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CMEA ENERGY OUTLOOK AND CONSEQUENCES FOR THE WEST, 1980-1990

Note by the Secretary General

The Council is invited to take note of this document which analyses the CMEA energy outlook and its consequences for the West over the timespan 1980-1990.

2. The report was prepared by the Economic Committee as a result of a meeting with experts from the capitals.

(Signed) Joseph M A.H. LUNS

NATO,
Brussels.

This document includes: 1 Annex

CMEA ENERGY OUTLOOK AND CONSEQUENCES FOR THE WEST, 1980-1990

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CMEA ENERGY OUTLOOK AND CONSEQUENCES FOR THE WEST, 1980-1990

I. SUMMARY

Energy production in the CMEA countries will probably increase more slowly throughout the 1980s than energy consumption. The CMEA area as a whole will thus go from a position of being a net energy exporter, principally of Soviet oil, to one where supply and demand are approximately in balance. Because of uncertainties regarding Soviet oil production, however, coupled with rising CMEA demand, the CMEA nations as a group may well become net oil importers before the end of the decade, and so may compete with Western nations on world oil markets. Moreover, partially as a result of declining oil availability and inability to switch over rapidly to other sources of energy, the CMEA economies may experience energy-related growth constraints and competing energy investment priorities. Soviet gas production, expanding rapidly, will probably become an increasingly important source of hard-currency earnings from sales to the West during the decade, and to some extent will be used to make up for declines in oil availability throughout the CMEA area.

2. Western nations are thus faced with the potential for increasing CMEA interest in the oil-producing areas of the world and potentially increasing West European dependency on Soviet exports of natural gas. To minimize the effects of possible CMEA competition on world oil markets, Western nations might consider strategies such as further restraining their own oil use. To prevent economic and strategic vulnerability from partial West European dependence on Soviet gas, West European nations can take such steps as encouraging conservation and substitution of other energy sources for gas, and diversifying their national sources of energy supply to the fullest extent.

II. INTRODUCTION: CMEA ENERGY IN GLOBAL CONTEXT

3. The CMEA area(1) is a net energy exporter, thanks primarily to the USSR's position as the world's leading oil producer nation. Total CMEA energy production in 1979 was approximately equal to that of the OPEC countries(2), and roughly two-thirds that of the OECD, as the adjoining Diagram I shows. Approximate CMEA energy consumption, on the other hand, was some 6% less than production, as indicated in Diagram II.

4. Within the CMEA, the Soviet Union, with three-quarters of the area's GNP, is by far the largest energy producer, accounting for 80% of total energy output. In 1979, the USSR extracted 98% of all CMEA oil, 88% of its natural gas, and two-thirds of its hard coal. Poland mined another 25% of CMEA's hard coal, and East Germany and Czechoslovakia, over half of its lignite; largely because of these items, the three countries together produced over 15% of all CMEA energy. Hard coal and lignite provide the basis for most energy consumption in energy-short Eastern Europe. Diagram V shows current energy production and consumption patterns in the USSR and Eastern Europe.

5. Having met most of their growing energy needs in the 1970s through reliance on cheap and relatively plentiful Soviet oil, the CMEA economies will probably obtain most of their additional energy in the 1980s from Soviet natural gas, because of the rising production cost and lessening availability of Soviet oil. In addition, in the latter part of the decade in particular, nuclear energy projects currently underway should begin to make a more noticeable contribution to fulfilment of total energy requirements. Plausible energy production and consumption patterns within CMEA and other groups of nations in 1990 are shown in Diagrams III and IV.

