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TOWARDS A EUROPEAN POLICY FOR ENERGY EFFICIENCY

IN INDUSTRIAL FIRMS

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(Communication from the Commission to the Council)

COUNCIL RESOLUTION

on improving energy efficiency in industrial firms
in the Member States

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(submitted to the Council by the Commission)

Com 264

# TOWARDS A EUROPEAN POLICY FOR ENERGY EFFICIENCY IN INDUSTRIAL FIRMS

( Communication from the Commission to the Council)

**PREFACE**

This paper was drafted before oil prices started to collapse at the beginning of 1986. Oil prices staying low over the long term would of course affect energy savings in all sectors.

At the time of writing, neither the scale nor the duration of these price movements can be assessed with much certainty and their effects for energy savings are therefore only described in general and provisional terms (points 11 to 13 of the summary and point 5.2 of the report).

**SUMMARY**

1. Twelve years after the first oil crisis the most severe constraints on the energy markets have been overcome, not least thanks to a policy for the rational use of energy (RUE).

2. From 1950 to 1973 the Member States of the European Community[1] doubled their energy consumption to 932 m toe, becoming heavily dependent on imported oil.

In 1984 the primary energy consumption of the ten Member States was 912 m toe while GDP had risen by over 20% since 1973, meaning that energy efficiency had improved by 20%. (The consumption of the Community of Twelve in 1984 was 991 m toe).

3. Industry is one of the main sectors of consumption with a final energy consumption of 211 m toe or 32% of the Community total. The percentage rises to 42% if we include 70 m toe for non-energy uses (essentially chemical feedstocks).[2]

It is also the sector in which the cut in consumption per unit of output from 1975 to 1983 has been the largest, at 24%.

4. Structural changes in industry and the effects of the economic crisis go a long way towards explaining this trend. Energy savings proper have also played a significant part. Three industries lead the field in energy consumption: iron and steel, chemicals and non-metallic minerals. In these sectors energy costs account for more than 20% of production costs. Together these industries account for more than 60% of energy consumption by the whole of industry. The economic recovery in steel and chemicals in 1984 largely

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[1] As Spain and Portugual did not join the Community until 1986, the figures refer to the Community of Ten.

[2] The data are for 1984 and the Community of Twelve.

explains the increase of about 2% in energy consumption by industry compared with 1983.

5. The way firms use energy has been examined in detail through various national and Community programmes (energy audits of major sectors, energy bus etc), and clearly there is still a very large potential for further energy savings which could be achieved using known technologies that show a fast economic return. This potential is put at some 25% of specific consumption between 1985 and the end of the Century, i.e. about 60 million toe/year.

6. A large part of this potential can still be harnessed without any major investment, by means such as stricter monitoring of consumption, reducing heat losses and heat recovery using proven techniques.

7. In the long run the greatest energy savings will be achieved by replacing production machinery and equipment, introducing microelectronic control systems and converting to radically new manufacturing processes.

8. Research and development programmes and demonstration programmes at both national and Community level have given considerable impetus to RUE initiatives in industry and have contributed to the development of energy saving equipment manufacturing. As a result, European industries have become more competitive and new jobs have been created in a sunrise industry.

9. Many techniques for a more rational use of energy exist (helped along by Community RD&D measures), but their industrial application is hindered by a series of obstacles. These, which have been known about for some years, relate to informing and training industrial engineers and managers, the decision-making process for energy saving investments and financial difficulties.

10. National and Community authorities have introduced a range of measures to overcome these obstacles, including programmes of information, advisory services, demonstration and financial assistance for investment. Some of these programmes have now come to an end in several countries or have been cut back for budgetary reasons, so that the time has come to examine the best ways of pursuing and stimulating RUE investments in industry.

11. The present fall in energy prices threatens to discourage RUE investments. Any relaxation of the RUE effort would make industry more vulnerable in the medium term in its energy supply (short-term price levels do not represent long-term supply costs), and would also cause major difficulties for the RUE equipment sector and seriously threaten its future.

12. On the other hand, vigorous economic growth in the Community stimulated by lower energy prices could speed up the replacement of production plant, when more energy-efficient machinery could be installed.

13. Current energy price trends could therefore have contradictory effects, but in any case control over energy remains an essential objective. Here the dissemination and application of RUE experience, through energy technology projects for example, is of primary importance, the more so in that one of the main obstacles to RUE investments is industry's general ignorance of its energy consumption figures and of the techniques for reducing them.

14. The Commission is at present preparing a broader campaign for dissemination and application of the results of demonstration programmes through project monographs, information workshops, conferences, etc.

15. A databank on R&D projects, demonstration projects and hydrocarbon technology projects has been set up. It is known as SESAME and contains not only Community projects but also a growing number of national projects. On 1 July 1986 it is planned to open public access to information on the technology projects under Community programmes (energy demonstration projects and hydrocarbon projects) through the intermediary of the major European databank centres. SESAME could be usefully developed as the core of a documentation centre on RUE technologies. This centre, in cooperation with European producers, could at a later date store information on European RUE machinery and equipment.

16. A European Federation of Energy Management Associations (EFEM) was set up recently. Its members are associations of experts on energy conservation in several Community countries, and it could help to disseminate RUE technologies.

17. Work on the analysis of energy consumption should also be continued both in industry audits and under the energy bus programme. The results of the earlier programmes are most encouraging and it has been decided to

continue the programme over the period 1985-87, concentrating on a more detailed analysis of energy-greedy sectors and sectors where small businesses proliferate. The Commission will soon be assessing, using a sample of the audits carried out, how far firms have made the investments recommended after an audit.

18. Apart from the information barrier, which also stems from the training received by industrial engineers and managers (there is little teaching on energy and its uses in colleges and universities), the main obstacles to the penetration of RUE techniques are financial.

19. Most firms cannot themselves finance energy saving investments, or else they prefer to use their capital for development or expansion projects. Capital expenditure on RUE usually ranks after other expenditure, considered more important, such as the replacement of old machinery or workforce rationalizing.

20. RUE investment is therefore subject to extremely stringent profitability criteria. A payback time of less than two years is almost the general rule. This very high profitability requirement also stems from the weak financial structure of firms. When a large proportion of operating funds are borrowed, banks are reluctant to make further loans to firms, or at any event long-term reduced-interest investment lending, even for RUE projects with high profitability and low risk.

21. Firms are therefore concerned to make RUE investments without a major financial outlay. New financing mechanisms devised in recent years are an answer. In "third party financing", an agency outside the company studies the problem, proposes a technical solution and contributes the investment funds required. This agency monitors the performances and maintenance of installations. It is reimbursed on the basis of a given percentage of the energy savings achieved by the customer over a period stipulated in the contract, at the end of which the ownership of the machinery may be transferred to the customer firm.

This financing mechanism made its appearance around 1980 in North America. It has been slower to emerge in Europe, but is now arousing growing interest. The initial successes have been achieved in the building sector but a recent study has discovered a large potential in industry also, especially in non-process installations such as central heating systems, cogeneration, space heating, lighting, remote controls etc. The Commission will make sure that these new financing mechanisms become better known.

22. Other possibilities for promoting RUE investment in industry lie in systems of credit insurance as a means of facilitating access by firms to the financial market on favourable terms. This system could have a considerable leverage effect. The Commission's departments are now considering whether to propose a credit insurance scheme for RUE equipment manufacturers. The aim would be to cover part of the investment and marketing risk inherent in selling a new product or a new energy saving technology.

The Member States could also usefully consider such a mechanisms for users of RUE equipment.

23. Major energy savings can be achieved by recycling raw materials, from paper to plastics to non-ferrous metals . A boost to initiatives in this area could have a considerable impact.

24. To increase energy efficiency will demand further R&D and demonstration efforts. Future research should be increasingly multidisciplinary as the line between energy optimization in the strict sense, on the one hand, and product quality and the use of new materials or technologies, on the other, is increasingly blurred. Control over energy is a major element in the modernization of industrial firms and warrants continuing and expanding the effort at national and Community levels.

25. After twelve years of energy crisis, the potential and the means for greater energy efficiency are better known. The time has now come for disseminating and exploiting the knowledge and introducing the most effective ways of helping to harness industry's still vast energy saving potential. The prospects of renewed growth and therefore rising energy demand in the Community against a background of a temporary fall in energy prices are a challenge which must be met if the future is to be secure.

26. This is the context in which the Commission is putting the attached draft resolution to the Council, Parliament and the Economic and Social Committee, stressing the need to increase efforts to use energy efficiently in industry.

# TOWARDS A EUROPEAN POLICY FOR ENERGY EFFICIENCY IN INDUSTRIAL FIRMS

(Draft communication from the Commission to the Council)

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## R E P O R T

# CONTENTS

## A. INTRODUCTION

### 1. Historical background

Until fairly recently, the Community member countries obtained their energy supply essentially from indigenous resources, especially coal: in 1950 the share of imported energy was still less than 10%.

