



EUROPEAN  
COMMISSION

Community research

# Energy R&D Statistics in the European Research Area

EUR 21453

**Interested in European research?**

*RTD info* is our quarterly magazine keeping you in touch with main developments (results, programmes, events, etc.). It is available in English, French and German. A free sample copy or free subscription can be obtained from:

European Commission

Directorate-General for Research

Information and Communication Unit

B-1049 Brussels

Fax (32-2) 29-58220

E-mail: [research@cec.eu.int](mailto:research@cec.eu.int)

Internet: [http://europa.eu.int/comm/research/rtdinfo/index\\_en.html](http://europa.eu.int/comm/research/rtdinfo/index_en.html)

**EUROPEAN COMMISSION**

Directorate-General for Research

Directorate J – Energy

Unit J-1 – Strategy and Policy

Contact: [Martin.Huemer@cec.eu.int](mailto:Martin.Huemer@cec.eu.int)

Helpdesk : [rtd-energy@cec.eu.int](mailto:rtd-energy@cec.eu.int)

Internet : [http://europa.eu.int/comm/research/energy/index\\_en.html](http://europa.eu.int/comm/research/energy/index_en.html)

# **Energy R&D Statistics in the European Research Area**

**Final report**

***Europe Direct is a service to help you find answers  
to your questions about the European Union***

**Freephone number:  
00 800 6 7 8 9 10 11**

**LEGAL NOTICE:**

Neither the European Commission nor any person acting on behalf of the Commission is responsible for the use which might be made of the following information.

The views expressed in this publication are the sole responsibility of the author and do not necessarily reflect the views of the European Commission.

A great deal of additional information on the European Union is available on the Internet. It can be accessed through the Europa server (<http://europa.eu.int>).

Cataloguing data can be found at the end of this publication.

Luxembourg: Office for Official Publications of the European Communities, 2005

ISBN 92-894-8964-2

© European Communities, 2005

Reproduction is authorised provided the source is acknowledged.

*Printed in Luxembourg*

PRINTED ON WHITE CHLORINE-FREE PAPER

# TABLE OF CONTENTS

<b>1 Background</b>	<b>5</b>
<b>2 Analysis of the Situation</b>	<b>7</b>
2.1 International energy R&D statistics	7
2.2 Organisation of data collection	7
2.3 Data collection process, concepts and definitions	8
2.4 IEA energy R&D nomenclature	8
2.5 Public and private energy R&D	9
2.6 European Union and energy R&D	9
<b>3 Recommendations</b>	<b>11</b>
3.1 Extending IEA nomenclature and definitions of categories	11
3.2 Better guidance for country submissions to the IEA	11
3.3 Better understanding of the national data compilation process on energy R&D statistics	11
3.4 Segregating budget and expenditure data in the IEA database	12
3.5 Deepening cooperation between the IEA and OECD/EUROSTAT counterparts	12
3.6 Providing an internet based central repository for relevant documents and data	12
3.7 Including EC expenditures in the IEA statistics	12
Annex I – Terms of Reference of the Expert Group	13
Annex II – Participants of the Expert Group	15
Annex III – Survey of CERT Members	17
Annex IV – Survey among IEA Data Providers	23
Annex V – Proposal of a revised IEA Questionnaire (including Definitions)	37
Annex VI – Quick User Guide to the Frascati Manual for Energy R&D Statisticians (not available yet)	49
Annex VII – A Comparison of Energy R&D Nomenclatures (IEA and NABS)	51
Annex VIII – Contacts of IEA and EUROSTAT	55
Annex IX – Comparison of Concepts and Definitions of GBOARD, GERD and IEA statistics	57
Annex X – List of abbreviations	61



# 1 BACKGROUND

Accurate and reliable data and statistics are indispensable instruments for policy making. This applies to energy research and development (R&D) as to any other policy area. Priority setting, implementation of policies and evaluation and assessment of past activities all require sound, detailed figures on who spent - or intends to spend - how much money in what area of energy R&D.

Industrialised countries therefore have been collecting data on energy R&D expenditures for many years, and have produced a variety of statistics at both the national and the international level. Given the different backgrounds and histories of these statistics, it is not surprising that they differ considerably.

There are three sets of international energy R&D statistics<sup>1</sup> that cover all or most EU member countries:

- OECD/EUROSTAT statistics on GBAORD (Government Budget Appropriations or Outlays for Research and Development), which follow the NABS (Nomenclature for the Analysis and Comparison of Scientific Programmes and Budgets) classification, a socio-economic nomenclature, and are collected from government R&D funders;
- OECD/EUROSTAT statistics on GERD (Gross Domestic Expenditure on R&D), which follow an institutional classification by sector and are collected from all R&D performers;
- International Energy Agency (IEA) statistics on energy R&D, which use a scientific/technical nomenclature and are collected from government R&D funders.

All of these data sets have been in place for many years and have proved to be very useful in allowing the analysis of trends, priorities and effects of activities. There is, however, still room for improvement. For example, shifts in priorities, emergence of new technologies and growth in cross-cutting research programs mean that today's statistics do not completely match users' needs. Data cannot easily be compared across countries or between the IEA and OECD/EUROSTAT owing to differences in how R&D activities and categories are defined and in how the data are collected. Coordination among data providers within and among countries is quite restricted.

Energy R&D has increasingly been viewed as a policy tool to address energy and related environmental challenges. In this context, an understanding of R&D expenditures and trends is more essential than ever. In this context, EUROSTAT began a process to revise the NABS to better reflect recent developments and to improve compatibility with other R&D statistics. This work is being done in coordination with the OECD and should, i.a., lead to a revised energy chapter.

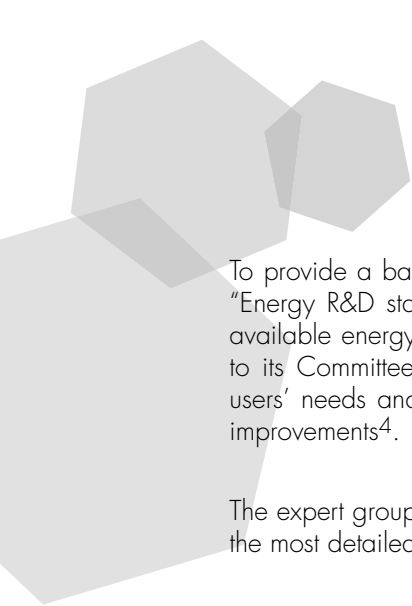
At the same time, the IEA was planning to review its own data collection questionnaire and classifications with a view to improving data quality and relevance.

Thus it seemed the right moment to stimulate discussion on these efforts and how they might contribute to correcting the deficiencies mentioned above. The European Commission (EC) therefore set up an expert group on energy R&D statistics<sup>2</sup>. The group, which included representatives from the IEA, EUROSTAT and 10 EU Member or Associated Countries<sup>3</sup> held four meetings resulting in a number of concrete recommendations on how to improve the data production chain and how to make energy R&D statistics more responsive to users' needs.

<sup>1</sup> See also "Annex IX – Comparison of concepts and definitions of GBAORD, GERD and IEA statistics" for more details.

<sup>2</sup> See "Annex I – Terms of Reference of the Expert Group".

<sup>3</sup> See "Annex II – Participants in the Expert Group".



To provide a basis for discussion, the EC commissioned Ge-Systems s.à.r.l. to perform a small study, "Energy R&D statistics in Europe, synthetic analysis and evaluation", describing and comparing the available energy R&D statistics. In addition, the IEA sent a short survey on data use to the delegates to its Committee on Energy Research and Technology (CERT). The results provided useful insight on users' needs and to what extent they were being met by existing statistics, provided suggestions for improvements<sup>4</sup>.

The expert group decided to use the IEA's nomenclature and definitions as the basis for its work as it is the most detailed data set available on energy R&D.

The expert group then undertook a number of specific activities:

- Ms. Treanton (IEA) prepared a questionnaire for data providers, focusing on the data collection chain<sup>5</sup>, which was sent to officials in IEA member countries in charge of collecting national energy R&D data. The results showed considerable differences in the application of existing instructions and definitions across countries.
- The group made proposals to improve the nomenclature used in the IEA questionnaire and the corresponding definitions (lead author Ms. Woodruff)<sup>6</sup>.
- The group commissioned the preparation of a user guide that provides consistent guidelines for reporting energy R&D data (lead author Mr. Faninger)<sup>7</sup>. The guide is based on the Frascati Manual (OECD 2002), an internationally recognised methodology for collecting and using R&D statistics.

The group then developed a number of practical recommendations to improve the relevance and comparability of R&D expenditure data and statistics.

These recommendations are presented here.<sup>8</sup> It is, however, beyond the scope of this group's mandate to implement the proposed measures. It will be up to policy makers, data collectors, data providers and delegates to the responsible bodies of the IEA and EUROSTAT to decide how, when and to which extent these recommendations will be implemented.

---

4 See "Annex III – Survey of CERT Delegates".

5 See "Annex IV – Survey of IEA Data Providers".

6 See "Annex V – Proposal for a revised IEA Questionnaire (Including Definitions)".

7 "Annex VI – Quick User Guide to the Frascati Manual for Energy R&D Statisticians" is still being discussed within the group and therefore not yet available.

8 See "Recommendations" in Chapter 3.

## 2 ANALYSIS OF THE SITUATION

### 2.1 International energy R&D statistics

Some member states (e.g., D, CH) develop statistics on their own energy R&D expenditures, and the Nordic countries (Nordforsk) collect regional data. But for purposes of policy assessment in an increasingly international and complex R&D system, international data are indispensable. Two organisations – the IEA and EUROSTAT – collect and publish international Energy R&D data and statistics. The data collection instruments used differ quite substantially in structure<sup>1</sup>. Some examples:

- EUROSTAT covers all areas of R&D in its GBAORD and GERD statistics while the IEA focuses on energy in its R&D questionnaire.
- EUROSTAT collects budget data in its GBAORD statistics and expenditure data in GERD while the IEA assembles both budget and expenditure data in its energy R&D questionnaire. It is not always clear which is being reported in a given year.
- GBAORD follows a functional classification, which has a first level representing socio-economic objectives (SEOs), and uses varying logical structures on the lower levels. For example, SEO Energy applies a scientific/technological nomenclature
- The top-level classification of the GERD statistics uses an institutional nomenclature distinguishing four sectors (business enterprise, higher education, government sector and private non-profit). A breakdown of government-financed GERD by SEO is optional.
- The sub-classifications used in GBAORD and GERD are often optional. Currently only five countries supply data to EUROSTAT for the sub-categories under GBAORD SEO energy.
- The IEA energy R&D data use a scientific/technological structure; all IEA member countries comply with this very detailed nomenclature. No institutional nomenclature is used.

