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GUIDELINES FOR THE ELECTRICITY SECTOR IN THE COMMUNITY

The role of electricity in a new energy policy strategy

(Communication from the Commission to the Council)

C O N T E N T S

1. INTRODUCTION: THE AIMS OF THE GUIDELINES

Aims, not forecasts

1. The purpose of the present guidelines is to set out the aims to be pursued in the medium term for the electricity sector in the Community and to suggest means of achieving them. This paper therefore is not a forecasting exercise, but is drawn up in the light of the need for the Community as a whole to adopt a deliberate and positive approach in energy policy. However, although this approach involves more than simply describing expected trends of development, any definition of objectives for the energy policy must be based on the real situation and not merely on wishful thinking.

The guidelines are part of the "New Strategy"

2. The guidelines for the electricity sector fall within the strategy adopted by the Commission for the whole energy field* and must be understood in this context.

Different national structures, but common aims

3. In the guidelines for the electricity sector, as in the New Strategy, the foundations of policy are dictated by Community interests. But it must not be forgotten that there are very substantial structural differences in this sector from one Member State to another, which must be taken into account both for the assessment of future trends and when it comes to applying the measures decided upon. All efforts, however, must work towards solutions which ensure that, from a Community point of view, electricity makes the maximum possible contribution to the economy and security of our future energy supplies.

(*) COM (74) 550 final: Towards a new energy policy strategy for the European Community.

2. SUMMARY - THE ROLE OF ELECTRICITY IN A NEW ENERGY POLICY STRATEGY FOR THE EUROPEAN COMMUNITY

Basic intention

4. The basic intention of the common energy policy for the Community as it has found expression in the New Strategy is that of reducing as far as is economically feasible the dependence on imports of energy supply for the Community. In this way, increased security of supplies should be assured and abrupt price changes in the energy sector avoided as far as possible.

Reduction of dependence on oil

5. A critical dependence of the Community on imports exists as far as oil is concerned. The events which occurred towards the end of 1973 should induce the Community, both for reasons of security and continuity of supplies and also in view of the balance of payments, to gradually reduce this dependence. In this context the long-term aim should be to restrict oil consumption essentially to specific uses in which for technical or economic reasons oil cannot be replaced. If corresponding measures are taken without delay, it should be possible to bring down the share of energy imports in the Community's total energy supply by 1985 from the current 63% to approximately 40%.* The tonnages of oil imports from third countries should in 1985 be essentially at the same level as in 1973.

Indigenous sources insufficient

6. There are technical and economic limits to the possible contributions of indigenous energy sources in the Community. The first few months of 1974 showed that in the short term a measure of flexibility in electricity production was achievable by substituting indigenous energy sources for oil, but more could certainly be achieved in the longer term. The New Strategy proposes ambitious but, it is believed, realistic objectives for such substitution, including the important aim of arresting the long-standing decline in Community coal production.

(*) Uranium imports excluded.

Nuclear energy needed

7. To achieve the degree of substitution envisaged in the New Strategy, there is no alternative to the massive utilization of nuclear energy. But during the next two decades this energy can only reach the consumer in large quantities through the medium of electricity. In turn, this requires a corresponding demand for electricity.

Electricity as a vehicle for cheap nuclear energy

8. Prospects are favourable for a development of electricity demand because, in the past, electricity has enjoyed a growth which well exceeded that of total energy. The convenience, cleanliness and versatility are well-known factors favouring electricity which often outweigh the direct cost. Moreover, electricity generated from nuclear energy is now much cheaper than that of any other origin.

Favourable long-term prospects for electricity costs

9. Over the past ten years electricity prices, expressed in terms of constant money, decreased by about 10% for industrial consumers and by as much as 25% for low voltage customers. In the long term this tendency is going to persist, as new large production units, especially nuclear, are inserted into the grids, while older, uneconomical conventional stations are being taken out of operation, thus decreasing production costs. Therefore, there is no doubt that, compared to other energy sources, electricity will be competitive in many applications.

In the short term electricity prices will be relatively high

10. For some time, however, under the influence of high fossil fuel prices, which for the rest of the decade are likely to apply to the input of primary fuels to many Community electricity producers, and of a heavy boost of investment expenditure marking the transition to nuclear-based electricity generation, a temporary departure from the general trend of decreasing electricity prices might well occur.

Development outlook for electricity demand

11. As electricity prices will progressively become more attractive, the consumers will find advantage in planning to use electricity in preference to its competitors, wherever possible. Demand can thus be expected to continue its expansion still over the next decades. Until recently electricity consumption has been doubling in the Community countries every ten years (i.e.~ 7% per year). However, during the 1970's, because of the economic development in several Member States, a certain slow-down of growth has become apparent. The aftermath of the oil crisis is likely to make this situation continue for some time. It will probably not be before the beginning of the next decade that a marked increase in the demand growth rate will occur. During the late 1980's annual growth rates up to 9% can be expected as cheap electricity produced from nuclear energy will increasingly replace oil products in certain domestic and industrial applications. Electricity production should increase to around 2 400 TWh in 1985 and its share of total energy supply should have increased from the present 25%* to 38%, of which about half would be nuclear. This prospect is nevertheless allied to the objectives for the total supply of energy, notably those of a less rapid increase in global demand, a more rational utilization and a larger role reserved for solid fuels.** In the longer term, if the above trends are followed, electricity could well satisfy more than 50% * of the Community's energy needs by the year 2000.

(*) For the energy balances it is assumed in this document that electricity is entirely produced by thermal power stations consuming 2200 kcal/kWh. In some countries electricity is represented in energy balances by its thermal equivalent (860 kcal/kWh). In such a balance the figures given above would be 12% and 18% respectively for 1973 and 1985. For the year 2000 the corresponding value would be 40%.

(**) Community energy policy - Aims for 1985.

Tariff policy instrumental to demand development

12. The principal instrument of which electricity supply undertakings (and public agencies of control) can avail themselves in order to exert an influence on demand is their policy concerning prices and tariffs. This instrument should be employed as far as possible to match demand and production possibilities. In tariff policy design the probably effects which price measures have, both on the structure of demand and on the consumer's choice between electricity and competing forms of energy, have to be taken into account.

Prices must cover costs

13. A tariff design taking these effects into account is bound to differentiate between tariffs and to calculate them separately for the different sectors of electricity sales. The requirement to cover costs should be fulfilled separately for each sectorial tariff in this context. Artificially low rates for certain sectors at the expense of higher charges for others involves the risk of distortions in the structure of demand. In all cases, due provision should be made in cost calculation for a reasonable degree of self-financing. These principles do not exclude tariff measures which would take account of regional policy, since competitive energy prices are especially important for development regions.

Continuing scope for conventional production

14. As regards the choice of input fuels for the generation of electric energy, even the most ambitious expansion of nuclear production will leave room for the utilization of indigenous sources to be developed. Some of these sources do in fact find their "optimal" utilization in power stations. This applies to hydro and geothermal power, derivative gases, low-grade coal and lignite (although there are prospects of coal and lignite finding a better valorization in gasification by nuclear heat once the latter becomes available in sufficient quantities and quality). Although any new contribution of these sources to electricity production will be welcome, the scope for such contributions is rather limited.

Coal use in power stations and fuel storage

15. Also for hard coal power station demand is becoming one field of "optimal" utilization (apart from that in the iron and

steel industry). In fact, if the replacement of oil usage in power stations is to succeed, and if natural gas is only to be used in power stations when there are no better ways of valorizing its usage, an increased use of coal in electricity generation must necessarily be strived for. Regularity in coal supplies will, in this respect, be as essential for electricity producers as long-term arrangements will be to the suppliers of coal. Moreover, wherever this can be done to further reduce the use of oil, long-term supply agreements for imported coal should be concluded between coal producers and electricity supply undertakings. To increase the security of supplies for oil and coal-fired power stations it has been proposed* that minimum fuel stocks be kept.

Nuclear contribution to supply security

16. From the point of view of supply security, nuclear generated electricity is attractive. Even though it cannot, strictly speaking, be regarded as an indigenous source of energy its physical characteristics render it comparable in security of supply to domestic fuels not only because of the practical facility of storage but also because of the pluriannual fuel inventory necessarily involved in the operational fuel cycle of the reactor. Interruptions of fuel supply are, therefore, less likely to affect the continuity of energy output as in the case of oil or coal. However, to achieve maximum security of supplies and price stability, a sufficient diversity of uranium supply sources would be needed, together with appropriate participation of Community-based undertakings in the discovery and production of uranium**. Also, adequate enrichment capacities should be provided within the Community.

(*) Proposal for a Council Directive obliging the Member States of the EEC to maintain minimum stocks of fuel at thermal power stations (Doc. COM (73) 2245).

(**) Proposal to the Council on a Nuclear Fuel Supply Policy for the Community (Doc. XVII/328/74) refers.

Nuclear contribution to production economy

17. Already before the drastic rise in mineral oil product prices at the end of 1973 the economics of nuclear generation of electricity were such as to render it the most economic proposition for base load supply. At the present time, the competitiveness of electricity from nuclear power stations extends far into the field of medium load, and this situation can be expected to prevail in the future. Nuclear energy thus satisfies the requirements, as regards electricity generation, of both security of supplies and economy.

Conditions to be met to enable rapid penetration of nuclear power

18. Notwithstanding the no longer doubted advantages of nuclear electricity generation as regards economy of operations, security of supplies and environmental protection, a series of prerequisites must be achieved in order to enable nuclear power to penetrate the energy market in the desired quantities. On a large part of these conditions the Commission has already declared itself in the Action Plan for the promotion of nuclear energy which it has submitted to the Council of Ministers.* In the wider context of electricity supply in general, there are certain points which merit particular attention.

- Reservation of suitable construction sites requires coordinated site selection well in advance of actual construction work; in the choice of sites, considerations of both the environment and regional development must be taken into account;

- Availability of sufficient reserve power and transport facilities being particularly important for the installation of the very large-sized units typical of nuclear power, smaller regional networks notably in development regions, might require reinforcement and more coordinated interconnection with neighbouring systems, whether national boundaries intervene or not;

- The widely varying administrative procedures and security regulations concerning the construction and operation of power stations - especially nuclear plant - and of transmission lines require a certain amount of rationalization and harmonization in order to avoid unnecessary delays in

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(*) Guidelines and priority measures for a Community energy policy (Doc. COM (74) 10 final.

the commissioning of new equipment;

- In view of the unprecedented investment amounts involved, necessitating heavy appeals to the capital market, adequate financial returns will have increased importance for electricity supply undertakings investing in nuclear plant;

- The manufacturing industry for heavy electrical and nuclear equipment, in order to be able to make adequate and timely construction capacities available, will need to be reasonably assured that orders will be forthcoming according to predetermined programmes.

- Types and sizes of the power stations should be kept unchanged over as long a period as possible and the different plant components should be standardized wherever feasible in order to allow for a feed-back of experience between generations of power stations and thus increase their operational reliability and economy in construction;

- The inherent low efficiency of thermal power stations in general and of nuclear plants in particular should be improved both to lower waste heat rejections to the environment and to make better use of the primary energy. The combined production of electricity and of commercial heat could present a solution to this problem Where applied, this process could permit the optional use of the heat generated by the power stations for the generation of electricity, for domestic heating or for covering the industrial demand for process heat, or by varying combinations of these. In many cases, efforts of this kind, aiming at the reduction of energy waste, could be promoted by collaboration between public supply and industrial self-producers of electricity, where the latter have either a low-grade fatal energy source or a demand for both process heat and electricity.

- Research and development work has a fundamental role, particularly in the areas of nuclear technology, the safeguarding of public health and the protection of the environment;

- Finally, the public approval of the nuclear development is essential. To achieve this a substantial effort has to be made in order to inform the public as much as possible on the necessity for the construction of nuclear power stations, the technical factors concerning the security of these installations as well as the nuclear risks as compared to the accepted risk in other fields of human activity.

Growing similarity of Community electricity production structures

19. Although the present structure of electricity production is markedly different in the various Member States of the Community, one common feature is that these different structures have all been aimed at minimizing production costs, consistent with local circumstances. In future the structure of production can be expected to move towards greater similarity insofar as nuclear generation progressively assumes first the base load and later an increasing proportion of mid-load needs.

Scope for action at Community level

20. These developments lead to common features and problems; there should be advantages in tackling them on a Community basis. Besides those already identified in the Nuclear Action Plan* the problems qualifying for common consideration and action in the framework of a Community energy policy are discussed in Chapter 3. The Guidelines for a Community energy policy in the electricity sector are outlined in Chapter 4.

(*) Doc. COM (74) 10 final : Guidelines and priority measures for a Community energy policy.