The economic boom of 1950-70 was to a large extent based on the availability of cheap, abundant and easy-to-use energy sources, particularly oil from the Middle East and North Africa.

The massive introduction of petroleum products as an energy vector triggered a staggering improvement in the productivity of firms, which were prompt to use them owing to their ease of use, flexibility and performance; at the same time it boosted the economic growth of sectors using oil, such as motor vehicles, polymer chemicals and residential central heating. Electricity, increasingly generated from fuel oil, also achieved rapid penetration. Energy consumption rose rapidly during this period of intense economic growth, but industry also became much more capital and labour intensive. Volume output grew much faster than energy consumption, with the result that the energy intensity of the economy and especially of industry declined throughout this period, as shown in Figure 1.

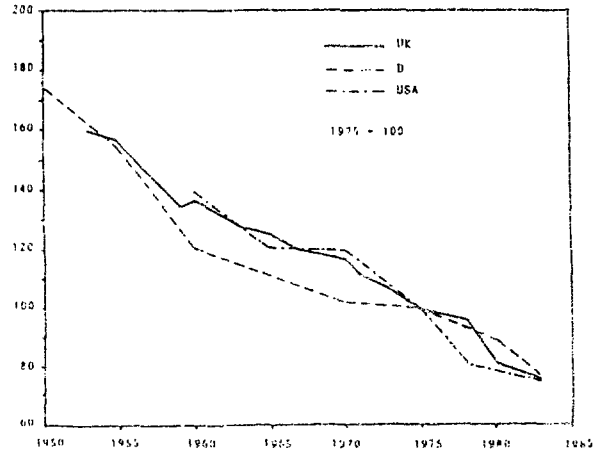


Figure 1: Trend of the energy consumption/industrial output ratio from 1950 to 1983 in the US, the Federal Republic of Germany and the United Kingdom.[1]

[1] Sources: The rational use of energy sources to meet the demand for heat, United Nations E/ECE/1064, 1985;
Industrial Energy Use and Conservation, EDP 23, Cambridge, England, 1982;
Eurostat.

But the rapid increase in oil consumption depleted proven reserves, and this together with a reaction by Third World Countries, especially OPEC, culminated in the first oil shock in 1973, when the price of crude quadrupled and there was serious threats that supplies might be interrupted.

The initial response to this upset, abruptly brought home to most industrialized countries as net importers of energy, was to diversify energy supply sources (natural gas, nuclear, coal) rather than try to reduce consumption. Energy consumption in the Community countries did rise more slowly after 1973/74, but this was mainly due to the slowdown in general economic growth.

For several years both government and industry were convinced that it would be difficult to reduce energy consumption.

This explains why in the first years of the energy crisis emphasis was primarily placed on a supply-side policy involving substantial investment in nuclear power stations, oil and gas prospection in the North Sea, subsidies to coalmines etc., and aimed at guaranteeing energy supplies.

Similarly, energy consumption forecasts for 1985 made ten years ago suggested figures about 50 to 70% higher than those actually achieved.

Gradually, however, it became clear that there was also considerable scope for action regarding the rational use of energy and energy savings in various sectors.

This was taken on board over the period 1974-78 by the Member States and at Community level (Council resolution of 17 September 1974, Council recommendation 77/713 of 25 October 1977).

The second oil shock of 1979-80, which sent the oil price through the USD 30 per barrel mark was the real starting-point for important changes in energy consumption.

In 1984 gross energy consumption in the Community of Ten was 912 m toe as against 932 m toe in 1973. In the Community of Twelve, these figures were respectively 993 m toe and 998 m toe.

Total final energy consumption of 723 m toe in 1984 was distributed as follows:

| | EUR-10 | EUR-12 |
|---|---|---|
| - Industry | 190 m toe (29%) | 211 m toe (30%) |
| - Transport | 161 m toe (24%) | 178 m toe (25%) |
| - Residential and Tertiary | 252 m toe (38%) | 265 m toe (36%) |
| - Non-energy uses | 65 m toe (9%) | 70 m toe (9%) |
| Total: | 666 m toe (100%) | 723 m toe (100%) |

Table 1: Distribution of final energy consumption between principal sectors in 1984.
Data from Eurostat (provisional), IEA (for Spain and Portugal).

Industrial energy consumption therefore represents one of the main uses of energy, which amply justifies efforts to ensure that energy is used efficiently in this sector.

## 2. Energy in industry

### 2.1 Economic importance of industry

At 1984 prices the Community's gross domestic product stood at some 2 775 billion ECU. Industry accounted for about 30% of this total, but a large share of GDP in other sectors of the economy (tertiary, transports, services etc), stems directly from industrial activity.

As these figures show, the European economy is still largely based on industry. Better performances in this sector, not least through a more rational use of energy, is consequently an essential factor in economic and social progress in the Community.

### 2.2 Energy in industry

Energy consumption in industry has changed substantially over recent years.

(m toe)

| Year | B | DK | D | HE | F | IRL | I | LUX | NL | UK | EUR-10 | E | P | EUR-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1973 | 18.5 | 3.6 | 86.0 | 3.7 | 46.1 | 1.3 | 49.7 | 3.2 | 20.8 | 65.3 | 298.2 | 23.0 | 2.8 | 324.0 |
| 1978 | 16.8 | 3.8 | 79.2 | 4.5 | 53.8 | 1.8 | 43.5 | 2.5 | 23.9 | 56.9 | 286.7 | 24.5 | 3.4 | 314.6 |
| 1983 | 12.4 | 2.7 | 67.7 | 4.3 | 43.0 | 1.6 | 37.6 | 1.6 | 15.8 | 49.1 | 235.9 | 22.1 | 4.0 | 262.0 |
| 1984 | 12.9 | 2.9 | 69.1 | 4.4 | 43.6 | 1.6 | 39.1 | 1.8 | 17.3 | 43.3 | 236.0 | 21.4 | 3.5 | 261.0 |

Table 2: Final energy consumption in industry (including the energy industry). Data from Eurostat and IEA.

This table shows striking differences from one country to another, which stem from two factors:

- RUE efforts;
- economic trends in industrial and intra-sectoral development.

In two member countries, Ireland and Greece, and in Portugal, energy consumption in industry continued to rise during the period, but to absolute levels which are still fairly moderate. This was because in those countries industry developed late, especially heavy industry, which was still in its infancy in the early 1970s.

In contrast, the sharp falls in consumption in the United Kingdom, Belgium and especially Luxembourg largely stem from the decline of traditional energy-intensive sectors like steel and non-metallic minerals.

The rise in industrial energy consumption in the Netherlands over the period 1973-79 stemmed from the development of a large chemical and petrochemical industry using national natural gas resources.

The comparison between countries can also be made on the basis of per capita final consumption of energy in industry.

(per capita Koe)

| Year | B | DK | D | HE | F | IRL | I | LUX | NL | UK | EUR-10 | E | P | EUR-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1980 | 1 313 | 615 | 1 056 | 414 | 833 | 566 | 654 | 6 238 | 981 | 739 | 839 | | | |
| 1981 | 1 196 | 519 | 980 | 372 | 707 | 560 | 630 | 4 997 | 935 | 701 | 772 | | | |
| 1982 | 1 102 | 472 | 879 | 364 | 679 | 505 | 560 | 4 637 | 840 | 687 | 712 | | | |
| 1983 | 1 029 | 427 | 897 | 363 | 631 | 447 | 543 | 4 325 | 806 | 654 | 688 | | | |
| 1984* | 1 065 | 476 | 955 | 371 | 638 | 424 | 566 | 4 825 | 936 | 552 | 700 | 463 | 303 | 656 |

Table 3: Per capita final energy consumption in industry.

*Eurostat provisional figures.

These figures show that in the Community as a whole energy consumption in an industry is declining and there is a general trend towards the Community average although there are still major differences.

However, there was a slight overall increase in 1984 except in the United Kingdom, where a substantial drop in energy consumption in industry was recorded, partly because of the miners' strike.

Consumption by industry increased most sharply in the Netherlands and in Luxembourg and to a lesser extent in Denmark and the Federal Republic of Germany. The recovery of the chemical and steel industries were largely responsible.

