators used, and the extent to which it is used and attitudes to it.
- The results of the various exercises and their analysis and use.
- Recommendations for improving standards and achieving harmonisation in this area in the future.

## 2. METHODS

### 2.1 Setting the objectives

The objectives of the evaluation and impact assessment exercises examined fell roughly into four categories:

1. To take stock of past activities, the results obtained and the lessons learned;
2. To provide information on the outcomes and impact of those activities;
3. To ensure transparency and accountability;
4. To obtain inputs for future policy-making.

The objectives in categories 1 and 2 are generally the main reasons for carrying out evaluations and impact assessments after a research programme or other activity has finished (*ex post*).

*Ex-post* evaluation can be defined as the systematic and objective evaluation of completed activities to determine the effectiveness of the intervention and the impact and usefulness of the outcome, including its sustainability in the longer term. It is usually carried out a few years after activity completion and assesses the achievement of outcomes against the original objectives and the impact of the activity on participants, sectors and other areas defined in the original proposal.

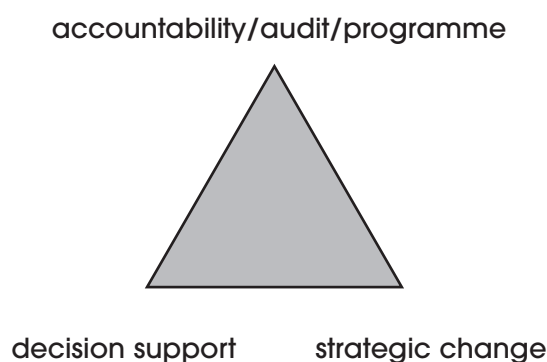
The main objective is epitomised by the objective of the Dutch evaluation of their participation in the IEA non-nuclear energy IAs examined for this report: to provide their financing bodies with an improved understanding of the benefits associated with international collaboration in the framework of the IEA and the value for money associated with it.

Many of the evaluations of government-funded energy research programmes examined in this review were *ex post*. Some utilities and energy agencies in the EU have also carried out ambitious and relevant *ex-post* evaluations of their completed research so as to benefit from the lessons learned. Many more have invested in campaigns and programmes with only a limited assessment of the impact and no clear idea of how much energy is being saved, where the savings are taking place and why, the extent to which greenhouse gas emissions are being reduced, and whether the programmes are being operated cost-effectively. They would benefit from carrying out an assessment of these programmes to determine their impact and value for money.

Evaluation clearly performs a policy function, e.g. it can ensure transparency and accountability (category 3) and can aid the setting of future policies (category 4). There is an interrelationship between these objectives and those in categories 1 and 2. The first action in the formulation of any project or programme – the setting of the activity objectives *ex ante* (i.e. upfront) – is a policy decision that conditions the results of any subsequent evaluation and impact assessment exercise. It follows, therefore, that clear objectives should be set at the beginning of each research activity so that the final outcomes and impacts can be compared easily with those originally planned. This is particularly important in the complex field of energy research where impacts are multidimensional. Great care should be taken to define goals that are not too reductive and to

secure links between evaluation and objectives, and between the energy programme and energy policy.

The policy functions of research evaluation can be summarised in the following schematic diagram:



The top corner of the triangle stands for the accountability, audit and programme management part of the exercise – the “what did you do with the money?” types of question that lead to audit-type evaluations. They do not generally provide information on socio-economic issues.

The bottom left-hand corner stands for evaluation that aims to provide decision support and attempts to assess efficiency and effectiveness through a combination of quantitative and qualitative methods.

The bottom right-hand corner stands for strategic change and is concerned with evaluating the appropriateness of policy goals and of the promises of actual/possible directions of research with a bearing on the way research is developing in the research performer.

## 2.2 The evaluation actors

Over the years, the types of actor involved in the research scene – and therefore those concerned with research evaluation – have changed. To the traditional figures of decision-makers at policy level and research performers at technical level are now added an increasing number of other stakeholders from, for example, industry (including SMEs), local government, NGOs, and the general public and their representatives.

The actors can be broadly divided into two classes – those in the public sector and those in the private sector. In the past, the public sector was regarded as being primarily interested in tasks carried out for the public good, and the public sector with financial return. Today, the picture is different. Public administrators are just as concerned with achieving value for money as their private-sector counterparts, and the views of the private sector (particularly representatives of users and the general public) have a strong influence on the public sector. The actions of the two sectors are increasingly interdependent.

### *2.2.1 Public-sector actors*

In the EU Member States, the ministries of research or industry and their dependent research institutes or agencies are the main public-sector actors concerned with energy research and its evaluation. In many countries, responsibility for the national programme is centralised in one ministry. In other cases, there is split responsibility. In France, for instance, the land transport research programme, Predit, is funded by four ministries and two agencies. Under such circumstances, achieving co-operation between all the parties can be a real issue.

Although in general the national programmes are administered centrally by a government agency, if not by the ministry itself, this is not always so. In Spain, for instance, administration of the government-funded PROFIT programme has been partly decentralised. Although there is only one managing organiser for the energy sub-programme, the Autonomous Communities play a role in decision-making, negotiation, evaluation and follow-up.

There are also a number of international players whose main aim is to foster co-operation and comparison of evaluation and impact assessment techniques. In the EU, the Scientific and Technical Research Committee (CREST), which advises the European Council and European Commission on the research sector, has an evaluation sub-committee. The European Committee set up a European Technological Assessment Network (ETAN) in 1998. In addition, a European *ex-post* evaluation guidebook for demand-side management and energy efficiency services programmes was developed over the period 1997-2001 by a number of contractors funded by the SAVE programme of the EU's energy framework programme.

In the IEA, the IEA CERT has overall responsibility for the IEA's non-nuclear energy research programme and has developed a framework methodology for evaluating the work carried out through the IEA IAs in this area. The Dutch used a modified version of this, adapted to their specific needs, when they evaluated the benefits of Dutch participation in the programme.

### *2.2.2 Private-sector actors*

Private-sector companies (including SMEs) and research institutions as well as universities are all involved in the research scene as research performers. Many of them also fund (partially if not completely) the research carried out in their organisations. In addition, some of them commission research carried out by others: even today, some private companies fund university research.