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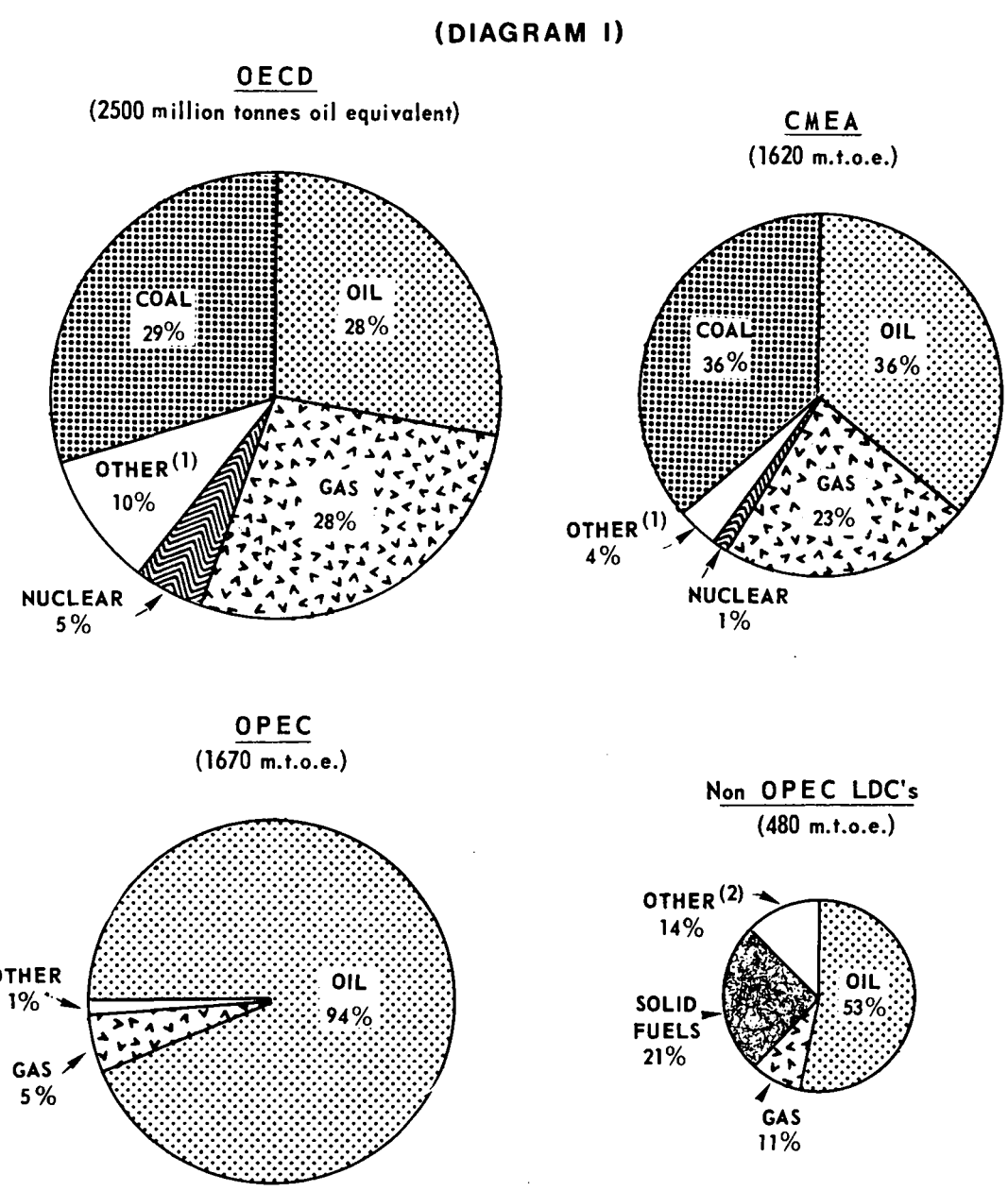
(1) The Council for Mutual Economic Assistance, comprising Bulgaria, Cuba, Czechoslovakia, the German Democratic Republic, Hungary, Mongolia, Poland, Romania, the Union of Soviet Socialist Republics and Vietnam.
(2) For explanation of abbreviations used in this paper, see Annex.

WORLD ENERGY PRODUCTION 1979 BY COUNTRY GROUPS

(DIAGRAM I)