The production indices in these two dominant sectors rose by nearly 10% from 1983 to 1984, which shows that nevertheless the trend towards energy conservation continued in that year.[2]

In 1984 the distribution of energy consumption by industrial sector and by energy vector was as follows:

(m toe)

| | Solid fuels | Petroleum products | Gas[1] | Electricity[2] | Total[3] |
|---|---|---|---|---|---|
| Steel | 22.8 | 2.7 | 16.2 | 6.3 | 48.1 |
| Non-ferrous metals | 0.2 | 0.9 | 1.4 | 4.3 | 7.2 |
| Chemicals | 1.9 | 9.6 | 14.5 | 10.3 | 35.0 |
| Non-metallic minerals | 4.4 | 6.1 | 7.8 | 3.0 | 21.6 |
| Extraction (excluding fuels) | 0.0 | 0.6 | 0.5 | 0.7 | 1.9 |
| Foodstuffs | 0.6 | 6.1 | 5.2 | 3.1 | 15.1 |
| Textiles, leather etc | 0.5 | 2.3 | 1.6 | 2.0 | 6.4 |
| Paper and printing | 0.6 | 2.7 | 3.0 | 3.0 | 9.3 |
| Metal manufacture | 0.4 | 4.9 | 6.7 | 6.7 | 18.6 |
| Others and adjustments | 7.7 | 10.4 | 2.7 | 3.3 | 27.1 |
| TOTAL | 39.3 | 46.5 | 59.6 | 42.7 | 190.2 |

[1] Natural gas + derived gases.
[2] Direct energy equivalent: 1 Kwh = 3.6 MJ.
[3] Including 2.0 m toe in the form of heat.

Table 4: Distribution by sector and energy vector of energy consumption in industry, EUR-10 in 1984 (Eurostat provisional data).

[2] Given constant energy intensity, the increase in energy consumption due solely to the growth of the steel and chemical industries would be 4.5%. In fact for the whole of industry energy consumption increased by 1.3% only.

## 2.3 Analytical tools

Technicol-economic indicators such as the energy intensity of the economy must be used for the analysis of energy consumption patterns and their trends over time so as to identify progress in RUE.

But there are major difficulties in the use of these indicators. Changes in the index numbers have several causes :

- the level and trend of general economic activity;
- sectorial and industrial product structures and trends;
- stock changes;
- climatic effects;
- energy efficiency proper.

Aggregated data, often the only data available, make it difficult to identify the relative importance of each of these factors. Energy consumption can be expressed for physical magnitudes such as the tonnage of a particular product, but this greatly limits the possibilities of comparison between sectors and does not allow product trends to be followed. It can also be given for macroeconomic magnitudes such as the volume of output expressed in constant currency value terms, or for value added.

Using macroeconomic and physical magnitudes at the same time is, however, a delicate matter and there is doubt about the relevance of conclusions drawn from such data, in particular as regards the analysis of RUE incentive policy effects.

Under the non-nuclear R&D programme the Commission has launched a study on the development of indicators for energy efficiency which are more precise and yield more reliable information.

This information can be supplemented by the analysis of energy consumption by industry and by type of product. Based on disaggregated data, this will allow quantitative comparisons and enable technological factors to be taken into account. The Commission and several national departments have had such analyses carried out (point 7.1).

## B. THE POTENTIAL FOR ENERGY SAVINGS IN INDUSTRIAL FIRMS AND THE OBSTACLES

### 3. Introduction

Energy is one of the main items of production costs (ranging from 10% to 60%) in many industries, especially steel, non-ferrous metals, chemicals, non-metallic minerals and paper pulp.

In other sectors such as foodprocessing, textiles and metal manufactures, energy costs account for only a small percentage of total costs but still affect corporate profitability.

The way in which firms tackle the energy problem often depends on the general quality of management, control of production processes and the financial situation.

Industry presents a wide range of situations and there are many very different technologies for the efficient use of energy. They are examined below.

The potential for energy savings in industry in the medium term is generally estimated at 25% using proven technologies showing a good return. However, their introduction comes up against a variety of obstacles, some inherent in the firms and some stemming from the general context (point 5).

### 4. RUE technology

4.0 Ways of improving energy efficiency in industry fall into four main groups :

(a) measures requiring little or no investment:

- regular maintenance of installations producing or consuming energy;

- monitoring of consumption, systems management (e.g. automatic control systems to regulate temperature, lighting, door closing etc.) and training;

(b) limiting energy losses in distribution and use, essentially by insulating pipes or machinery or by improving heat transfer;

(c) by recovering heat in the process itself or by channelling excess heat to outside users (district heating etc), or using it for electricity generation etc.

(d) by modifying energy-consuming processes either by replacing plant or by making fundamental changes to the stages of manufacture.

To identify these possibilities, a study must be made of energy use in the firm. Such studies use measurement exercises, mathematical models simulating the operations, etc.

Measures in category (a) usually require very little investment but need constant monitoring if they are to remain effective, which will be shown by investigation on the spot. For the most part they show a high return in the short term. Some microelectric systems can be included in this category.

Category (b) measures require some investment, usually showing a good return, which most firms have already made. Much more could still be done in this area.

Heat recovery (category (c)) has made a significant contribution to energy savings in the last few years and for many applications the technologies are proven, their rate of return also. Nevertheless further development and/or demonstration is still needed in particular areas (very-high-temperature effluents, corrosives etc). There is still considerable scope for saving energy by these recovery techniques, but their introduction is hampered both by general considerations militating against the use of RUE technologies, and also by uncertainty concerning the duration of use of the installations.

Potentially the largest energy savings fall within category (d). Faster replacement of old machinery by more efficient plant already equipped with the most effective techniques for energy use or conversion, including recovery, control and regulation devices, will bring about major savings on a permanent basis.

In many practial cases observed in various industries, this type of investment, which may be fairly costly, brings about substantial savings, sometimes more than 50%, both in energy and in raw materials or labour, and are thus highly profitable.

Finally, an examination of the possibilities for a more efficient use of energy can prompt industries to make radical changes in their processes. This will generally necessitate introducing technologies from other fields such as remote control, microelectronics, lasers, new materials, biotechnology etc.

Various RUE techniques in industry are described below. For each technique the category to which it belongs as defined above is given together with the potential for energy savings.[3]

**4.1 Energy managment (a)**

When the directors of a firm realise the cost of energy they will in many cases appoint an energy manager, who is often required to combine this function with others. His first task is to establish a specific energy accounting system for monitoring consumption.

This work can also be entrusted to an outside body; it is then called an energy audit.

The first measures are usually directed towards staff information and training. More attention will be paid to regular maintenance and optimum regulation of installations.

Potential energy savings by these measures is of the order of 5- 10% in industries of low or medium energy intensity.

**4.2 Automatic control and governing systems (a, d)**

Microelectronic control and governing systems both for industrial processes and for heating and lighting show very good returns in industry. They are modern equipment and are expected to be widely adopted over the next ten years. More progress can yet be made in programming complex processes.

Possible energy savings through these techniques are between 5 and 10% in industrial processes and could be as high as 25% or more for heating and lighting.

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[3] The real savings that are obtainable in industry are generally achieved by combining several techniques. The energy savings shown are not always arrived at from the same bases of calculation. The final potential is therefore not the sum of individual possible savings, which represent orders of magnitude.

**4.3 Improvement of thermal characteristics of buildings (b)**

In some sectors industrial space heating is the most important item of energy consumption. Air conditioning of industrial premises poses particular problems, which can be solved using traditional techniques that generally show a good return.

Heating costs can sometimes be reduced by a half.

**4.4 Improving thermal insulation (b)**

Insulation of fuel oil tanks and steam pipes and the recovery of condensates are highly economic and widely used. New insulating materials have been developed for ovens.

Energy savings by these measures amount to 15 to 30%, sometimes more.

**4.5 Rationalizing energy distribution (b)**

The use of decentralized systems limits distribution losses while meeting the requirements of remote or occasional users of heat. Savings of 25% are possible in many cases.

Heat recovery or the use of waste energy, on the other hand, will mean using energy distribution networks.

**4.6 Heat recovery (c)**

Heat recovery is best used in the heat-generating process itself (preheating of combustion air, recycling etc.). There is a wide range of applications and techniques and others are being developed.

Total potential savings through heat recovery is often more than 20%, taking into account what has already been achieved.

**4.7 Mathematical modelling (a, b, c, d)**

Mathematical computer modelling of installations will optimize operating points and can be used to simulate structural modifications. This is an irreplaceable tool for the equipment designer and manufacturer. The best systems of regulation, recovery and so on can be designed in advance. An increased use of simulation techniques is an essential condition for achieving energy savings. Specific energy saving potential: 15 to 25% (meaning savings which will not be apparent except through computer modelling).

**4.8 Use of computers in industry (d)**

The use of information technologies in industry mainly means:

- computer assisted design and for manufacturing (CAD/CAM);
- production management and stock management;
- computer-guided optimizing and robots (cutting etc.)
- automatic quality control.

These technologies improve productivity and reduce waste, rejects etc. Specific energy consumption per product may be reduced by 10 to 30% depending on the case.