Commenting on the quality or usefulness of a particular piece of research – whether it be publicly or privately funded – is no longer the prerogative of the funding organisation, manager and performer alone. All stakeholders (investors, shareholders, tax-payers, users, etc.) can become involved and report to the legislators, company board, and so on. All these people now constitute the audience for the results of the assessment process.

France provides an example of the situation found in most Member States where each level of intervention in the chain, from research through development to final use, corresponds to a different category of actor. The public sector, in the form of regional and national authorities, deals with science and regulation. Private-sector researchers and engineers are concerned with science and technology, and private-sector manufacturers, distribution and service companies



with technology and the users, i.e. the general public and their representatives. Finally, consumer authorities are concerned with users and regulation.

In the assessment of the socio-economic impact of the energy part of Spain's PROFIT programme, the private sector was represented by industrial companies (which received the financial support, executed the energy-saving projects and owned the installations, etc.) and the utilities (which had an interest in demand-side management).

The private sector also figures largely in the carrying out of evaluation and impact assessment exercises. Many public authorities contract external consultants to assist them by defining evaluation criteria and process and carrying out evaluation tasks. This is true, for example, for the Danish, French, Finnish and Swedish programmes. The European Commission, too, uses external experts from the industrial, research and user sectors for its evaluation exercises.

### *2.2.3 Consultative committees*

To ensure that the needs and views of all these different types of actor are considered in research programme planning, management and execution, most energy research programmes nowadays appoint an external consultative committee comprising a mix of representatives from the public and private sector. Their role is to influence the programme decision-makers and encourage the carrying out of impact assessment exercises.

## **2.3 Evaluation indicators**

If the impact of a research project or programme is to be assessed, a set of indicators has to be used that takes account of the context of the work (i.e. the specificities of the local situation), its goals and the areas on which it is going to have an effect. The indicators could be aimed at obtaining a qualitative and/or a quantitative idea of impacts. Quantification of impacts is generally sought but is not always possible.

A lot of thought has already been put into the development of appropriate indicators. ADEME, for instance, has carried out a project on energy efficiency indicators. However, much remains to be done. Specifically, a standard set of key indicators to measure the impact of energy research on employment, industrial productivity and other areas of socio-economic relevance – a notably difficult subject on which to obtain useful results – has yet to be defined. The durability of indicators needs to be considered. In addition, indicators are needed to establish the impact of research on energy-related EU policy objectives, e.g. the establishment of a single market for energy in the Union, security of supply, the competitiveness of EU industry involved in the energy sector, reduction of greenhouse gas emissions and protection of the environment. Also lacking is a means of measuring the impacts of the European Commission energy research programme in the context of the wider EU energy research scene.

The presentations made to the EREVIA Group show that Union experience in the setting of indicators is diverse.

At the level of the European Commission's Research Framework Programme, CREST has established a checklist of core indicators for use in the annual and five-yearly monitoring exercises.

Introduction of the new instruments for the Sixth Framework Programme has caused changes of emphasis in project evaluation. For instance, in Networks of Excellence the focus is on the additional value generated by the network. Evaluation will not only look at the funded part of the exercise but also examine the impact of the network on participants' core activities. It will consider the European added value in the short term and the persistency of the integration after the funding has ceased. Integrated Projects, on the other hand, are meant to be of a scale that will affect the strategic direction of the sub-sector of the economy concerned. Evaluation will therefore look at the impact of the integrated project on the socio-economic status of the sub-sector and its market structure.

Some Member States (notably Austria, Germany, Greece, Ireland and Italy) use similar indicators in their national impact assessment studies to those developed by the European Commission for the Framework Programme. However, the presentations examined for this report suggest that **indicators tend to be formulated and used in different ways in different countries. The assessments may achieve comparable results but the ways of getting there, and the logic behind them, differ.** In France, for instance, the evaluation of public interventions examined the efficiency of the action (i.e. the link between inputs and outputs), its effectiveness (i.e. the link between objectives and results) and its utility and sustainability (i.e. the link between societal, economic and environmental problem areas and impacts). The Netherlands, on the other hand, considered value for money in their evaluation of their participation in the IEA IAs. Their main assessment criteria were the value of research avoided, the value of investments made, and the value of improved competitive position.

**Some of the indicators are common to all the exercises. These might be termed 'generic' indicators. Three main categories can be distinguished:**

**1. Achievement of the project.** This was variously worded; examples are:

*Denmark:* practical accomplishment of the project; achievement of technical and scientific targets; other positive effects – spin-off?

*Sweden:* number of patents and licensing agreements; number of workshops and short courses, new curricula, courses and coursework; number of books, monographs, peer-reviewed and conference proceedings papers.


*Spain:* expected activities in the R&D/innovation sector due to results of the project; prevision of the impact in other current activities in the R&D/innovation sector due to the results of the project.

**2. Use of results:**

*Denmark:* use of results by the target group(s); applicants' use of results; dissemination of results to relevant groups; objective evaluation of usefulness of the project result.

**3. Contribution to wealth and job creation:**

*Sweden:* employment, internships and degrees granted; evaluation by industrial management of the effectiveness of so-called competence centre graduates as compared to non-competence centre graduates from the same institutions (Are they more effective in dealing with cross-disciplinary issues? Do they display more



breadth and depth in knowledge? Are they more ready to perform and contribute to industry?); contribution to wealth and job creation.

*Spain:* industrial investments derived from the results of the project; employment creation (direct jobs) in the R&D/innovation sector due to the project; employment creation (direct jobs) in the company where the project is developed.

Measurement of indicators can be carried out at intermediate levels. The UK, for example, has defined common impact indicators for all its government programmes that focus on intermediate level outcomes with indicators at the level of firms, market processes, networks and supply chains, technology development, links between industry and the science base, finance, and institutions supplying business services.

The overall impact of a project can be rated by assigning a score for each criteria and using the sum of the scores to make a judgement on whether the project can be regarded as good or well done, acceptable or unacceptable. This was done in the Danish exercise examined for this report.

It is worth noting that the analyses of the Spanish PROFIT programme made use of budget indicators. Spain also adapted the general equilibrium model GEM-E3 to quantify the impact of their energy efficiency programmes for residential and other sectors on direct and indirect employment.