Conclusion

IEA and EUROSTAT data and statistics are not or not directly comparable.

### 2.2 Organisation of data collection

In most of the countries concerned, EUROSTAT and IEA data are compiled by individuals in different organisations. In a number of countries, there seems to be a lack of coordination between those two groups, an observation confirmed by the IEA survey of data providers and group members' reports on the situations in their own countries. Another indication of this lack of cooperation is the observed inconsistency between the two data sets.

Conclusion

Coordination within countries on the collection and reporting of data for the two systems should be improved.

---

<sup>1</sup> See also "Annex VII – A Comparison of Energy R&D Nomenclatures (IEA and NABS)" for more details.

## 2.3 Data collection process, concepts and definitions

Energy R&D data reflect many components of the R&D chain: basic research, applied research, experimental (technology) development, demonstration.

IEA member countries pursue different ways to collect these data; interpret the IEA questionnaire and the underlying concepts and definitions differently; or simply deviate for practical reasons from IEA guidelines (for example, on the level of detail provided). Differences may also arise stemming from the timing of data preparation and transmission and from changes in the responsible institutions or personnel. A few examples:

- Some countries collect data on budgets, others on actual expenditures. Only a minority provides budget data for future years and expenditure data for past years.
- Despite detailed definitions in the Frascati Manual<sup>2</sup>, demonstration projects may be interpreted quite differently across countries because of their potential to contribute both to experimental development and to preparation for commercialisation. While the IEA data set includes (technical) demonstration in the detailed data, it breaks out the fraction of expenditure going to demonstration projects only for the total R&D reported. The EUROSTAT figures include technical demonstration as well but do not indicate it separately. Compiling data for each component of the R&D chain is optional for GERD and not done for GBAORD at all.
- For practical reasons, some countries attribute the whole budget of a program or project to the first year, whereas others indicate actual yearly expenditures.
- Some federally-organised countries have substantial energy R&D activities on the regional level, but the degree to which regional and local expenditures are included varies considerably.

Conclusion

IEA data are inhomogeneous and not fully comparable among countries or with EUROSTAT data.

## 2.4 IEA energy R&D nomenclature

The research landscape has changed substantially since the IEA R&D nomenclature was first developed. New technologies, such as CO<sub>2</sub> Sequestration, Hydrogen and Fuel Cells, have emerged or gained importance, priorities have shifted over the years, and cross-cutting programmes, which do not fit well into a single category, have become increasingly important. One indication of this development is the steadily rising share of R&D funding reported under less-specific categories, such as “Other Cross-Cutting Technologies or Research”.

Conclusion

The nomenclature of the IEA questionnaire does not fully reflect the structure and content of today’s energy R&D portfolios.

---

<sup>2</sup> The Frascati manual (see e.g. <http://www1.oecd.org/publications/e-book/9202081E.PDF>) puts forth well-accepted definitions for categories of R&D.

## 2.5 Public and private energy R&D

The boundary between public and private R&D expenditures has changed over time (e.g., reflecting the privatisation of energy companies) and is more and more difficult to draw due to the growing number of public-private partnership activities. In a time of generally shrinking public and private budgets, many countries consider public-private partnerships to be a key mechanism for stimulating private energy R&D in an efficient and targeted way. This increasingly complex pattern of public-private cooperation reinforces the need for energy R&D policy-making to consider the role of private-sector activities, underlining the need for reliable data on private R&D.

The IEA does not collect data on private R&D expenditures. EUROSTAT does compile business data as part of its GERD data set, but not as part of GBAORD.

GERD data, which are reported by R&D performers, are broken down by institutional sector (business enterprise, higher education, government, and private non-profit) but are not further classified into scientific/technological categories. Although government-financed GERD can be allocated to SEOs, one of which is energy, this is optional, making it impossible to extract information on private-sector energy R&D from GERD data.

### Conclusion

Despite the growing need, statistics on energy R&D expenditures in the private sector remain a problem.

## 2.6 European Union and energy R&D

Supranational funding of energy R&D, in particular in the framework of the European Union and the European Economic Area, has increased substantially over the past two decades. But data on energy research expenditures under the successive EU Framework programmes have not been included in the IEA statistics.

### Conclusion

The lack of EU data means that IEA statistics can at best provide only a limited view of the R&D funding landscape in Europe and in specific technology areas.



## 3 RECOMMENDATIONS

The group identified two areas in which action is needed: updating existing nomenclature to make it more responsive to users' needs, and improving such dimensions of data quality as reliability, comparability and transparency.

In order to contribute to these aims, the group made the following recommendations. (Because the IEA's nomenclature and definitions provided the basis for the group's work, most of the recommendations refer to the IEA.)

### 3.1 Extending IEA nomenclature and definitions of categories

In order to respond to recent developments and emerging priorities in energy R&D, while at the same time minimising disruptions to time series of data, the group proposes a moderate revision of the IEA's R&D nomenclature and of the definitions of what should be included in each category. The proposed revisions are outlined in Annex V<sup>1</sup>. In designing these changes, group members attempted to avoid increasing the workload of data providers.

### 3.2 Better guidance for country submissions to the IEA

Both EUROSTAT and IEA statistics rely on the Frascati manual. However, there is striking evidence that most data providers are not familiar with its basic definitions, resulting in broadly different interpretations of categories such as "demonstration". In addition, the IEA survey on the data production chain revealed a strong demand for clear and concise guidelines for data collection.

The group therefore proposes that such guidelines be provided in the form of a short manual for data providers and analysts<sup>2</sup>, summarising definitions and conventions for measuring research and experimental development (R&D) from the Frascati manual 2002 and pointing out how they apply to the IEA's data collection.

### 3.3 Better understanding of the national data compilation process on energy R&D statistics

IEA countries apply substantially different methodologies to produce data sets, but currently little is known about the data compilation process. Additional information on data providers, sources of information, survey techniques, funding organisation, timeliness of data and so on (metadata) would facilitate evaluation of data quality, harmonisation of practices across different countries and tracking of discrepancies between EUROSTAT and IEA data.

The group therefore recommends collecting additional information on the structure of government financing and on factors affecting the accuracy of the reported data. Such additional information, which would be gathered each time that data are collected, should be limited to a few high-priority areas so as to minimise the additional workload for data providers. Another option would be to complement the IEA's one-time survey of data providers<sup>3</sup> with an additional, one-time survey of IEA member countries along the lines of a similar survey carried out by EUROSTAT as part of the NABS revision. This would,

---

<sup>1</sup> See "Annex V – Proposal for a revised IEA Questionnaire (Including Definitions)".

<sup>2</sup> The "Quick User Guide to the Frascati Manual for Energy R&D Statisticians" (Annex VI) is still being discussed in the group and thus not available yet.

<sup>3</sup> See "Annex IV – Survey of IEA Data Providers".

i.a. provide the foundation for a more detailed study of the increasingly complex patterns of private-public cooperation in energy R&D. Given the effort required to respond to the survey, participation should be on a voluntary basis.

### **3.4 Segregating budget and expenditure data in the IEA database**

The IEA requests more information in its questionnaires than is included in the published database. Countries reporting to IEA send provisional, final and forecasted budget and expenditure data. The group recommends making this additional information publicly available as it would facilitate the comparison of IEA data with the appropriate data sets of EUROSTAT.

### **3.5 Deepening cooperation between IEA and OECD/EUROSTAT counterparts**

The IEA's survey of data providers revealed that contacts between IEA and OECD/EUROSTAT data providers are limited. It is likely that the comparability and reliability of EUROSTAT and IEA data would be enhanced by increased cooperation among data providers. The reasons for discrepancies between the two data sets would probably become more evident. The group recommends that Member governments encourage closer links among all data providers. In support of country efforts, the group has assembled a list of IEA and EUROSTAT contact points<sup>4</sup>.

### **3.6 Providing an internet based central repository for relevant documents and data**

The expert group identified a number of needs for information sharing and coordination among data providers, and for training. Given the usually tight schedule of people involved in the process it would be very difficult to organise regular meetings. One option would be to establish an internet forum, but such forums are time consuming to create and maintain and do not enjoy wide use among target audiences. At the same time, a central repository for relevant documents and data would be useful.

The group therefore suggests that documents and data relevant to collecting and using energy R&D data be stored centrally. The IEA's web site, which already permits access to its R&D data, would be an ideal place to store related documents and links.

### **3.7 Including EC expenditures in the IEA statistics:**

The attempt made a few years ago to collect and transmit EC expenditures to the IEA according to the IEA nomenclature should be resumed as quickly as possible.

---

<sup>4</sup> See "Annex VIII – Contacts of IEA and EUROSTAT".

# ANNEX I – TERMS OF REFERENCE OF THE EXPERT GROUP

## Background

Availability of reliable and comparable data in the field of statistics on government budget appropriations or outlays for R&D (GBAORD) on energy and on R&D statistics on energy is a requisite to analyse and compare energy RTD policies and programmes in Europe, in the context of ERA. Various energy R&D expenditure surveys are carried out on regional, national and international levels, in particular in the framework of the EU and the International Energy Agency. Due to different conditions, histories and target groups in individual member countries, these statistics vary substantially.

The present situation therefore does not seem to be optimal, notwithstanding the effort being made at least during the last 25 years.

EUROSTAT is in the process of revising the NABS classification (= Nomenclature for the analysis and comparison of scientific programmes and budgets) in order to take account of the developments of recent years and to improve compatibility with other R&D statistics. Thus it seems to be very timely to make a synthetic analysis of the present situation and to provide suggestions for improvement.

The EC, Directorate J therefore decided to set up a small expert group to address these issues, consisting of experts in the field of energy related R&D statistics and representing both the producers and the users of such statistics.

As a basis for discussion, the EC committed a small study to analyse, evaluate and assess in a synthetic way the present situation.