**4.9 Rankine cycles (c)**

Rankine cycles can be used to convert unused waste heat into mechanical energy (electricity). Their performance and efficiency however are low. They are unlikely to be adopted widely in industry; a realistic estimate would be at the most a few hundred MW (electric) in the Community or about 0.1% of electricity produced. The theoretical potential is much higher.

**4.10 Heat pumps (c)**

Heat pumps of various types increase the temperature of heating fluids. The high cost of the equipment hampers their use in industry and other solutions such as heat exchangers are preferred when possible.

In some sectors where low-temperature heat is used the contribution is fairly high. Mechanical steam compression systems offer the most advantage. The range of applications could be increased by technological innovations for which more research and demonstration is required.

**4.11 Energy from waste (c)**

Some manufacturing waste or residues can be burnt or converted into biogas. Waste-fuelled boilers show a good return, but biogas systems are warranted in industry only on environmental grounds.

The energy potential of industrial waste represents 5 to 10% of energy used in industry.

**4.12 Raw material recycling (d)**

Some materials such as metals, glass, paper and plastics have a high energy content. The use of recycled materials makes for large energy savings (up to 95% for aluminium) and is beneficial both for the environment and for the balance of payments. A vigorous campaign would increase the level of recycling.

**4.13 Replacement of plant and machinery (d)**

There is a large long-term energy saving potential in the modernization of production equipment by replacing old and inefficient machinery by new machinery incorporating modern techniques. Energy savings of more than 50% are possible in some cases.

**4.14 Efficiency standards (a)**

As industrial installations are extremely diverse and complex, it is very difficult to introduce standards.

Target standards, even voluntary, can however stimulate research and the replacement of ordinary equipment such as boilers, motors, transformers etc.

**4.15 Specific applications of electricity (d)**

For many industrial processes the use of electricity makes for high performances. This is the case for electricity for heating purposes where the substitution factor can range from 1:3, 4 or more (1 KWh of electricity replaces x KWh of fuel).

Such processes include heating by conduction, induction, resistances, electric arc, infra-red, microwave etc; surface treatment by electron beams, lasers, plasmas etc; concentration by reverse osmosis, hyperpress drying, etc.

The relative prices of the KWh of electricity and of fuel are a determining factor in substitutions.

Further improvements to these electric processes are possible. The potential for energy savings may be over 30%.

**4.16 Electricity savings (a, d)**

Substantial savings can be obtained in the traditional uses of electricity (lighting, motive power, electro-chemical uses) by using high-efficiency equipment, speed regulation, etc.

Average potential savings of 10-20% for these applications can be economically exploited if the electricity producers and distributors promote this trend.

**4.17 Technological and industrial innovation (d)**

The introduction of radically new production processes can be encouraged by the need to conserve energy. A technological and scientific contribution from other branches of engineering in essential.

In the long term it is at this level that the largest savings will be achieved.

**4.18 Combined heat and power generation (c, d)**

The combined generation of heat and power (electricity) gives a high energy conversion efficiency usually above 80%.

Doubling the industrial cogeneration capacity in the Community would produce a saving in primary energy of about 10 million toe. Achieving this aim will demand a resolute policy approach in view of the present obstacles in most Community countries to any extension in CHP such as the terms for taking surplus electricity or for obtaining emergency power.

CHP systems of use to industry include:

- total energy systems (heat engines with waste heat recovery);
- back-pressure steam turbines;
- gas turbines with heat recovery;
- steam offtake in power stations;
- combined cycles (coal combustion or gasification).

**5. Obstacles to RUE**

**5.1 The problem**

Basically, saving energy is not the main aim or first concern of industry. Industry's primary purpose is to produce or process goods from raw materials using the means of production supplied by capital and labour in order to obtain an economic return on the products by marketing them. Companies are entirely organized in the service of this aim.

Energy has only a secondary role. At the most it keeps the machinery turning and sometimes is itself a raw material. Yet it is indispensable, for when it runs short production is held up or brought to a complete stop.

This already explains why, except in certain heavy consumption sectors where the energy component can claim an importance in the organization equivalent to its share in production costs, energy management is allowed very little place in purchasing, production supervision (including personnel management and industrial relations), product development and sales. Deliberate, purpose-directed action will be needed to overcome these innate corporate tendencies to neglect the energy component.

## 5.2 Effect of energy prices

Energy prices have fluctuated in the last few years. A sudden jump in the late 1970s provoked a major energy conservation drive. While the results achieved may to a large extent be regarded as irreversible, we must be alert to the repercussions of a fall in energy prices (for example oil at less than USD 20 per barrel) on efforts to achieve further energy savings which are in any case necessary in the long term.

On the other hand, lower oil prices could boost economic recovery in the Community. At the same time a high rate of modernization investment would improve the energy efficiency of industrial processes.

Present energy price trends could therefore have contradictory effects. In any event the results of the RD&D efforts of the last few years must be disseminated and exploited. The Commission will keep a close watch on energy price movements and their effects, especially as regards energy savings, and will report to the Council as necessary.

## 5.3 Decision making process

Efficient energy management calls for a high level of competence : fairly senior staff must be assigned to this task despite more immediate corporate priorities.

In small firms where one person is usually both director and manager, he will be too busy to devote much time to energy management. In highly ramified groups which may well have departments studying energy questions, the decision-making process (regarding RUE investment for example) is a long-drawn-out matter of procedures and energy is liable to lose out against other investments, especially as regards financing.

In some cases small steps which would make for large energy savings are not put into effect as the decision making structures tend to give priority to major projects.

**5.4 Lack of knowledge of consumption**

More generally, firms make no RUE measurements if real consumption (in volumes and by energy vector) is quantified only as an overall figure for the firm. It is often difficult to find out the energy efficiency of individual machinery or installations for lack of measuring or metering devices, and there is no direct incentive to make improvements.

Specialized firms offer their services for making energy measurements and audits. But industry is often reluctant to consult them, seeing them as intruders : there is a psychological barrier. Industry generally is unaware of the real level of competence of these firms and regards them as a risk. It is certain that the incentives adopted by Member States for carrying out energy audits and the European Energy Bus Programme are encouraging acceptance by industry of the supposed constraints of calling on outside consultant (points 7.1 and 7.4).

Unlike firms in the United States, European companies are less open-minded and tend to do things their own way. The same problem arises over the introduction of third party financing mechanisms (point 7.6).

**5.5 Secrecy clauses**

Similarly, firms are reluctant, more so in some sectors (the chemical industry is hypersensitive in this respect), to disclose the results of RUE measures or investments on energy consumption on grounds of secrecy clauses. This hampers the spread of information on the technical possibilities for saving energy in industry.

**5.6 Training of technical managers**

Ignorance of practical RUE possibilities is also a major obstacle. There are several reasons for this situation.

In the training of technical managers in industry (usually engineers) energy use and conversion is hardly touched upon. University and higher education curricula give pride of place to technical knowledge of production and energy questions are crowded out, although there are some slight indications of a change of heart. Post-graduate

training courses and seminars etc. are now available for industrial engineers but with varying degrees of success as firms are unwilling to send their managers on these courses.

### 5.7 Plethora of information

Firms are inundated with information on energy from every source and of every description, which may only confuse them. Information comes from:

- energy producers and distributors,
- equipment manufacturers,
- public authorities,
- the media.

The messages may be contradictory (competing advertising for different forms of energy or equipment), inaccurate or likely to arouse suspicion.

There is a particular need for information that is appropriate, seen as objective and disseminated through suitable channels. The authorities can lead the way here, and the success of initiatives such as the demonstration programmes and the energy management associations in various Member States gives an idea of the possibilities. The Commission is preparing various measures in this field on the basis of information gathered under the Energy Bus campaign and RD&D programmes (point 7.2 to 7.4).

The exchange of information on RUE techniques would also be stimulated by using the possibilities offered by the Community's data banks. These systems can be extended by the transfer of information gathered in the Member States and by creating a special section into which RUE equipment manufacturers could feed technical data on their equipment.

### 5.8 Financial structure of firms

Corporate financial difficulties are a minefield in the way of penetration by RUE technologies. Difficulties are particular acute against a background of economic crisis which suggests a poor profitability outlook and at the same time generates high interest rates.

At microeconomic level the result can be a very unsatisfactory capital/borrowings ratio. The obstacles originate in the financial institutions such as banks, which are most reluctant to grant additional loans to firms, even for projects with very high marginal profitability like certain RUE investments, depending on the overall financial exposure of the firm. Third party financing for energy conversation could be a solution for equipment users.

A specific credit insurance mechanism would also help to remove this obstacle. The Commission is now studying such a mechanism for equipment manufacturers. The Member States could run such a system for users (point 7.6).