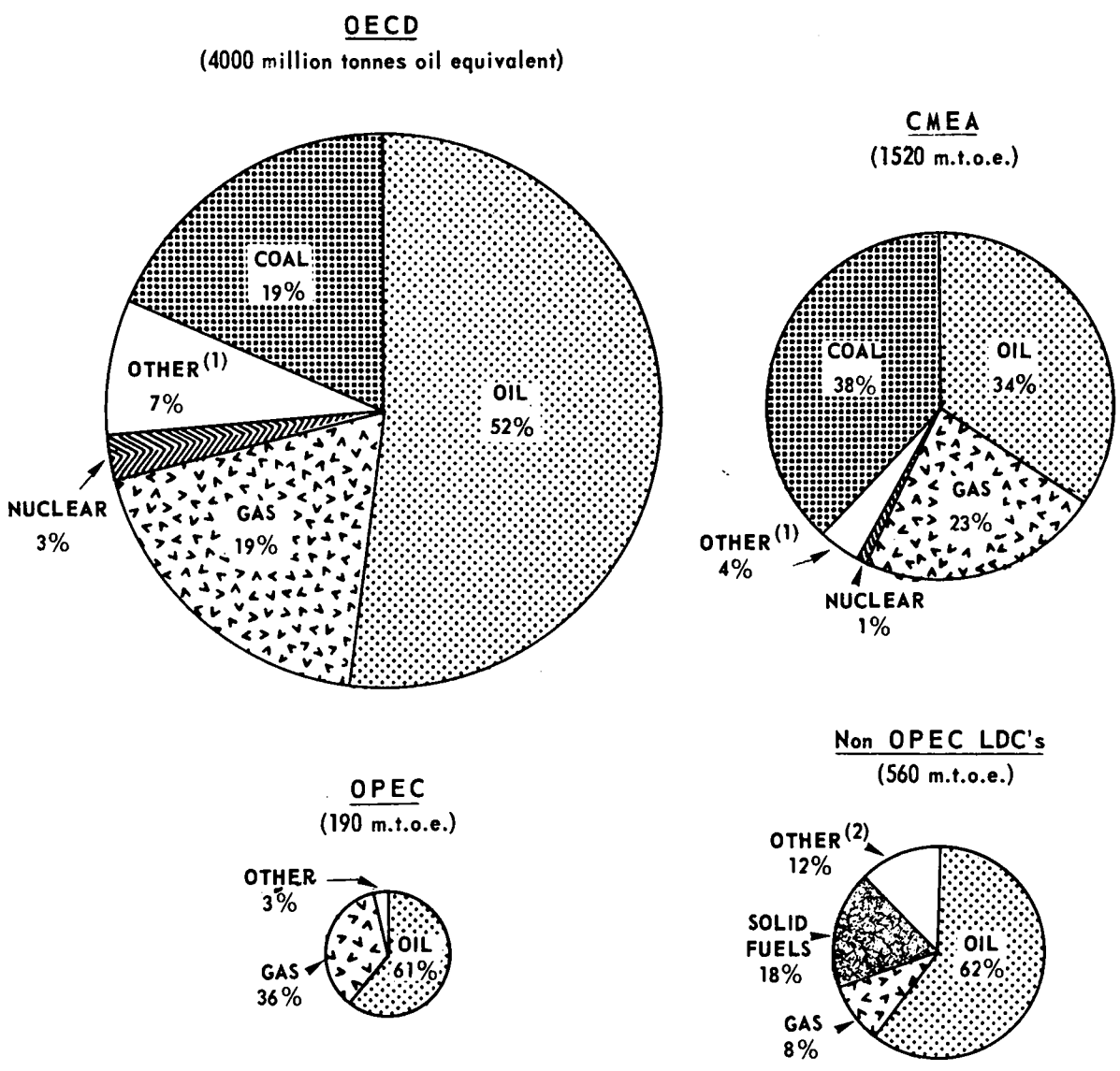


1) *INCLUDING HYDROPOWER*
2) *INCLUDING NUCLEAR, GEOTHERMAL AND HYDROPOWER*

SOURCES : CIA, IEA

WORLD ENERGY CONSUMPTION 1979 BY COUNTRY GROUPS

(DIAGRAM II)

