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EUROPEAN ENERGY POLICY

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Introduction

Since its foundation and more especially since the events in the world oil market of 1973, the Commission of the European Community has striven to establish a co-ordinated energy policy for the member states. It has from the outset faced considerable difficulties. In the first place, unlike agriculture no mention is made of energy in the Treaty of Rome establishing the Community. Thus the Commission has had difficulty in winning acceptance of the need for a coordinated policy amongst the ten member countries. Secondly the energy situations of the individual member countries have little in common - some are significant energy importers (see Table 1), others are producers as well as consumers and all have different traditions of government intervention in the operation of the energy sector and in levels of public subsidy. The Commission has had more success in achieving agreement to resolutions on principles than in obtaining decisions. The most recent energy policy proposals were introduced in mid 1985 and have made only slow progress within the Community. It is the purpose of this paper to consider the development of energy policy in Europe in relation to relevant economic criteria for policy making and then to try briefly to evaluate the policy`s success and to indicate some directions for future policy making.

TABLE 1

NET ENERGY IMPORTS AS A PERCENTAGE OF GROSS INLAND ENERGY CONSUMPTION

	1973	1979	1984
		%	
EUR 10	64.3	55.1	40.6
BELGIUM	88.0	88.0	69.8
DENMARK	99.6	97.9	86.7
GERMANY	55.7	57.3	50.6
GREECE	91.4	82.3	62.3
FRANCE	81.7	81.4	60.7
IRELAND	85.7	83.6	43.9
ITALY	85.7	86.3	78.7
LUXEMBURG	99.8	99.5	99.9
NETHERLAND	22.9	4.8	6.3
UNITED KINGDOM	50.2	12.4	-17.6

Background Data on Inland Energy Consumption and Production

	1973	1979	1984
		mtoe	
Energy Consumption			
EUR 10	930.2	984.8	939.1
Energy Production			
EUR 10 Production	344.6	455.1	507.1
of which U.K.	110.1	192.6	203.8
Non U.K.	234.5	262.5	303.3
Net Imports			
EUR 10	620.3	558.7	409.7
of which U.K.	113.1	27.9	-20.3
Non U.K.	507.2	530.8	430.0

Source: Eurostat.

Economic Analysis of Energy Policy

Any kind of economic policy, including energy policy must contain three elements - goals or objectives, operational targets derived from them, and policy measures or instruments by which the specific targets are to be achieved. Out of the many alternative policies which may be available, the policy maker has to make a selection of which the outcome may either be a detailed plan or more likely in the context of the market oriented economies of Western Europea, Japan and the U.S.A. something much less rigid To what extent is it possible to evaluate the results of this policy selection process? We may do so in terms of the usual criteria of economic efficiency, distributive justice as well as of certain factors specific to the energy market.

Economic efficiency is concerned with two aspects - technical or managerial efficiency and allocative efficiency. The former has to do with the relationship between inputs and output. For example, for any given level of inputs of coal, gas or oil, have we achieved maximum output levels of generated electricity? If not there is technical inefficiency. Similarly, if for any given level of output we could save on the use of any or all inputs we would not be attaining an efficient outcome perhaps due to managerial incompetence or ignorance. This type of efficiency is a necessary but not sufficient condition for allocative efficiency. Clearly there could well be many "state of the art" methods of producing electricity, each one having its own technically efficient production arrangements. Allocative efficiency is obtained by choosing the production method for which the sum of the input costs is minimum for a given level of output or, equivalently, which maximises output for a given level of costs. Behind this lies the idea that scarce resources are only allocated efficiently if it is impossible by varying inputs and outputs (i.e. changing resource allocation) to make someone better off in the economy without making others worse off.