## Tasks of the expert group

1. To identify the needs of users of energy GBAORD statistics and R&D statistics on energy;
2. To discuss, based on the above mentioned background paper and on work already undertaken by EUROSTAT, advantages and drawbacks of present energy GBAORD statistics and R&D statistics on energy with respect to
  - structure and level of aggregation
  - coverage
  - data collection methodology
  - bodies involved
  - and, if necessary, technical specifications
3. To create a draft revised NABS classification for the energy part;
4. To make recommendations and provide suggestions for improving energy related R&D statistic;
5. To discuss other points of common interest and possible future common activities;
6. To prepare, supported by the author of the background study, a small report with outcomes and conclusions of expert group's discussion.



## ANNEX II – PARTICIPANTS OF THE EXPERT GROUP

### Chairman:

Poireau, Michel  
European Commission, DG RTD, J1 - Energy, Strategy and Policy

Alegria, Fernando  
Research Centre for Energy, Environment & Technology (CIEMAT); Spain

Bonneau, Monique  
Ministère de la Jeunesse, de l'Education nationale et de la Recherche; France

De Reyff, Christophe  
Federal Office of Energy; Switzerland

Faninger, Gerhard  
University of Klagenfurt; Austria

Faure-Miller, Yvan  
Ministère de l'Economie, des Finances et de l'Industrie; France


Ferre, Maria Angeles  
Research Centre of Energy, Environment & Technology (CIEMAT); Spain

Götzfried, August  
Eurostat, A4 - Research and Development, Methods and Data Analyses; Luxembourg

Grippio, Emanuele  
Ge-Systems; Luxembourg

Heggemeier, Friedrich  
Ge-Systems; Luxembourg

Huemer, Martin  
European Commission, DG RTD, J1 - Energy, Strategy and Policy; Belgium



Hügard, Åke  
Energy Agency (STEM); Sweden

Jimenez Alba, Isabel  
European Commission, DG RTD, J1 - Energy, Strategy and Policy; Belgium

Lösönen, Pekka  
Eurostat, D4 - Energy Statistics; Luxembourg

Michaux, Gabriel  
Service Public Fédéral Economie, P.M.E., Classes moyennes et Énergie, Belgium

Perrella, Giovanni  
National Agency for New Technology, Energy & Environment (ENEA); Italy

Rikheim, Harald  
Research Council of Norway

Sachse, Michael  
Research Centre Jülich; Germany

Stephenne Alain  
Ministère de la Région wallonne, Direction Générale des Technologies, de la Recherche et de l'Énergie (DGTRE), Division de l'Énergie; Belgium

Stones, Robert  
Department of Trade and Industry; United Kingdom

Strack, Guido  
Eurostat, A4 - Research and Development, Methods and Data Analyses; Eurostat; Luxembourg

Treanton, Karen  
International Energy Agency (IEA); France

Van Gyseghem, Gernot  
Research Centre Jülich, Germany

Woodruff, Madeline  
International Energy Agency (IEA); France

## **ANNEX III – SURVEY OF CERT MEMBERS**

The expert group on energy R&D statistics initiated a survey of CERT members (CERT = Committee on Energy Research and Technology of the International Energy Agency (IEA)) in order to address questions about users' needs concerning energy R&D statistics. The main results are:

### ***Do CERT delegates use energy R&D statistics?***

Approximately half of the delegates use IEA and national data sets on a regularly basis. EUROSTAT data are used rarely.

### ***For what purpose do CERT delegates use energy R&D statistics?***

Delegates use energy R&D statistics primarily to analyse past and future trends. Priority setting and benchmarking are only minor reasons.

### ***Do energy R&D statistics significantly influence decision making?***

About half of the respondents reported that national data would have an impact on decision and policy making.

### ***Do present energy R&D statistics meet the needs of users?***

About 50% of the delegates indicated that their needs are more or less met.

### ***What do CERT delegates think about reliability and comparability of data?***

The trust in energy R&D data is restricted. The majority estimates reliability and comparability as medium or small.

### ***What are the mayor problems with respect to data collection?***

Delegates reported difficulties to get private data, to achieve a high response rate, to collect data from many different funding bodies and to classify projects accordingly

### ***What do delegates expect from IEA/EUROSTAT, what do they suggest?***

There is a big demand for harmonisation and cooperation between IEA, OECD and EUROSTAT. In addition people call for adaptations of the nomenclatures to changed needs and demand clear definitions.

# Statistics on Energy RTD Expenditures

## Analysis of the questionnaires

We sent the questionnaire to 18 people and have received 13 answers (return rate 72%)

### Results:

Please note that one respondent in some answers distinguishes national and international data. Consequently the sum of percentages may exceed 100%

## A. Use of energy RTD statistics:

### 1. Do you use Energy RTD statistics in your present work?

YES	NO
13 (100%)	

### 1a If so, which type of statistics do you use how often?

	regularly	seldom	never	not specified
<b>IEA-RTD</b>	6 (46%)	7 (54%)		
<b>EUROSTAT</b>	1 (8%)	6 (46%)	4 (31%)	2 (15%)
<b>National</b>	7 (54%)	5 (38%)		1 (8%)
<b>Other</b> (please pecify)	1 (8%): US data from DEO,EIA,NSF +R&D data from companies	1 (8%): British Petroleum		11 (85%)

### 1b For what purpose (e.g. priority setting, evaluation of energy RTD programmes, strategies and measures, analysis of past and future national and international trends, requests from ministers, parliament, journalists, etc)?

Nearly all respondents (12 (92%)) use energy RTD statistics for **analysis of past and future national and international trends**, and most of them (10 (77%)) to answer **requests, either from ministers, parliament, or from journalists, researchers and other sources outside the ministry**. Only a minority (4 (31%)) **bases development of strategies and measures** partially on R&D statistics and 5 (38%) use it in **evaluations of energy RTD programmes**.

Surprisingly only one country (8%) quotes **priority setting** as a reason to collect R&D data, but 2 (15%) mention the need to **benchmark country's performance against other IEA countries**.

Finally 2 (15%) respondents indicate to use R&D statistics to get **information both on project and on program level**.

**1c Does data on energy RTD expenditures significantly influence decision and policy making in your country?**

	YES	NO
national data	6 (46%) *	7 (54%)
data of other countries	5 (38%) **	8 (62%)

\* Remark from one respondent: "May be internal national data for budget decision making"

\*\* Remark from one respondent: "Seldom, and may be, but specialists know they are late and poorly reliable"

**2. Do present Energy RTD statistics meet your needs?**

Fully	to a high degree	average	to a low degree	not at all	not specified
	4 (31%)*	7 (54%)**	2 (15%)		1 (8%)

\* In one country this only applies to national statistics, another delegate expresses severe doubts on statistics reliability

\*\* In one country this only applies to international statistics

**3. Is the structure of available energy RTD statistics (areas covered, level of aggregation, long term/ short term, basic/applied research/demonstration) appropriate for your work?**

	Fully	to a high degree	average	to a low degree	not at all	not specified
<b>areas covered</b>	1 (8%)	6 (46%)*	4(31%)**	2 (15%)□		1 (8%)
<b>level of aggregation</b>		1 (8%)*	9 (69%)	3(23%)**Δ		1 (8%)
<b>long term/ short term</b>	1 (8%)*°		3 (23%)	7(54%)**	2 (15%)	1 (8%)
<b>basic/ appl. research/ demonstration</b>		1 (8%)*	7(54%)**	3 (23%)	2 (15%)	1 (8%)

\* In one country this only applies to national statistics

\*\* In one country this only applies to international statistics

□ Remark from one respondent: "E.g. in IEA statistics Hydrogen is grouped with "others" even though this presently is a high focus area"

Δ Remark from one respondent: "The annual EUROSTAT statistics for Energy R&D are very poor: only one figure for each country, so the level of aggregation is "0" for EUROSTAT!"

° Since 1977

#### 4. Do you consider available data on energy RTD expenditures to be reliable and comparable?

	high reliability	average reliability	low reliability	not available
public expenditures	2 (15%)*	6 (46%)	6 (46%)** $\Delta$	
private expenditures		5 (38%)* $\square$	8 (62%)**	1 (8%)

\* In one country this only applies to national statistics

\*\* In one country this only applies to international statistics

$\square$  Remark from one respondent: "but they are not generally available with enough details"

$\Delta$  Remark from one respondent: "chiefly low comparability"

## B. Production of Energy RTD Statistics

### 1. Which are the major problems your country is faced with collection of data on R&D in energy?

<ul style="list-style-type: none"> <li>– Private data difficult/nearly impossible to get 4(31%)</li> <li>– funds scattered among different funding entities (Ministries, RTD Centres, energy agencies, etc) 5 (38%)</li> <li>– Difficulty to get a high response rate 4(31%), this seems to apply in particular to countries with project based collection methods</li> <li>– Difficulties with classification of projects 4(31%), in one (federally organised) country this is mainly due to different aggregation and classification methods of the provinces. Another country mentions problems in segmenting multi-annual project budgets</li> <li>– lack of resources/high expenditures for data collection</li> <li>– problems to disaggregate data with respect to Long Term/Short Term/Demo.</li> <li>– lack of compatibility between IEA RTD statistics and EUROSTAT RTD statistics</li> </ul>
---

### 2. Has the situation improved/worsened over the last years, and if so, why?

improved	worsened	remained stable	I don't know
1 (8%)*	3 (23%)**	8 (62%)	1 (8%)
because: * option to fill in the questionnaires one-line increased response rate ** several remarks: <ul style="list-style-type: none"> <li>– gap between required data for strategy development and available data increases</li> <li>– no international attempt to include private data, poor consistence of collection methods in different countries -&gt; international benchmarking of new technologies nearly impossible</li> <li>– decrease of interaction between the domestic administration and companies.</li> <li>– stronger focus of research institutes on private companies</li> </ul>			

### 3. What would you expect in this context from EU/EUROSTAT and IEA?

*Do you have any comments and/or suggestions?*

Following most of the respondents, answers to questions 7 and 8 have been combined:

There is an overwhelming demand for harmonisation, increased co-operation and common activities of IEA/OECD and EU/EUROSTAT with respect to

- collection and aggregation methods/procedures
- definitions
- scope
- and presentation.

(one respondent called for a “common policy” of IEA/OECD and EU/EUROSTAT).

Respondents also heavily call for adjusting current nomenclature/classification to changed needs (one respondent pleaded for creating a kind of “Energy Frascati Manual”)

People also expressed demand for clear definitions (e.g. Long Term/Short Term, Demo?, what does the term public expenditures include? etc).

Finally several countries call for harmonisation of processes and improving consistency and compatibility in and between IEA countries.

One respondent made a concrete proposal to improve the insufficient situation with respect to private data by making a first regional attempt to include those data with the help of a “technical group of specialists”.