## 2.4 Implementation

Although generally regarded by Member States' governments as being important, evaluation and impact assessment of energy research is implemented to a varying degree across the EU. **All the countries represented in the EREVIA Group except one have established evaluation exercises of some sort.** The Nordic countries are probably the most advanced but even they focus on qualitative assessments. Quantitative assessments are generally acknowledged as more complicated – and therefore difficult – to develop at the strategic level. Collecting the information needed for the assessment can also be a problem. In many Member States, impact assessment is carried out project-by-project and is confined to technical aspects. Measurement of socio-economic impacts is recognised as difficult. Most countries understand that to achieve successful impact assessment of completed work it is necessary to carry out *ex ante* evaluations of the proposed programme or project in order to establish measurable objectives.

The members of the EREVIA Group recognised that none of the national achievements in the field of energy research evaluation so far come close to the quality of the work carried out under the auspices of the European Commission.

### *2.4.1 Implementation at European Commission level*

Evaluation of the European programme began formally in 1996. Focusing originally on financial aspects, over the years it has developed to examine other issues as well, in an increasingly sophisticated way. The evaluation of the Fourth Framework Research Programme (FP4, 1994-1998), for instance, was confined to assessing the relevance of the programme objectives, the efficiency with which the programme was implemented, its effectiveness and major achievements, and making recommendations for the next Framework Programme. For the Fifth Framework Programme (FP5, 1998-2002), a clearer link had been established between target actions and socio-economic Community objectives. As a result, the evaluation was able to look in more detail at results and impacts.

The European Commission carried out 28 studies on socio-economic impacts in the various subject sectors covered by the Framework Programme. Regardless of sector, project and programme, outputs were covered better in these studies than impacts. Short- and medium-term effects tended to be given more attention than longer-term impacts, even though the latter are generally more important. Socio-economic effects received slightly more attention than purely scientific and technical issues.

Non-nuclear energy was one of the first areas to be included in the Research Framework Programmes. The non-nuclear energy programme has therefore been evaluated several times since 1996. In addition to the annual and five-yearly monitoring exercises common to all parts of the Research Framework Programme, DG Research's Energy Directorate and DG TREN have also carried out a series of impact evaluations of the non-nuclear energy research and demonstration work in FP4, and of the energy saving projects in the SAVE programme and renewable energy projects in the ALTENER programme within the energy framework programme.

In 2000, DG Research's Energy Directorate carried out a pilot impact evaluation of the results of 90 completed non-nuclear energy projects in FP4. A further study was conducted in 2001-2003 to examine the impact of the remaining completed FP4 non-nuclear energy projects. Between them, the two studies looked at some 700 projects. The work – which can be regarded as one of the few examples of good practice in this area – combined quantitative and qualitative information effectively. It used two time horizons in the assessment of impact: the time the project ended and three years after that.

These achievements should not detract from the fact that a coherent and comprehensive methodology for evaluating impact is still lacking. In the work carried out so far, the following problems have not been covered:

- Data generally come from one source only (e.g. the respondent) and are not validated against, for example, company information or official statistics.
- Data are not analysed exhaustively. For instance, frequency tables are not analysed statistically.
- Quantitative information tends to be overstated. Non-participants' views are generally neglected.
- Not much effort is made to trace societal effects.

## 2.4.2 Implementation at Member State level

On the basis of the information presented by the EREVIA Group, Member States' experiences in impact assessment can be divided roughly into four groups:

- 1. Very advanced.** Characterised by a well-established tradition of impact assessment design and implementation, the existence of a common strategy, well-defined methods and tools, and the involvement of all stakeholders in the assessment process. Examples are Denmark, Finland and Sweden. This group can therefore be termed 'The Nordic Model'.
- 2. Advanced but not coordinated.** For these Member States, the impact assessment methods developed by the authorities are advanced but very specific. For that reason, individual authorities may be isolated from their national context or strategy. Examples are Germany and The Netherlands.
- 3. Centralised.** For these Member States, impact assessment studies are designed and coordinated at a central level. Examples are France and the UK.
- 4. Emergent.** Experience of impact assessment remains relatively limited for these Member States. Examples are the southern European countries, Ireland, and the new Member States. It is important to note that some countries in this group (e.g. Spain) have developed some very interesting initiatives.

### 2.4.2.1 Very advanced

Further details of approaches used by Member States with very advanced experience in evaluation and impact assessment of energy research are given below:

**Denmark:** The Danish development programme for renewable energy, managed by the Danish Energy Agency, was established in 1990. In 1996, the programme's technical committee decided that all the wind power projects supported by the programme should be evaluated. The first phase of the evaluation covered the 100 or so projects running during the period 1990-1994. The work was carried out by external consultants who agreed a methodology and set of evaluation criteria, which included some quantitative elements, with the technical committee. The evaluations were not as precise as the impact assessment work carried out by the European Commission. The consultants carried out the individual project evaluations by reviewing the project documentation and final report, interviewing the project manager or related person, contact with specific target groups, completing an evaluation form with comments for each criterion, presenting a verbal appraisal to the project team, finalising the evaluation and sending it to the programme technical committee and the Danish Energy Agency. The final step was preparation of an overall evaluation of the programme for 1990-1994. This report includes a distribution of the projects by specific technological area (i.e. technological development, planning and environmental issues, collection of information, dissemination projects, special assessments, etc.) and a judgement of the objective usefulness of the projects from the viewpoint of national energy policy, the national energy agency programme, and international co-operation.

**Finland:** Evaluation of the Finnish energy technology programme managed by the national technology agency, Tekes, covers project portfolio analyses, programme evaluations and specific evaluations. The strategy includes *ex post* external evaluations, monitoring (including annual

assessments, self-appraisal by contractors, and mid-term evaluations) and analyses of fund allocation, lessons learned, and technology strategies. Impact assessment examines outputs and qualitative and quantitative effects. The impact on the wider economic scene is also analysed. The evaluation report for the 1993-1998 energy technology programme presented the results at portfolio, policy, programme and participant level.