Under ideal conditions such allocative efficiency could be achieved by perfectly competitive markets functioning without government intervention. In reality and in the energy markets in particular, market imperfections abound. The world price of oil is affected by the OPEC grouping of oil producer nations which, although not until recently a formal cartel with market sharing arrangements, has undoubtedly maintained cohesion among its members and inhibited downward pressures on prices. Again in Europe in particular, many energy utilities are owned or controlled by government agencies and possess varying degrees of monopoly power. Government intervention in energy pricing and investment can in principle alter the market outcomes from those which we should expect from the existence of the imperfections described e.g. higher prices, higher profit returns, lower factor payments and lower output levels. There is however potential (and frequently actual) conflict between such concerns and the need to motivate management and ensure the financial viability of energy enterprises by establishing minimum target rates of return or profitability objectives.

The cost and avilability of energy clearly also has

distributional aspects. Thus governments are likely to be concerned about the effect of policy on the distribution of real income among households. Energy may be subsidised for various specific groups deemed to be in especial need either by specific subsidy or through general social security provision as in the U.K.

Two further micro economic impacts should also be considered. In the first place any subsidy policy involves not only income transfers but also impacts on the level of employment since output will be larger than otherwise. Secondly the authorities may not be so much concerned about levels of income but about the magnitude of shocks to various groups in society. Thus windfall profit may be of more concern than gradual effects on income distribution (see Schmallensee (1)) and policy will vary accordingly.

Apart from these micro economic issues, policy is likely to take into account such macro economic impacts as the effects of rising energy prices on inflation rates, international trade between energy rich and energy deficient countries, and the overall level of "risk" to which the economy is exposed. Thus undue dependence on imported oil, it is often argued, increases the risk that the country may suffer severely if supplies are varied by the exporters. The cost of this risk can be measured in terms of the amounts of GDP which would be sacrificed through sudden reductions in energy input availability. One estimate for the U.S. (1) has put the expected cost of shortage at around $3 per barrel. The problems of computing any such cost are, however, quite formidable. They require an assumption that domestic supplies are inherently less risky and that is at least questionable in the light of recent U.K. experience in regard to domestically produced coal. Nevertheless arguments have been put forward for an oil import tax to indicate to the resource user that the fuel he consumes has associated security costs. These costs can be offset to some extent by storage of oil which in principle should proceed to the point where the marginal cost of storage equals the marginal expected risk cost of imports.

The Development of European Energy Policy

For the legitimisation of its role in the energy policy area, the European Commission looks back to meetings of the Heads of State of the Community members in Paris in 1972 and in Copenhagen in 1973. In 1972, the Commission was instructed to prepare the basis for a coordinated energy policy. Interestingly they put forward two scenarios - one of which was that oil prices would remain low and the other that oil prices would increase substantially. When in 1973 this second scenario was borne out, the Heads of State at their Copenhagen meeting (December 1973) turned to the Commission for more specific recommendations. These early days saw energy policy conceived in crisis, almost strangled at birth and thereafter exhibiting all the symptoms of a battered babyhood - apparent neglect by the Council and the well meaning but ineffective criticism of outsiders. The Council rejected the Commission's first response but eventually passed a resolution endorsing a revised policy document (2) which remained official Community policy until overtaken by events in 1979. A summary of the 1974, 1980 and 1985 policies is given in Table 2.

Behind the detail of the policy document it is possible to discern a number of underlying real objectives. In the first place there was concern for security of energy supplies (3). The 1973 crisis was seen as a threat to the continuity of availability of a basic factor of production without which economic growth would cease or at least be severely constrained. There is implicit an assumption of a clear link between energy input and economic output and a perception of inadequacy of the market mechanism to promote substitution of alternative energy sources for oil without some form of intervention. The question of the value of greater security and the costs of being insecure were not discussed so that the individual measures designed to improve security are difficult to justify. Since no effort was made to place a price on security, the possibility of an import tax designed to improve security was not considered, and instead the Commission recommended all sorts of targets for reducing oil (and especially oil import) dependence, and increasing the availability of substitute energy sources (see Table 2).