**5.9 Investment priorities**

Firms often have their own order of priority for investments. These may be broadly classified as development investments to ensure the firm's expansion into new markets or increase market shares, and investments to maintain production capacities and their profitability.

The first category of investments is essential to ensure the firm's long-term viability and will therefore be given high priority in times of growth or technological change.

The second category can be subdivided into necessary expenditure and optional expenditure. Necessary expenditure includes the replacement or repair of out-of-use or obsolete installations (in cases where energy accounts for a large share of operating costs, energy efficiency may be one of the elements taken into account) and the costs of complying with safety, health and environmental regulations and obligations.

Optional investments are often seen as rationalization expenditure designed to reduce production costs. Postponing them is usually not a direct threat to the firm's activity, even though in the long run profits will heavily depend on these investments being carried out. The energy component usually falls into this category and the level of priority given to it varies according to sector and energy intensity. Very often RUE investments are given very low priority, ranking after investments to reduce labour costs (robots, etc.).

Accordingly, RUE investments are generally required to show extremely short payback times, and in recent times these are being cut even further. It is by no means rare for projects whose initial cost will be recovered in two years to be abandoned as showing too slow a return.

**5.10 Limited effects of public aids to RUE investment**

Subsidies or tax relief for RUE investments, to reduce payback times, only indirectly influence the decision whether or not to make the investment, and often mean that aid is being given to investments

which are already highly profitable and would have been carried out in any case. Taking into account the real stimulation impact, the cost/benefit ratio of these systems for public finance is unfavourable, especially in the frequent cases where such mechanisms have undergone rapid changes or are of short duration.

Public authorities can have a useful impact on the decision-making processes by being more selective and requiring, for every public financing, a detailed energy analysis by an approved body showing the high quality of the investments for which aid is requested.

The largest obstacle in fact is not lack of money (in that the financial market has substantial resources) but rather the whole path that the resource allocation decision must take.

**5.11 Summary**

To sum up, the scope for energy savings has immensely widened in the last few years, and the public authorities together with the Commission departments have played a major role, especially through various RD&D programmes.

Transferring this knowledge to industry is now an essential task and the various obstacles to the penetration of RUE technologies have been analysed. This information and investment stimulation campaign demands a coherence and continuity in increased action and efforts in collaboration with specialized departments and private consultancies.

Any break in government or Community action is damaging to the extent that it could lead to the scattering or disappearance of competence and knowledge which are the result of years of effort in scientific, human and financial terms.

## C. ENERGY CONSERVATION INITIATIVES BY PUBLIC AUTHORITIES

### 6. National and regional measures

6.0 In June 1980 and in January 1985 the Council adopted resolutions on Community guidelines for energy savings.[4] The Council asked the Member States to adapt their energy saving programmes to cover all main sectors of use and to adopt an appropriate pricing policy.

Several Member States have taken steps in this direction, and the Commission has sent the Council several comparative reports on national programmes and energy policies.[5] Accordingly only the main outlines of national energy saving programmes are indicated here.

### 6.1 Financial assistance

Public assistance to RUE investments in industry totalled some 600 MECU in 1981 and 1982. The figures fell from 1983 onwards either because programmes had been completed or for budgetary reasons.

The most frequently used techniques are subsidies and tax reliefs for approved investments. In several Member States the low level of public assistance was justified on grounds of confidence in market forces for introducing RUE techniques in industry and of the priority given to assistance to the residential sector.

### 6.2 Information and advisory services

Considerable support has been given by public authorities to advisory and information programmes, especially for small and medium-sized businesses.

The Energy Bus programmes were supported in several Member States either financially or through facilities of access to information.

Technical brochures and publications were disseminated and several advice-by-telephone services are available for industrial firms.

Conferences, symposia and seminars are organized or supported by public authorities or technical associations promoting RUE technologies, such as the ATEE in France.

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[4] OJ No C 149, 18.6.1980; OJ No C 20, 22.1.1985.
[5] E.g. COM(84)36 final; COM(84)88 final.

The substantial differences between the expenditure of one Member State and that of another on information and advisory programmes are largely a matter of whether the bodies carrying out these activities are public or private.

### 6.3 Research and development

Most Community countries have set up research and development programmes for energy. Although the larger part of the effort has been devoted to nuclear energy, since 1977 these programmes have made an important contribution to the development of RUE technologies in industry.

In each of the years 1983 and 1984 government expenditure on R&D for industry RUE in the Commity averaged 50 MECU. As this does not include regional measures and those financed by industry, it is difficult to give a figure for the total R&D effort.

Government expenditure tends to concentrate on the most advanced technologies and R&D responsibility is increasingly transferred to the manufacturing industry depending on how far advanced the technologies are.

Programmes are coordinated by the research or industry ministries and in some countries the task is delegated to private or public-interest bodies.

### 6.4 Demonstration

Several Member States run demonstration programmes (United Kingdom, France, Belgium, Netherlands) or related research and development programmes (Federal Republic of Germany). Some measures are of the nature of government aids to certain projects.

Programmes are threatened with cuts as a result of general budgetary restrictions.

The Commission examined the Member States programmes in its evaluation report.[6]

### 6.5 Regulations

It is often difficult to draw up regulations in view of the multiplicity of technological and structural characteristics of factories, plants and workshops.

However, there are statutory requirements concerning combustion installations, and boilers in particular.

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[6] COM(85)29 final/2.

## 7. Actions at Community level

### 7.0 Introduction

In view of the importance of making efficient use of energy in undertakings, the Council, acting on a Commission proposal, took several steps in the 1970s to promote this aim, particularly in industry. (See, for instance, the Council resolution of 17 December 1974[7] and the recommendation of 25 October 1977[8]).

In its resolution of 9 June 1980[9] the Council sought to step up efforts in the Community to save energy and recommended that the Member States adopt certain guidelines on a basic energy savings programme. It issued further guidelines in its resolution of 15 January 1985.[10]

Alongside this coordination, the Commission initiated a number of Community actions described below.

### 7.1 Sectorial audits

With the cooperation of industrial circles, the Commission set out to make and publish energy audits for different industries with a view to making a major contribution towards energy efficiency in industry.

Each report covers a specific industrial sector and comprises the following sections: a brief description of the industry and its energy profile, the technologies already available or still in the course of development and those being demonstrated as capable of promoting a more rational use of energy.

Various consultancies in Member States have carried out the studies and these have been published with the agreement of the European professional associations concerned.

Technically speaking, the audit reports are very useful, particularly in sectors characterized by numerous small and medium-sized undertakings. The reports enable small businesses to check their own consumption against a reference level and benefit from the description of the available technology in order to improve their own performance. For management, the reports are a guide to be used in making decisions on RUE investments.

The information is also directed at banks which will be called upon to finance such investments. The audits are published in the "Energy" series by the Directorate-General for the Information Market and Innovation (DG XIII).

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7 OJ No C 153, 9.7.1975.
8 OJ No L 295, 18.11.1977.
9 OJ No C 149, 18.6.1980, p. 3.
10 OJ No C 20, 22.1.1985.

The Commission has made provision for regular updates.

The following audits have so far been completed:

**(a) Published audits**

| | | |
|---|---|---|
| No 1: | STEEL | (Nuova Italsider) |
| No 2: | ALUMINIUM | (Aluminium Federation Ltd.) |
| No 3: | PAPER | (P.A. Management Consultants Ltd.) |
| No 4: | GLASS | (Comité Permanent des Industries du Verre de la CEE) |
| No 5: | BRICKS AND CLAYS | (British Ceramics Research Assocation Ltd.) |

**(b) Audits completed and in course of publication**

| | | |
|---|---|---|
| No 6: | CHEMICALS | (Serete) |
| No 7: | GRAINS | (SEMA) |
| No 8: | MILK* | (Birch & Krogboe) |

**(c) Audits planned or in preparation**

| | | |
|---|---|---|
| No 9: | CERAMICS* | (MacHale Associates, Dublin; European Studies, Athens) |
| | SUGAR | |
| | NON-FERROUS METALS | |
| | ABATTOIRS* | |
| | BREWERIES | |
| | CANNERIES | |
| | STEEL | (Update of the first audit) |
| | CONSTRUCTION MATERIALS | |
| | METAL GOODS | |
| | TEXTILES, LEATHER, CLOTHING* | |
| | RUBBER | |

*The audits for these sectors will be completed with the help of a data-gathering programme under the Energy Bus programme (cf. 7.5).

## 7.2 Non-nuclear research and development programme

Aware of the contribution of new technologies towards the achievement of the energy policy objectives, the Council in 1975 approved a first Community energy R&D programme managed by the Directorate-General for Science, Research and Development (DG XII). The programme included a large section on energy saving which in fact covered the following aspects: improving insulation in buildings, the use of heat pumps, urban transport, the recovery of residual heat, materials recycling, energy from waste, industrial processes and energy storage.