3. OBJECTIVES FOR THE ELECTRICITY SECTOR

3.1. Economic prospects

Electricity price trends in the past

In constant money terms electricity prices have fallen continuously

21. Ever since electricity has come into general use in the countries of Europe, the average sales prices of electrical energy, expressed in constant money terms have fallen continuously. Electricity has thereby followed the same trend as most industrial products, for which the unit costs usually fall when the volume of production increases. Over the last ten years, while electricity consumption in the present nine countries of the Community has more than doubled, the average price per kWh supplied at low voltage has fallen by 25% (in constant money terms); that of a kWh supplied at high voltage by 10%. Electricity prices dropped most sharply in the late 60's and the early 70's, when they fell by an annual average of 6% in the Community.

Reasons for drop in electricity prices

22. This trend is due to the following:

- The cost price per kilowatt falls in inverse proportion to the size of the generation units; similarly, the specific costs of transport fall with the increase in capacity in transmission lines; the costs of electrical installations remained relatively stable;

- Technological progress has brought about a substantial improvement in the efficiency of power stations; the average specific consumption of thermal power stations has fallen from 4400 kcal/kWh in 1950 to about 2200 kcal/kWh at present, which has meant about a 50% drop in fuel requirements per unit of electricity produced;

- In the 60's, the cost of oil products burnt by the thermal power stations was very favourable;

- Thanks to a more regular pattern of electricity demand, the average annual utilization of all the power stations rose from 3530 hours in 1950 to 4080 hours in 1973; the impact of investment costs on the cost per kWh was therefore reduced;

- Customer services (connections, breakdown services, meter reading, invoicing and collection of payments) were able to be rationalized and the costs were spread over an increasing number of generated kWh.

Electricity prices during the 80's

Electricity will become more competitive

23. Except for the reversal of the development trend of oil prices, the reasons given above hold good for the future: the price of electricity in constant money terms should continue to fall or become stable. The prerequisite, however, is that electricity should continue to show a relatively high rate of growth at least for the next ten or twenty years. Only if there is a sustained increase in demand for electricity will it be possible to introduce nuclear power stations into the European systems at an early date and on a large scale.

Nuclear-generated electricity is the cheapest

24. Henceforth, nuclear-generated electricity will be by far the cheapest. Graphs 3.1 and 3.2 show the differences in cost price per kWh of conventionally generated and nuclear-generated electricity in terms of the annual utilization of power stations (graph 3.1) and of fuel prices (graph 3.2). The economic data used for this calculation (shown on the graphs) are within the spread of values for the Community. They are purely indicative, as there are substantial differences from one Member country to another. Graph 3.1 shows that, on the basis of an annual utilization rate of about 3000 hours, nuclear power stations of 600 to 800 MWe produce electricity at the lowest cost, and that, with an increasing annual utilization rate, the return from these power stations increases faster than that of conventional power stations. It will therefore be possible henceforth both to construct

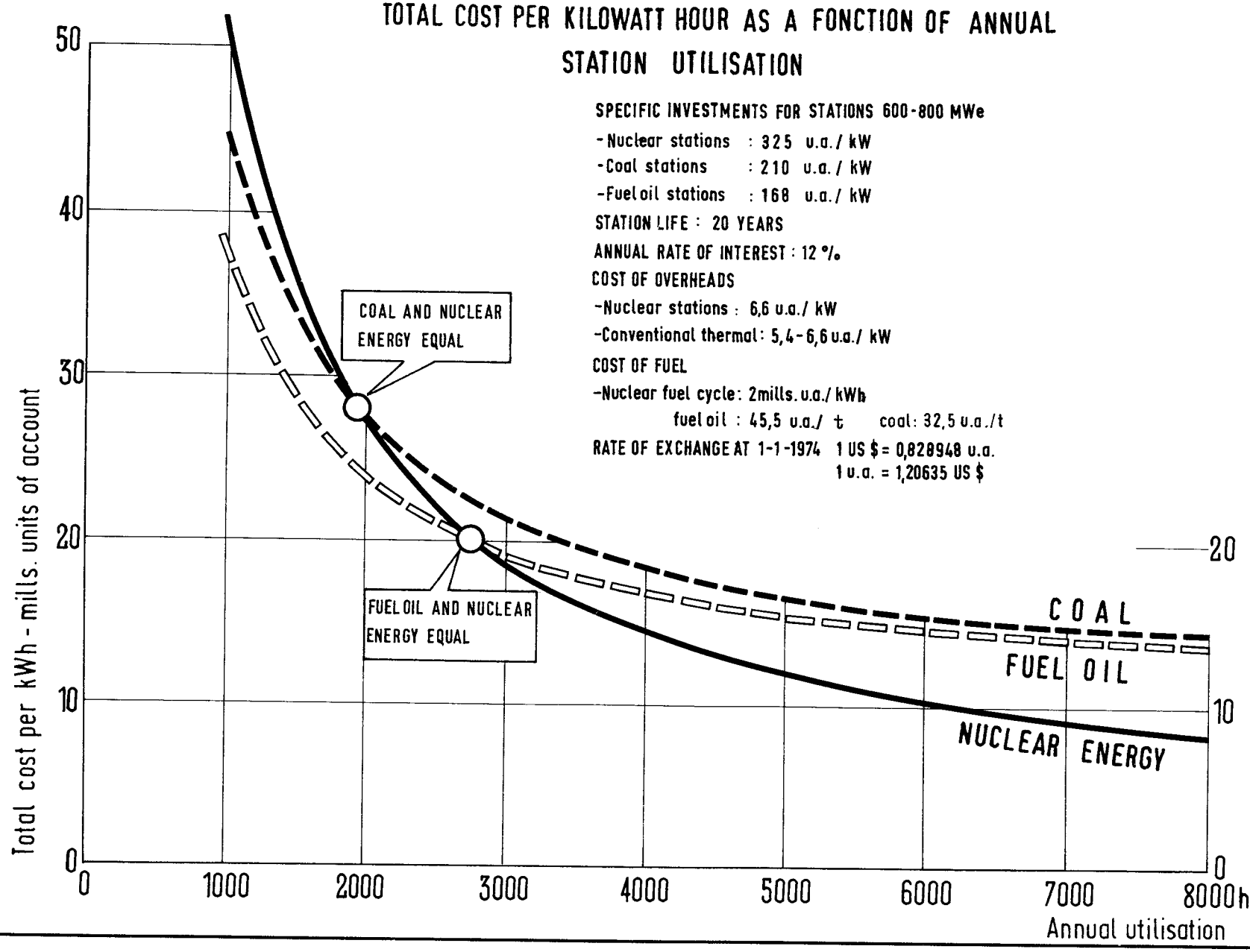
TOTAL COST PER KILOWATT HOUR AS A FONCTION OF ANNUAL STATION UTILISATION

SPECIFIC INVESTMENTS FOR STATIONS 600-800 MWe
- Nuclear stations : 325 u.a./ kW
- Coal stations : 210 u.a. / kW
- Fuel oil stations : 168 u.a./ kW

STATION LIFE : 20 YEARS
ANNUAL RATE OF INTEREST : 12 %
COST OF OVERHEADS
- Nuclear stations : 6,6 u.a./ kW
- Conventional thermal: 5,4-6,6 u.a./ kW

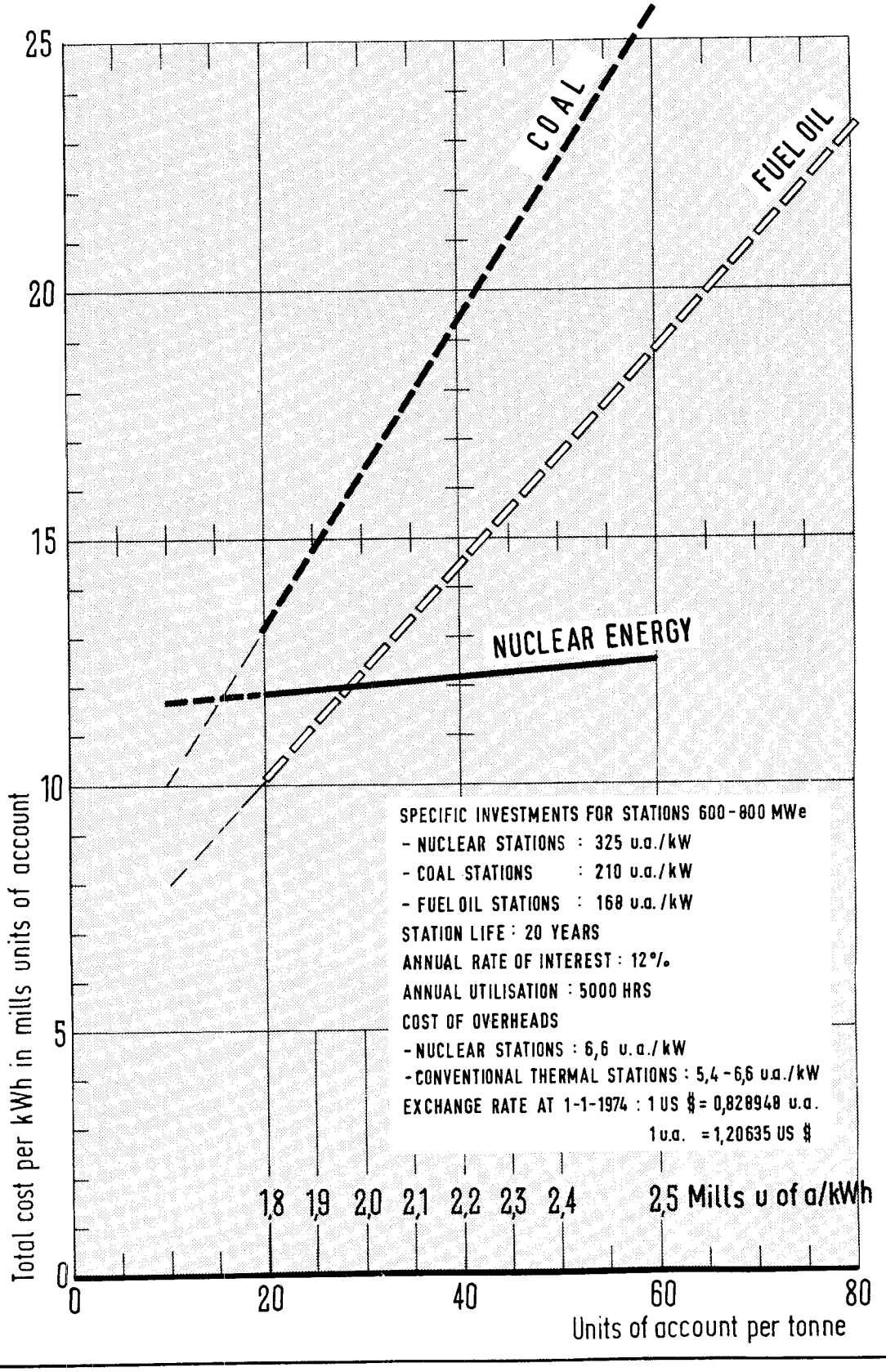
COST OF FUEL
- Nuclear fuel cycle: 2mills. u.a./ kWh
  fuel oil : 45,5 u.a./ t coal: 32,5 u.a./t

RATE OF EXCHANGE AT 1-1-1974 1 US $ = 0,828948 u.a.
1 u.a. = 1,20635 US $



GRAPH 3-2

TOTAL COST PER KILOWATT-HOUR AS A FUNCTION OF VARIATIONS IN THE PRICES OF FUELS



base-load power stations of smaller size and to make economical use of the large nuclear power stations with an annual utilization rate of only 2500 to 3000 hours. As a result, the smaller supply systems will be able to make economical use of nuclear energy and the major systems will be able to absorb a far greater installed nuclear capacity. But, despite their competitivity in the medium-load range, nuclear power stations will no doubt continue to be operated for a good ten years yet at the base of the load diagram. The substantial reduction in cost price per kWh of nuclear-generated electricity together with the increase in the annual utilization rate of power stations will thus make it possible to produce energy at a relatively low cost price throughout this period.

The use of nuclear energy will lead to substantial savings

25. In 1985, the total electricity requirements in the Community should be produced as follows: 45% from nuclear energy, 25% from solid fuels, 24% from oil, natural gas and manufactured gas and 6% from hydro-electric sources. Forecasts made from 1985 at the beginning of 1973 showed that much the same quantity of electricity would be produced as follows: 32% from nuclear energy, 43% from oil and gas, 19% from solid fuels and 6% from hydro-electric sources. An assessment, based upon current cost figures, of the production cost of electricity consumed in 1985 shows that the patter of production as proposed in these guidelines should bring about savings of about 7%, i.e. 2500 million u.a. (1973 value), compared with the pattern given in the 1973 forecast.