**Sweden:** The Swedish government has a long tradition of evaluation. In the energy field, structured evaluations are conducted at national energy policy level, at national energy agency level, and on international co-operation. At policy level, regular reviews are conducted on all the relevant programmes – the investment programme for energy efficiency, the investment programme for energy supply, and the energy research and development programme – which include an examination of outputs and impacts. Evaluation indicators for the investment programmes include funding and construction of new generating capacity (these are reasonably straightforward to obtain) and energy savings achieved (less straightforward). The energy research and development programme, including its evaluation, is the responsibility of the Swedish Energy Agency. *Ex ante* and *ex post* evaluations are conducted on the entire programme, on each activity area, and on the specific sub-programmes that make up the whole programme. The assessment of the entire programme results in a judgement statement on the development status of each activity area, a prioritisation of the activity areas and a judgement on when and how a market introduction of specific technologies may occur. The assessments of the individual activity areas results in a review of objectives and targets for the area, a judgement on its present status and expected development, markets, the role of government for further development, the important national and international research and development players, the comparative advantages of the existing technology, barriers, a judgement on future research and development needs, etc. Each activity area is covered by a number of specific sub-programmes. In all, there are around 30 such sub-programmes each running for three to six years. All work within a sub-programme is subjected to *ex ante* evaluation covering its compatibility with general energy policy objectives, the role and importance of the technology in relation to the objectives and its development potential, the Swedish and international research and development environment for the work, the scientific quality of the proposed work, its energy and industrial relevance, and environmental aspects. *Ex post* evaluations of the specific sub-programmes are carried out regularly. Several specific programmes are evaluated each year so long-running programmes have been evaluated more than once. An evaluation is normally conducted by an international review panel during one week, and includes visits, interviews and report writing. The review covers a background description of the programme, scientific achievements, degrees granted, publications and patents, industrial participation and relevance, leadership, management and organisation, information dissemination and recommendations for future work. Societal aspects are included where relevant.

#### 2.4.2.2 *Advanced but not coordinated*

Information on some advanced evaluation work specific to a particular activity is given below:

**Germany:** The EREVIA Group's discussions suggest that in Germany a number of specific impact assessment exercises have been conducted on energy research that emphasise soft effects, measurement of outputs and the quantitative analysis of this.



**The Netherlands:** The impact assessment of Dutch participation in the IEA non-nuclear energy IAs examined by the EREVIA Group is just one example of energy research impact assessment carried out in the Netherlands. The methodology used, which is far from being the only way in which impacts are studied in the Netherlands, was based on the procedure developed by the IEA CERT. This focused on three aspects of the IA: evaluation of objectives and achievements, including an analysis of the instruments adopted and an appraisal of the costs and benefits of the activities; a survey of initiatives taken to increase the participation, to expand the work, to improve dissemination of results and to involve non-member countries; and strategic assessment of the future role with regard to IEA priority objectives, and an analysis of the effectiveness of the portfolio in different technology areas and in the overall collaboration. The Dutch Ministry of Economic Affairs, and NOVEM which was responsible for the work, wanted to improve their understanding of the benefits to their own country of participating in the IEA work and the value for money associated with it. Therefore, they adapted the IEA standard procedure to their own needs. Initially, a pilot exercise was carried out on 12 IAs. It was carried out by external consultants and was completed successfully in 1997. The exercise was then extended to the remaining eight non-nuclear energy IAs, and was completed in 1998. The methodology involved a literature study to gain an understanding of how the IA was structured, etc., followed by interview with the Dutch member of the Executive Committee for the IA and a number of IA participants. The interview questions aimed to tease out the value of the research involved, the value of the investments made, and the value of the improved competitive position as a result of participation in the IA. An evaluation report was produced for each IA.

#### *2.4.2.3 Centralised*

Further details on some centralised approaches to evaluation and impact assessment are given below:

**France:** The French presentations to the EREVIA Group suggest that evaluations give priority to qualitative aspects and are less detailed than the European Commission's pilot impact assessment of the results of FP4's non-nuclear energy projects. The meta-evaluation of all the sub-sectors of ADEME's research programme 1985-1995 began with an inventory of past evaluations, conducted two additional evaluations (on buildings and industry), and collated the results of all the evaluations. This synthesis concentrated on examining the main modes of intervention and their effects over the 11-year period. It defined the techno-economic and socio-economic networks that pertain to non-nuclear energy research and its exploitation and impacts, and showed the effects of the interventions on these. The evaluation of the inter-ministerial land transport research programme, Predit, was conducted both at mid-term (1998) and at the end of the programme (2001). The mid-term evaluation was carried out by means of a postal survey of participants, interviews with programme management, and a strategic conference involving a panel of foreign experts. The final evaluation involved a national experts panel, a postal survey of participants, interviews with programme management, an appreciation of the programme within the panel, and four case studies that compared success and shortcomings in similar areas.


**United Kingdom:** In the UK, Treasury and Cabinet Office pressures for measurable outcomes from interventions and evidence-based policy means that the climate favours evaluation activities. In the Department of Trade and Industry, a Scientific Evaluation Committee reports to the departmental

board. Both policy and programmes are evaluated in all sectors. Performance is assessed against targets and objectives, and the relative effectiveness of activities contributing to targets is also analysed. Programmes are compared using a set of common impact indicators. Company surveys are augmented by examination of large-scale statistical data on firms and background research/literature surveys. For evaluations of energy-related policies and programmes, the DTI Energy Group has established an Energy Evaluation Committee and employs a full-time energy evaluator. A strategic review has been undertaken of the role of evaluation in the Energy Group. A three-year programme has been developed to cover all sub-sectors. Each evaluation covers policy, regulations, performance against targets, and expenditure programmes. Recent evaluations covered renewables research and development, renewables market stimulation, oil and gas R&D, cleaner coal R&D, nuclear fusion R&D and nuclear decommissioning. Future work will cover performance against targets on gas and electricity prices and greenhouse gas emissions, regulatory reforms in electricity and gas sectors, nuclear safety in the Former Soviet Union, cleaner coal R&D, support to the coal industry, environmental regulation of North Sea oil and gas, and consultation processes. The recent oil and gas R&D evaluation covered two programmes – the LINK programme between industry and universities on hydrocarbon reservoirs, and a programme to support innovation in the oil and gas supplies sector. Both programmes supported pre-commercial R&D, largely by SMEs. The evaluations focused on technical and economic impacts. The methodology involved surveys of companies and institutions directly involved, interviews with oil companies, peer review of the technologies developed under LINK, and case studies to look at longer-term impacts and spin-offs. The recent renewables evaluations covered support for market stimulation – the so-called Non-Fossil Fuel Obligation (NFFO) programme – and R&D. The evaluations focused on support for wind, landfill, gas and biomass over the previous ten years. The methodology involved surveys and interviews with renewables companies, financial organisations and the managers of the support, and review of bid data for NFFO. The focus was on technical, economic and environmental impacts.