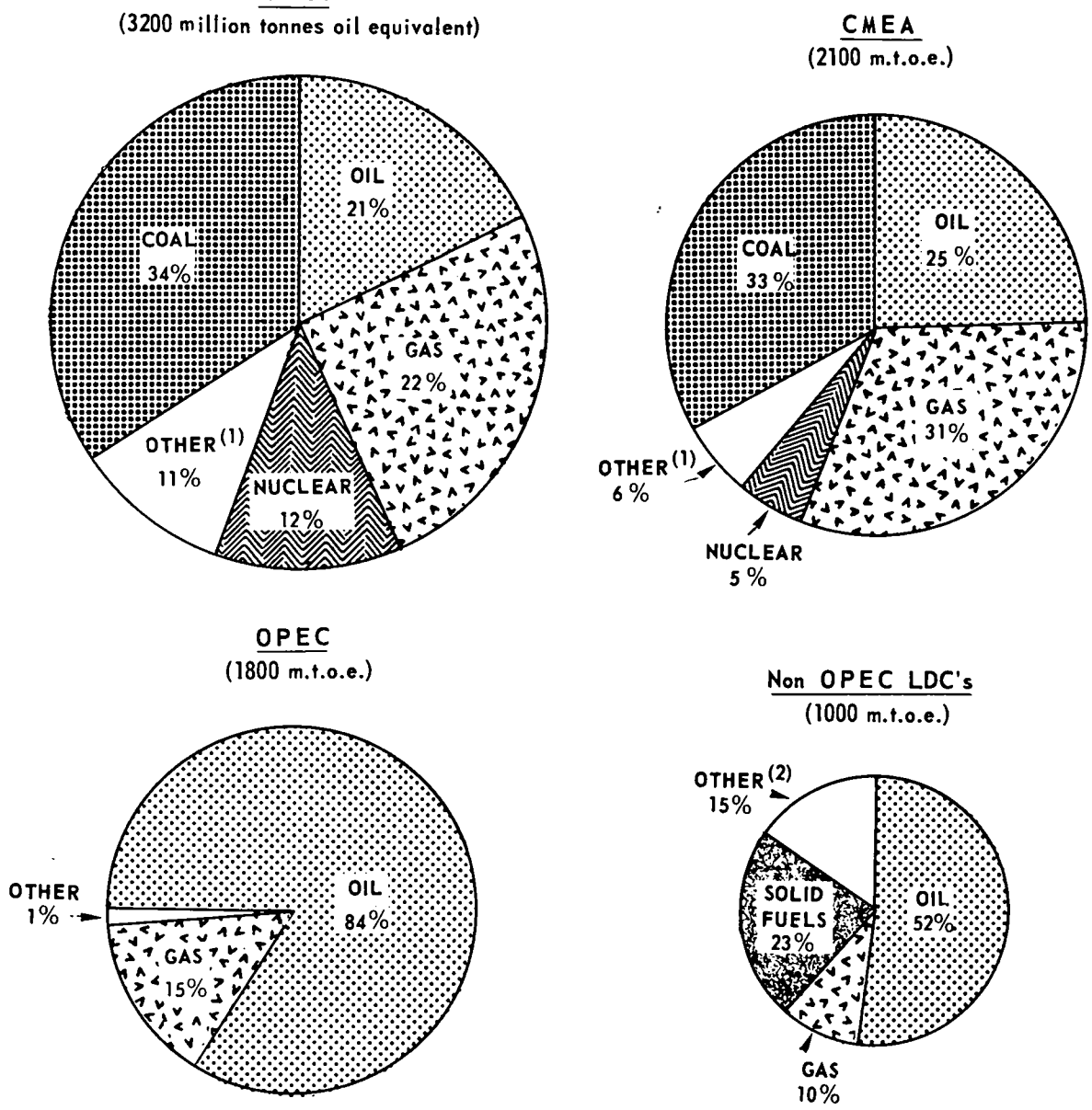


1) *INCLUDING HYDROPOWER*
2) *INCLUDING NUCLEAR, GEOTHERMAL AND HYDROPOWER*

SOURCES : IEA, NATO COLLOQUIUM 1981

PLAUSIBLE WORLD ENERGY PRODUCTION 1990 BY COUNTRY GROUPS

(DIAGRAM III)