The second concern was with stability of energy prices. Prices were not seen as reflecting and signalling changes in the scarcity of resources, rather they were perceived as imposing costs on investment decision makers, making it more difficult for them to justify long term investments in alternative energy sources and thereby reducing the effectiveness of any energy policy requiring such investments. There seems to have been a presumption that firms in the energy supply industry were not able to evaluate risks and make the necessary adjustment to required rates of return before engaging in investment. And yet it is not clear why investors having discounted the risks should not undertake projects with positive expected cash flows in the energy area to the same degree as in any other sector. Any

TABLE 2

ENERGY OBJECTIVES OF THE EUROPEAN COMMUNITY

POLICY	1974	1980	1985
TARGET YEAR	1985	1990	1995
IMPORT DEPENDENCE			
Energy	50% (40% if poss)		
Oil	38% (28%) total energy		33.3% total energy cons.
ENERGY CONSUMPTN.			
Energy	15% reduction		
Elect	35% of energy		
Oil		40% of total cons.	
ENERGY SUPPLY			
Prodn			
Oil	180 mtoe		
Solid	180 mtoe		Maintain share
Brown & Lignite	30 mtoe		
N. Gas	175-225 mtoe		Maintain share
Nuclear	160-200 Gwe capacity		
Hydro+ Geo	45 mtoe		
New+ Renew			3-fold increase
Imports			
Oil	540 mtoe		
Coal	40 mtoe		
R D&D	YES	YES	YES
ENERGY EFFICIENCY		PE/GDP growth ratio 0.7	FD/GNP ratio reduce by 25%
ELECTRICITY INPUT MIX		Coal + Nuclear =70-75% of inputs	Oil + Gas not more than 10% Nuclear = 40%
ENERGY PRICING		YES	YES
Resolution	17/12/74. OJC 153 1975	18/6/80. OJC 149 1980	Commission Proposal.28/5/85. COM 245(85)

Note: PE Primary Energy, FD Final Demand

programme of accelerated investment in the face of market risk must increase rather than diminish risk and increase costs to taxpayers. One thing is clear, the Commission's arguments were not based on either of the traditional economic arguments for intervention - to improve market efficiency or to prevent radical income redistribution.

Thirdly, there is a concern for the impact of higher oil prices on the balance of payments of what was a largely importing group of countries. This was seen rather vaguely as a cost of holding external debt in order to maintain the same value of imports. Unless adjustment was instantaneous it is clear that heavily import dependent countries must either increase their foreign indebtedness, reduce internal demand or allow currency depreciation to cope with changes in balances of payments. But it is not clear that coordinated action at a Community level would lead to a better outcome than might be expected where each country acted in its own interests according to the balance of its costs of being out of equilibrium and those of adjusting towards equilibrium.

Finally, and perhaps most significantly was the desire for a harmonised Common Market approach to the energy crisis. There was a concern that the different circumstances of the individual member countries would lead to "divergence in policies and priorities" and in consequence "wipe out the potential advantages of a unified common market". In contrast the potential benefits of harmonisation were seen to lie in an opportunity to spread risks - a kind of insurance argument.

From these basic preferences, the individual policies advocated by the Commission readily followed - a greater dependence on nuclear energy to promote supply security and satisfy a more flexible consumer demand for electricity; a heightened use of gas to satisfy current environmental anxieties and to provide a pipework network suitable for the eventual transmission of substitute gas alternatives, and a substantial R & D programme to overcome technical difficulties facing the development of less oily technologies for the longer term future. Sixteen specific targets were set by the Commission for the year 1985 (see Table 2), amongst which the most important were that import dependence was to be reduced to 40% (from 63% in 1973) while the share of oil in total energy supply was to be reduced to 38% (from 60% in 1973).