26. These savings, however, based as they are on current production costs, will no doubt be exceeded for the following reasons:

- While the specific investment for conventional power stations is unlikely to reduce for unit sizes above 600 to 700 MW per unit, it would appear that for nuclear power stations increases in unit size will make it possible to achieve further substantial savings in costs per kW installed (see graph 3.3).

- Improvement of the load factor by appropriate tariff measures will help towards reducing the cost per kWh; the reduction will be greater as nuclear power stations account for a larger proportion of electricity production;

- The impact of the prices of conventional fuels on the cost of electricity will diminish as more nuclear power stations come into operation. The cost per nuclear kWh is much less affected by changes in the price of fuel than a kWh from conventional plant. As fast breeder reactors become operational, the effect will be even less.

Problems of the next few years

But short-term problems exist

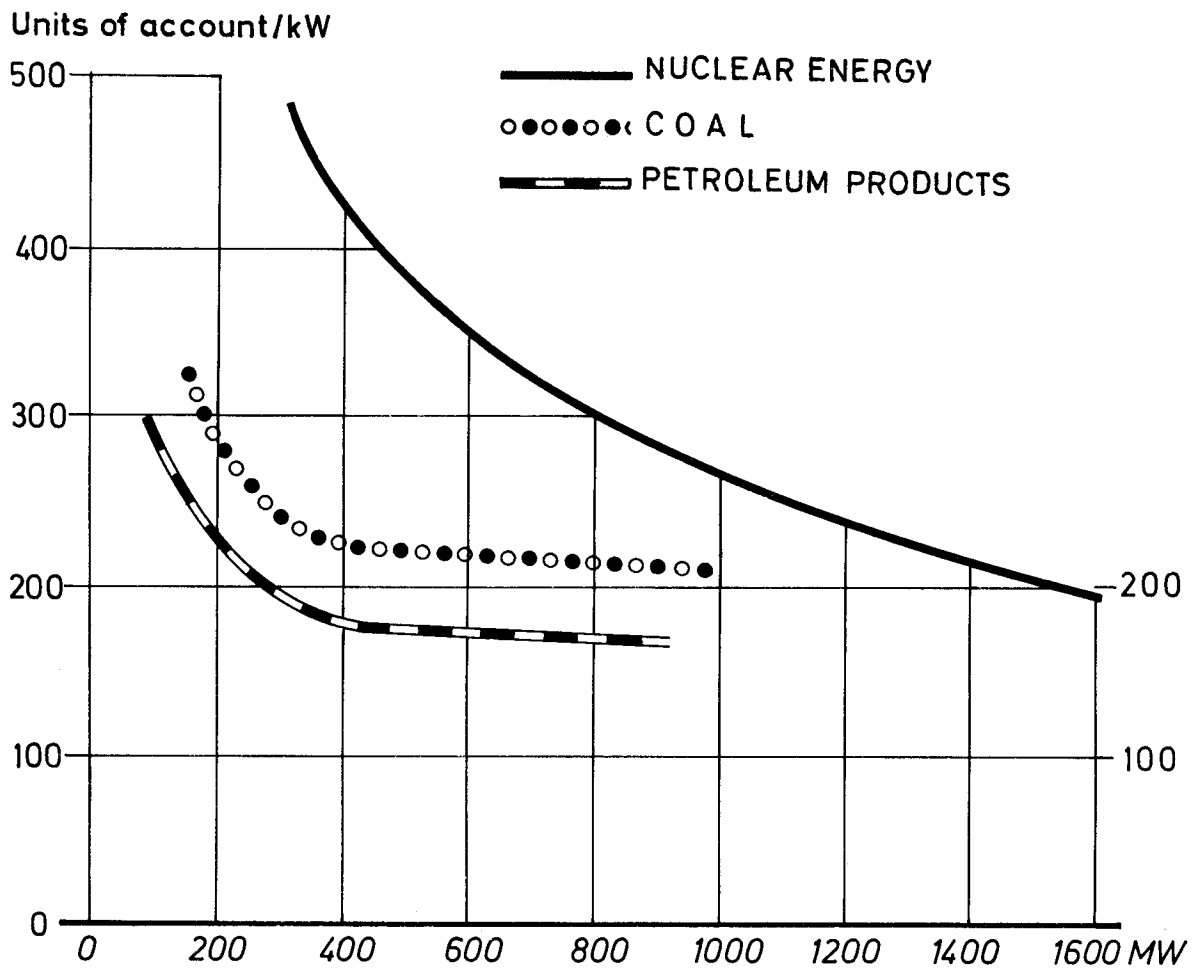
27. Although in the medium and long term electricity is likely to become more competitive, a number of transitional problems will certainly arise in the next few years.

Higher prices of fossil fuels

28. The substantial increase in oil prices which occurred at a time when almost a third of the electricity in the Community was produced from this fuel, will certainly have an impact on the selling price of electricity. In view of the total capacity of the oil-fired power stations being built at the beginning of 1974, this dependence on oil will unavoidably increase for a few more years. The tendency

GRAPH 3-3

SPECIFIC INVESTMENTS AS A FUNCTION OF UNIT SIZES



for the prices of other fossil fuels to follow that of oil can only accentuate this rise in electricity prices. In 1973, nearly 80% of total electricity production in the Community was from fossil fuels. It is true that expenditure on fossil fuels incurred by the electricity producers accounts on average for only about one-third of the average sales price of electricity. Price increases will therefore be relatively less substantial than those of the primary energy sources. If higher fossil fuel prices were the only factor to be taken into consideration, electricity would be even more competitive.

Increased expenditure to speed up nuclear programmes and improve environmental protection

29. The need to rapidly ensure security of supplies by speeding up nuclear energy programmes will, however lead to a substantial increase in the pace of investment in the electricity sector (see Chapter 3.5). Furthermore, the introduction of more rigorous environmental protection regulations, particularly as regards sulphur emission into the atmosphere and thermal rejects, will mean substantial extra expenditure. These extra financial costs will inevitably be reflected in electricity tariffs. The situation is aggravated in periods of inflation, when interest rates are very high.

In the short term, electricity will not be more competitive

30. Under the impact of the unusual financial burden resulting from the accelerated nuclear programmes and more rigorous environmental regulations, electricity is likely to lose much of the competitive potential it would have gained from the increase in the price of fossil fuels.

The growth in demand is likely to be cut back temporarily

31. The slackening in industrial production resulting from the increased price of fossil fuels may also lead to a temporary cut-back in industry's demand for electricity. Moreover, efforts to encourage savings and a rational

utilization of energy will temporarily contribute to reducing the rate of demand growth. For some time, therefore, we must expect a slowdown in the growth in demand for electrical energy.

A unique opportunity to develop the electricity sector

The slower growth in demand must not lead to a slowdown in nuclear construction

32. If from the 80's onwards we are to have the secure and economical energy supplied by nuclear-generated electricity, nuclear construction programmes must be speeded up, even if the immediate demand growth rates do not seem to justify it. Any slowdown in investments in nuclear power stations would prolong the Community's heavy dependence on oil products and would make electricity less competitive compared with other forms of energy. This unique opportunity for electricity to become the most important energy source in the Community by the end of the century, accounting for over 50% of total energy demand, depends on a sustained investment effort in the nuclear sector. Among the new energy production techniques, nuclear power stations have reached the highest level of technological development. Any delay in profiting from this advance means that the electricity sector would lose part of its potential market to other energy sources.

Action must be taken

33. As regards both demand and production, action must be taken to ensure that as soon as possible adequate utilization factors will be achieved by the nuclear power stations which must be built for the reasons given above.

Consumption: the substitution of electricity for oil must be promoted

34. From now on a great effort must be made to promote the gradual substitution of electricity for petroleum products. Consumers must be told that, even if prices might seem less attractive at the moment, in the medium and long term electricity will, for the reasons indicated, be a very competitive form of energy and that this should be taken into account now when choosing new equipment (e.g. furnaces, domestic heating, etc.). The use of electricity can be promoted only within the framework of a tariff policy involving price continuity and stability. Tariff freezes, followed by relaxations of restrictions, are not likely to give consumers the confidence which is indispensable if the process of substituting electricity for petroleum products is to be speeded up. What is more, shortages, which could result from delays in bringing new production capacities into service, are extremely detrimental to the development of electricity as a substitute form of energy for oil.

Production: the substitution of nuclear energy for oil must be speeded up

35. From the point of view of production, the total cost per kWh of nuclear-generated electricity is now lower than the cost of the fuel needed to produce one kWh of energy from oil (comparison between two base-load plants). It will therefore be in the interest of electricity producers to move oil-fired power stations to the top of the load diagram, or even to go as far as the premature dismantling of the economically least viable power stations.

Use of electricity must be promoted judiciously

36. In the current economic situation in Europe, the risk of a serious slow-down in the growth of demand for electricity is greater than that of excessive growth in the short term. If the latter should occur, it would automatically lead

to an increase in oil consumption for the production of electricity. The use of electricity must be promoted judiciously with a view to enabling as far as possible the increase in demand to correspond to the production potential of the nuclear power stations.

3.2. Demand for electricity - development and guidelines

Previous growth of demand

Annual growth rate exceeding 7% during the past 25 years

37. Post-war conditions caused the average annual rate of growth of demand for electrical energy in the nine countries forming the present Community to attain the relatively high level of 8.4% during the 1950's. During the ensuing decade it stabilized at around 7%, which represents a doubling over ten years. This pace has not continued during recent years, mainly on account of the economic situation in certain Member countries.

The domestic sector was the most dynamic

38. Between 1950 and 1975 the demand for electricity in industry will have increased fivefold, which represents an average annual growth rate of 6.6%. During the same period the demand for electricity in the domestic sector (including commerce, the craft industries and agriculture) will have increased tenfold, i.e. it will have shown an average annual growth rate of 9.6%. The increase will be less marked in the case of the transport sector, where demand will have tripled in 25 years. Thus, in a quarter of a century, total demand for electricity in the nine countries forming the present Community will have increased sixfold. These figures illustrate the extraordinary dynamism of the electricity sector in the past.

Future development of demand

After a slowdown, growth will speed up during the 1980's

39. The fact that it is a reliable and economical form of energy will increase the competitivity of electricity vis-à-vis other forms of energy in future. Electricity consumption should therefore continue to grow constantly as in the past, or even at a faster pace. However, during the coming years the economic situation in the Community countries could affect the growth of demand. Consequently, in the near future growth rates cannot be expected to exceed those of the recent past. At the beginning of the 1980's, however, the annual rate of growth of demand should rise to 8%, and could approach 9% for a while during the second half of the decade as a result of a continued promotion of the use of electricity and increasingly competitive prices. Only after 1990 will the process of substituting electricity for oil be completed and annual growth rates will fall once again.

Growth rates will vary from country to country

40. The growth rates set out above represent averages for all the Member States. Demand will generally grow at a faster pace in those countries in which the annual consumption of electricity per head of the population is currently lower than the Community average, which is at present approximately 3,600 kWh, including 1 970 kWh for industrial purposes and transport, and 1 650 kWh for domestic and similar purposes (services, commerce, craft industry, agriculture, etc.). In Italy and Ireland, for example, demand can be expected to grow at faster than the Community average. In the United Kingdom, on the other hand, demand will grow more slowly than the Community average during the coming years since annual consumption per head of the population is currently considerably higher than the Community average.

The domestic sector

The domestic sector is the most important because of the level and growth of its demand

41. The domestic sector (including commerce, the craft industries and agriculture) will probably remain very dynamic. Average annual growth rates of the order to 8- 9% will no doubt be reached. The consumption of this sector is on the point of exceeding that of the industrial sector, and in a few years' time more than 50% of total demand for electricity in the Community will come from the domestic sector.

Promote the rational utilization of electric heating

42. Apart from the increase in the conventional uses of electricity in this sector, demand will grow mainly as a result of the increased use of electric heating. However, this system of heating should be promoted only in cases where rational utilization of electricity can be guaranteed. Electric heating should be confined primarily to new buildings with good thermal insulation. In view of the length of time it will take to penetrate the market, now is the time to start to promote electric heating.

Exclusive promotion of storage heating

43. When heating buildings by means of electricity, energy must be used outside peak periods whenever possible. Principally storage heaters should therefore be used. In certain regions the promotion of this type of heating system has led to the creation of new peak demand periods at the beginning of the night. Supplies of electricity for systems involving storage (heating, cold storage, battery charging,* etc.) should therefore be made more flexible. One solution to this problem might be the introduction of a system whereby supplies of electricity could be interrupted by remote control at different times selected by the producers, depending on the load at the time.