#### *2.4.2.4 Emergent*

Further details of Member States where evaluation and impact assessment are not widely used are given below:

**Spain:** Spain has two separate energy programmes covering scientific and technology research (the PROFIT programme) and demonstration (the energy efficiency and renewable energy sources programmes). Neither has been subjected to much impact assessment. For the PROFIT programme, which gives loans and subsidies for technology research, those submitting proposals have to complete a questionnaire on the future socio-economic impacts they expect from their project. However, the questionnaire results are not verified. A very interesting study was carried out by IDEA in 1997-1999 on the impact on employment of the energy efficiency demonstration programme and related initiatives. The work was part of a wider study on experience in nine Member States funded by the European SAVE programme and coordinated by the UK's Association for the Conservation of Energy. The methodology included carrying out six Spanish case studies which looked at new direct jobs created, both in the companies that produce new goods for energy-efficient equipment and the companies that receive assistance. The data were gathered in the firms themselves through a questionnaire prepared specifically for each case study. The Spanish case studies covered: subsidies granted to projects in the manufacturing sector



in 1996 and 1997; subsidies granted to projects in the services sector in 1996 and 1997; third-party finance in the manufacturing sector in 1996 and 1997; third-party finance in the services sector in 1996 and 1997; demand-side management programmes aimed at the industrial sector in 1997; and demand-side management programmes aimed at the domestic sector in 1995 and 1997. The data collected was analysed using input-output models. A similar exercise was carried out to determine the impact on employment of the Spanish renewable energy demonstration programme.

*Other countries:* The EREVIA Group discussions provided the following information on other countries. *Estonia* is embarking on an evaluation exercise and has asked for the relevant final reports to be submitted to the evaluators. In *Greece*, evaluation of the technical results of the national research programme has been carried out but it does not cover socio-economic impacts. Despite difficulties in collecting the appropriate information, *Ireland* has carried out an evaluation of Irish participation in FP4. Evaluators found that a period of two to three years after project end is sufficient for evaluating impacts in the energy sector. In *Italy*, ENEA has carried out an assessment of the results of research projects, focusing mainly on qualitative aspects.

## 2.5 Conclusions on methodology

The following general conclusions can be drawn from the EREVIA Group's presentations and discussions on methods.

The earliest evaluations were essentially peer reviews. Procedures have developed over the years so that nowadays evaluations tend to be professional exercises conducted by independent experts. Most, but not all, Member States carry out some sort of evaluation of their national energy research and development programmes. Many of these exercises examine impacts to a greater or lesser extent. The Member States use a variety of approaches for assessing impacts at different levels. Most Member State procedures give priority to qualitative aspects. Quantification of impacts is complicated – and therefore difficult – to achieve at the strategic level. Collecting the relevant information is also an issue. However, it is possible to quantify impacts provided that projects and programmes have well-defined and measurable objectives. Energy research has special characteristics that need to be taken into account in designing and implementing impact assessment exercises. The needs of energy research impact assessment practitioners cannot be met by general fora such as ETAN. Because of the different experiences among the Member States, the lack of a common methodology, and the growing awareness of the usefulness of impact assessment in defining best practice in energy research and in implementing and setting energy-related policies, energy research impact assessment practitioners are very interested in exchanging views and comparing existing procedures so as to improve impact assessment techniques. A clear understanding of the limitations of each of the available methods needs to be obtained and, where relevant, harmonisation achieved. The Nice Treaty requires the European Commission takes steps to coordinate, where possible, the Community-specific research programmes with Member State programmes. Such coordination should fruitfully address evaluation methods. Many common problems need to be addressed, e.g. how to link input indicators with impact assessment, how to progress from qualitative to quantitative analysis, and how to assess outputs/inputs in long-term research.

## 3. RESULTS

### 3.1 Main results and lessons


The main results and lessons from Member State evaluation and impact assessment exercises examined by the EREVIA Group are summarised below:

**Denmark:** Evaluation of the Danish wind programme suggested that a reasonable choice of evaluation process and criteria had been made. Among those projects judged to be “acceptable” there was a big difference in quality from the best to the worst: maybe the differential was too great. It can be difficult to accomplish an evaluation three to four years after the project-end because the project team may well have dispersed. On the other hand, an objective view of project usefulness cannot be formed immediately after project-end: a period of at least a year, probably two to three, is needed. Overall, however, it can be said that the evaluation proved beyond doubt that the programme had contributed to building up competences in many parts of the Danish wind sector, and had strengthened the institutional framework for wind power development in the country. Moreover, the special agreements and information activities contributed to educating the public about wind power and helped provide a better platform for decision-making prior to the introduction of new legislation and regulations. However, the evaluation proved that quantification of the use of programme results and their impact on energy policy is difficult – just as difficult as it would be to answer the question: “What would have been the situation regarding wind power development in Denmark if the government programme had not existed?”.

**Finland:** The evaluation of the Finnish energy technology programmes showed that projects should focus on goals, interactions should be maximised, and the work should be relevant to policy and have verifiable objectives.

**France:** The evaluation of the ADEME programme concluded that programme impacts were high – but difficult to quantify because of the lack of clear and consistent objectives over time. The evaluators recommended that support for research should continue but only if it was part of a broader energy vision. They underlined the importance of benchmarking within the European perspective. They suggested that a techno-economic network appraisal should be adopted for monitoring and evaluating instruments. The evaluation of the Predit programme suggested that the programme would have been more successful if it had been structured to meet the needs of transport policy and supported by indicators. Absence of strategic design can lead to some research areas being omitted from a programme for no clear reason. In the case of Predit, the programme focused on meeting the demands of industry and therefore did not contribute to policy as well as it might. It should have supported the research infrastructure around transport and improved network effects by introducing new actors and new domains.

**The Netherlands:** Evaluation of Dutch participation in the IEA non-nuclear energy IAs proved the importance of obtaining good written material on which to base analyses. It also showed that when a methodology is based on interviews, the success of the evaluation depends on the knowledge, availability and involvement of the people interviewed. Overall, the evaluation showed the main benefits of participation in the IEA programme were the sharing of research, the



possibility of solving problems quickly by learning about others' solutions, and using results produced by others in other parts of the programme. Networks and collaborative agreements were set up. Hearing about others' failures during informal gatherings led to costs avoidance. Access to unpublished information on policy choices was also improved.