It was claimed that these targets were not arbitrary but were based on a consideration of relevant macroeconomic objectives (in particular a 4.5% p.a. economic growth rate), and of energy constraints. Most of these constraints seem designed to show why oil dependence could not be reduced further than 40%, for example the claim that substitution between fuels in demand was difficult, that there were commitments to support existing energy forms (e.g. coal) and that the outcome of long term investments in energy supply was uncertain. More to the point however, the Commission was vague on policy instruments - mentioning but not quantifying an oil tax option and elaborating only on Community expenditures designed to promote long term energy investments. However, R & D expenditure is notoriously unpredictable in its

effects, the most important of which may be extremely long term. Again bureaucrats are likely to make arbitrary judgments on the prospects for research programmes and these may increase the risks of misallocation of funds. Thus we have a problem of lack of policy instruments - too few in relation to the constraints - contrary to one elementary result of the theory of economic policy that there must be at least as many instruments as targets (4) for a determinate policy. Finally it was based on the rather naive assumption that the members would sacrifice their own interest in order to harmonize policies. Instead they vigorously promoted their own conflicting energy interests e.g. those of the coal industry in the U.K. and those of coal consumers and importers in Italy and so effectively prevented the adoption of the Commission's proposals for coal.

The Second Phase 1979-1985

In 1978/79, the constraints facing energy policy makers in Europe were suddenly tightened by the interruptions to oil supplies occasioned by the onset of the Iran/Iraq war. This however merely aggravated a situation of sharply increased world oil prices and greater than expected rates of energy demand in a period of relatively high economic growth. These events were taken by the Commission to illustrate Europe's extreme vulnerability to exogenous shocks in energy availability and to justify the call for fresh and more effective energy policies. The main features of the new policy which emerged as the Council Resolution of 18th June 1979 (5) were firstly a realisation of the unreality of certain of the 1974 objectives e.g. on oil import limitations, secondly an emphasis on the role of coal especially in electicity generating, so that nuclear power would not need to bear all the responsibility for displacing oil in this sector and thirdly a tightening of the energy consumption objective. The main innovation in the new policy was that the targets were now expressed in terms of ratios of growth in energy consumption to GDP growth rather than merely in terms of absolute consumption levels. For the rest the policy simply repeated, although in much less detail, the 1974 objectives but now extended forward to 1990 in place of 1985. The overriding importance of security of supplies was still emphasized on the basis of an argument that the costs of being out of stock were substantially greater than those of having an excess supply of an equivalent amount (6). The Commission made no attempt to qualify their objectives, even though the member states indicated substantial margins of uncertainty particularly in their forecasts of natural gas, nuclear availability and energy conservation.

Much of the 1979/80 policy emphasis on speeding up energy savings and stimulating coal production stem from a conviction that the mid 1980`s would witness renewed pressure on energy supplies as non OPEC oil sources began to contract. The price rises of 1978 were taken to indicate that adjustment times available were shorter than had been anticipated. What the Commission failed to appreciate was the cumulative impact of both 1973 and 1978

price movements on the level of energy demand - both through structural changes away from energy intensive activities and through substitution effects - which were already removing the need for massive supply expansion.

The Third Phase 1984/85

By 1984, the Commission itself conceded that namy of its targets (for 1990) were now no longer relevant (7). The Commission argued that most had been achieved early, that this showed the effectiveness of the 1980 policy, that however there was a danger of complacency and that new policies for the medium and long term were needed. It is clear however that the most significant changes in the European energy situation had occurred without Community involvement. On the supply side the rapid exploitation of North Sea Gas had by 1983 reduced import dependence by almost 30% Again the availability of natural gas imports had allowed a significant expansion of the share of gas in total energy supplies. The expansion of coal and nuclear power, heavily promoted by the Community, had on the other hand been much less than anticipated. On the demand side, energy efficiency whether measured in terms of primary energy or of final demand had improved much more significantly than envisaged by the Commission, and all sectors except transport witnessed an absolute decline in consumption between 1973 and 1982 (8). Finally, the balance of payments "constraint" was very much less than expected. By 1983 the cost of net oil imports into the EC (apart from France) was etimated by the IEA (9) to have fallen from $70.2 billion in 1980 to $41.9 billion in 1983 due to a combination of falling oil prices and reduced oil demand, neither of which had been anticipated by the Commission.