(*) Electricity consumption for battery charging of electrical vehicles is accounted for in the transport sector.

Promote district heating from combined stations

44. Electricity should not be introduced for purposes for which other more economical and equally secure sources of energy have already been used for a long time. Thus the heating of buildings by electricity should not be promoted in areas which already have a heat distribution network or for which the construction of such a network might be considered. This applies in particular to recently-built suburban housing complexes. The efforts undertaken in order to reduce the thermal rejects and, at the same time, to improve the utilization of primary energy will lead to greater use of district heating from electric power stations during the coming decades.

The industrial sector

Industrial demand will grow more slowly

45. Because of economic reasons, consumption of electricity by industry has grown more slowly in certain Member countries during recent years. The Community average growth rate has fallen to approximately 3% per annum. The recent difficulties as regards energy supplies have also slowed down industrial production. In addition there is the fact that during periods when abundant labour is available, industry makes less effort to achieve rationalization and automation, which in turn leads to a reduction in the demand for electricity. It is therefore difficult to imagine that consumption of electricity by industry will increase by more than 4 - 6% per annum in the near future.

Industry should agree to make an additional effort to reduce its demand at peak periods and to increase its use of energy outside peak periods. Tariff measures should be introduced to help to bring about such a development. Increased use of electrical processes and the gradual conversion to electricity of technologies which are technically and economically capable of using it (arc furnaces, inductive and capacitative furnaces, micro-wave ovens, heat pumps) will lead to growth rates of approximately 7% during the first half of the 1980's, which could rise to almost 8% during the second half of that decade. In any case, the inflexibility of demand found in the industrial sector will mean relatively lengthy delays in the conversion process.

The important role of the heat pump

46. As a result of the general rise in the price of energy, the heat pump can play an important role in future in both industry and the domestic sector. This thermo-dynamic device enables an amount of low-temperature heat to be removed from a liquid, gaseous or solid medium (river, lake, sea, atmosphere, industrial fluid, subsoil) and raised to a higher temperature. Depending on the operating conditions the electricity absorbed by the pump represents only approximately 20 - 30% of the amount of transposed heat. The device can be designed for both heating and cooling. Air-conditioning systems are equipped with such devices. The heat pump not only enables residual heat from electric power stations, industrial plant and domestic waste to be used for heating, but could also allow direct use of solar energy which has accumulated in surface water, the atmosphere and the ground. In Europe the heat pump has not yet come into widespread use, and it has

therefore remained relatively expensive. Originally designed for use for refrigeration and air-conditioning systems, it has not yet been perfected for use in heating installations. A considerable amount of development remains to be carried out with regard to certain of its industrial uses. The development of the heat pump must therefore be promoted in order to reduce the cost of production and make it competitive with direct heating appliances which are less expensive but consume more energy.

The transport sector

Development of public transport systems

47. In the transport sector the promotion of electrically-powered public and private transport systems is necessary not only in order to reduce energy consumption but also to further environmental protection. New electrically-powered urban and interurban transport systems, and a resurgence in the popularity of conventional railway systems, especially for the long-distance transportation of private cars, will enable electricity to penetrate further into this sector. Furthermore, increased speed and frequency of train services will lead to a marked increase in the consumption of electricity by the railways.

Development of the electrically-powered car

48. Finally, the electrically-powered car could also help to solve the problem of private transport over short distances. However, in view of the electricity storage systems currently in use, it is difficult to imagine that electrically-powered cars will exceed 10 - 15% of the number of cars on the road during the next decade. If the batteries of electrically-powered cars were recharged during the off-peak hours of the night, this could improve the eveness of demand and thereby help to achieve better utilization of the power station capacities. The development of new battery storage techniques must be promoted.

49. Despite these development prospects, the transport sector will continue to play a limited role in the development of the electricity demand pattern in the Community.

Relative importance of the various sectors

The domestic sector takes over first place from the industrial sector

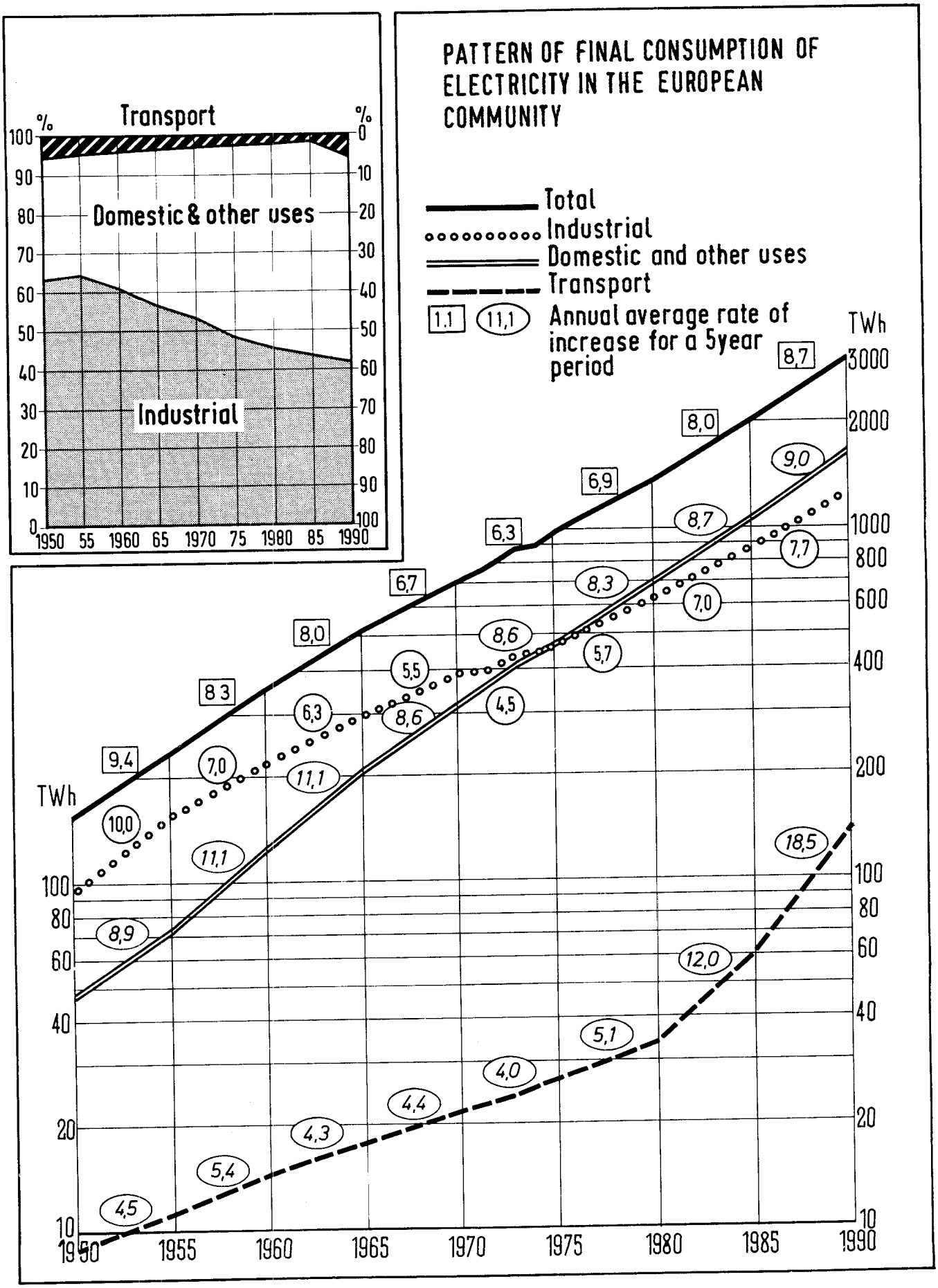
50. The development of demand in the various sectors is shown in graph 3.4. It is interesting to note that, although in 1950 the industrial sector consumed 63% of total electricity demand, while the domestic and related sectors consumed 31.3%, by 1990 the situation will be reversed: 41.5% of total demand will come from industry and 54% from the domestic sector.

3.3. Electricity production - development and guidelines

Better utilization of the total generation capacities by an improved regularity of demand

51. If it is to attain the objectives laid down in respect of demand for electricity in 1980, 1985 and 1990, the electricity industry must have production capacities of 390, 540 and 750 GW and produce 1540 TWh, 2400 TWh and 3650 TWh respectively from those capacities. These figures imply average utilization rates for all the power stations of the order of 4400 and 4800 hours during 1985 and 1990 respectively. This parameter is currently around 4000 hours, whereas it was 3500 hours in 1960. Thus demand for electricity should become considerably more regular during the next fifteen years: the base load capacity should increase from the current figure of 35% to more than 40% of the installed capacity. If such results are to be achieved, efforts to improve the load curves must obviously be intensified and firm measures implemented chiefly in the field of tariffs. Thus, for example, special tariffs should be introduced on all low voltage systems for supplies which can be interrupted by remote control.

GRAPH 3-4


PATTERN OF FINAL CONSUMPTION OF ELECTRICITY IN THE EUROPEAN COMMUNITY
Total
Industrial
Domestic and other uses
Transport
1.1 11,1 Annual average rate of increase for a 5year period
Transport
Domestic & other uses
Industrial
%
TWh
1950 55 1960 65 1970 75 1980 85 1990

Criteria for allocation of production

Two basic criteria for electricity production

52. The electricity required must be obtained in the most economic proportions from nuclear, conventional thermal and hydro-electrical energy, bearing in mind the following two overriding requirements:

- increased security of electricity supplies, to be achieved by transferring the major part of production to indigenous and nuclear sources;

- the need to make the best use of the Community's energy resources by restricting power station consumption of those fuels which could be used with greater efficiency in other ways.

The role of nuclear energy

Nuclear energy will be the most important

53. In accordance with our objectives, nuclear energy will have the most important role to play in electricity generation. In the long term, this primary energy source must supply the whole range of electricity production requiring a high load factor and not covered by "inevitable" or privileged fuels (hydro-electric power, brown coal, manufactured gases, combustible wastes and geothermal energy). At current prices of fossil fuels, nuclear power stations are already competitive with conventional thermal power stations at an annual utilization rate of 2500 to 3000 hours (see 3.1). This position will probably improve further through technological progress and improved manufacturing methods.

Difficulties facing nuclear energy

54. However, there are obstacles. The nuclear controversy, the arguments about environmental protection, the reliability of the plant components and the provision of qualified staff, the financing of the power stations and of the other

equipment of the fuel cycle - all these difficulties could stand in the way of a rapid advance in the generation of electricity from nuclear energy.

Authorization procedures are very slow

55. The whole corpus of standards, administrative regulations and requirements governing the authorization to build and operate nuclear and conventional power stations and electrical transmission systems are often very complex, and they vary widely from one Community country to another. A whole series of bodies at central and local level is usually required to give approval for the construction and operation of electrical installations. This state of affairs can delay projects and, in extreme cases, even threaten the security of electricity supplies. These procedures should be rationalized and speeded up, and there should be closer coordination between the various bodies concerned in the decision-making process.

Construction delays

56. To the very lengthy authorization procedure must be added the construction time for nuclear power stations: one to two years longer than for a conventional power station. In some cases electricity producers may be obliged, because of delays, to commission conventional power stations rather than nuclear plant. Construction delays should therefore be cut down by suitable measures such as the creation of reserves of those plant components whose manufacture is normally on the critical path of the construction programme (pressure vessels, turbo-alternator rotors etc.).

Standard unit sizes and steady flow of orders

57. In order to simplify the analyses of safety factors and improve the reliability of nuclear power stations - and also reduce their cost - it will be necessary to standardize unit sizes for electricity producers to commit themselves

to ordering essentially identical power stations at regular intervals. Only if this is done will the constructors be able to make the investments needed for the mass production of plant and equipment. Only in this way will it be possible to gain the fullest benefit from the experience of building the first units of a given capacity and improving the reliability of subsequent units.

Objectives for nuclear generation

58. By 1980, up to which time decisions or options have already been made, nuclear energy will account for only 20% of electricity generation. But in 1985 it should already account for more than 45%, rising to around 70% in 1990. The installed capacity of the nuclear power stations should rise from 67 GW in 1980 to 200 GW in 1985 and to over 400 GW in 1990. The present decade - and even more the next - will see the third great structural change in the production of electricity. The first was the move in certain countries from hydro-electric energy to thermal production, and the second was the rapid expansion in the use of petroleum products in the 60's.