**Spain:** The methodology used to evaluate the PROFIT programme did not include much impact assessment and was generally weak as regards economic criteria. Proposers were asked to complete a questionnaire on the future socio-economic impacts they expected from their projects. Analysis of questionnaires showed that few past proposals had measurable objectives. Therefore, the practical results from the exercise were low. This led to recommendations that more specific objectives should be set for the programme in the future, with the inclusion of comprehensive and measurable socio-economic as well as scientific indicators, and the assignment of adequate budgets for impact assessment. The Spanish study on the impact on employment of the energy efficiency demonstration programme showed that the programme made an obvious favourable contribution to direct and indirect employment. Between ten to 20 new direct jobs were created per million euro of investment. Private investment created more jobs than public investment. The number of indirect jobs created by the programme was also significant, and was greater in situations where avoided energy costs were higher. In general, regulatory legislation was more effective than fiscal or subsidy measures, especially in the residential and tertiary sectors. EU-wide policy produces greater gains in employment than national policies. The Spanish study on the impact on employment of the renewable energy demonstration programme confirmed the results of the energy efficiency programme impact assessment.

**Sweden:** Sweden has a wide experience of evaluation. A key lesson learned from the evaluation of the energy programmes is that *ex ante* objectives are not always commensurate with *ex post* measurability. However, a recent review of the energy research and development programme gave the following conclusions regarding the programme's impacts. It has resulted in a considerable increase in knowledge and competence in many energy technology fields, a significant build-up of R&D infrastructure in the energy field, and an increased number of options for energy policy action, with climate effects having an increasingly strategic importance. However, the programme has not had a decisive impact on changes to the energy system in past decades due to inherently long lead times for such systems. Also, some development paths have failed technically and/or economically and have been abandoned. A recent evaluation of the investment programme for renewable energy supply concluded that, up to 1995, the programme produced new CHP capacity of 327 MW and new wind power capacity of 67 MW. The programme also resulted in quicker decisions to make investments. However, this programme supports investment but not operating costs, so there has been low usage of the CHP capacity due to electricity market conditions. A recent evaluation of the investment programme for energy conservation concluded that the programme has produced new solutions in household appliances, lighting, windows, control systems, etc. In this case, higher efficiency is often combined with high quality. However, the specific costs of these new solutions were often high and frequently it was too early to observe market penetration. Moreover, it was found that measures like standards and energy labelling were more suited to the EU than to national programmes.

**United Kingdom:** The UK has accumulated valuable experience in evaluation. It has developed a well-organised overall system that ensures clear outputs and good influence on individual programmes. However, the evaluation work does not impact much on overall resource allocation. The experience gained from recent oil and gas and renewables evaluations highlighted a number of general issues, as follows. There is a conflict between the time it takes to accumulate evidence and the need for a quick feedback to influence future policy/programme design. It is difficult to obtain quantified data from companies, particularly for spin-off benefits. It is also difficult to assess institutional impacts, including those achieved from collaboration, and to disentangle the impacts of a range of factors.

### 3.2 Use of results by decision-makers

Evaluation results are important to decision-makers. The results can provide a basis for the design or reorientation of activities. They can inform decisions on fund allocation, and can aid the setting of the clear legal requirements that decision-makers need.

The use of evaluation results for this purpose is a relatively new concept in Europe. Until recently, the relevant results were not available. Scientific excellence was achieved through competitive proposals and project selection by peer review. Decision-makers felt that, as a result of this rigorous selection process, they could be confident they were funding the best available projects. Today, with the pressure for accountability, decision-makers have to do more than achieve quality control at project selection level: they also need to show that project and programme outputs and impacts match the plans and are useful, usable and appropriate.


The EREVIA Group discussions illustrate some of the different types of experience encountered in the use of evaluation results by decision-makers:

**Denmark:** Evaluation of the Danish wind power programme showed that the programme built up technical competencies and strengthened the institutional framework for wind in Denmark. However, the evaluators found themselves unable to quantify the effect of the programme on national energy policy or show what would have happened to wind power development if the programme had not existed.

**France:** For the French, a research programme is justified if the results are taken into account in the definition of public policies. Based on that criterion, the Predit land transport research programme was not successful: the influence the programme results had on transport policies did not correspond to the effort put in. Diffusion of the programme results to decision-makers was judged to be insufficient.

**The Netherlands:** The results of the evaluation of Dutch participation in the IEA IAs had few actual consequences beyond the fact that the country participated in more IAs. Despite dissemination of the evaluation results to the relevant ministries and departments, understanding in the Netherlands of the benefits of international co-operation of this type remains low and the evaluation approach has not been replicated elsewhere.

**Spain:** The results of the study of the impact of the renewable energy demonstration programme on employment and economic growth were taken into account when the Spanish renewable energies promotion plan for 2000-2010 (approved in December 1999) was being formulated.



**Sweden:** The results of the Swedish energy research and development programme evaluation were taken into account when the decision to increase the funding for the successor programme 1997-2004 was taken. A new evaluation along similar lines was planned to help decision-making for the next programme.

**EC:** Shifting the focus of the European programmes away from R&D for its own sake towards work to meet EU challenges requires management of the Community research programmes to be conducted through an interactive process. The results of impact assessments of completed programmes (e.g. the pilot impact assessment of all the completed non-nuclear energy projects in FP4) should therefore be obligatory reading, not only for those formulating future programmes but also for those submitting proposals to them, because of the clear messages they give on management issues.

### 3.3 Difficulties in analysing results

The EREVIA Group discussions identified a number of difficulties that can be encountered in the analysis of the results collected in an impact assessment study.

First, of course, problems will arise if the questions asked in the evaluation (i.e. the evaluation indicators) do not link with the *ex ante* objectives of the project or programme. The questions need to tease out qualitative and quantitative information that can be analysed.

In addition, it must be remembered that superficial comparison of the results of individual reviews is risky as it can lead to incorrect conclusions.