More than 100 research contracts were negotiated with Community institutions and undertakings and the budget for the programme exceeded 22 MECU, half of it paid by the Commission.

The programme identified a huge range of techniques of use to industry. The results were announced at the conference on "New Ways to Save Energy" held in Brussels in October 1979.

Given the success of the first programme, the Council decided in 1979 to adopt a further programme. The call to submit projects attracted some 600 proposals relating to energy saving, 160 of which were selected. The total cost of the second energy saving programme is some 50 MECU, 25 million of which is being paid by the EEC. The results of the second programme were presented at the conference on "Energy Conservation in Buildings" held in November 1984 at The Hague and at the conference on "Energy Conservation in Industry" held in February 1984 in Dusseldorf.

In the first two programmes research connected with industry covered the following topics:

- general research and development on industrial heat pumps (particularly in the second programme);
- controlling and improving combustion;
- advanced heat exchangers;
- heat recovery in industrial processes;
- organic Rankine cycles;
- the optimization of metallurgical processes;
- recycling of raw materials, plastics, fibreglass, etc;
- developing catalysts for the chemical industry;
- devulcanization of rubber (used tyres);
- process integration in the textile industry (impregnating damp fabric, etc.);
- improving various processes in the cement and paper industries and in preparing grain for human consumption, etc;
- the use of microwaves in industry.

The invitation to submit projects for the third R&D programme was closed in July 1985 and project selection is already well advanced.

The Commission received 376 proposals on energy saving but the budget available for contracts is only some 23.9 MECU. This has meant that the Commission and the advisory project selection committee, made up of government officials, have had to drop many valuable proposals.

The Commission has given priority to projects in which several research centres or industries are involved, and in particular to topics on which work was done at earlier stages (e.g. basic research on combustion). This has resulted in the launching of a global harmonized research project on the subject.

If a further R&D programme is launched, the Commission intends to concentrate the research effort on perfecting new industrial processes making major energy savings. Research is therefore tending towards multidisciplinary activities and integrating advanced technologies developed in other contexts. Examples of fields worth considering are: applied superconductivity, the applied development of new diagnostic methods, applied MHD (Magneto Hydro Dynamics).

### 7.3 Energy demonstration programme

Everyone recognises the importance of real-life demonstrations of technologies resulting in the more efficient use of energy if the penetration of these technologies into the market is to be speeded up.

In 1977 the Commission therefore proposed that the Council should set up a programme covering various aspects of energy that were of importance to the Community as a whole. In June 1978 the Council adopted Regulation No 1303/78 on the granting of financial support for Community demonstration projects resulting in a major improvement in energy efficiency. Financial support for such projects has been renewed successively every year since then. Nevertheless there has been a change in the type of project accepted and in the clauses concerning repayment of the subsidy in the event of the project proving successful.

In the section on energy saving in industry, 202 projects were adopted between 1979 and 1985. To this should be added 44 projects connected with the energy industry and 22 projects on heat and power. By the end of 1985, 154 contracts providing Community support for demonstration projects had been concluded. Of these 37 have now been completed. A list of current projects broken down by subject and the technology involved is given in Annex I.

The Commission had an analysis of the programme results made by independent experts (See COM(85)29/2). Their verdict is that the section on energy saving in industry can be regarded as the section of the demonstration programme which has the best prospects of success.

The number and quality of the projects, their profitability, the large amount of energy saved by each project and the potential for reproducing these savings on a larger scale are the main reasons for the overall success.

Lately the Commission has stepped up its efforts to disseminate the results and encourage firms to put into practice the experience already gained. On-site information workshops have been organized for the benefit of persons and undertakings interested, leaflets on completed projects have been widely distributed, and the results have been presented at conferences and seminars and stored in data banks (see points 7.7 to 7.10).

The most recent developments in industrial RUE technology have indicated the need to place more emphasis on research and development in new technologies and radically different production methods.

In its demonstration programmes the Community can play a considerable part in stimulating the application of many now mature techniques which could lead to major energy savings in industry throughout the Community.

Involving the manufacturers of equipment in the projects is essential to ensure the success of this approach. It has been included in the conditions governing the latest call to submit projects.

It is also planned to devote more effort to disseminating the results of successfully completed projects and ensuring that they have a knock-on effect.

### 7.4 Energy Bus

The Community Energy Bus programme was launched in 1980 following a recommendation from the Commission.[11] It is aimed mainly at small and medium-sized undertakings, the idea being to help them to save energy by making on-the-spot energy audits.

The Energy Buses are fitted with a computer, measuring instruments and display units (videos, etc.). They come with a team comprising two experienced engineers and can carry out up to 200 audits a year.

Generally a visit to customers' premises lasts one day, during which energy consumption data are analysed and the onboard computer is used to calculate potential energy savings.

The computer can receive data stored in the programme's common data bank (EDSES) which is located at the JRC in Ispra and fed by the various bodies participating in the programme. The EDSES staff process the anonymous data supplied by participants to obtain statistics that the latter can use.

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[11] Commission recommendation of 29 July 1980 on the rational use of energy in industrial enterprises (OJ No L 239, 12.9.1980).

There are now twelve bodies in six European countries involved in the programme. Participation is open to any body which, in this activity, has no objective other than to promote the rational use of energy.

Also, following the signing of a memorandum by the Commission and the Canadian Government on 17 December 1979, the Community and Canada now cooperate closely on the Energy Bus audits.

By 1 September 1985 the programme data base contained the results of 4 576 audits at industrial premises and over 4 600 audits in the service industry. Potential energy savings identified by the Buses vary between 10 and 20% of the amount normally consumed by the factories visited, i.e. an average of 130 toe/year per audit or over 1 m toe/year in all.

The Energy Bus programme has been extended from October 1985 to September 1987 but its aims have been reframed. It will concentrate on a few sectors where there is a high energy saving potential (ceramics, abattoirs and the preparation of cold cuts, dairies, breweries and malthouses, textile finishing, the leather industry, industrial washeries).

In each case the methodology used to analyse a sector is worked out by someone familiar with that sector.

The Commission's departments plan to use a sample of the completed audits to assess how far undertakings have actually carried out the investments recommended as a result of the audits.

**7.5 Loan systems**

The European Investment Bank grants loans for certain types of investment in energy saving, including in industry.

Between 1973 and 1985 the EIB lent nearly 13 000 MECU to the energy sector and 3 200 million of this went on the rational use of energy. Some of the projects (involving over 1 000 MECU) received support from the New Community Instrument (NCI).

The Bank's decisions on lending, in accordance with principles enunciated in the Treaty of Rome and laid down by the Committee of Governors of the Central Banks, are based on economic and financial criteria including, as an essential factor, the solvency of the applicant and the prospects of the project being profitable. Major projects are examined by the EIB itself. Smaller projects are assessed by the financial intermediaries in the Community countries which have links with the Bank (global loans); subloans ranging from 20 000 ECU to 7,5 MECU are granted under EIB rules.

Over 400 projects have been financed in this way in Italy, France, the United Kingdom and Denmark and have resulted in savings of 2.5 m toe/year.

The major projects mentioned in an EIB Report[12] relate to conversion to solid fuels in cement works, the modernization of a chemical complex and oil refineries, production of reflective glass, energy management in industrial buildings in the motor industry, combined heat and power generation projects, etc.

The financial terms for obtaining EIB loans are very attractive in certain countries which have or have had high rates of interest, such as Italy, Greece, Ireland, the United Kingdom and France.

7.6. **New methods of financing**

7.6.0. Firms wishing to make RUE investments, whether they are users or producers of equipment, have various financing methods at their disposal.

Firstly self-financing may be mentioned; this requires little comment other than to say that few firms can do this in practice. Even where they could, they may prefer to devote their funds to development projects with a higher risk, but entailing greater prospects for eventual expansion or redeployment.

Several Member States provide partial subsidies or tax relief for energy-saving investments.[13] However, firms will have to turn to the money market for the major part of their investment capital.

7.6.1. As indicated in point 5.8, banks will sometimes be reluctant to grant loans on favourable terms (long-term, low interest rate) where the overall financial position of the firms is not strong, even if the investments proposed present little risk and are very profitable. Such firms will not obtain an EIB loan (point 7.5), as they cannot offer sufficient guarantees.

A credit insurance mechanism, the conditions for which remain to be worked out, could provide a valid solution to this very common financing problem.

One of the effects for firms, apart from stimulating investments, would be lower interest rates and access to a type of preferential loan on the financial market.

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[12] EIB, Information N°46, October 1985.

[13] See "Comparison of energy-saving programmes of European Community Member States" (COM(84) 36).

Present systems of subsidies and tax reliefs could usefully be supplemented or replaced by a credit insurance system. The Commission plans to study such a system for equipment manufacturers in a post-demonstration stage (point 7.6.3). The Member States could also consider a system of this kind for users of RUE equipment.