The role of petroleum products

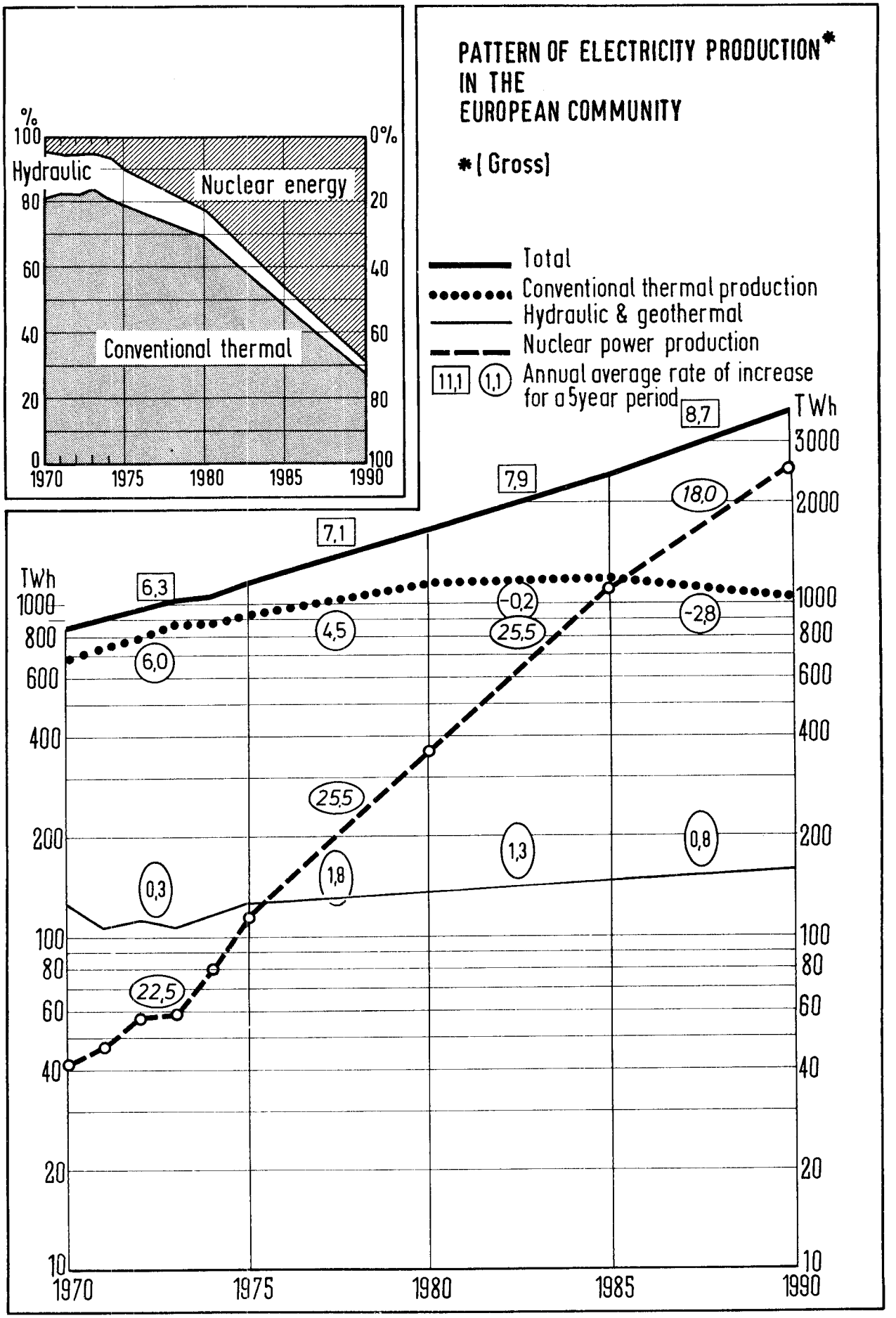
In the short and medium term oil will still play an important role

59. In the short and medium term, petroleum products will continue to play an important role - albeit a relatively decreasing one - in electricity production. A large number of power stations fuelled by these products are now in operation or under construction. The transfer of electricity production to other fuels can only be carried out on a progressive basis.

In the long term only heavy residues from refineries should be burnt in power stations

60. In the long term, petroleum products should no longer be used in electric power stations except in the form of heavy residues from refineries which cannot be used more efficiently in other ways. In order to achieve this aim, no

GRAPH 3-5


PATTERN OF ELECTRICITY PRODUCTION*
IN THE
EUROPEAN COMMUNITY
*(Gross)
Total
Conventional thermal production
Hydraulic & geothermal
Nuclear power production
11,1 (1,1) Annual average rate of increase for a 5 year period
%
100
80
60
40
20
0
0%
20
40
60
80
100
Hydraulic
Nuclear energy
Conventional thermal
1970
1975
1980
1985
1990
TWh
3000
2000
1000
800
600
400
200
100
80
60
40
20
10
8,7
7,9
7,1
6,3
18,0
25,5
-0,2
-2,8
4,5
6,0
25,5
22,5
1,8
1,3
0,8
0,3

further base-load power stations fuelled by petroleum products should be authorized other than in exceptional cases.* Further, existing power stations or those now being built should as far as possible gradually come to be used as medium- and peak-load plants.

Objectives for electricity production from oil

61. While the percentage use of petroleum products in total electricity production will fall from 32% in 1973 to 27% in 1980, their contribution in absolute terms will increase from 326 TWh to 440 TWh (see graph 3.6). It is only after reaching a peak in the early 80's that electricity production from oil will start to fall, to reach in 1990 a level roughly corresponding to the utilization of heavy residues from the refineries.

The role of coal

A coal policy has been proposed

62. The role which indigenous and imported coal will have to play in electricity production is set out in the Medium-term guidelines for coal 1975-1985.** The implementation of this coal policy should make it possible to increase by about 30 million tce the amount of coal burnt in electric power stations.

To increase coal supplies long-term commitments are necessary

63. The fact that in electricity production coal has become competitive with petroleum products is not by itself enough in present circumstances to affect coal supplies. In order substantially to increase available quantities of steam coal, long-term commitments should be entered into by the coal and electricity producers. At a time of sudden and unforeseeable changes in the prices of petroleum products, electricity producers could more easily enter into such

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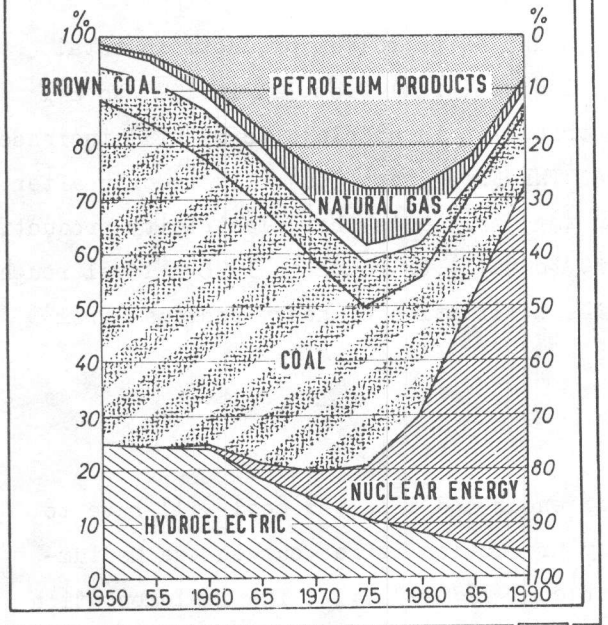
(*) Draft Council Directive covering the limitation of the use of petroleum products in power stations (Doc. COM (74) 550 final).

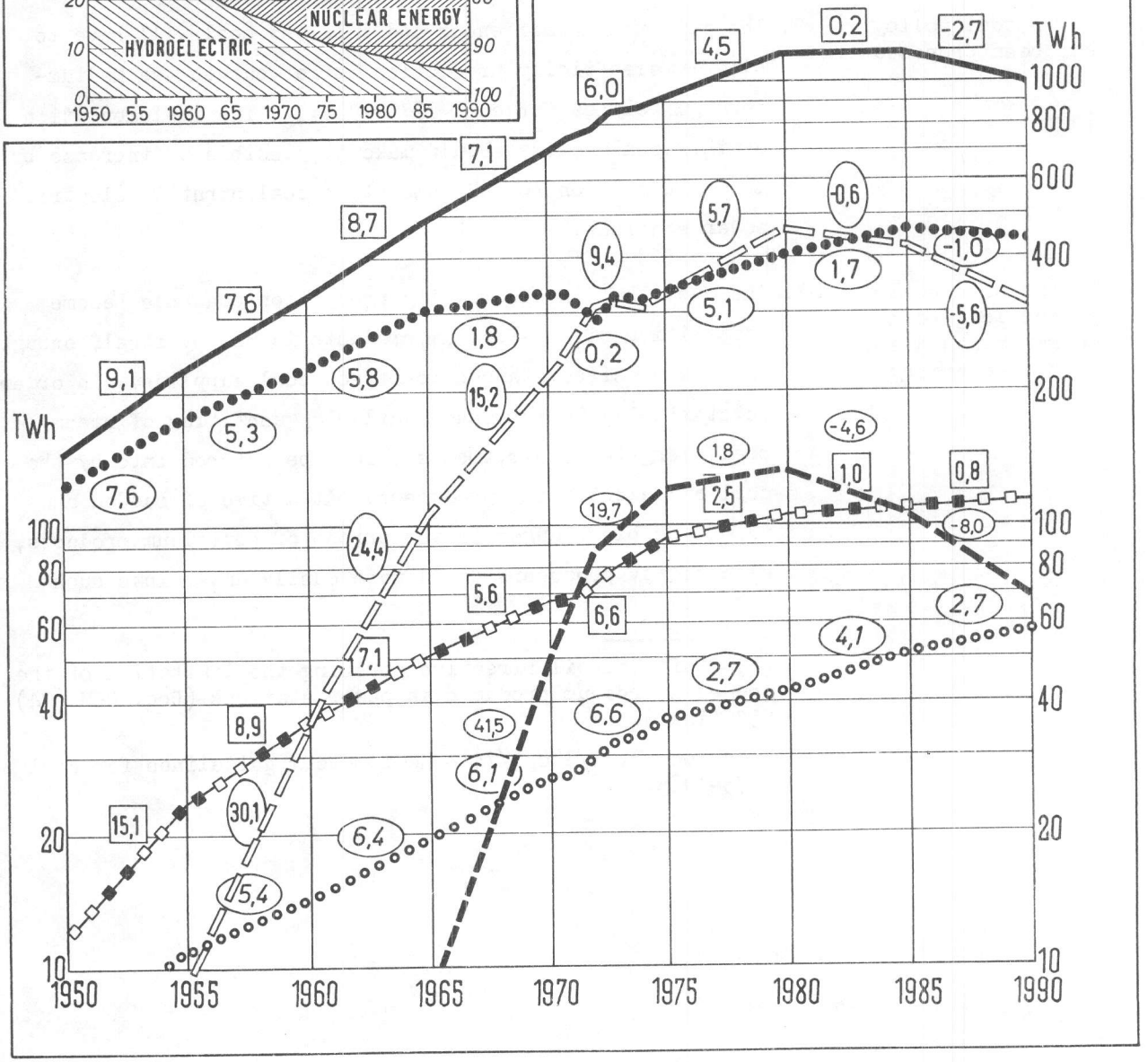
(**) Doc. XVII/188/1/74 - Medium-term guidelines for coal 1975-1985.

GRAPH 3-6

PATTERN OF CONVENTIONAL THERMAL PRODUCTION IN THE EUROPEAN COMMUNITY



Total
Coal
Petroleum products
Brown coal
Natural gas
Derivated gases
(2,2) [2,2] Annual average rate of increase for a 5 year period



commitments if they were given adequate guarantees by the public authorities.

Objectives for coal-fired power stations

64. In the short and medium term, coal-fired power stations should be used as base-load plants and then gradually be used more and more for medium loads as the nuclear power stations come into operation. Despite the difficulties encountered in some countries in complying with recent regulations on the emission of sulphur dioxide, a series of new coal-fired power stations should be commissioned between now and 1980. By 1980 coal should cover about 26% of electricity production, 20% in 1985 and 12% in 1990. This would correspond respectively to 428, 467 and 444 TWh, compared with 325 TWh in 1973. From the middle of the 80's coal could be used more efficiently for gasification than for firing power stations.

The role of natural gas

Natural gas should be reserved for more economic uses than fuelling power stations

65. As natural gas resources are at present limited, this fuel should generally be reserved for applications which give a better efficiency than that obtained by burning it in power stations. It should be available for electricity generation only if it is accepted that supplies are interruptable, and only when a more efficient use is temporarily impossible or the use of gas is essential for economic, technical or environmental reasons.* If there is a fundamental change in the natural gas supply situation in the Community, this approach could of course be reviewed.