Other problems can stem from 'evaluation fatigue' on the part of those surveyed or interviewed. If those conducting the evaluation do not take the time or trouble to ensure that participants understand why the exercise is being carried out, the benefits to be derived from it, and the time and effort that will be required of them, participants may well not provide all the information needed for the subsequent analysis. Steps to avoid evaluation fatigue need to be programmed in when the evaluation exercise is planned.

In evaluating both Member State and Community research programmes, problems can arise if questions are not framed in a way that allows a clear picture of 'additionality' to emerge. Most programmes require that projects funded must achieve benefits additional to those which would otherwise occur. Therefore, evaluations must answer the question: "What differences did the intervention make and do those differences justify the intervention?". Several aspects of the subject need to be considered: output, input and behavioural additionality and commercial benefits. To obtain output, additionality information has to be acquired that allows the question "Could the same outputs have been obtained without policy action?" to be answered. Input additionality addresses the question "Does the public action add to, or substitute, the regular (usually financial) inputs?". Behavioural additionality addresses differences in behaviour among agents when following the policy action or its persistence beyond the action. For instance, it might answer the question "Did the policy action change the different dimensions of the agents' capacity to learn?". As regards commercial benefits, the EREVIA Group reported difficulties in quantifying the commercial benefits of the project or programme to industrial or commercial enterprises.

Responsibility for developing appropriate indicators and methods of analysis needs to be shared among all parties concerned with an impact assessment. Otherwise, the required data may not be forthcoming from interviewees and the analysis may not provide the necessary answers. In assessing the impact of the Spanish energy efficiency demonstration programme on employment, operational difficulties were encountered in three main areas. First, for reasons of confidentiality, it was difficult to obtain information from the companies and equipment suppliers that benefited from the programme. Second, it was difficult to estimate private-sector investment, volume of employment, and the associated energy savings *before* implementation of the energy efficiency policies. It was also difficult to differentiate between job opportunities which resulted from company expansion and those which resulted from investments in energy efficiency in cases where the energy efficiency investment was done as part of a larger investment programme to increase production capacity.

Another issue causing problems in results analysis is the inertia of the energy sector. The high value of pre-existing investments in energy infrastructure and in those energy-intensive structures which have a long life means that they cannot be discarded easily in favour of more efficient solutions. Also, the energy sector has low growth in industrialised countries which means it can take a long time for R&D results to have an impact on the energy system. On the other hand, when they do have an effect, they are long-lasting. Therefore, in some energy sub-sectors (fusion is a good example) increased knowledge and a working R&D structure can legitimately be taken as the outputs and impacts of an energy R&D programme, since they are prerequisites for the long-term relevance of the programme.



### 3.4 Conclusions on results

The following general conclusions can be drawn from the EREVIA Group presentations and discussions on the results:

A better understanding is required of the expectations and assumptions of all relevant parties concerning evaluation results and their use. Different actors have different interests. A variety of policy rationales and purposes exist, and policies are pursued at multiple levels. It is difficult to attribute effects to interventions. All these issues need to be clarified.

Evaluations have to be organised so that the results meet the needs of decision-makers more readily.

The value of the strategic planning of energy research, particularly of fundamental research where the drawing up of road maps is not practicable, is often treated with ambivalence by researchers. However, strategic planning allows long- and short-term research and development goals to be transformed into performance goals which present a clear target for the organisation of research effort. If the goals are made part of the discussion in the everyday life of the organisation, the exercise becomes more meaningful for the researchers involved. Moreover, the process benefits the public.

More effort must be put into revising the ways in which the results of evaluations are used by decision-makers. The process should allow goals to be reset as a result of what has been learned.

The value of evaluation results changes with time, so results should be made available and used rapidly. Their importance in the formulation of follow-up programmes needs to be more widely recognised.

There is a need for the outcomes of national energy research programmes to be more visible – better known – both within the Member States and at the European level. Dissemination of results and marketing of products arising from the programmes is currently weak, partly because companies are conservative in their dissemination. More effort has to be given to publicising programme results.

Also, the opening up of Member State thinking to European influence on the use of evaluation results is worthy of consideration. It is, of course, up to each country to make its own decision on this.

A final conclusion is that the actual results of the European energy research programme evaluations (as opposed to the methodology) have a relatively small audience beyond those decision-makers who are directly involved. This is because the European programme is concerned with a specific set of topics which are managed in a top-down manner. It does not lend itself to achieving co-operation between many parties. By contrast, the IEA non-nuclear programme covers a large area of interest and examination of the results allows participants to gain an idea of the relative importance of the different aspects of the subject. A global network of interested parties is built through the programme which provides a setting for participants' decisions on the direction that further exploration of the subject should take. Studying the benefits of this approach in achieving co-ordination could prove useful to European Commission programme managers.

## 4. RECOMMENDATIONS


The following recommendations regarding assessment of the impact of energy research can be drawn from the presentations and discussions of the EREVIA Group:

### 4.1 Broad recommendations

- Continue to support energy research, but only as part of a structured and comprehensive energy vision
- Develop benchmarking, which will be increasingly important in the European perspective
- Use a techno-economic network approach to monitoring projects and programmes and evaluating the impact of interventions.

### 4.2 Methodological recommendations

- Establish clear objectives, quality targets, and criteria for choices for programme/projects from the start, i.e. *ex ante*. Show a clear link between programme activities and sustainable development – energy and environmental – policies. Establish a clear relationship between *ex ante* objectives and *ex post* evaluation by providing programme managers with quantifiable objectives and indicators for impact assessment at programme and project/proposal level. These should enable assessment of impacts on energy systems, impacts on technology systems, and socio-economic impacts. Doing this will facilitate the work of programme managers and applicants for funding and increase the credibility of results.
- Clarify what are meant by quality, excellence and relevance by:
  - **Defining standards.** That means establishing a common understanding of what constitutes quality and excellence, taking into account national and European situations. This will aid preparation of better-quality proposals and improve research credibility. It will also enable projects to fit better into the overall research scene and ensure that the results can be inserted easily into public policies.
  - **Improving indicators.** Energy indicators are central to the definition of the quality standards mentioned above. In addition, a comprehensive set of measurable socio-economic indicators should be developed along with improved methodologies for measuring socio-economic impacts.
- Ensure the evaluation results are usable and followed up by:
  - **Planning a complete evaluation scheme from the beginning that is relevant to the programme** and is adequately staffed with proactive personnel and has sufficient funding to do an effective job. The scheme should take a broad perspective and include a series of compulsory evaluations to be applied at different stages of the action plus a framework for project monitoring that is compatible with the evaluation work.
  - **Arranging for evaluation results to be followed up** by a committee with both scientific and technical expertise relevant to the field and also expertise relevant to the making of