7.6.2. Another way of financing RUE investments is for users to turn to an outside body which would study, implement and finance the investments on behalf of the firm.

This system, known as Third Party Financing (or"performance contract" or "financing through savings") began in the United States and Canada around 1980 and has developed rapidly, especially in commercial, services (hospitals, schools, etc) and office sectors.

The financial intermediary is repaid from the energy savings made over a period which is agreed on, and is responsible for the management of the equipment. The user may receive a refund on his energy costs.

After the agreed period, the equipment normally becomes the property of the user, who has not had to commit any funds at the outset.

The penetration of Third Party Financing (TPF) into industry has been more recent. So far it has been restricted to non-processing sectors such as boiler rooms, air conditioning of premises, remote control, combined heat and power generation, etc.

The main reasons are: the complexity of industrial processes, which do not give much scope for standardization; the reluctance of industries to let outsiders know about their manufacturing methods; the lack of experience of TPF bodies and uncertainty concerning the repayment of the sums advanced (working life of machines, etc.).

In Europe, companies offering this type of service have been slower to emerge. They are linked with large groups in the energy sector which have sought to diversify or with design and engineering consultants. A considerable initial capital stake is required for the first five to six years of operation, after which repayments tend to catch up with the rate at which new investments are made. However, TPF bodies have easier access to the financial market than RUE equipment users, as the risk is distributed over a portfolio of projects whose quality of design is above the average normally found in industry. It is certainly a great advantage to belong to a group which has a reputation for financial soundness (such as an oil company), because the profitability of TPF companies depends on the proportion of the borrowings which they can mobilize.

The Commission is studying ways of assisting industry to use TPF in collaboration with the public and private bodies involved. In 1986 it will publish a study on the possibilities for TPF in the Community.

7.6.3. Where equipment manufacturers are concerned, the Commission is at present considering whether to present a proposal for a Council Regulation providing for credit insurance for products for the efficient use of energy. The aim of this proposal would be to facilitate access to the financial market for RUE equipment manufacturers by providing partial coverage of the risk for banks in case of bankruptcies, losses, etc.

One of the various financing possibilities would be for roughly half the sum to be insured by a surcharge on the interest rate, with a subsidy from the Community after the projects had been assessed by the Commission.

This type of system could have an important leverage effect and lead to considerable industrial activity and energy savings (several m toe/year by the year 2000) using limited resources, which careful selection of projects should keep within strict bounds.

Access to this Community mechanism would be reserved for projects of sufficient scale, but Member States could provide for a similar mechanism on a national or regional scale for smaller development projects.

7.7. **Publications**

The Commission has set up an extensive system of publications which deal with the activities mentioned above.

The demonstration projects are the subject of regular publications on the contracts in progress and of leaflets describing each successfully terminated project.

Industry audit reports (point 7.1) are published in the form of brochures intended primarily for firms and federations involved, government departments, etc.

The projects carried out under the Research and Development Programmes are presented in the form of brochures.

The final reports of projects are available from the Publications Office in Luxembourg. Certain confidential information is sometimes recorded in unpublished annexes. In addition, video cassettes on some projects are available for loan.

## 7.8. Conferences and seminars

Several very well attended conferences have been held to make known the results of the Research and Development Programmes. On-site information workshops are more usual for demonstration projects and this practice should expand considerably over the next few years.

## 7.9. Energy saving associations

Energy saving associations are very important collaborators in disseminating knowledge of RUE technology.

These bodies also contribute to a better understanding of energy problems and can draw the attention of public authorities and the Commission to trends in industry.

National federations of consultants and energy managers, under which most private or semi-public energy consultancy bodies are grouped, recently formed themselves into a European Federation at EEC level, called the EFEM (European Federation of Energy Management Associations).

The Commission welcomes this initiative and will endeavour to involve this Federation as much as possible in any RUE work which it may initiate.

The energy saving associations can play a dynamizing role in large sectors of the economy, especially in industry. Some of these associations are in fact mainly or exclusively made up of energy managers in business, and engage in wide-ranging exchanges of information on actual and possible developments in their firms, regions or sectors. In a number of countries they have organized themselves into regional clubs.

This activity appears to confirm that energy problems are a permanent concern for many sectors of industry and should be given practical encouragement by the Member States.

## 7.10. Data Banks

The Commission has set up two data banks on energy saving.

The EDSES system at the Joint Research Centre in Ispra, Italy, provides support to teams carrying out energy audits under the Energy Bus Programme.

Data are transmitted anonymously by participants and then processed. The system provides statistics on consumption and potential energy savings.

The SESAME data base contains information on research and development and demonstration projects and on hydrocarbon technology projects in the Community. It has been open to all the Commission departments since the beginning of 1984. For a trial period, the section containing data on demonstration projects and hydrocarbon technology projects has now been made available, by means of international teleprocessing systems, to authorities responsible for energy questions in all the Community Member States. At the end of the trial period, information on Community technological projects (energy demonstration projects and hydrocarbon technology projects) will be made available to the general public through the major data bank centres which supply the information market in Europe. It is planned to open them to public access on 1 July 1986. From this date onwards, anyone wanting this information will only need to interrogate one of these centres to obtain data on projects managed by DG XVII. It is envisaged that users of the Prestel, Bildschirmtext and Minitel systems will also have access to SESAME at a later date.

SESAME now contains all data on the (roughly 1000) projects managed by DG XVII. There are new projects every year and the range of information on each project is to be extended. SESAME should progressively become the core of a Community centre for information on RUE technology and, in collaboration with European manufacturers, on equipment and techniques available on the market.