It may therefore seem somewhat surprising that the Commission advocates in its new policy proposals objectives which include further increases in energy efficiency of 25% by 1995, further reductions in the share of oil imports in total energy consumption, the maintenance of natural gas and coal market shares, an increased role for nuclear power and a tripling of the contributions from new and renewable energy sources. In order to justify this policy the Commission point to three types of risk to which European energy supplies have become vulnerable - the growing competitive demands of third world countries for energy supplies, the narrow margins which continue to exist between supply and demand in Europe and finally uncertainties about energy efficiency trends when prices are falling. It is not clear however why the extra demands from the third world should necessitate policy actions - they may simply reflect the fact that the more energy intensive activities as for example refineries and petrochemicals are diverting to these locations in response to comparative advantage factors, resulting in a lowering of the demand for energy in Europe If the marginal productivity of energy is greater outside of Europe then, on efficiency grounds, everyone is potentially better off by a reallocation of energy resources away from Europe, and actually better off if trade restrictions are removed. The harmful social effects of the closure of energy inefficient industries

might be dealt with better through general social security provision than through special energy policies. The other two arguments indicate that there remains a positive social cost associated with import dependence. This cost must however surely be lower now that the rate of change of oil prices is negative than in previous years, as the following consideration demonstrates. Let p be the current price of oil, r the expected 'shortage' premium payable on imports, and x the current level of oil demand. For simplicity assume that p + r is payable whenever demand exceeds x. Then it can be shown (10) that the optimal import dependency is limited to p/(p+r). It is evident that as r falls, the optimal level of import dependency increases. The policy implication is that as shortage penalties fall, import dependency targets ought to be relaxed. Indeed the recent behaviour of commercial oil stockholders indicates some realisation of a decline in these costs. Stocks of oil held privately declined worldwide from 92 days to 73 days between 1980 and 1985 (10). On the other hand governments both in Europe and elsewhere seem to have ignored these trends and have actually increased their holdings from 6 days to 22 days of current consumption in the same period.

The Success of Policy

We may dispose of one popular criticism of European energy policy at the outset - namely that since the budgetary resources devoted to energy policy are small, significant effects cannot be expected. It is not the absolute size of the resources however but their size in relation to the incentive needed to change behaviour which is important. This may be quite small in relation to simple conservation projects where the present value of projected cashflows is close to zero. As long as the financial incentive is greater than (0-PV project), an impact on behaviour might be expected. Where projects are longer term and the risk premium is high however, the incentive must be greater, and lack of budgetary resources may have more significant consequences.

"Success" may be judged in two ways - firstly in relation to the rdeclared objectives of policy and secondly in relation to its general economic effects in terms of efficiency and equity. Although it may be very difficult to assess whether broad objectives have been realised it is possible to test the detailed targets which the Commission has derived from its objectives. It is indeed rather surprising that the Commission should have been so explicit about its targets, although the availability of scapegoats in the form of national governments suggests that the incentive to fudge objectives may not have been great here. In any case, as Table 3 shows, the Commission`s 1974 targets set for 1985 came nowhere near to being achieved. Gross energy consumption was overestimated by 34%, indigenous production by 30% and net imports by 40%. The most outstanding failures were in regard to oil consumption, net imports, and nuclear electricity generation and the targetted increase in new and renewable energy contribution did not occur. On the other hand, the Commission was not alone in making projection errors on quantities and it did rather better in terms of its share targets. Here its projections of net import dependency were almost fulfilled and the oil import ratio target was over-fulfilled. Nevertheless the Commission had been far too optimistic about the role of nuclear and in particular had not perceived the political and economic risks in the rapid exploitation of nuclear power.

Granted that the Community did not achieve its absolute targets it may be that the Community`s policies made the member countries better off than they otherwise would have been. We will examine three areas - import dependency, gdp energy intensity and price harmonisation. One way of testing whether belonging to the Community made any difference as regards import dependence is to relate changes in import dependence across a wide variety of countries to membership of the E.C. This procedure allows for the common policies pursued by wider groupings e.g. the IEA which might also have been expected to reduce import dependence. In fact the IEA grouping is a useful `universe` since its members are relatively homogenous in terms of economic structure. The hypothesis that the EEC has had a significant impact on import