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* Proposal for a Council Directive on limiting the use of natural gas in power stations - Doc. COM (74) 550 final.

Objectives for electricity produced from natural gas

66. This policy of limiting the use of natural gas in power stations will reduce its share of electricity production from the current 9% (96 TWh) to 8% in 1980 (131 TWh), 4% in 1985 (103 TWh), and 2% in 1990 (68 TWh).

Brown coal and peat

Brown coal and peat are of importance for fuelling power stations only in the Federal Republic of Germany and in Ireland

67. Brown coal and peat will continue to be of primarily regional importance. In the fields of brown coal now being worked in the Community, mainly in the Federal Republic of Germany, this fuel can be extracted at a competitive cost. However, reserves are limited and the commissioning of new fields would call for considerable investment. It is therefore advisable in the medium and long term, when nuclear energy will be able to meet the growth in electricity demand, that this fuel should be put to more efficient use than that of using it to fuel power stations (mainly gasification).

Future prospects for these fuels

68. At present, peat accounts for over 20% of electricity generation in Ireland. Even if there is some increase in quantities of peat available, this fuel will become less important there. In the light of these prospects, brown coal and peat, at present supplying 80 TWh or about 8% of total Community production, will account for no more than about 3% in 1990; over the next ten years, production will remain fairly constant in absolute terms at about 100 TWh per year.

Other sources of energy

By 1990 other sources of energy will account for only a small proportion of electricity production

69. Electricity production from geothermal sources,"inevitable" manufactured gases and other combustible waste products will account for only a few percent of the total and will continue to decrease. The use of manufactured gases and other

by-products in power stations will grow at much the same rate as the industries producing these fuels. There should be more research regarding geothermal energy, at present used on certain geologically suitable sites in Italy; however, by 1990 it is unlikely that it will be able to make any substantial contribution to electricity production. The same applies to other forms of energy such as solar, wind and tidal energy. However, although their contribution to electricity generation at Community level will remain marginal, they may be of appreciable importance locally or regionally. In any event, the recovery of energy from waste products and the exploitation of new sources must be encouraged.

Fuel stocks at thermal power stations

A minimum level of fuel stocks must be kept at thermal power stations

70. Although there is very little risk of a sudden breakdown in fuel supplies to nuclear power stations, the still substantial generation from conventional thermal plant is not free from this problem. In order to prevent a temporary shortage threatening the regularity of electricity supplies and interrupting exchanges of energy between Member countries, a common fuel storage policy at power stations must be introduced. A proposal on these lines has been sent to the Council.*

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* Proposal for a Council Directive obliging the Member States of the EEC to maintain minimum stocks of fuel at their thermal power stations - Doc. COM (73) 2245 final.

The role of hydro-electric energy

Slight increase in hydroelectric production but substantial development of pumped-storage stations

71. Except for pumped-storage, hydraulic production will increase little because there are practically no more sites in Community countries which could be profitably developed solely with a view to the production of electricity. On the other hand, pumped-storage plants will need to develop rapidly in order to produce peak-load energy and enable nuclear power stations to attain a higher annual utilization.

Forecasts of hydroelectric production

72. Hydroelectric energy at present accounts for about 11% of total production (110 TWh). Taking into account the installations at present in course of construction and the development of pumping, hydroelectric production could attain 140 TWh in 1980 and slightly over 150 TWh in 1990, i.e. 8% and 4% respectively of the total production.

The production of peak energy

Peak-load energy should be increasingly supplied by pumped-storage

73. Once the entire base of the load diagram is covered by energy from "inevitable" fuels and nuclear power plants the problem of the best use of the nuclear stations will become acute. Despite the tariff measures which will have to be taken in order to increase the proportion of off-peak demand in the total demand for electricity, this stage will be reached by most of the Community systems during the coming decade. The construction of new-peak load power stations, burning fossil fuels, would then be abandoned in favour of the off-peak energy storage plants and the production of peak-load energy from these sources. Hydraulic and pneumatic pumping stations are one solution to this problem. Other and less expensive solutions should also be developed. Synthetic gas or hydrogen could be produced with the off-peak energy from nuclear reactors and used in peak-load generators (gas turbines and fuel cells). It is essential to encourage the development of these new techniques.

Electricity production in the various Member States

Indigenous energy resources vary from one Member State to another

74. The availability of indigenous energy has in the past greatly influenced the structure of electricity production in the various Member States. This is true not only of fossil fuels but also of water power. One consequence is that certain Member States which do not have indigenous energy sources of any importance have had to accept an extensive dependence on oil imports, with its implications for the security of their electricity supplies.

The adoption of a common policy for the use of fuels will give uniform security of supplies to all Member States

75. As all the Member States turn to nuclear energy to satisfy their future electricity needs, the structures of electrical production in the various countries will become progressively more uniform. In the meantime, the implementation of the principles developed in these electricity sector guidelines, and in particular the use of fossil fuel in power stations, should facilitate optimum use of the indigenous energy sources of the Community and thus improve the security of supply of all the Member States. In seeking to attain the aims of the present guidelines it will be necessary to take into account the starting positions of each Member country. Procedures will therefore have to be adapted to the particular structure of each Country.

3.4. Patterns in the electricity sector

The patterns are very varied

76. National, provincial, local, private and mixed companies, and industrial production: there are many different kinds of undertakings producing, transporting and distributing electrical energy. Thus the pattern of the electricity sector differs widely from one Community country to another.

This diversity must not be allowed to lead to distortions of supply conditions

77. This diversity of the electricity sector must not be allowed to lead to distortions of the supply conditions within the Community. Whatever the nature and status of the local production and distribution companies, consumers in comparable situations should be able to obtain electricity supplies at comparable conditions.

Income in the electricity sector must cover expenditure

78. In order to attain these conditions the producers and distributors must act in accordance with certain common criteria whatever the status of their company. In particular, they should be able to run their undertaking solely on the revenue from the sale of their supplies and services. For this purpose the public authorities should permit the electricity sector to follow a tariff policy which will enable it to cover its expenditure.

The undertakings or groups of undertakings should have a minimum size

79. Wherever geographically possible the electricity producers should ensure that their undertaking or group of undertakings has the minimum size necessary to permit the use of the latest and cheapest means of production (e.g., large nuclear power stations). It is unacceptable that consumers in one area should pay more for their electricity because the local producer, owing to the small size of his undertaking, has not the financial and technical resources to include low production cost power stations in his system. In particular for regions in economically difficult circumstances unacceptable supplementary charges could arise.

Jointly-owned power stations

Considerable advantages in jointly-owned power stations

80. It is not only the smaller undertakings which find it worthwhile to form groups of two or more for the construction and operation of the latest means of production; even large national undertakings often find it more advantageous to supply a boundary area of their network from a jointly-owned power station. This can be installed near the load centre and thus avoids the need for the construction of long transmission lines. It is obvious that frontiers between the Member States should be no barrier to cooperation of this kind.

A number of jointly-owned power stations have already been built or are in the course of construction. Appropriate measures should be taken to promote and encourage this development.

81. The potential advantages of the joint construction of new power stations are the following:

- the reduction in cost per installed kilowatt obtained by taking maximum advantage of the fall in costs with increase in unit size;
- a contribution to the protection of the environment, in view of the dwindling number of suitable new sites in Europe;
- reduction in the cost per installed kilowatt obtained by installing on one site several power stations belonging to different producers (power station complexes);
- a steadier rate of growth of the installed power of the various networks owing to the reduction of the temporary over-capacity which occurs when a new unit comes into service;
- smoother flow of financing and its distribution over a wider capital market;

- the sharing of risks;
- the reinforcement of the system interconnections;
- opening up the markets for electro-mechanical equipment.

The problem of maintaining reserves

82. The construction of a single new large production unit in place of two small ones requires the maintenance of a greater reserve capacity. But this is divided between the operators of the station and should not normally present un obstacle to the construction of a jointly-owned power station.

Industrial production of electricity

Cooperation between electricity producers must include industrial producers

83. Cooperation in the construction of power stations should not be limited to public producers but should include industrial producers (whose surplus output is fed into the national system). It could often confer substantial advantages on both sides: industrial producers could benefit from the scale economy of large nuclear units, and would find it easier to solve the difficult problem of maintaining reserves; the supply of steam for industrial heating from a common power plant would lessen the problems of environmental protection raised by industrial waste, and make a contribution to the more rational use of energy. For the above reasons it will in general be essential in future, wherever possible, to couple electricity production with the production of steam for industrial and urban heating.

The proportion of industrial generation varies considerably from country to country

84. The ratio of industrial generation to total production varies greatly from one Community country to another. For the nine as a whole it was 18.4% in 1972.

The reasons for industrial generation

85. An industry may decide to produce its own electricity for various reasons:

- the industry may have a particularly cheap source of primary energy (wastes, blast-furnace gas, gas from synthesis and refining processes, coal by-products etc.) or need large quantities of low-temperature heat (such as can be supplied by a back-pressure turbine in a power station);

- industrial production may be seen as the most economic ccurse.

The construction of power stations using waste energy does not present problems in any Member country; on the other hand, the competitive industrial production is subject to more or less restrictive limitations in certain cases.

The need to guarantee a quantative supply of electricity under rational and consequently economic conditions can only be satisfied by constructive cooperation between the parties concerned. In this context it is important that all countries apply comparable principles.

Cptimum interconnection of networks

International bodies promoting the integration of networks

86. The indispensable instrument for any cooperation between the various European electricity producers is the network of interconnections. The creation of an optimal system of interconnections enables considerable economies to be made in the power station installed capacities. Several

international bodies are at present pursuing this aim. Six Community countries are members of the Union for the Coordination of the Production and Transport of Electricity (UCPTE); Denmark belongs to the Union of Nordic Countries for Cooperation in the Electrical Industry (Nordel); UCPTE and Nordel cooperate closely and maintain exchanges with other regions of Europe. Being islands, the United Kingdom and Ireland have not joined any organization for the coordination of electrical interconnections. Interconnections exist, however, between the United Kingdom and France as well as between the Republic of Ireland and Northern Ireland. All the nine Member countries of the Community are represented on the International Union of Producers and Distributors of Electrical Energy (UNIPEDE).*

The advantages of interconnection

87. A thorough interconnection of European networks makes possible large-scale supplies under the most economical conditions. For example, exchanges between networks makes it possible to take advantage of an exceptional local supply of hydroelectric power, to respond in the most technically and economically advantageous way to a power-plant or line failure, to blend into the load curve power plants of various networks obeying their own economic dictates and following the availability of their type of fuel, etc. Over and above the existing systems, it should be established what advantages would arise from reinforcement of the large interconnecting systems. In this context the opportunities to create control centres for the large integrated systems should be examined.

(*) Permanent coordination committees have been set up between the services of the Commission of the European Communities and UNIPEDE, representing the public electricity suppliers, and FIPACE, representing the industrial producers.

The choice of power station sites

88. The problems of the interconnection of networks, the joint construction of power plants, the production of heat for industrial and urban heating, the more rational use of primary energy and the reduction of the effects of thermal rejects have one common factor, namely the choice of power station sites. Usually this choice is the result of a judicious compromise between various and frequently contradictory requirements. In order to prevent differences of assessment leading to an excessive diversity within the Community, it would be advisable to define the main lines of a common policy for the siting of power plants.

A common approach to assessment of the safety of nuclear boilers

89. It is particularly important that there should be a common approach to the assessment of the safety of nuclear boilers and to the question of installing them near large centres of electricity consumption. Divergencies of opinion on this subject could lead to a serious distortion of competition between industries wishing to obtain supplies of industrial heat and electricity from nuclear sources.

Common criteria for assessing the effects of thermal rejects

90. It is equally important to establish common criteria for assessing the effects of thermal rejects from electrical power plants into surface waters and the atmosphere. The Commission will undertake a series of studies, facilitate exchanges of information between Member countries and prepare proposals on this question.

3.5. Investments and financing

The volume of investment

A faster transition to nuclear energy will considerably increase the problems of financing

91. The electricity industry is a very large user of capital. This is because, on the one hand, the cost of production, transmission and distribution equipment is very high and,

on the other hand, the installed capacity of such equipment more than doubles every ten years. The problem of financing will become still more acute in the next few years owing to the need to install large nuclear plants with high specific costs (about 90% more than those of an oil-fired power plant), long construction times (1 - 2 years more and consequently very high interim interest charges) and large unit sizes (twice those of conventional power plants).