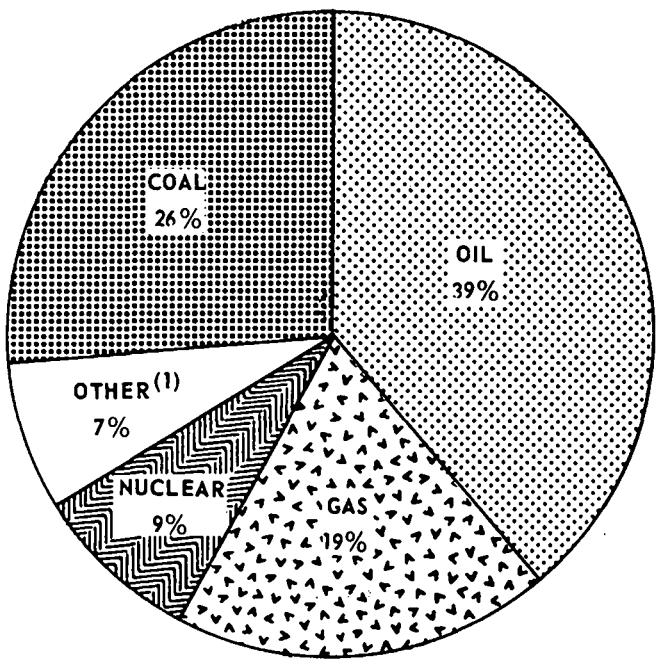


1) *INCLUDING HYDROPOWER*
2) *INCLUDING NUCLEAR, GEOTHERMAL AND HYDROPOWER*

SOURCES : IEA, NATO COLLOQUIUM 1981

PLAUSIBLE WORLD ENERGY CONSUMPTION 1990 BY COUNTRY GROUPS

(DIAGRAM IV)



1) *INCLUDING HYDROPOWER*

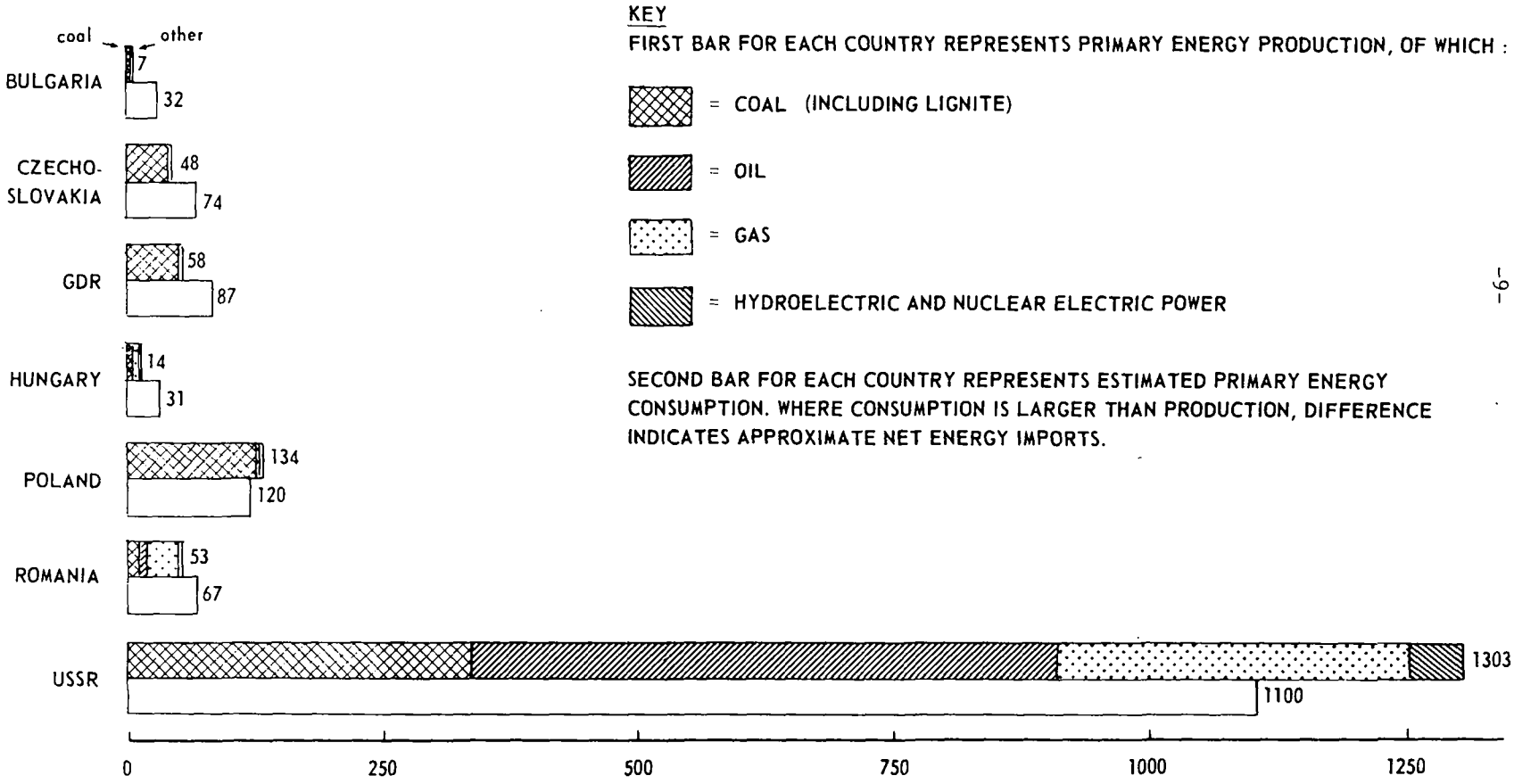
2) *INCLUDING NUCLEAR, GEOTHERMAL AND HYDROPOWER*