TABLE 3

EUROPEAN ENERGY POLICY
1974 OBJECTIVES AND ACHIEVEMENTS

	1973 Actual	1985 Objective	1985 £ Estimate	% Difference
		mtoe		
Gross Energy Consumption	973	1450	958	-33.9
Solid Fuels	222	250	205	-18.0
Oil (inc Bunker)	593	695	437	-37.1
Gas	118	270	182	-32.4
Primary Electricity	14	190	120	-36.8
Other	27	45	13	-71.1
Indigenous Products	365	800	559	-30.1
Solid Fuels	200	210	157	-25.2
Oil	12	180	146	-18.9
Natural Gas	114	175	123	-29.7
Nuclear	14	190	120	-36.8
Others	25	45	13	-71.1
Net Imports	613	650	392	-39.7
Solids	19	40	46	+15.0
Oil	589	515	284	-44.9
Natural Gas	3	95	61	-35.8
Electricity	-	-	2	-
Other	2	-	-	-
Ratios				
Net Import/GEC	63%	40%	41%	+1
Oil Share in Supply	60%	40%	45%	+5
Oil Imports/Oil Supply	98%	75%	66%	-9
Solid share in Supply	23%	>15%	21%	?
N.Gas share in Supply	2%	25%	19%	-6
Nuclear/Electricity Supply	£%	50%	30%	-20

£ Energy in Europe No.2. August 1985. European Communities

NB Differences between consumption and the sum of indigenous production and net imports are due to stock changes.

dependence can be tested by estimating the regression relationship between import dependence and a dummy variable representing membership of the Community. Using IEA data for the period 1973 to 1983 (12), I estimated a linear rrelationship by O.L.S. between the rate of growth of the oil import share of total primary energy requirements (y) of each IEA

member country and membership of the EEC (EEC). The IEA data of course excludes France, and both the UK and Norway were also excluded since they are important oil producers and exporters (12). The following results were obtained.

$$y = -2.5273 - 0.8102\ EEC \qquad R^2 = 0.049$$
$$(-4.48)\ (-0.93) \qquad \bar{R}^2 = 0$$

n = 20 (omitting Norway and the United Kingdom and excluding France)

t ratios in parenthesis.

These results give a very poor fit to the data. They do not support the hypothesis that membership of the Community significantly affected dependence on oil imports in the period. Including the U.K. and Norway has the effect of reducing the magnitude of the EEC effect but does not improve its significance.

Much of the Community`s efforts to improve energy intensity were through measures designed to encourage investment in energy saving capital. A test of effectiveness is obtained by rexamining the relationship between Primary Energy/GDP ratios for the IEA countries. However here the ratios might well also be affected by regional factors (similarities of climate, culture, etc.) and a dummy was incorporated into the analysis to allow for a European effect. The hypothesis tested was that the percentage changes in TPER/GDP ratios between 1973 and 1983 (y) were significantly affected by EEC membership (EEC) as well as by being in geographic Europe (Europe), and the results were:

$$y = 0.85 - 2.222\ EEC + 0.75\ Europe \qquad R^2 = 0.313$$
$$(-1.36)(-2.75) \quad (0.85) \qquad \bar{R}^2 = 0.237$$

Again the explanatory power of the equation is not high. This time, however, belonging to the Community seems to have had a desirable negative impact on energy intensities. The contrast is most marked with the rest of Europe perhaps because both the U.S. and Japan had a relatively good record of efficiency improvements. Most of this change would appear to have been due to structural changes in the EEC countries and the movement from heavy industry in particular, a movement unanticipated and unwanted by the Community.