## **ANNEX IV – SURVEY AMONG IEA DATA PROVIDERS**

The ad-hoc expert group carried out a survey among the data providers of the International Energy Agency in order to address their problems in compiling the data for the IEA R&D questionnaire. The questionnaire was sent out to 23 countries and 20 answers were received (return rate 87%)

### **IEA questionnaire concepts**

The reference publications for their definitions are the Frascati manual and the yearly OECD survey of resources devoted to RD&D.

There are two exceptions: the IEA data includes basic research only if it is directed to energy as well as demonstration projects.

Data of current and coming years are based on intentions (budgets) while data for the past years are based on final measures (expenditure). The data represents national and regional R&D expenditure of governments.

The following summarises the results of the survey:

### ***Budget and expenditure***

Budgets and expenditures are sometimes (35%) mixed if data is lacking.

### ***Regional R&D***

Only some (35%) regional data is available.

### ***National data collection framework***

Half (55%) of the member countries use a national data collection framework.

### ***National and IEA categories***

Often (55%) national and IEA categories do not match.

### ***Budgets, appropriations and expenditures***

While expenditures are easy to assign to IEA categories, budgets cause problems.

### ***Definitions***

The definitions of IEA categories are sometimes a problem.

### ***Fiscal or calendar year***

Sometimes the fiscal year is not identical to the calendar year.



### ***Multi-year projects***

Most member countries do not know how to handle multi-year projects (Often the budget is not assigned to the starting year of the project)

### ***Demonstration projects***

Though member countries often seem to understand the distinction between technical and user demonstration, it is difficult to do with the available data.

### ***Public and private funding.***

Only public funding is recorded.

### ***Missing categories of IEA questionnaire***

Missing categories are put under others. IEA categories need update.

### ***Separating demonstration from other data***

Fifty per cent of the countries include demonstration projects but only a few (25%) can separate demonstration from the other data.

### ***Deployment support and data dissemination***

Some member countries (30%) include deployment support and data dissemination in R&D but cannot provide these figures separately.

### ***Cooperation between Eurostat and IEA data providers***

There is no cooperation between Eurostat and IEA data providers. The latter are not familiar with the NABS classification.

### ***General administration***

Only some (25%) countries include general administration in R&D.

### ***Frascati manual***

The majority does not use the Frascati manual.

### ***Check of accuracy***

The majority (75%) checks the accuracy of their data.

### *Data publishing*

The majority (65%) of countries does publish their national data.

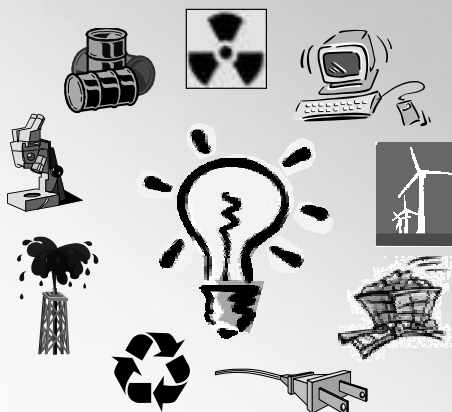
### *Training and manual*

Only about half of the countries (45%) think that training would help. But the majority (80%) feel that a manual would be helpful.

### *Conclusion*

- Little cooperation between Eurostat and IEA data providers.
- The majority does not use the Frascati Manual.
- IEA categories have to be updated.
- Need to have more notes associated with the submission to see what is being included.
- There should be more guidelines for the IEA questionnaire on energy R&D.
- A manual and training package would be helpful.

**Expert Group on Energy  
R&D Statistics**  
2<sup>nd</sup> Meeting  
10<sup>th</sup> December 2003



# **Questionnaire on IEA Energy RD&D Statistics**

**Karen Treanton**

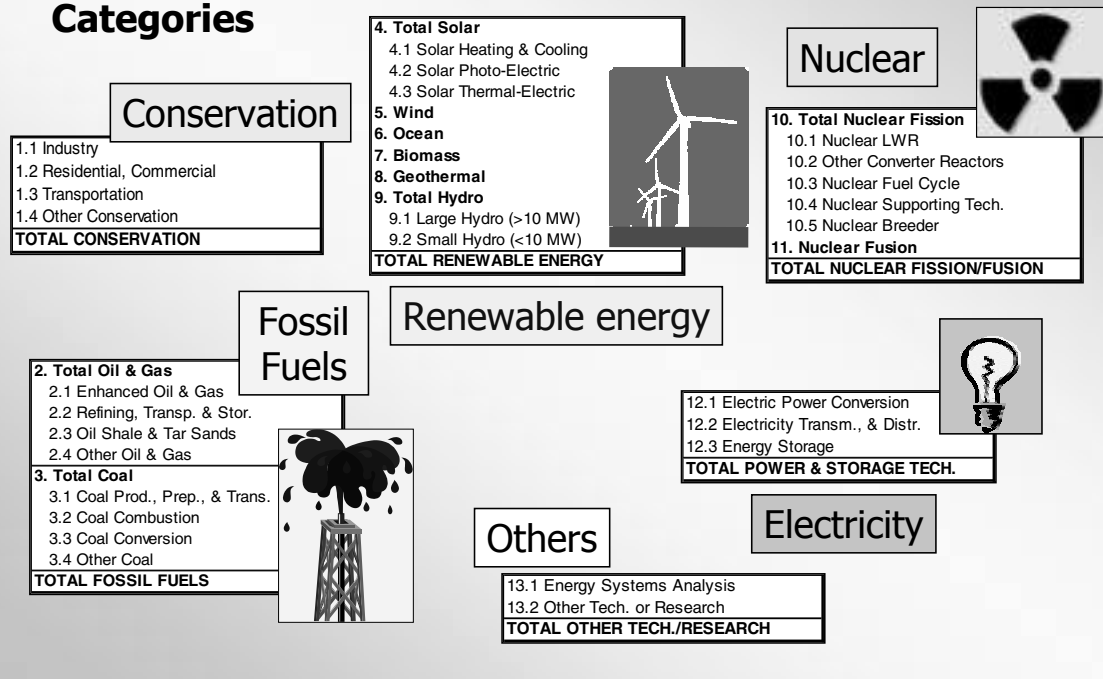
Head of the Energy Balances, Prices and Emissions Section  
Energy Statistics Division  
International Energy Agency

## **Content**

- **What data should be included in the IEA/SLT/CERT questionnaire?**
- **Results of the survey on the IEA Energy RD&D statistics questionnaire?**
- **Conclusions**

# Data Collected in the IEA/SLT/CERT Questionnaire

## Categories

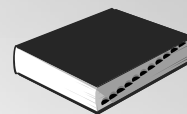


# Data Collected in the IEA/SLT/CERT Questionnaire

## Definitions

The **reference publications** for definitions are


- the "Frascati manual" of 1993, containing proposed guidelines for surveys of research and experimental development
- the yearly "Survey of the Resources Devoted to RD&D by OECD Member Countries" from the OECD Directorate for Science, Technology and Industry



**According to these guidelines, R&D statistics generally include "basic research", "applied research" and "experimental development"**

**For the IEA RD&D database, a few distinguishing criteria apply**

- "Basic research" is generally excluded** unless it is clearly oriented towards the development of energy-related technologies.  
**"Applied research" and "experimental development" are included.**
- "Demonstration" projects are included.**  
Demonstrations encompass those projects that are of large-scale but which are not expected to operate on a commercial basis.



## **Data Collected in the IEA/SLT/CERT Questionnaire Contents (1)**

- Data should be reported in millions of national currency, for a single year (any double-counting for money carried forward should be excluded).
- Data for the current and coming years should be based on initial intentions; data for past years should be based on final measures.
- The statistical information collected concern energy RD&D expenditures from government (both national and regional).
- Contributions to the European Commission (EC) sponsored energy RD&D budget are not included in national budgets. Information on EC energy RD&D budgets is supposed to be obtained directly from the EC (this is a problem).

## **Data Collected in the IEA/SLT/CERT Questionnaire Contents (2)**

- Direct expenditures in bilateral or multilateral projects are included in the budgets.
- Data should include public General University Funds (see Frascati Manuel).
- The personal costs for central government administration should generally be excluded from the Government energy RD&D expenditures (see Frascati Manuel).
- Not specified whether data should be based on reports by the funder or the performer (probably based on funder).

## Results of Survey on the IEA Questionnaire

23 questionnaires sent with 20 answers, **return rate 87%**

### Data Sources

- **Do you sometimes mix budget and expenditure data?**

YES	NO
7 (35%)	13 (65%)

**YES:** TR, FR, ES, SE, FI, PT, CA

**NO:** DE, DK, AT, NO, NZ, AU, US, HU, NL, CH, JA, UK, BE

- **Do you have access to regional RD&D data?**

**YES:** DE, ES, AT, CA, CH, UK, BE

**NO:** FR, DK, NO, NZ, FI, AU, PT, US, NL, JA

**No answer:** TR, HU, SE

YES	NO	No answer
7 (35%)	10 (50%)	3 (15%)

## Results of Survey on the IEA Questionnaire

### Nomenclatures (1)

- **Do you have your own data collection framework for national reporting on RD&D?**

**YES:** TR, DE, SE, CA, NZ, FI, PT, NL, CH  
UK, JA

**NO:** ES, DK, AT, NO, AU, US, HU, FR, BE

YES	NO
11 (55%)	9 (45%)

- **If you have, does the national system match the IEA categories?**

**YES:** SE, CA, FI, CH

**NO:** TR, DE, NZ, PT, NL, JA

**No answer:** UK

YES	NO	No answer
4 (36%)	6 (55%)	1 (9%)

## Results of Survey on the IEA Questionnaire

### Definitions and Coverage (1)

#### Problems filling out the IEA/SLT/CERT questionnaire

##### ■ Budgets/commitment appropriation/actual expenditures

It is difficult to deal with changing strategic segmentation (FR). For the present and the future years we only estimate gross values and often only for the main lines (CH). The amount of the budget for the future years is not well defined (Region BE). Future years cannot be divided into IEA categories (SE, DE).

##### ■ Definitions

Lack of clear definition of some IEA categories (NZ, DE).

In many cases, definitions are either too vague or broad or are not the same as those used for official purposes (UK).

It would be useful to take into account the dramatic increase of the number of public/private partnerships on one side, and the beginning of increasing international public cooperation within long term international programmes on the other side (FR).