SOURCES : IEA, NATO COLLOQUIUM 1981

THE ENERGY BALANCE IN THE USSR AND EASTERN EUROPE 1979

(MILLION TONNES OIL EQUIVALENT)

(Diagram V)



KEY

FIRST BAR FOR EACH COUNTRY REPRESENTS PRIMARY ENERGY PRODUCTION, OF WHICH :

= COAL (INCLUDING LIGNITE)

= OIL

= GAS

= HYDROELECTRIC AND NUCLEAR ELECTRIC POWER

SECOND BAR FOR EACH COUNTRY REPRESENTS ESTIMATED PRIMARY ENERGY CONSUMPTION. WHERE CONSUMPTION IS LARGER THAN PRODUCTION, DIFFERENCE INDICATES APPROXIMATE NET ENERGY IMPORTS.

III. CMEA ENERGY SUPPLY AND DEMAND, 1980-1990

(a) Supply

6. Soviet oil production, which currently accounts for 20% of world output, and is the only significant source of supply among the CMEA nations, may range between 500 and 600 million tonnes by 1985, as opposed to a Five-Year-Plan target of 620-645 million tonnes(1). The shortfall is expected to stem from the inability of the USSR to develop new, smaller fields, mostly in Siberia, rapidly enough to match the anticipated decline in output from older, larger fields. The USSR will probably not be able to achieve its ambitious programme of exploratory drilling for new wells because of a lack of sufficient, reliable equipment and settled, trained labour. In the short term, the most critical equipment constraints on Soviet oil production will be submersible pumps and gas lift mechanisms for enhanced recovery from older wells. In the longer term, the USSR may be unable to produce enough deep-drilling equipment, notably rotary drills, needed for oil exploration, and steel drill pipe of adequate quality. From the labour viewpoint, the USSR faces the problem of building up a skilled labour force in the remote Siberian regions where new drilling must be conducted(2). As a result of the cumulative effect of these problems, Soviet oil production by 1990 may have fallen to 525-555 million tonnes, compared with an official Soviet forecast of 620-700 million tonnes.

7. Soviet production of natural gas, at present at 435 billion m^3 annually (1980) and accounting for 25% of world output, is expected to attain its goal of 600-640 billion m^3 annually (500-530 million tonnes oil equivalent) by 1985, providing the USSR can install the required amounts of pipe and compressors. Total Soviet pipe production (all sizes) is about 18 million tonnes a year (mty); it exports about 0.5 mty and has imported about 3 mty in recent years. Imports from the West meet around 15% of its overall needs for pipe. But imports from the West are chiefly Large Diameter Pipe (LDP) for natural gas and hence meet a much higher proportion (about 50%) of its trunk line needs. The Soviets will need to lay 50,000 km of LDP during 1981-1985: about 30,000 km will be for trunk lines; but the remaining 20,000 km (for minor lines and link-ups in the grid system) will also have an important effect on the level of gas output. For such reasons Soviet gas output in 1985 is likely to be towards the lower end of their target range. It will also have to install over 100 compressor stations by 1985, with a total combined power of 25,000 MW, and to build adequate electrical power transmission systems to run electrical drilling equipment in remote areas, although one proposal for electricity supply for oil and gas fields is locally generated power from small gas driven stations. By 1990, none the less, most Western experts put Soviet natural gas output at around 750 billion m^3 annually, or 625 million tonnes oil equivalent, and Soviet projections aim as high as 820 billion m^3. Romanian gas production, currently at around 28 billion m^3 annually (1980) and the only other significant CMEA source outside the USSR is, in the absence of new finds, likely to fall slowly throughout the decade, although the plan for 1985 is for 33.5 billion m^3 which, the French experts considered, would be reached.