Testing the third objective - greater harmonisation of prices for end users is more difficult. Here we are trying to find whether, over time, the dispersion of prices has decreased more in the EEC than in other industrialised countries. Regression analaysis is inappropriate here since we have essentially only two observations. Instead, we compute the change in the standard deviation of end user prices for two products - gasoline and electricity sales to industry, and simply compare the changes for the two sub-samples. From Table 4 we see that for gasoline the standard deviation of prices, including taxes, in EEC countries was lower than that in the non EEC group both in 1978 and in 1983. However there was little change within the period

TABLE 4

COMPARISON OF PRICE VARIATION
EEC AND NON EEC COUNTRIES IN IEA

Standard Deviation of Prices in $US

	Gasoline per litre			Electricity to Industry per kwt		
	1978	1983	Difference	1978	1983	Difference
EEC	0.0825	0.0819	-0.0004	0.0086	0.0108	+0.0072
Non EEC	0.1506	0.1306	-0.0200	0.0155	0.0258	+0.0103

Source: IEA Energy Prices and Taxes 4th Quarter 1984.

in the EEC price whilst the non EEC group showed a reduction in variance. In the case of electricity, the results are different - the variance of prices grew, but less in the EEC group than in the non EEC group. This result may be due more to the efforts of particular industrial consumers to achieve comparable prices, at a local level than to action by the Community. Data is not available for the period 1973 to 1978 so that we cannot conclude that the EEC harmonisation policy has not worked. However there is no evidence of significantly diminished variance of prices between members in recent years.

Conclusion

Other aspects of EEC energy policy are not susceptible to testing because of their long term nature. Thus the impact of policies designed to improve the availability of data to decision makers will take time to show. Again, the research, development and demonstration programmes on which the Community has spent much of it energy budgets will not bear fruit for many years. It is likely that these will prove to be the Community`s most significant contributions to efficient energy provision.

The Community has concerned itself largely with two objectives of policy - a desire to ensure sufficient energy supplies to enable the member states to produce a growing level of GDP and a desire to achieve as great a degree of energy self sufficiency as possible. In regard to the first objective it has not paid enough attention to the functioning of the energy market and prices in adjusting demands and stimulating supplies. Its policies to secure greater import independence have not been sensitive to changes in oil prices. Such policies are likely to come under increasing pressure as the economic justification for oil stockpiles becomes less.

Instead of attempting to prescribe detailed targets for each sector of the energy market, the Community might be wiser to pursue an energy policy more closely linked with concerns of efficiency and equity. One such area would be the structure of the energy markets themselves many of which exhibit significant monopolistic characteristics especially in regard to the provision of gas and electricty. The Commission might also set its sights on the attainment of lower cost supplies by efforts towards establishing freer trade in energy - the trade in gas is a good example. Coal subsidies, formal and informal links between electricity producers and coal suppliers, might well be eliminated in the interests of efficiency. Existing efforts in the information area - collecting and disseminating data on price movements - are justified to some extent by external economies, as are its attempts to promote RD and D projects and these might well be given more emphasis in future policy.

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9. Energy Policies and Programmes of IEA Countries 1984 Review (1985) OECD/IEA Paris. p.14. Net Import costs for the 9 members of the EC excluding France were

	1973	1980	1983
	$billion (US current prices)		
EC	13.0	70.2	41.9
OECD	33.8	263.8	176.6

The overall increase between 1973 and 1983 of 3.2 times for for the EC is substantially less than that for the OECD as a whole (5.2 times).

10. The expected cost of oil is

$$C = px+(p+r)\sum_{q=x}^{\infty}(q-x)\ \text{prob}\ (q)$$

where q is actual demand.
Minimum costs are

$$\frac{\partial c}{\partial x} = p-(p+r)\ \text{prob}\ (x+1)\ \ldots\ = 0$$

$$= p-(p+r)\sum_{q=x}^{\infty}\text{prob}\ (q) \quad = 0$$

i.e. where $\sum_{q=x}^{\infty}\text{prob}\ (q) = p/p+r$

Now $\sum_{q=x}^{\infty}\text{prob}\ (q)$ is the probability of being dependent on high cost imports. It is the optimum level of import dependence whenever a common expected price p is paid both for domestic and imported oil.

11. Oil Market Report. International Energy Agency. Nov 1985.
12. The IEA has the following member countries - Canada, USA,

Japan, Australia, New Zealand, Austria, Belgium, Denmark, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey and the UK. Data is taken from "Energy Policies and Programmes of IEA Countries - 1984 Review". IEA (1985). Annex VI.