## Results of Survey on the IEA Questionnaire

### Definitions and Coverage (2)

#### Problems filling out the IEA/SLT/CERT questionnaire.

##### ■ Geographical coverage

It is difficult to monitor expenditure since funding of RD&D may be at the local, regional or national level, or across a range of activities of which RD&D may be a small but significant part but which does not register as far as official statistics are concerned (UK).

YES	NO	No answer
2 (10%)	5 (25%)	13 (65%)

##### ■ Fiscal year / calendar year

Funding allocations made for fiscal years is reported against the calendar years required by IEA (NZ, AU, JA).

Different Departments/Organisations use different time frames, therefore difficult to arrive at a single set of figures (UK).

## Results of Survey on the IEA Questionnaire

### Definitions and Coverage (3)

#### Problems filling out the IEA/SLT/CERT questionnaire

##### ■ Multi-year projects

The comprehensive budget of the project is declared for the year of the beginning of the project (BE).

True annual payments if they are known, and with a proportional distribution, if only the global financing is known (CH).

Difficult to monitor over what time period the money has or will be spent and difficult to monitor future spending. Also, projects may not be completed or may be extended, funding of projects may also be revised in light of new or further information, giving rise to inaccuracies in the figures submitted (UK).

It is sometimes not possible to produce budget plans for future years (TR).

Some multi-year data cannot be divided between calendar years. Some data do not fit in just one category, the whole amount put in largest category (FI).

Other countries did not specify their problems (ES, AU, PT).

## Results of Survey on the IEA Questionnaire

### Definitions and Coverage (4)

#### Problems filling out the IEA/SLT/CERT questionnaire

##### ■ Basic science/fundamental research, applied research, technical development, pilot plants, technical demonstration, economical demonstrations, deployment support/dissemination, etc.

Data cover all the categories including deployment/dissemination (DE).

It is not always clear in which category specific RD&D belongs (NL).

Different organizations take different approaches to what should be included and often is not so clear cut what is the nature of the project. It is particularly difficult differentiating between R&D and demonstration/deployment (UK).

## Results of Survey on the IEA Questionnaire

### Definitions and Coverage (5)

#### Problems filling out the IEA/SLT/CERT questionnaire.

##### ■ Distinction between public and private funding

What to do with subsidised private projects? It would be useful information to identify and present them in separate tables (FR).

Potential problems with which portion of public/private funding is going towards support of RDD and not another activity (UK).

##### ■ Where to put items not explicitly mentioned?

IEA Classification needs to be updated to include new technologies (BE, NL).

These are usually included in " Total Other Tech./Research" category (NZ).

## Results of Survey on the IEA Questionnaire

### Definitions and Coverage (6)

#### Problems filling out the IEA/SLT/CERT

##### ■ What additional items should be mentioned?

- Gas-to liquids.
- Co-combustion of fossil fuels with biomass.
- Solar architecture, solar chemistry.
- More sub-items for other renewables (geothermal).
- Environmental impact of the energy sector development.
- Fuel cells, hydrogen and batteries.
- Hybrid technologies.
- Superconductivity.
- CO<sub>2</sub> sequestration and storage.

## Results of Survey on the IEA Questionnaire

### Definitions and Coverage (7)

Are you including pilot plants and demonstration (P&D) data?

YES	NO	No answer or don't know
10 (50%)	3 (15%)	7 (35%)

**YES:** TR, DE, ES, DK, AT, AU, PT, CH, BE, FI

**NO:** NZ, NO, HU

**No answer or don't know:**

UK, US, JA, FR, SE, NL, CA

Would you be able to provide them separately from the other R&D data?

YES	NO	No answer or don't know
6 (25%)	4 (20%)	10 (55%)

**YES:** SE, NO, CH, BE, NL, CA

**NO:** JA, DE, AT, AU

**No answer or don't know:**

NZ, UK, US, DK, FR, FI, HU, PT, TR, ES

## Results of Survey on the IEA Questionnaire

### Definitions and Coverage (8)

Are you including deployment support/dissemination data?

YES	NO	No answer or don't know
6 (30%)	11 (55%)	3 (15%)

**YES:** DE, ES, DK, AU, BE, UK

**NO:** FR, SE, AT, NO, NZ, FI, PT, NL, CH, CA, HU

**No answer or don't know:**

US, JA, TR

Would you be able to provide them separately from the other two categories?

YES	NO	No answer or don't know
1 (5%)	8 (40%)	11 (55%)

**YES:** BE

**NO:** DE, DK, AT, NO, AU, CH, UK, NZ

**No answer or don't know:** FR, US, FI, HU, JA, NL, PT, ES, SE, TR, CA

## Results of Survey on the IEA Questionnaire

### Definitions and Coverage (9)

#### Co-ordination between provider of data to IEA and Eurostat?

- For France, Spain and Finland, the same person or body provides the data to both organizations.
- When the data are submitted by different persons/bodies normally there is not coordination.

#### Familiar with the NABS?

- Only Sweden and Switzerland (not part of Eurostat) are familiar with NABS.

#### Possible differences with IEA classification

- Discrepancies perhaps because the data are coming from the Research/Technical Ministry for IEA and from the Statistical/Economic Ministry for Eurostat (CH).
- IEA is demanding true actual expenditures while Eurostat is more interested with " budgets" (CH).
- The IEA classification has more components than NABS (is incomplete) (CH).

## Results of Survey on the IEA Questionnaire

### Definitions and Coverage (10)

#### Do you include general administration spending?

YES	NO	No answer or don't know
5 (25%)	9 (45%)	6 (30%)

**YES:** DE, CA, NO, PT, CH

**NO:** FR, DK, SE, AT, NZ, FI, HU, NL, BE

**No answer or don't know:**

AU, US, UK, JA, TR, DK

#### Do you use the Frascati Manual?

YES	NO
6 (30%)	14 (70%)

**YES:** TR, FR, SE, NO, CH, UK

**NO:** JA, DE, DK, AT, CA, NZ, FI, AU, PT, US  
HU, NL, BE, ES

## Results of Survey on the IEA Questionnaire

### Definitions and Coverage (11)

#### What improvements would you like to see in the IEA questionnaire?

- Ask countries to state the statistical coverage each year (FR)
- Make distinction between short and long-term R&D (NL)
- Provide possibility to submit sub-totals instead of individual items – e.g. nuclear research and oil/coal/gas (SE)

## Results of Survey on the IEA Questionnaire

### Quality control and data dissemination

#### Do you check the accuracy of the data you submit?

YES	NO
15 (75%)	5 (25%)

**YES:** AT, BE, CA, FI, DE, HU, JA, NL, NZ, NO, ES, SE, CH, UK, US

**NO:** DK, AU, FR, PT, TR

**Note:** see summary to see how each country checks the accuracy of its submission.

#### Do you publish/disseminate your country's Energy RD&D data?

YES	NO
13 (65%)	7 (35%)

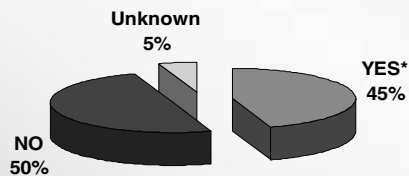
**YES:** AT, BE, CA, FI, DE, NL, NZ, NO, PT, ES, SE, CH, UK

**NO:** AU, DK, FR, HU, JA, TR, US

## Results of Survey on the IEA Questionnaire

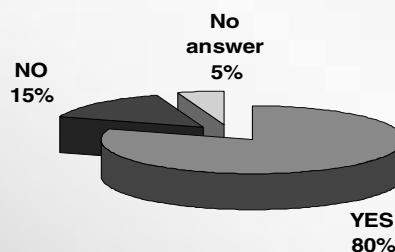
### Assistance

Do you think that a training session would help in filling in the questionnaire?



\*AT: only an online training session

What about a manual?



## Conclusions

- Not good co-ordination between the data providers of the IEA and Eurostat.
- 2/3 of the countries are not using the Frascati Manual.
- Need to refine some categories and add new ones.
- Need to have more notes associated with the submission to see what is being included.
- Transparency would be increased if there is a split between the numbers for pilot plants and demonstration, but most countries would not be able to report this.
- Questionnaire should specify the preferred method of dealing with multi-year projects.
- Questionnaire should address the issue of deployment support/dissemination data.
- Manual and training package (on-line?) would be helpful.

# ANNEX V – PROPOSAL OF A REVISED IEA QUESTIONNAIRE (INCLUDING DEFINITIONS)

## Research Areas, Research Sectors and Classification

Because energy R&D is being given higher priority in many countries and in the EU energy research programme, there is a need to revise the IEA data collection questionnaire to refine some categories and add new ones. The following changes in the IEA questionnaire are proposed:

### **Rename Group I to be “Energy Efficiency” instead of “Conservation”**

### **Expand the coverage of one sub-category in Group II:**

- Change “Oil shale and tar sands” to be “Non-conventional oil and gas production”

### **Add additional categories:**

- In Group II, Fossil Fuels, Oil and Gas, add the sub-categories “oil and gas combustion” and “oil and gas conversion”
- In Group II, Fossil Fuels, add a new research sector  
**CO<sub>2</sub> Capture and Storage**
  - Capture/separation
  - Transport
  - Storage
- In Group III, Renewable Energy Sources, Bio-energy, add the sub-categories
  - Production of transport bio-fuels
  - Production of other biomass-derived fuels
  - Applications (excluding transport)

### **Add a new research area:**

- Add a Group for Hydrogen and Fuel Cells  
**Hydrogen and Fuel Cells**
  - Hydrogen
    - Production
    - Storage
    - Transport and distribution
    - Other infrastructure and systems R&D
    - End uses (including combustion; excluding fuel cells)
  - Fuel Cells
    - Stationary applications
    - Mobile applications
    - Other applications

**Refinement of category definitions:** Some of the category definitions have been clarified or modified.

**Note:** The numbers of the IEA codes have been modified to take into account the new structure. Changes from the existing questionnaire have been marked in italics with a yellow background.