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(1) Projections of future Soviet oil production vary significantly among experts, even within governments: such estimates in this document must be viewed as a range of possibilities and do not necessarily reflect official member government projections. The 500-600 million tonnes stem from US and UK estimates. France, Germany and other countries estimate that the USSR will probably reach the lower end of its five-year oil production target, or 620 million tonnes a year. American and British estimates of Soviet oil production in the 1980s would have potentially the most far-reaching consequences for the West, and so are chosen for the sake of analysis.

(2) British authorities estimate that a total additional settled labour force of possibly 200 thousand, or at least twice the current number, is required.

8. CMEA hard coal production is dominated by the USSR, one of the world's leading producers, which mines around 550 million tonnes a year, and by Poland, the world's fourth largest producer, which extracted over 200 million tonnes in 1979(1). CMEA hard coal output is not expected to grow significantly in the first half of the decade at least, because of lasting disruptions arising from the Polish strikes(2), and because of the USSR's slowness, largely as a result of budgetary constraints, in developing vast coal deposits located near Kuznetsk and Ekibastuz(3), to replace rapidly declining reserves in the Donets Basin(4). By 1990, however, Polish hard coal production is planned to exceed 250 million tonnes, and Soviet output may also have increased by 50 million tonnes annually, thus providing the CMEA area with at least an additional 100 million tonnes of hard coal each year, or the energy equivalent of roughly 70 million tonnes of oil. Over the next 20 years, the USSR will press toward developing high-energy liquefied coal, which might be easily transported over the growing pipeline network in the USSR and Eastern Europe; to do so, however, it appears to be counting on imports of coal-refining technology from the West.

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(1) Of which 41 million tonnes was exported by Poland to the West in 1979 for earnings of over $1.1 billion; as a result of the strikes, production fell in 1980 to 193 million tonnes, and is expected by Western experts to be in the range 150-160 million tonnes in 1981, of which some eight million tonnes may be exported to the West. The decline in the Polish production figure may be exaggerated, however, by the fact that former production figures included 15-20% slag; if expected improvements are made in the quality of the purity of the coal delivered, less weight will be needed for the same heating value.

(2) Re-establishment of a 200-million tonne production level in Poland by 1985 is considered unlikely because of a current lack of investment and equipment maintenance, and because of the unwillingness of miners to work extra shifts.

(3) The Kuznetsk Basin, whose output was 150 million tonnes of hard coal in 1980, is claimed by Soviet writers to have enough reserves to support production of 500 million tonnes a year; nonetheless, despite the fact that favourable geological conditions make the cost of extracting Kuznetsk coal relatively low, enabling high transport costs to the west to be absorbed, no new mines have been opened in the area since 1968. Ekibastuz coal output, which is subbituminous, and currently at 66 million tonnes a year, is to reach 85 million tonnes by 1985 and 150 million tonnes sometime in the 1990's; much of the production will be used to fuel four giant mineside power stations of 4,000 MW each, scheduled for completion in the 1980s.

(4) The share of coal in the Soviet fuels balance declined from 66% in 1950 to 25% in 1980. Although Soviet policy is to raise the coal share to around 30%, the time lag required to expand mining capacity and to provide the necessary infrastructure, especially rail facilities, will retard the re-orientation of the Soviet economy towards coal. (See Solid Fuels: Resources, Production, and Demand in the 1980s, Theodore Shabad, NATO 1981 Colloquium.)