170 000m u.a. (1973 value) must be invested before 1985

92. The amount of funds required can be seen from the amount of investments which must be made by the electricity producers in the Community between 1975 and 1985 if the quantitative objectives of these guidelines are to be attained. Between 1975 and 1985 the electricity sector will receive approximately two-thirds of the investments in the energy field as a whole, while the percentage of total energy requirements covered by electricity during the same period will rise from 26% to approximately 38%. During that period, investments in the electricity sector will amount to some 170 000m u.a. (1973 value), including approximately 100 000m u.a. in the production sector (including the construction of around one hundred nuclear units) and approximately 70 000m u.a. in transport and distribution installation. These investments will represent approximately 1.4% of the Community's gross national product during the same period.

Means of financing

In general, financing should be achieved without recourse to subsidies

93. In order to obtain the necessary funds, electricity producers should borrow from the capital market and rely on self-financing, without, in principle, receiving subsidies. This presupposes:

- that a sufficient level of self-financing can be attained, and

- that the electricity sector is considered attractive by investors.

A suitable rate of self-financing

94. A sufficient rate of self-financing is particularly necessary if a sound investment policy is to be implemented. During the past ten years a distinct tendency for the rate of self-financing in the electricity sector to rise is evident and in 1973 the Community average was between 50 and 60%.

It is hoped that this trend will continue; a thorough analysis should be made of theproblems relating to financing in the electricity sector so that the prospects for self-financing during the coming years can be assessed. It seems difficult to imagine that more than 70 000m u.a., i.e. approximately 40% of the 170 000m u.a. to be invested in the electricity sector by 1985, could be covered by this method of financing.

It is currently difficult to obtain money on the capital market

95. Almost 100 000m u.a. (1973 value) would therefore have to be obtained from the capital market. However, it is difficult to obtain money on the capital markets at the moment, partly because interest rates are very high and partly because of the need to reduce the use of the GNP by internal investors in order to increase exports and thus absorb the deficit on the Community's trade balance.

A common financing policy

The instruments of a common financing policy

96. The raising of a large amount of capital from a capital market which is under stress would be made easier by a common financial policy. Such a policy could be composed of the following elements:

- increased use of the various financing instruments at the Community's disposal:
  - the European Investment Bank,
  - ECSC loans, to enable new coal-fired power stations to be financed,
  - direct investment of money borrowed by the Community on the capital market;

The loans granted to electricity producers from these sources should, wherever possible, cover the entire period of depreciation of the plant (e.g. 17 - 20 years). This would prevent the need for the undepreciated part to be financed again after ten or twelve years, as is currently the case.

- tax relief or exemption for nuclear and coal-fired power stations and for storage stations used during peak periods, which are built during the next three to five years. During that period, which will be characterized by relatively slow growth of demand for electricity, electricity producers will not be able to speed up their power station construction programmes unless the financial burdens, resulting from the creating of excess capacity, are limited.

4. GUIDELINES FOR A COMMUNITY ENERGY POLICY FOR THE ELECTRICITY SECTOR

99. On the basis of the analysis of the problems facing the electricity sector, as indicated in the previous chapter, the following guidelines can be laid down for the implementation of an energy policy for the electricity sector:

1. Improvement of the security of electricity supplies in the Community by the preferential use of indigenous energy sources and nuclear energy for electricity production and by building up stocks of fuel: increase in the capacity of power stations using solid fuel; speeding up of nuclear equipment programmes; limitation of the building of new oil-fired power stations; gradual shifting of existing oil-fired power stations towards the top of the load diagram; building up of reserve stocks of fossil fuel at the conventional power stations.

2. Improvement in the economy and security of energy supplies in the Community by increasing the proportion of electricity in the final energy demand: gradual substitution of electricity for petroleum products for certain uses in the industrial, domestic and transport sectors in which rational utilization of electricity can be guaranteed.

3. Optimal allocation of the Community's energy resources for the production of electricity: the use, wherever possible, of forms of energy which are currently difficult to use for other purposes (nuclear energy, hydraulic power, solid fuel, wast products); restriction of the use of natural gas and petroleum products in power stations.

4. Increase in the regularity of demand for electricity with a view to achieving better utilization of production and transmission capacities: promotion of the use of electricity outside peak hours by the introduction of suitable tariff measures.

5. Promotion of the joint production of electricity and heat in order to reduce thermal rejects into the environment and to achieve a more rational utilization of primary energy: closer collaboration between electricity producers, distributors of heat for district heating and users of industrial heat; construction of conventional and nuclear power stations close to high consumption areas, whilst at the same time maintaining high standards of environmental protection.

6. Improvements in the economy and security of electricity supply by the optimal interconnection of the networks; research into the optimal degree of integration of electricity production and transmission systems; promotion of the joint construction and use, on the most suitable sites, of new power stations or groups of power stations.

7. Laying down of harmonized Community norms, rules and regulations for electrical plants in order to protect the environment. The priority areas are the safety of nuclear plants, thermal rejects and the emission of sulphur into the atmosphere by conventional power station.

8. Technological development of methods of production and transmission and means for achieving rational utilization of electricity.

9. In order to ensure the steady and uniform development of the electricity sector in all the countries and

regions of the Community, electricity prices and tariffs should guarantee producers and distributors sufficient revenue. This implies that the electricity sector must remain attractive to investors of capital and that producers must be able to maintain an adequate level of self-financing.

Whilst respecting these criteria, account can be taken, in the tariff measures, of regional policy; in this context, the provision of supplies under the most competitive conditions is an essential element.

10. Implementation of a common policy for financing the very large investments which must be made in the electricity sector during the coming years.

COMMISSION
OF THE
EUROPEAN COMMUNITIES

GUIDELINES FOR THE ELECTRICITY SECTOR IN THE COMMUNITY

The role of electricity in a new energy policy strategy

Annex : Electricity demand and production
in the Community
1950 - 1990

Ist Part : ELECTRICITY DEMAND IN THE COMMUNITY 1950 - 1990

THE DEVELOPMENT OF ELECTRICITY CONSUMPTION AND DEMAND - COMMUNITY

TWh

	DEMAND (including losses)	Station internal and pumping requirements	CONSUMPTION (GROSS)	Balance of exchanges (+ Imp. - Exp.)	PRODUCTION (GROSS)
Development between 1950 and 1970					
1950	183,471	10,208	193,679	+ 1,555	192,124
55	277,553	16,109	293,662	+ 1,300	292,362
60	408,825	24,023	432,848	+ 4,206	428,642
65	587,237	39,350	626,587	+ 8,165	618,422
1970	809,472	55,085	864,557	+ 9,147	855,410
	Annual average rate of increase				
60 - 50	8,4	8,9	8,4	10,5	8,4
70 - 60	7,1	8,7	7,2	8,1	7,1
70 - 50	7,7	8,8	7,8	9,3	7,7
Current situation and trends 1970 - 1975					
1970	809,472	55,085	864,557	+ 9,147	855,410
71	848,729	58,931	907,660	+ 5,156	902,504
72	903,220	62,416	965,636	+ 4,191	961,445
73 *	972,550	66,240	1.038,790	+ 8,170	1.030,620
	Forecasts				
74	1.003,070	68,180	1.071,250	+ 5,180	1.066,070
1975	1.092,600	74,700	1.167,300	+ 6,500	1.160,800
	Annual average rate of increase				
71 - 70	4,9	7,0	5,0		5,5
72 - 71	6,4	5,9	6,4		6,5
73 - 72	7,7	6,1	7,6		7,2
74 - 73	3,1	2,9	3,1		3,4
75 - 74	8,9	9,6	9,0		8,9
75 - 70	6,2	6,3	6,2		6,3
Medium term development to 1980 - Long term trends to 1990					
1975	1.092,6	74,7	1.167,3	+ 6,5	1.160,8
80	1.540,0	105,0	1.645,0	+ 5,0	1.640,0
85	2.250,0	156,0	2.405,0	+ 5,0	2.400,0
1990	3.430,0	226,0	3.656,0	+ 6,0	3.650,0
	Annual average rate of increase				
80 - 75	7,1	7,1	7,1		7,1
85 - 80	7,9	8,3	7,9		7,9
90 - 85	8,8	7,7	8,7		8,7
80 - 70	6,6	6,7	6,6		6,7
90 - 80	8,3	8,0	8,3		8,3

* provisional data

DEVELOPMENT OF THE PATTERN OF FINAL ENERGY CONSUMPTION - COMMUNITY

TWh-%

	Industry	Transport	Domestic and other uses	Total
Development between 1950 and 1970				
1950	95,193 - 63,0	8,670 - 5,7	47,891 - 31,3	151,754 - 100
55	153,524 - 64,7	11,002 - 4,6	72,996 - 30,7	237,522 - 100
60	215,749 - 61,0	14,307 - 4,0	123,516 - 35,0	353,572 - 100
65	292,563 - 56,7	17,703 - 3,4	209,111 - 39,9	519,377 - 100
1970	382,231 - 53,1	21,965 - 3,1	315,420 - 43,8	719,616 - 100
	Annual average rate of increase			
60 - 50	8,5	5,2	10,1	8,9
70 - 60	5,9	4,4	9,8	7,3
70 - 50	7,2	4,8	10,0	8,1
Current situation and trends 1970 - 1975				
1970	382,231 - 53,1	21,965 - 3,1	315,420 - 43,8	719,616 - 100
71	390,893 - 51,8	22,320 - 3,0	341,708 - 45,2	754,921 - 100
72	408,685 - 50,6	23,006 - 2,8	376,384 - 46,6	808,075 - 100
73 *	432,970 - 49,8	24,128 - 2,8	412,989 - 47,4	870,087 - 100
	Forecasts			
74	442,390 - 49,2	25,117 - 2,8	430,593 - 48,0	898,100 - 100
1975	476,160 - 48,7	26,660 - 2,7	475,880 - 48,6	978,700 - 100
	Annual average rate of increase			
71 - 70	2,3	1,6	8,3	4,9
72 - 71	4,6	3,0	10,1	7,0
73 - 72	5,9	4,9	9,7	7,7
74 - 73	2,2	4,1	4,3	3,2
75 - 74	7,6	6,1	10,5	9,0
75 - 70	4,5	4,0	8,6	6,3

Medium term development to 1980 - Long term trends 1990

TWh - %

1975	476,16 - 48,7	26,66 - 2,7	475,88 - 48,6	978,70 - 100
80	630,00 - 45,8	34,00 - 2,5	710,00 - 51,7	1.374,00 - 100
85	880,00 - 43,6	60,00 - 1,9	1.080,00 - 53,5	2.020,00 - 100
1990	1280,00 - 41,6	140,00 - 5,5	1.660,00 - 53,9	3.080,00 - 100
	Annual average rate of increase			
80 - 75	5,7	5,1	8,3	6,9
85 - 80	7,0	12,0	8,7	8,0
90 - 85	7,7	18,5	9,0	8,7
80 - 70	5,2	4,5	8,4	6,7
90 - 80	7,3	15,2	8,9	8,4

* provisional data

DEVELOPMENT OF THE PATTERN OF AVERAGE CONSUMPTION PER HEAD OF THE POPULATION - COMMUNITY

kWh - %

	Industrial and transport uses(*)	Domestic, commercial and other uses	Total
Development occurring between 1950 and 1970			
1950	644 - 76,7	196 - 23,3	840 - 100
55	975 - 74,9	327 - 25,1	1.302 - 100
60	1.069 - 66,8	532 - 33,2	1.601 - 100
65	1.366 - 61,7	847 - 38,3	2.213 - 100
1970	1.737 - 58,1	1.255 - 41,9	2.992 - 100
	Annual average rate of increase		
60 - 50	5,2	10,5	6,7
70 - 60	5,0	9,0	6,5
70 - 50	5,1	9,7	6,6
Current situation and trends 1970 - 1975			
1970	1.737 - 58,1	1.255 - 41,9	2.992 - 100
71	1.765 - 56,7	1.348 - 43,3	3.113 - 100
72	1.833 - 55,4	1.475 - 44,6	3.308 - 100
73(**)	1.928 - 54,5	1.607 - 45,5	3.535 - 100
	Forecasts		
74	1.957 - 54,1	1.663 - 45,9	3.620 - 100
1975	2.091 - 53,4	1.825 - 46,6	3.916 - 100
	Annual average rate of increase		
71 - 70	1,6	7,4	4,0
72 - 71	3,8	9,4	6,3
73 - 72	5,2	8,9	6,9
74 - 73	1,5	3,5	2,4
75 - 74	6,8	9,7	8,2
75 - 70	3,8	7,8	5,5

(*) Industrial uses include consumption in the energy sector

(**) Provisional data

2nd. Part : THE PRODUCTION OF ELECTRICITY IN THE COMMUNITY 1950 - 1990

Objectives for the increase in the production of electrical energy

and for the internal consumption of energy in the Community

Year	Electricity production (gross) TWh	Rate of increase of production (gross) %	Petroleum equivalent * of electricity production (gross) Mio toe	Objective for internal energy consumption Mio toe	Increase of internal energy consumption %	Share of electricity * %	Share of electricity** %
1970	855		188	830		23	10
		6,3			3,6		
1975	1160		255	990		26	13
		7,2			3,5		
1980	1640		361	1175		30	15
		7,9			3,5		
1985	2400		528	1400		38	18
		8,7			3,5		
1990	3650		803	1660		48	26
		7,3			3,5		
1995	5200		1144	1975		58	35
		5,5			3,5		
2000	6800		1500	2350		64	40

* Conversion factor : 0,22 Mio toe/TWh
The total gross electricity production is assumed to be provided by thermd stations consuming 2200 Kcal/kWh. This arises from the assumption of an average net station efficiency of about 36%.