## Information on Government Energy RD&D Budgets

Country: \_\_\_\_\_  
(Millions, national currency)

Research Area	Research Sector	IEA CODE
<b>GROUP I: CONSERVATION ENERGY EFFICIENCY</b>	<b>Industry</b>	<b>I.1</b>
	<b>Residential and commercial</b>	<b>I.2</b>
	<b>Transport</b>	<b>I.3</b>
	<b>Other</b>	<b>I.4</b>
<b>GROUP II: FOSSIL FUELS: OIL, GAS and COAL</b>	<b>Oil and Gas</b>	<b>II.1</b>
	Enhanced oil and gas <i>production</i>	II.1.1
	Refining, transport and storage of oil and gas	II.1.2
	<i>gas</i>	II.1.3
	<i>Non-conventional oil and gas production</i>	II.1.4
	<i>Oil and Gas Combustion</i>	II.1.5
	<i>Oil and Gas Conversion</i>	II.1.6
	Other oil and gas	<b>II.2</b>
	<b>Coal</b>	II.2.1
	Coal Production, preparation and transport	II.2.2
	Coal Combustion	II.2.3
	Coal Conversion <i>(excluding IGCC)</i>	II.2.4
	Other coal	<b>II.3</b>
	<i>Other coal</i>	II.3.1
	<b>CO<sub>2</sub> Capture and Storage</b>	II.3.2
<i>Capture/separation</i>	II.3.3	
<i>Transport</i>		
<i>Storage</i>		

<b>GROUP III: RENEWABLE ENERGY SOURCES</b>	Solar Energy Solar heating and cooling <i>(including daylighting)</i> Photovoltaics Solar thermal power and high-temperature <i>applications</i> Wind Energy <b>Ocean Energy</b> <b>Bio-Energy</b> <i>Production of transport bio-fuels</i> <i>Production of other biomass-derived fuels</i> <i>Applications (excluding transport)</i> <b>Geothermal Energy</b> <b>Hydropower</b> Large hydro (capacity of 10 MW and above) Small hydro (less than 10 MW)	<b>III.1</b> III.1.1 III.1.2 III.1.3 <b>III.2</b> <b>III.3</b> <b>III.4</b> III.4.1 III.4.2 III.4.3 <b>III.5</b> <b>III.6</b> III.6.1 III.6.2
<b>GROUP IV: NUCLEAR FISSION and FUSION</b>	<b>Nuclear Fission</b> <i>Light-water reactors</i> (LWR) Other converter reactors Fuel cycle Nuclear supporting technology Nuclear breeder <b>Nuclear Fusion</b>	<b>IV.1</b> IV.1.1 IV.1.2 IV.1.3 IV.1.4 IV.1.5 <b>IV.2</b>
<b>GROUP V: HYDROGEN and FUEL CELLS</b>	<b>Hydrogen</b> <i>Production</i> <i>Storage</i> <i>Transport and distribution</i> <i>Other infrastructure and systems R&amp;D</i> <i>End uses (including combustion; excluding fuel cells)</i> <b>Fuel Cells</b> <i>Stationary applications</i> <i>Mobile applications</i> <i>Other applications</i>	<b>V.1</b> V.1.1 V.1.2 V.1.3 V.1.4 V.1.5 <b>V.2</b> V.2.1 V.2.2 V.2.3
<b>GROUP VI: OTHER POWER and STORAGE TECHNOLOGIES</b>	<b>Electric power conversion</b> <b>Electricity transmission and distribution</b> <b>Energy storage</b>	<b>VI.1</b> <b>VI.2</b> <b>VI.3</b>
<b>GROUP VII: OTHER CROSS-CUTTING TECHNOLOGIES or RESEARCH</b>	<b>Energy system analysis</b> <b>Other</b>	<b>VII.1</b> <b>VII.2</b>

# Definitions of the IEA R&D Questionnaire Categories

The definitions of the IEA R&D questionnaire categories have been improved by: adding more sub-categories and clarifying others. Changes from the current instructions have been marked in italics with a yellow background.

## DEFINITIONS OF THE IEA R&D QUESTIONNAIRE CATEGORIES

### Research Area, Research Sector and Research Category

#### I. **ENERGY EFFICIENCY**

##### I.1 Industry

- Reduction of energy consumption in industrial processes including combustion;
- development of new techniques, new processes and new equipment for *industrial application*;
- *other*.

##### I.2 Residential and Commercial

- Space heating and cooling, ventilation and lighting control systems other than solar technologies;
- low energy housing design and performance other than solar technologies;
- new insulation and building materials;
- thermal performance of buildings;
- domestic appliances;
- other.

##### I.3 Transport

- Analysis and optimisation of energy consumption in the transport sector;
- *efficiency improvements in light-duty vehicles, heavy-duty vehicles, non-road vehicles*
- public transport systems;
- engine-fuel optimisation;
- use of alternative fuels *(liquid, gaseous)*;
- fuel additives;
- diesel engines;
- stirling motors, electric cars, hybrid cars;
- *other*.

##### I.4 Other

- Waste heat utilisation (heat maps, *process integration*, total energy systems, low temperature thermo-dynamic cycles);
- district heating;
- heat pump development;
- recycling and uses of urban and industrial wastes *(excluding III.4.2)*;
- use of wastes and low-temperature heat in the agricultural sector (drying, greenhouses).

## II. FOSSIL FUELS: OIL, GAS AND COAL

### II.1 Oil and Gas

#### II.1.1 Enhanced Oil and Gas Production

- Secondary and tertiary recovery of oil and gas;
- hydro fracturing techniques.

#### II.1.2 Refining, Transport and Storage of Oil and Gas

- Refining;
- gasification of naphtha and feedstocks;
- transport of liquid hydrocarbons;
- pipeline network system evaluation;
- submarine pipelines (shallow and deep sea) transport of gaseous hydrocarbons;
- safety aspects of LNG transport;
- pipeline network system evaluation;
- storage of liquid hydrocarbons (strategic storage);
- submarine large scale storage units;
- storage of gaseous hydrocarbons (strategic storage);
- safety aspects of LNG storage.

#### II.1.3 Non-Conventional Oil and Gas Production

- *Advanced drilling technologies;*
- *heavy oil;*
- *deep-water extraction;*
- oil shale;
- oil sands.

#### II.1.4 Oil and Gas Combustion

- *Turbo-engines, multi-fuel gas turbines, conventional and combined cycles; combustion turbines; micro-turbines.*

#### II.1.5 Oil and Gas Conversion

- *Gas-to-liquid technology*

#### II.1.6 Other Oil and Gas

- Development of advanced exploration methods (geophysical, geochemical, seismic, magnetic) for on-shore and off-shore prospecting;
- on-shore and off-shore deep-drilling equipment and techniques;
- safety aspects of off-shore structures;
- alleviation of environmental impact of off-shore oil and gas.



## II.2. Coal

### II.2.1 Coal Production, Preparation and Transport

- Mining techniques (operations underground and control of operations, mine safety);
- mechanical preparation of coal;
- coal degasification and desulphurisation;
- coking, blending and briquetting of coal;
- coal transport techniques, including coal slurries.

### II.2.2 Coal Combustion

- Conventional utility boilers;
- fluidised bed combustion;
- industrial applications;
- integrated gasified coal combined cycle (IGCC);
- *re-powering, retrofitting, life extensions and upgrading of coal power plants;*
- *co-firing with biomass.*

### II.2.3 Coal Conversion (excl. IGCC)

- Coal gasification, including underground (in-situ) gasification, low Btu gasification, (except for IGCC) and high Btu gasification;
- coal liquefaction, including hydro generation, Fischer-Tropsch synthesis.

### II.2.4 Other Coal

- Coal, lignite and peat geological survey techniques, deposit evaluation techniques;
- peat production and conversion;
- R&D on environmental, safety and health aspects of coal.

## II.3 CO<sub>2</sub> Capture and Storage

### II.3.1 Capture/Separation

- *Absorption;*
- *adsorption;*
- *cryogenic separation;*
- *membranes;*
- *oxygen combustion;*
- *hydrogen/syngas production;*
- *chemical looping;*
- *direct capture of CO<sub>2</sub> from air.*

### II.3.2 Transport

- *CO<sub>2</sub> transport.*

### II.3.3 Storage

- *Deep saline aquifers;*
- *deep unminable coalbeds;*
- *mineralization;*
- *monitoring and verification;*
- *direct ocean injection.*

## III. RENEWABLE ENERGY SOURCES

### III.1 Solar Energy

#### III.1.1 Solar Heating and Cooling *(note: includes daylighting)*

- Collector development;
- hot water preparation;
- combined-space heating;
- passive solar;
- daylighting;
- solar architecture;
- solar drying;
- swimming pool heating;
- low-temperature process heating;
- other.

#### III.1.2 Photovoltaics

- Solar cell development;
- PV module development;
- PV-inverter development;
- building-integrated PV-modules;
- PV-system development;
- other.

#### III.1.3 Solar Thermal-Power and High-Temperature Applications

- Concentrating collector development;
- solar-thermal power plants (design, construction and testing);
- solar-high-temperature applications for process heat;
- solar-chemistry;
- other.

### III.2 Wind Energy

- Converter development;
- system integration;
- on-shore applications;
- off-shore applications;
- other.

### III.3 Ocean Energy

- tidal power;
- wave energy;
- ocean current power;
- ocean thermal power.



### III.4 Bio-Energy

#### III.4.1 Production of Transport Bio-Fuels

- Conventional bio-fuels;
- cellulosic conversion to alcohol;
- biomass gas-to-liquids.

#### III.4.2 Production of Other Biomass-Derived Fuels

- Bio-solids;
- bio-liquids;
- biogas thermal;
- biogas biological (fermentation).

#### III.4.3 Applications (excluding transport)

- Bio-heat excluding multifiring with fossil fuels;
- bio-electricity excluding multifiring with fossil fuels;
- CHP (combined heat and power) excluding multifiring with fossil fuels.

### III.5 Geothermal Energy

- Hot dry rock;
- hydro-thermal.

### III.6 Hydropower

III.6.1 Large Hydro Plants with capacity of 10 MW and above.

III.6.2 Small Hydro Plants with capacity of below 10 MW.

## IV. NUCLEAR FISSION AND FUSION

### IV.1 Nuclear Fission

#### IV.1.1 Light Water Reactors (LWR)

R&D specifically related to LWR (Light Water Reactors) including safety and environmental aspects.

#### IV.1.2 Other Converter Reactors

R&D specifically related to the following reactors including safety and environmental aspects:

- HWR (Heavy Water Reactors);
- HTR (High Temperature Reactors);
- AGR (Advanced Gas-cooled Reactors);
- SGHWR (Steam Generating Heavy Water Reactors).