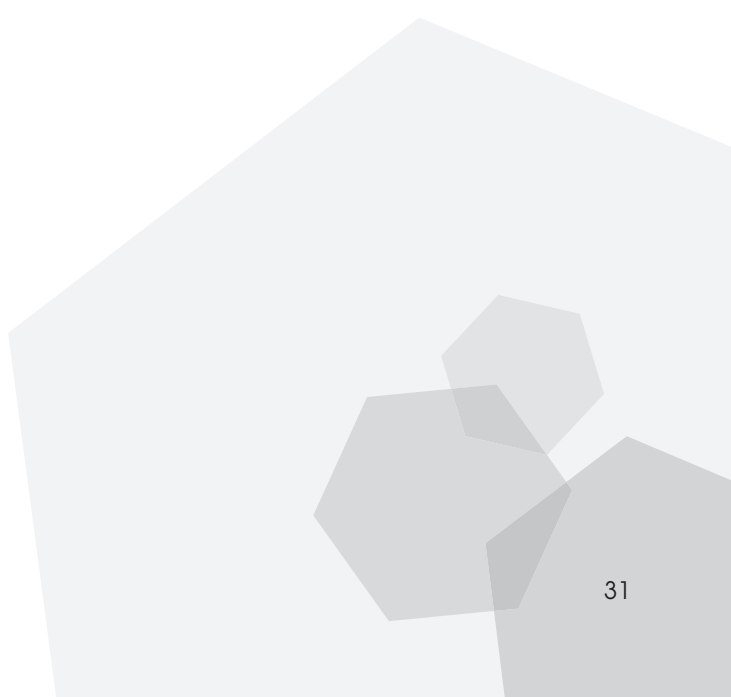


judgements on European added value, energy and environmental policies, and industrial relevance. The committee could be formed by strengthening the programme scientific consultative committee to provide the range of relevant expertise. The committee could even be given a mandate to control the evaluation process.

### 4.3 Policy recommendations

Set up a 'European Evaluation Area' for energy research and development to ensure convergence of evaluation methodologies and procedures for this subject. This would enable the creation of an ERA with coordinated research objectives and policies. The main steps in the creation of this would be:

- **Developing an information system on indicators, methods, results, and expertise** to allow improved access, through a simple portal, to European Commission and Member State impact assessments and evaluations.
- **Defining energy-specific indicators suitable for common use** while taking account of specific local needs. Existing lists could be used as a starting point.
- **Exchanging views and benchmarking/learning by comparison** to facilitate identification and diffusion of best policies and good practices across the Union. The exercise would provide evidence on EU research performance, the qualitative factors that underpin this performance, the ways in which these factors are addressed by energy research policies, and the relative levels of success of such policies. Implementation of this measure could involve identification of the 100-120 or so people involved in energy evaluation and impact assessment in the EU, the setting up of a virtual network, establishment of a more formal group, convening special meetings, establishing a database of Member State experts, and identifying 20 or so interested decision-makers in the EU and inviting them to a dedicated seminar.
- **Promoting a more European approach** using the multinational panels and information system/database referred to above, defining clear parameters for the evaluation of European added value, and involving programme managers and people from relevant institutions and industry.
- **Improving the use of evaluation results in decision-making** by (a) strengthening links with decision-makers, encouraging them to use evaluation results, involving them in defining evaluation terms of reference; (b) translating evaluation results into operational processes – helping people decide which results to use for improving programmes and projects and defining priorities; and (c) improving links with stakeholders.
- **Improving dissemination of results emerging from energy research programmes.**
- **Sharing the responsibility for evaluation with the scientific community**, not imposing it on them from above, and encouraging researchers to develop coherent systems of self-assessment.





## SOURCES

In addition to the EREVIA Group discussions, the following sources were used in the preparation of this report:

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## ABBREVIATIONS USED IN THIS REPORT

ADEME	Agency for the Environment and the Management of Energy, France
ANVAST	ANVAST srl, Italy
AUA	Agricultural University of Athens
CIRCA	CIRCA Group Ltd. Europe, Ireland
CREST	Scientific and Technical Research Committee
DEA	Danish Energy Agency
Research DG	European Commission Directorate-General for Research
DG TREN	European Commission Directorate-General for Transport and Energy
DSM	Demand Side Management
DTI	Department of Trade and Industry, UK
EAU	Estonian Agricultural University
EE	Energy efficiency
Elforsk	Swedish energy industries' R&D organisation
ENS	Danish Energy Agency
ERA	European Research Area
EREVIA Group	Energy Research Evaluation and Impact Assessment Group
ESCAN	ESCAN S.A., Consulting, Spain
ETAN	European Technological Assessment Network
IDEA	Institute for the Diversification and Saving of Energy, Spain
IEA	International Energy Agency
IEA CERT	International Energy Agency Committee on Energy Research and Technology
IEA IA	International Energy Agency Implementing Agreement
MENRT	Ministry of Education, Research and Technology, France
NGO	Non-governmental organisation
NOVEM	The Netherlands Agency for Energy and the Environment
ÖGUT	Österreichische Gesellschaft für Umwelt & Technik, Austria
SME	Small and medium-sized enterprise
Tekes	National Energy Agency, Finland
UVE	Danish Development Programme for Renewable Energy

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Are we spending the right amount of money on energy research and development? Are we doing the right projects? Are we carrying out projects effectively? Are the results reaching the right people? Are the results being used properly? Was our last programme as useful as we thought it was going to be? What lessons can we learn from the past? What should our next research programme look like? How do we design it to meet future needs?

All energy research managers need answers to questions like these, whether they are concerned with single projects, small company or sector programmes, national programmes, or international programmes. Increasingly, they are turning to impact assessment tools to help them find the answers. However, approaches to energy research impact assessment, and the extent to which they are used, vary across the EU. Therefore, the European Commission brought together an informal group of experts from the Member States to establish the current status of energy research impact assessment in the EU, and to find out what might be done to improve standards and achieve harmonisation.