** In certain countries electricity is represented in energy balances by it's thermal equivalent (860 kcal/kWh). In such a balance the share of electricity would be as shown in this column.

DEVELOPMENT OF THE PATTERN OF PRODUCTION - COMMUNITY

TWh-%

Hydraulic	Conventional thermal *	Nuclear	Total

Development occurring between 1950 and 1970

	Gross production			TWh-%
1950	48,140 - 25,1	143,438 - 74,9	-	191,578 - 100
55	71,124 - 24,3	221,218 - 75,7	-	292,342 - 100
60	104,354 - 24,3	321,662 - 75,0	2,566 - 0,7	428,582 - 100
65	111,969 - 18,1	485,435 - 78,5	21,018 - 3,4	618,422 - 100
1970	123,866 - 14,5	690,190 - 80,7	41,354 - 4,8	855,410 - 100
	Annual average rate of increase			%
60-50	8,1	8,4	-	8,4
70-60	1,7	7,9	31,9	7,2
70-50	4,9	8,2	-	7,8

Current situation and trends 1970-1975

	Gross production			TWh-%
1970	123,866 - 14,5	690,190 - 80,7	41,354 - 4,8	855,410 - 100
71	109,459 - 11,3	746,606 - 82,7	46,459 - 6,0	902,524 - 100
72	112,337 - 11,7	792,220 - 82,4	57,093 - 5,9	961,650 - 100
73	109,644 - 10,6	862,388 - 83,7	58,808 - 5,7	1030,840 - 100
	forecasts			
74	118,626 - 11,1	868,490 - 81,5	78,954 - 7,4	1066,070 - 100
75	125,594 - 10,8	921,327 - 79,4	113,879 - 9,8	1160,800 - 100
	Annual average rate of increase			%
75-70	0,3	6,0	22,5	6,3

Medium term development to 1980 - Long term trends to 1980

	Gross production			TWh-%
1975	125,594 - 10,8	921,327 - 79,4	113,879 - 9,8	1160,800 - 100
80	137,499 - 8,4	1149,031 - 70,0	353,470 - 21,6	1640,000 - 100
85	146,799 - 6,1	1159,146 - 48,3	1094,055 - 45,6	2400,000 - 100
1990	152,999 - 4,2	1005,236 - 27,6	2491,695 - 68,2	3650,000 - 100
	Annual average rate of increase			%
80-75	1,8	4,5	25,5	7,1
85-80	1,3	- 0,2	25,5	7,9
90-85	0,3	- 2,8	18,0	8,7
90-70	1,1	1,9	22,6	7,4

* Including geothermal

DEVELOPMENT OF THE PATTERN OF PRODUCTION CAPACITIES - COMMUNITY

MW-%-h

	Hydro stations	Conventional thermal stations	Nuclear stations	Total
Development occurring between 1950 and 1970				
	Max. possible gross installed capacity			MW-%
1950	14.256 - 26,3	40.061 - 73,7	-	54.317 - 100
55	20.417 - 25,2	60.474 - 74,8	-	80.891 - 100
60	26.385 - 22,9	88.436 - 76,7	402 - 0,4	115.223 - 100
65	32.814 - 20,9	119.765 - 76,4	4.216 - 2,7	156.795 - 100
1970	36.850 - 17,5	166.884 - 79,1	7.183 - 3,4	210.917 - 100
	Average utilisation hours			h
1950	3.377	3.580	-	3.527
55	3.484	3.658	-	3.614
60	3.955	3.637	6.383	3.720
65	3.412	4.053	4.985	3.944
1970	3.361	4.136	5.757	4.056
	Annual average rate of increase			%
60-50	6,3	8,2	-	7,8
70-60	3,4	6,5	33,4	6,2
70-50	4,9	7,4	-	7,0
Current situation and trends 1970 - 1975				
	Max. possible gross installed capacity			MW-%
1970	36.850 - 17,5	166.844 - 79,1	7.183 - 3,4	210.917 - 100
71	37.557 - 16,5	179.965 - 79,3	9.428 - 4,2	226.950 - 100
72	38.001 - 16,0	188.726 - 79,3	11.342 - 4,7	238.069 - 100
73	39.568 - 15,7	201.279 - 79,7	11.789 - 4,6	252.636 - 100
	Forecasts			
74	42.333 - 15,6	212.946 - 78,5	15.903 - 5,9	271.182 - 100
1975	44.521 - 15,4	223.239 - 77,1	21.628 - 7,5	289.388 - 100
	Average utilisation hours			h
1970	3.361	4.136	5.757	4.056
71	2.914	4.149	4.928	3.977
72	2.956	4.198	5.034	4.039
73	2.771	4.285	4.988	4.080
	forecasts			
74	2.802	4.078	4.965	3.931
1975	2.821	4.127	5.265	4.011
	Annual average rate of increase			%
75-70	3,8	6,0	24,7	6,7
Medium term development to 1980 - Long term trends to 1990				
	Max. possible gross installed capacity			MW-%
1975	44.521 - 15,4	223.239 - 77,1	21.628 - 7,5	289.388 - 100
80	53.084 - 13,6	270.455 - 69,2	67.265 -17,2	390.804 - 100
85	61.184 - 11,3	282.000 - 51,9	200.165 -36,8	543.349 - 100
1990	67.784 - 9,0	272.880 - 36,2	412.465 -54,8	753.129 - 100
	Average utilisation hours			h
1975	2.821	4.127	5.265	4.011
80	2.590	4.248	5.254	4.196
85	2.399	4.110	5.465	4.417
1990	2.257	3.683	6.041	4.846
	Annual average rate of increase			%
80-75	3,6	3,9	25,5	6,2
85-80	2,8	0,8	24,3	6,8
90-85	2,1	- 0,6	12,8	6,8
90-70	5,2	2,5	.	6,6

DEVELOPMENT OF THE PATTERN OF CONVENTIONAL THERMAL PRODUCTION - COMMUNITY

CONVENTIONAL THERMAL					
Natural gas	Lignite	Coal	Petroleum products	Industrial gases ans others	Total *

Development occurring between 1950 and 1970

	Gross production					TWh-%
1950	0,110- 0,5	11,810-6,1	122,254-63,5	3,284- 1,7	6,408-3,3	143,866-75,1
55	2,072- 1,2	23,773-8,1	176,125-59,9	9,460- 3,2	11,015-3,7	222,445-76,1
60	6,410- 2,5	36,472-8,4	228,595-52,6	35,359- 8,1	14,351-3,3	321,187-74,9
65	8,613- 2,3	51,522-8,2	303,112-48,5	105,197-16,8	19,559-3,1	488,013-78,9
1970	48,852- 5,7	67,772-7,9	330,848-38,7	213,315-24,9	26,402-3,1	687,189-80,3
	Annual average rate of increase					%
60-50	.	15,2	6,5	26,8	8,4	8,3
70-60	22,5	6,4	3,8	20,0	6,3	7,9
70-50	.	9,1	5,1	23,2	7,3	8,1

Current situation and trends 1970 - 1975

	Gross production					TWh-%
1970	48,852- 5,7	67,772-7,9	330,848-38,7	213,315-24,9	26,402-3,1	687,189-80,3
71	64,859- 7,2	68,255-7,6	327,288-36,3	256,214-28,4	27,399-2,9	744,015-82,4
72	86,994- 9,1	73,211-7,7	295,626-31,0	303,764-31,9	30,043-3,3	789,638-83,0
73	96,455- 9,3	80,000-7,8	325,446-31,6	325,706-31,6	32,120-3,1	859,727-83,4
	Forecasts					
74	108,460-10,2	86,000-8,1	321,201-30,2	316,419-29,7	33,410-3,0	865,490-81,2
75	120,170-10,3	93,050-8,0	334,911-28,8	333,776-28,7	36,420-3,3	918,327-79,1
	Annual average rate of increase					%
75-70	19,7	6,6	0,2	9,4	6,6	6,0

Medium term development to 1980 - Long term trends to 1990

	Gross production					TWh-%
1975	120,170-10,3	93,050-8,0	334,911-28,8	333,776-28,7	36,420-3,3	918,327-79,1
80	131,100-7, 8	105,000-6,4	427,950-26,1	440,281-26,9	41,700-2,5	1146,031-69,7
85	103,000-4, 3	110,000-4,6	467,115-19,6	425,231-17,8	50,800-2,0	1156,146-48,2
1990	68,000 1,9	114,000-3,1	444,045-12,1	318,291-8,6	57,900-1,6	1002,236-27,4
	Annual average rate of increase					%
80-75	1,8	2,5	5,1	5,7	2,7	4,5
85-80	- 4,6	1,0	1,7	- 0,6	4,1	0,2
90-85	- 8,0	0,8	- 1,0	- 5,6	2,7	- 2,7
90-70	1,7	2,7	1,5	2,0	4,0	1,9

* Geothermal is excluded; the percentages refer to total production : hydro : conventional thermal + nuclear.

DRAFT RESOLUTION

relating to the
Guidelines for the Electricity Sector
in the Community

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

- having regard to the communication from the Commission of [doc.], entitled "Guidelines for the Electricity Sector in the Community",

- recognizing that the guidelines and target figures forming the subject of this communication were prepared with and form part of the Community energy policy proposed in the document "Towards a New Energy Policy Strategy for the European Community" [doc. COM(74) 550 final],

- whereas the aforesaid guidelines and objectives were the subject of the Resolution adopted by the Council on 17 September 1974 [doc. R/2391/74 ENER (45)],

- having regard to the Resolution on the objectives of the Community energy policy,

- whereas the principal objective of the Community energy policy is the achievement of the greatest possible security of supply under economically satisfactory conditions,

- whereas this objective involves the allocation and utilization of energy supplies in the most rational way possible,

- whereas the recourse to nuclear energy alone can effect an important measure of reduction in the Community dependence on hydrocarbons,

- whereas the large scale use of this energy source is dependant on a sustained and progressive development of electricity demand,

- whereas the increase in the share of electricity from nuclear sources in the final energy consumption can make an important contribution towards covering the energy requirements of the Community, whilst at the same time satisfying economic and ecological criteria, and also lead to an improvement in the security of energy supply in the Community,

- whereas electricity prices depend only partially on fuel costs and are thus subject to less variation than those of other forms of energy,

1) underlines the importance of the role which electricity is called upon to play in the Community energy policy,

2) recognizes that the realization of such a policy implies a close coordination of the positions of the Member States concerning the choice of actions to be taken in the sectors of electricity consumption and production,

3) adopts the following guidelines:

   - the progressive increase in the share of electricity in the final energy consumption, notably by the substitution, under conditions of rational utilization of energy, of electricity for petroleum products; this development should take account of the increasing production of nuclear-generated electricity,

   - the consideration of the criteria of optimum valorization of the energy resources of the Community for the production of electricity,

   - the maximum recourse to nuclear reactors for new large capacity generating units,

   - the intensification of R + D efforts in the field of nuclear energy, notably in the areas of the protection of public health and of the environment,

   - an increase in the contribution to electricity production of coal-fired power stations,

- the improvement in the economy and security of electricity generation and transmission systems (principally questions of power stations siting, generation reserves, system interconnection, construction and operation of stations on a communal basis and industrial generation),

4) requires the Member States to take account, in the definition of their national policies for the electricity sector, of the guidelines and target figures which form the basis of the Community policy for this sector,

5) takes note that the Commission will present to the Council, after consultation with all interested parties, proposals concerning the development of the electricity sector, in the context of the guidelines outlined in 3) above,

6) takes note that the Commission will develope, in conjunction with the competant authorities of the Member States, common criteria for the choice of power station sites,

7) takes note of the intention of the Commission to keep the document "Guidelines for the Electricity Sector in the Community" up to date and to prepare annually information on electricity production development prospects in order to keep the industrial sector informed on the market situation.