#### IV.1.3 Fuel Cycle

- Ore, uranium and thorium extraction and conversion;
- enrichment;
- reprocessing;

- fissile material recycling;
- transport of radioactive materials;
- nuclear parks siting studies (regional nuclear fuel cycle centres);
- nuclear waste treatment, disposal and storage;
- *other.*

#### IV.1.4 Nuclear Supporting Technologies

- General nuclear safety;
- general nuclear environmental protection;
- radiation protection and decommissioning of power plants and related nuclear fuel cycle installations;
- fissile materials control;
- *other.*

Note: nuclear ship R&D is excluded.

#### IV.1.5 Nuclear Breeder

- Metal-cooled fast breeder;
- gas-cooled fast breeder;
- other breeders.

### IV.2 Nuclear Fusion

- Magnetic confinement;
- laser applications.

## V. HYDROGEN AND FUEL CELLS

### V.1 Hydrogen

#### V.1.1 Production

#### V.1.2 Storage

#### V.1.3 Transport and Distribution

#### V.1.4 Other Infrastructure and Systems R&D

- *Including refuelling stations for hydrogen-fuelled cars.*

#### V.1.5 End Uses (including combustion; excluding fuel cells)

### V.2 Fuel Cells

#### V.2.1 Stationary Applications

#### V.2.2 Mobile Applications

#### V.2.3 Other Applications

- *Portable applications.*

## VI. OTHER POWER AND STORAGE TECHNOLOGIES

### VI.1 Electric Power Conversion

- Turbo engines, multi-fuel gas turbines, conventional and combined cycles;
- super-conducting generating machines;
- magneto hydrodynamic conversion;
- *CHP (combined heat and power) not covered elsewhere;*
- electricity generators and components *not covered elsewhere;*
- dry cooling towers;
- ~~re-powering, retrofitting, life extensions and upgrading of fossil fuel power plants;~~
- thermal pollution from power plants;
- air pollution from power plants *not covered elsewhere;*
- boiler R&D *not covered elsewhere;*
- *R&D specifically related to distributed generation not covered elsewhere;*
- *other.*

### VI.2 Electricity Transmission and Distribution

- Electricity transmission and distribution (e.g. solid state power electronics, load management and control systems, network problems, super-conducting cables, AC and DC high voltage cables, HVDC transmission);
- *other transmission and distribution R&D related to integrating distributed and intermittent generating sources into networks;*
- all high temperature super-conducting research *not covered elsewhere.*

### VI.3 Energy Storage

- *Batteries;*
- *super-capacitors;*
- *superconducting magnetic;*
- *water heat storage;*
- *sensible/latent heat storage;*
- *photochemical storage;*
- kinetic energy storage;
- *other (excl. fuel cells).*

## **VII. OTHER CROSS-CUTTING TECHNOLOGIES OR RESEARCH**

### **VII.1 Energy Systems Analysis**

- System analysis related to energy R&D *not covered elsewhere*;
- sociological, economical and environmental impact of energy which are not specifically related to one technology area listed in the sections above.

### **VII.2 Other**

- Energy technology information dissemination;
- studies not related to a specific technology area listed above.



## **ANNEX VI – QUICK USER GUIDE TO THE FRASCATI MANUAL FOR ENERGY R&D STATISTICIANS**

Remark: This user guide is still being discussed within the expert group. At the time of publication of this report the final version was not yet available. It is intended to publish the user guide on the IEA web page.



## ANNEX VII – A COMPARISON OF ENERGY R&D NOMENCLATURES (IEA AND NABS)

IEA RD&D (old) <sup>1</sup>		IEA RD&D (new) <sup>2</sup>		NABS	
				0500	General Research On Production, Distribution And Rational Utilisation Of Energy
GRP I	Conservation	GRP I	Energy efficiency	0506	Rational Utilization Of Energy
1.1	Industry	1.1	Industry		
1.2	Residential and commercial	1.2	Residential and commercial		
1.3	Transportation	1.3	Transport		
1.4	Other	1.4	Other		
GRP II	Fossil Fuels: Oil, Gas and Coal	GRP II	Fossil Fuels: Oil, Gas and Coal	0501	Fossil Fuels and their Derivatives
2.0	Total Oil and Gas	II.1	Oil and Gas		
2.1	Enhanced oil and gas	II.1.1	Enhanced oil and gas production		
2.2	Refining, transportation and storage	II.1.2	Refining, transport and storage of oil and gas		
2.3	Oil shale and tar sands	II.1.3	Non-conventional oil and gas production		
		II.1.4.	Oil and Gas Combustion		
		II.1.5.	Oil and Gas Conversion		
2.4	Others	II.1.6.	Other oil and gas		
3.0	Total Coal	II.2	Coal		
3.1	Production, preparation and transport	II.2.1	Coal Production, preparation and transport		
3.2	Combustion	II.2.2	Coal Combustion		
3.3	Conversion	II.2.3	Coal Conversion (excluding IGCC)		
3.4	Other	II.2.4	Other coal		
		II.3	CO <sub>2</sub> Capture and Storage		
		II.3.1	Capture/separation		
		II.3.2	Transport		
		II.3.3	Storage		
GRP III	Renewable Energy Sources	GRP III	Renewable Energy Sources	0505	Renewable Energy Sources
4.0	Total Solar	III.1	Solar Energy	05051	Solar thermal and photovoltaic energy
4.1	Heating and cooling	III.1.1	Solar heating and cooling (including daylighting)		
4.2	Photo electric	III.1.2	Photovoltaics		
4.3	Thermal electric	III.1.3	Solar thermal power and high-temperature applications		
5.0	Wind	III.2	Wind Energy	05053	Water, wind and wave energy

6.0	Ocean	III.3	Ocean Energy		
7.0	Biomass	III.4	Bio-Energy	05054	Research into biomass conversion (particularly into the areas of pyrolysis, gasification, extraction and enzyme processing), research on the processing of waste from industry, agriculture and the domestic sector with a view to energy
		III.4.1	Production of transport bio-fuels		
		III.4.2	Production of other biomass-derived fuels		
		III.4.3	Applications (excluding transport)		
8.0	Geo thermal energy	III.5	Geothermal Energy	05052	Geo thermal energy
9.0	Total Hydro	III.6	Hydropower		
9.1	Large (capacity of 10 MW and above)	III.6.1	Large hydro (capacity of 10 MW and above)		
9.2	Small (less than 10 MW)	III.6.2	Small hydro (less than 10 MW)		
GRP IV	Nuclear Fission And Fusion	GRP IV	Nuclear Fission And Fusion		
10.0	Total Nuclear Fission	IV.1	Nuclear Fission	0502	Nuclear Fission
10.1	LWR	IV.1.1	Light-water reactors (LWR)		
10.2	Other converter reactors	IV.1.2	Other converter reactors		
10.3	Fuel cycle	IV.1.3	Fuel cycle		
10.4	Nuclear supporting technology	IV.1.4	Nuclear supporting technology		
10.5	Nuclear breeder	IV.1.5	Nuclear breeder		
				0503	Radioactive waste management including decommissioning with regard to fuel/energy
11.0	Nuclear Fusion	IV.2	Nuclear Fusion	0504	Nuclear Fusion
		GRP V	Hydrogen and Fuel Cells		
		V.1	Hydrogen		
		V.1.1	Production		
		V.1.2	Storage		
		V.1.3	Transport and distribution		
		V.1.4	Other infrastructure and systems R&D		
		V.1.5	End uses (including combustion; excluding fuel cells)		
		V.2	Fuel Cells		
		V.2.1	Stationary applications		
		V.2.2	Mobile applications		
		V.2.3	Other applications		
GRP V	Power And Storage Technologies	GRP VI	Other Power and Storage Technologies		
12.1	Electric power conversion	VI.1	Electric power conversion		

12.2	Electricity transmission and distribution	VI.2	Electricity transmission and distribution		
12.3	Energy storage	VI.3	Energy storage		
GRP VI	Other Cross-cutting Technologies or Research	GRP VII	Other Cross-Cutting Technologies or Research	0509	Other Research on Production, Distribution and Rational Utilization of Energy
13.1	Energy systems analysis	VII.1	Energy systems analysis		
13.2	Others	VII.2	Other		

<sup>1</sup> see <http://www.iea.org/Textbase/stats/rdquest.asp>

<sup>2</sup> see Annex 5



## ANNEX VIII – CONTACTS OF IEA AND EUROSTAT

BE	Eurostat	Services fédéraux des affaires scientifiques, techniques et culturelles SSTC/DWTC
BE	IEA	Ministère des Affaires Economiques Administration de l'Énergie
DK	Eurostat	The Danish Institute for Studies in Research and Research Policy
DK	IEA	Danish Energy Authority / Ministry of Economic and Business Affairs
DE	Eurostat	Bundesministerium für Bildung und Forschung - BMBF
DE	IEA	Bundesministerium für Wirtschaft und Industrie - BMWI (Ministry of Economics and Technology)
GR	Eurostat	General Secretariat for Research and Technology
GR	IEA	Ministry of Development Energy Policy Directorate
ES	Eurostat	Instituto Nacional de Estadística
ES	Eurostat	Ministerio de Ciencia y Tecnología – Consejo Superior de Investigaciones Científicas (MCYT-CSIC)
ES	IEA	Ministry of Economy Directorate of Energy Policy and Mining
FR	Eurostat	Ministère de la jeunesse, de l'éducation nationale et de la recherche (MJENR) - Bureau des études statistiques sur la recherche (DPDC3)
FR	IEA	Direction Générale de l'Énergie et des Matières Premières
IE	Eurostat	FORFAS / Evaluations & Indicators Unit
IE	IEA	Department of Public Enterprise Intl & Sustainable Energy Division
IT	Eurostat	Italian National Research Council
IT	IEA	Ministero dell'Industria e Commercio
NL	Eurostat	Ministry of Education, Culture and Science Directorate Research and Science Policy
NL	IEA	Ministry of Economy
AT	Eurostat	Statistics Austria Directorate Macro-economic Statistics S&T Statistics Division
AT	IEA	Ministry of Transport, Innovation and Technology Bundesministerium für Verkehr, Innovation und Technologie
PT	Eurostat	Observatório das Ciências e das Tecnologias (OCT)
PT	IEA	Direcção-geral de Energia Departamento de Planeamento e Estatística
FI	Eurostat	Statistics Finland
FI	IEA	Ministry of Trade and Industry Energy Department
SE	Eurostat	Statistics Sweden / R&D and IT Statistics
SE	IEA	Swedish Energy Agency (STEM)
UK	Eurostat	Office for National Statistics
UK	IEA	Department of Trade and Industry
IS	Eurostat	Icelandic Research Council
NO	Eurostat	NIFU - Norwegian Institute for Studies in Research and Higher Education
NO	IEA	Ministry of Petroleum and Energy Division for External Trade, Energy and Industrial Production Statistics