# ANNEX I

## ENERGY SAVINGS IN INDUSTRY

## DEMONSTRATION PROJECTS:

## BRANCHES AND TECHNOLOGIES

## ENERGY SAVINGS IN INDUSTRY: CONTRACTS SIGNED

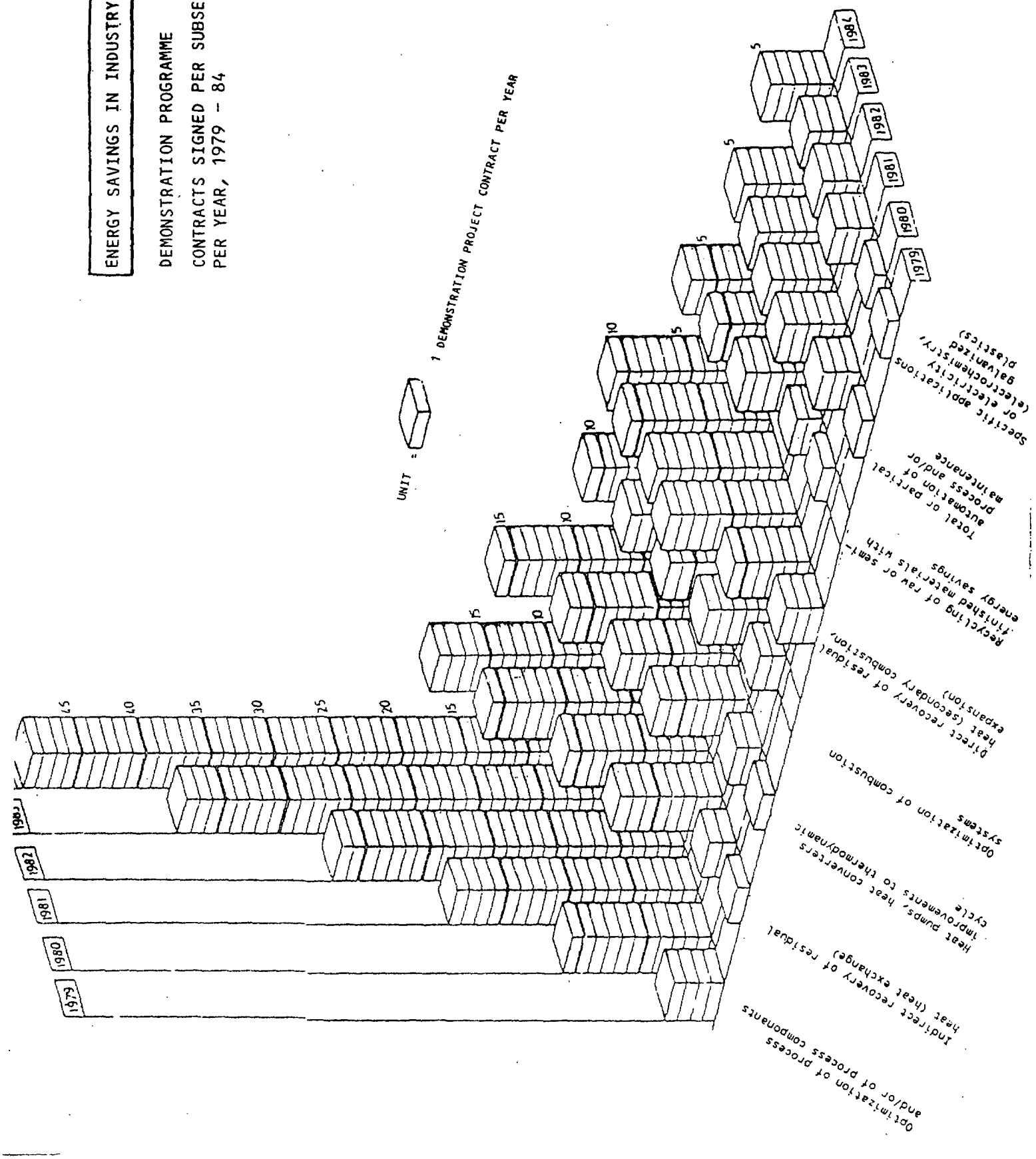
| | STEEL | NON-FERROUS METALS | METAL PROCESSING | CHEMICALS | GLASS | TEXTILES | PAPER, BOARD | CEMENT, CERAMICS, BUILDING MATERIALS | FOOD PROCESSING | OTHER |
|---|---|---|---|---|---|---|---|---|---|---|
| TOTAL OR PARTIAL AUTOMATION OF PROCESSES AND/OR MAINTENANCE, POSSIBLY COMPUTER-ASSISTED | EE/070/81 | | EE/251/80<br>EE/284/81 | | | EE/133/79 | | | | EE/167/80 |
| INDIRECT RECOVERY OF RESIDUAL HEAT (HEAT EXCHANGE) | EE/003/81<br>EE/229/81<br>EE/253/81 | EE/014/80<br>EE/034/81<br>EE/004/82 | EE/475/83 | EE/082/82<br>EE/088/84<br>EE/395/84 | EE/145/83 | EE/160/82 | EE/297/83 | EE/248/81<br>EE/055/83<br>EE/120/84 | EE/008/79<br>EE/205/81<br>EE/354/81<br>EE/658/83 | |
| DIRECT RECOVERY OF RESIDUAL HEAT BY DOWNSTREAM EXPLOITATION OF THERMODYNAMIC POTENTIAL (SECONDARY COMBUSTION, EXPANSION, ETC.) | EE/100/79<br>EE/074/80<br>EE/270/80<br>EE/246/81<br>EE/195/83 | | EE/077/80 | | EE/314/79 | | | EE/135/81 | | EE/244/79<br>EE/309/81 |
| RECYCLING OF RAW OR SEMI-FINISHED MATERIALS WITH ENERGY SAVING | | EE/093/83 | | EE/129/80<br>EE/136/82<br>EE/018/84 | | | | EE/017/81<br>EE/008/82 | | EE/017/82 |
| OPTIMIZING PRODUCTION PROCESSES AND/OR PARTS OF PROCESSES | EE/251/79<br>EE/203/80<br>EE/068/82<br>EE/083/83<br>EE/499/83<br>EE/163/84 | EE/068/83 | EE/228/80<br>EE/286/81<br>EE/048/82<br>EE/182/84<br>EE/379/84 | EE/274/79<br>EE/125/80<br>EE/022/81<br>EE/240/81<br>EE/003/82<br>EE/097/83<br>EE/124/83<br>EE/200/83<br>EE/535/83<br>EE/114/84<br>EE/143/84<br>EE/353/84<br>EE/621/84<br>EE/623/84 | EE/246/80 | EE/016/79<br>EE/065/79<br>EE/231/81<br>EE/149/82<br>EE/267/83 | EE/096/84 | EE/171/80<br>EE/021/82<br>EE/148/82<br>EE/785/83<br>EE/319/84 | EE/008/80<br>EE/156/80<br>EE/014/81<br>EE/103/81<br>EE/184/81<br>EE/382/81<br>EE/084/82<br>EE/081/83<br>EE/540/84 | EE/018/82<br>EE/350/83 |
| OPTIMIZING COMBUSTION SYSTEMS | EE/002/82<br>EE/029/84<br>EE/392/84 | | EE/212/83 | EE/224/80<br>EE/693/83 | | | | EE/094/80<br>EE/035/81 | EE/298/81 | EE/198/81<br>EE/073/82 |
| SPECIFIC APPLICATIONS OF ELECTRICITY (ELECTROCHEMICALS, GALVANIZED PLASTICS, ETC.) | | EE/147/79<br>EE/087/81<br>EE/092/81<br>EE/543/84 | EE/149/84 | | | | | | | |
| HEAT PUMPS, HEAT CONVERTERS IMPROVEMENT OF THERMODYNAMIC CYCLE EFFICIENCY | | | | EE/095/81<br>EE/146/81<br>EE/225/81<br>EE/241/81<br>EE/010/82<br>EE/012/82<br>EE/036/84 | | | EE/193/79 | | EE/043/81<br>EE/666/83<br>EE/173/84<br>EE/394/84<br>EE/410/84 | EE/176/80<br>EE/319/83<br>EE/857/83 |

NB. This table covers 123 projects referred to in Annex 1 and relates only to energy savings in industry. Each project is identified only by one main activity involving rational use of energy.

# ENERGY SAVINGS IN INDUSTRY

DEMONSTRATION PROGRAMME

CONTRACTS SIGNED PER SUBSECTOR PER YEAR, 1979 - 84



COUNCIL RESOLUTION

on improving energy efficiency in industrial firms
in the Member States

**THE COUNCIL OF THE EUROPEAN COMMUNITIES,**

Having regard to the Communication from the Commission of entitled "Towards European policy for energy efficiency in industrial firms",

Having regard to the Council Resolutions of 9 June 1980[1] and 15 January 1985[2] which inter alia called for increased efforts in the Community to save energy and to reduce oil consumption and oil imports and recommended guidelines to Member States for a basic energy saving programme,

Having regard to the Commission Recommendation of 29 July 1980 on the rational use of energy in industrial enterprises,[3]

Having regard to the Council Recommendation of 28 July 1982 concerning the encouragement of investment in the rational use of energy,[4]

Whereas industrial undertakings in the Member States have substantially improved their energy efficiency; whereas there nevertheless remains a large potential for energy saving in industry which could be achieved by introducing technologies whose sound economic profitability has been demonstrated;

Whereas in the long run the modernization of productive plant will be the main source of energy savings, and whereas this will improve the competitiveness of European industry and promote job creation in undertakings;

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1. OJ No C 149, 18.6.1980, pp. 1 and 3.
2. OJ No C 20, 22.1.1985, p. 1.
3. OJ No L 239, 12.9.1980, p. 26.
4. OJ No 247, 23.8.1982, p. 9.

Whereas measures to be implemented by the Member States and by the Community will support and facilitate the necessary improvements in firms' energy performance, these measures to be in the fields of research, demonstration, the appropriate financing of investments and information and training;

Whereas the recent sudden fall in oil prices may not necessarily reflect a satisfactory level for stable long-term supply and are therefore a new challenge for the Community's energy saving policy,

1. INVITES Member States not to relax their efforts to promote the efficient use of energy in firms in the present situation of falling energy prices, but on the contrary to increase them;

2. RECALLS that such policies should be based on the principles of energy pricing and on the measures set out in the Resolution of 9 June 1980 concerning new lines of action by the Community in the field of energy saving and in the resolution of 15 January 1985 containing additional guidelines;

3. NOTES that the Commission is keeping a close watch on energy price trends including that of oil prices and its effects for energy savings in the Community, in particular in industry;

4. TAKES NOTE of the Commission's intention of directing its future energy saving activities in industry along the following lines:

   - major emphasis will continue to be given to projects presented by industry and small business under the Community's demonstration programme, in particular as regards energy savings and raw materials recycling;

   - yet more will be done to inform industrial firms in the Community about completed demonstration projects and to arrange activities such as seminars and specific studies to facilitate the dissemination of the techniques demonstrated;

   - work will be expedited on the definitive establishment of the SESAME database on demonstration projects carried out under national and Community programmes with a view to setting up a documentation centre on new energy technologies;

- further detailed analysis will be made of the energy flows of small businesses in certain sectors under the Community energy bus programme, the results will be notified to the industries concerned and further measures will be planned on the basis of an assessment of the pilot phase 1985-87;

- an examination will be made of appropriate incentives to the marketing of new energy saving products or techniques, for example in the form of credit insurance;

- new methods of financing energy saving investments such as third party financing will be promoted, and industrial firms and financial institutions as well as Member States will be informed;

- support will be given for exchanges of views at European level between energy saving associations in the Member States;

- further energy audits will be carried out in addition to those already made for some industrial sectors.