## ANNEX IX – COMPARISON OF CONCEPTS AND DEFINITIONS OF GBOARD, GERD AND IEA STATISTICS

	OECD/Eurostat GBAORD <sup>1</sup>	OECD/Eurostat GERD <sup>2</sup> Error! Reference source not found.	IEA R&D questionnaire
Definition	Government budget appropriations or outlays for R&D <sup>2</sup>	Gross domestic expenditure on R&D <sup>3</sup>	Government energy technology R&D budgets <sup>4</sup>
Methodology	Frascati	Frascati	Frascati <sup>5</sup>
Reporting bodies <sup>6</sup>	National statistical offices, research agencies or ministries of education	National statistical offices, research agencies or ministries of education	Ministries of economy or industry or ministries or agencies of energy
Type of data collection	Administrative data	Survey based data	Survey based data
Type of funds	Budget	Expenditure	Budget and/or expenditure <sup>7</sup>
Source of data	Funder <sup>8,9</sup>	Performer <sup>9</sup>	Funder and/or performer
Coverage of countries	OECD / EU member countries	OECD / EU member countries	IEA member countries
Coverage of public/private enterprises	only government and administration	all R&D performers, includes private business <sup>10</sup>	government and administrations, private enterprise data if available <sup>11</sup>
Coverage of government & administration	includes central and sometimes provincial government R&D <sup>12</sup>	includes all government R&D (central, provincial & local) <sup>12</sup>	includes energy R&D of central and regional government
Coverage of international bodies, R&D abroad	includes contributions to international R&D organisations, except EC <sup>13</sup>	only national R&D organisations	includes contributions to international R&D organisations, except EC <sup>14</sup>
Treatment of GUF	includes GUF in objective 10 <sup>15</sup>	GUF is distributed among objectives <sup>16</sup>	GUF is distributed among chapters
Coverage of demonstration	included <sup>17</sup>	included <sup>17</sup>	included <sup>18</sup>
Coverage of basic research	included <sup>19</sup>	included	included if directed to energy R&D <sup>20</sup>
Coverage of R&D subjects	all R&D	all R&D	only energy R&D
Classification type <sup>21</sup>	Functional <sup>22</sup>	Institutional <sup>23</sup>	Functional
Classification system	NABS of 13 socio-economic objectives, sub-groups of industry objective use NACE, sub-groups of the energy objective use a science/technology nomenclature	NACE, NUTS and socio-economic objectives (only government financed GERD) <sup>24</sup>	science/technology nomenclature

Data availability, level of detail	13 socio-economic objectives are mandatory, sub-chapter levels are optional	no energy chapter (though energy sector can be identified by NACE)	4 subchapter level (26 technologies)
Reporting period	Calendar year <sup>26</sup>	Calendar or fiscal year <sup>26</sup>	Calendar or fiscal year
Treatment of multi-annual programs	allocated to the years in which they are budgeted, not the year of authorisation. <sup>27</sup>	allocated to the years in which they are budgeted, not the year of authorisation. <sup>27</sup>	allocated to the years in which they are budgeted, not the year of authorisation.

<sup>1</sup> see also "8.8. Main differences between GBAORD and GERD data" on page 149 of Frascati Manual 2002.

<sup>2</sup> see "8.1. Introduction" on page 138 of Frascati Manual 2002.

<sup>3</sup> see "6.7.1. Gross domestic expenditure on R&D (GERD)" on page 121 of Frascati Manual 2002.

<sup>4</sup> see IEA website <http://www.iea.org/Textbase/stats/rd.asp>

<sup>5</sup> see IEA website <http://www.iea.org/Textbase/stats/rdguide.asp>. It says:

The definitions of "R&D" to be used in this review are the same as those used in the "Survey of the Resources Devoted to R&D by OECD Member Countries" compiled by the OECD Directorate for Science, Technology and Industry, with two important exceptions:

- of the three major categories of R&D activities distinguished in the OECD R&D Survey, namely "basic research", "applied research", and "experimental development", this table should exclude "basic research" unless it is clearly oriented towards the development of energy-related technologies, in which case it should be included;
- secondly, "Demonstration" projects should be included. Demonstrations encompass those projects that are of large-scale but which are not expected to operate on a commercial basis.

<sup>6</sup> See "Annex VIII – Contacts of IEA and Eurostat".

<sup>7</sup> Budget and expenditure data are currently mixed in the time series. Some countries provide either budget or expenditure data (i.e. Switzerland) or both (i.e. Germany). IEA might separate budget and expenditure data in individual time series/collections.

<sup>8</sup> see "8.6.2. Funding and performer-based reporting" on page 140 of Frascati Manual 2002.

<sup>9</sup> see "8.8.1. General differences" paragraph 522 (2nd sentence) on page 150 of Frascati Manual 2002.

<sup>10</sup> In fact, GERD data are distinguished by sector of performance, which are 'Business enterprise', 'Government', 'Higher education' and 'Private non-profit' (see "3.3. Sectors" on page 53ff of Frascati Manual 2002).

<sup>11</sup> It has to be taken into consideration that budget and expenditure data are mixed (see footnote vii) therefore some countries do include private R&D.

<sup>12</sup> see "8.8.2. GBAORD and government-financed GERD" on page 150 of Frascati Manual 2002.

<sup>13</sup> see "8.6.6. GBAORD going to R&D abroad" on page 142 of Frascati Manual 2002.

<sup>14</sup> The Member States do not include EC energy R&D budget, as information on the EC expenditure is obtained directly from the EC (see the website <http://www.iea.org/stats/files/rdguidelines.htm>)

<sup>15</sup> see "8.6.4. Direct and indirect funding" on page 141 of Frascati 2002; NABS/GBAOD summarises GUF in objective 10 and does not include it in the other socio-economic objectives (see also page 146 of Frascati Manual 2002 for more detail).

<sup>16</sup> see "4.5.3. The distribution list" on page 87 and "4.5.4. The criteria for distribution" on page 88 of Frascati Manual 2002.

<sup>17</sup> see "2.3.4. Problems at the borderline between R&D and other industrial activities" on page 41 of Frascati Manual 2002, and in particular the definition on page 42. Table 1 in Annex 10 (of the Frascati Manual 2002, page 228) shows an overview of the various terminologies used in some countries and the appropriate terms used throughout the Frascati Manual. In the table, a distinction is done between technical demonstration (is R&D) and user demonstration (is NOT R&D).

- <sup>18</sup> IEA can separate demonstration R&D on one-digit level for most countries. Contrary to a wide spread assumption (see footnote iv), inclusion of demonstration is not a unique feature of IEA R&D statistics. GBAORD and GERD data do also comprise demonstration (see footnote xvii).
- <sup>19</sup> see "8.4.1. Basic definition" on page 139 of Frascati Manual 2002. Frascati Manual 2002 defines also oriented basic research (see paragraph 242 on page 77 and paragraph 243 on page 78).
- <sup>20</sup> Though IEA indicates a difference to other R&D statistics (see footnote v concerning IEA treatment of basic research), footnote xix shows that also GBAORD and GERD data comprise basic research or oriented basic research that is distributed among the objectives.
- <sup>21</sup> see "1.9. Classification systems for R&D" on page 23ff of Frascati Manual 2002
- <sup>22</sup> see "4. Functional Distribution" on page 75ff. of Frascati Manual 2002.
- <sup>23</sup> see "3. Institutional Distribution" on page 51ff. of Frascati Manual 2002.
- <sup>24</sup> see Section 1 of Annex of Commission Regulation (EC) No 753/2004 of 22 April 2004.
- <sup>25</sup> see Section 2 of Annex of Commission Regulation (EC) No 753/2004 of 22 April 2004. Only four countries provide data for the energy sub-chapters.
- <sup>26</sup> see "8.8.1. General differences" paragraph 523 on page 150 of Frascati Manual 2002. According Eurostat metadata on NABS/GBAORD the fiscal year almost always corresponds with the calendar year.
- <sup>27</sup> see "8.6.5. Types of expenditure" paragraph 495 on page 142 of Frascati Manual 2002.



## ANNEX X – LIST OF ABBREVIATIONS

CERT	IEA's Committee on Energy Research and Technology that guides IEA's Energy Technology Collaboration Programme.
EUREKA	European Network for Market-Oriented Industrial R&D
GBAORD	Government Budget Appropriations or Outlays for Research and Development
GDP	Gross Domestic Product
GERD	Gross Domestic Expenditure on R&D
GUF	(Public) General University Funds
IAEA	International Atomic Energy Agency
IEA	International Energy Agency
NABS	Nomenclature for the Analysis and Comparison of Scientific Programmes and Budgets
NACE	Nomenclature des activités Economiques dans la Communauté européenne
Nordforsk	Nordic Industrial Fund
NOVEM	The Netherlands Agency for Energy and Environment
OECD	Organisation for Economic Cooperation and Development
SEO	Socio-Economic Objectives



European Commission

**EUR 21453 — Energy R&D Statistics in the European Research Area**

Luxembourg: Office for Official Publications of the European Communities

2005 — 61 pp. — 21.0 x 29.7 cm

ISBN 92-894-8964-2



## SALES AND SUBSCRIPTIONS

Publications for sale produced by the Office for Official Publications of the European Communities are available from our sales agents throughout the world.

How do I set about obtaining a publication?

Once you have obtained the list of sales agents, contact the sales agent of your choice and place your order.

How do I obtain the list of sales agents?

- Go to the Publications Office website <http://publications.eu.int/>
- Or apply for a paper copy by fax (352) 2929 42758

In 2003 the European Commission set up an expert group on energy R&D statistics in order to investigate the situation in Europe. Available statistics, in particular those of EUROSTAT and the International Energy Agency, were analysed with respect to their structure, level of aggregation, coverage, data collection method etc. and compared to users' needs.

The group came up with a number of concrete recommendations how to improve quality, relevance and comparability of European Energy R&D statistics, including a proposal for a revised IEA nomenclature and an updated definition of categories.

This final report sums up the major findings, conclusions and recommendations for further actions.



Publications Office  
*Publications.eu.int*

ISBN 92-894-8964-2



9 789289 489645 >