9. Lignite, or brown coal, although low in calorific content, will continue to play a relatively important rôle in the 1980s in providing energy for the economies of Poland, the GDR, Czechoslovakia, and to a certain extent, of the USSR. Poland will use lignite increasingly in electric power stations to save exportable hard coal resources. East Germany, the largest lignite producer in the CMEA area, with an annual output of 260 million tonnes, plans to reach a yearly production level of 300 million tonnes before the end of the decade, but Czechoslovakia's earlier plans to raise its own production to around 120 million tonnes have been abandoned in favour of retaining the current level of some 100 million tonnes; both countries use lignite as their principal energy source. The USSR has an ambitious programme which will begin to be implemented in the 1980s, for the generation of large amounts of electricity from stations situated near extensive lignite deposits in the Kansk-Achinsk basin. Altogether, by 1990 the CMEA countries may be mining an additional 150 million tonnes of lignite annually, or the heating equivalent of around 30 million tonnes of oil.

10. After slow progress until the early 1970s, nuclear power generation in the USSR has more than trebled since 1975, reaching 71 billion kWh in 1980, or 5.5% of total electricity output. It is planned that output should treble again in 1985, reaching 15% of all electricity generated and the heating equivalent of some 70 million tonnes of oil. The principal constraint on Soviet nuclear power development in the first half of the 1980s will be a lack of capacity to manufacture large reactors(1). It is thus doubtful whether the USSR can attain its goal of 37-38,000 MW installed nuclear electricity generating capacity by 1985, up from 13,000 MW in 1980, and hence its goal for nuclear electricity generation(2). Similarly, the planned installation of 37,000 MW of nuclear capacity by 1990 to serve Eastern Europe will probably also be delayed, with perhaps only 20,000 MW in place by that date. Altogether, nuclear generating capacity in the CMEA area will probably amount to no more than 80,000 MW by 1990, or perhaps one-fifth of total power capacity, with the potential for producing an amount of electricity equivalent to around 70 million tonnes of oil. Stated otherwise, nuclear-generated electricity may account for around 5% of all primary energy produced in the CMEA area in 1990, and one-fourth of all electricity generated.

11. The potential for the expansion of hydroelectric power within the USSR remains greatest in East Siberia, on the Angara and Yenisei rivers, where development has been progressing since the 1950s. By the end of 1980, over 17,000 MW of capacity had been installed in the region, where the ultimate plan, into the twenty-first century, is to have 60,000 MW of capacity(3). The Siberian hydroelectric stations are situated too far to the east to contribute electricity to the western regions of the USSR and to Eastern Europe, however, where the hydroelectric potential is already being fully exploited(4). Altogether, total CMEA hydroelectric output will probably be expanded in the 1980s by no more than 100 billion kWh, or around 23 million tonnes of oil equivalent, and will continue to provide around 4% of all CMEA primary energy throughout the decade.

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(1) Atommash, the reactor manufacturing complex built with the aid of Western machinery and technology at Volgodonsk in southern RSFSR to meet this need, is now projected to turn out only seven 1,000 MW reactors during the entire 1981-1985 period, as opposed to an originally planned production schedule of 6 or 7 reactors a year over the same period; the complex is to reach its full capacity of 8 reactors a year only in 1990.

(2) See Table I, Appendix. US authorities estimate that the Soviet nuclear power programme may attain about 35,000 MW by 1986-1987.

(3) Total installed hydro capacity in the USSR as a whole was 50,000 MW in 1979.

(4) Research is currently underway in the USSR to overcome the loss problems associated with long-distance electrical transmission.

12. Sources of energy other than those already mentioned will contribute little to total CMEA primary supplies in the 1980s. Experimental work will continue on developing economic methods for the extraction of oil from shale, which is currently used to fuel two large thermal power stations in Estonia. Peat, traditionally used as a power station fuel in Central RSFSR, will increasingly be set aside for agricultural uses, in the face of declining reserves. Other than hydropower, there appears to be little interest among the CMEA nations in developing renewable energy sources, such as biomass, solar, and wind-generated energy, although the last has been applied to pumping and electricity generation in agriculture since the 1950s. Prevailing high winds in Siberia might eventually make local use of windmills feasible.

(b) Demand

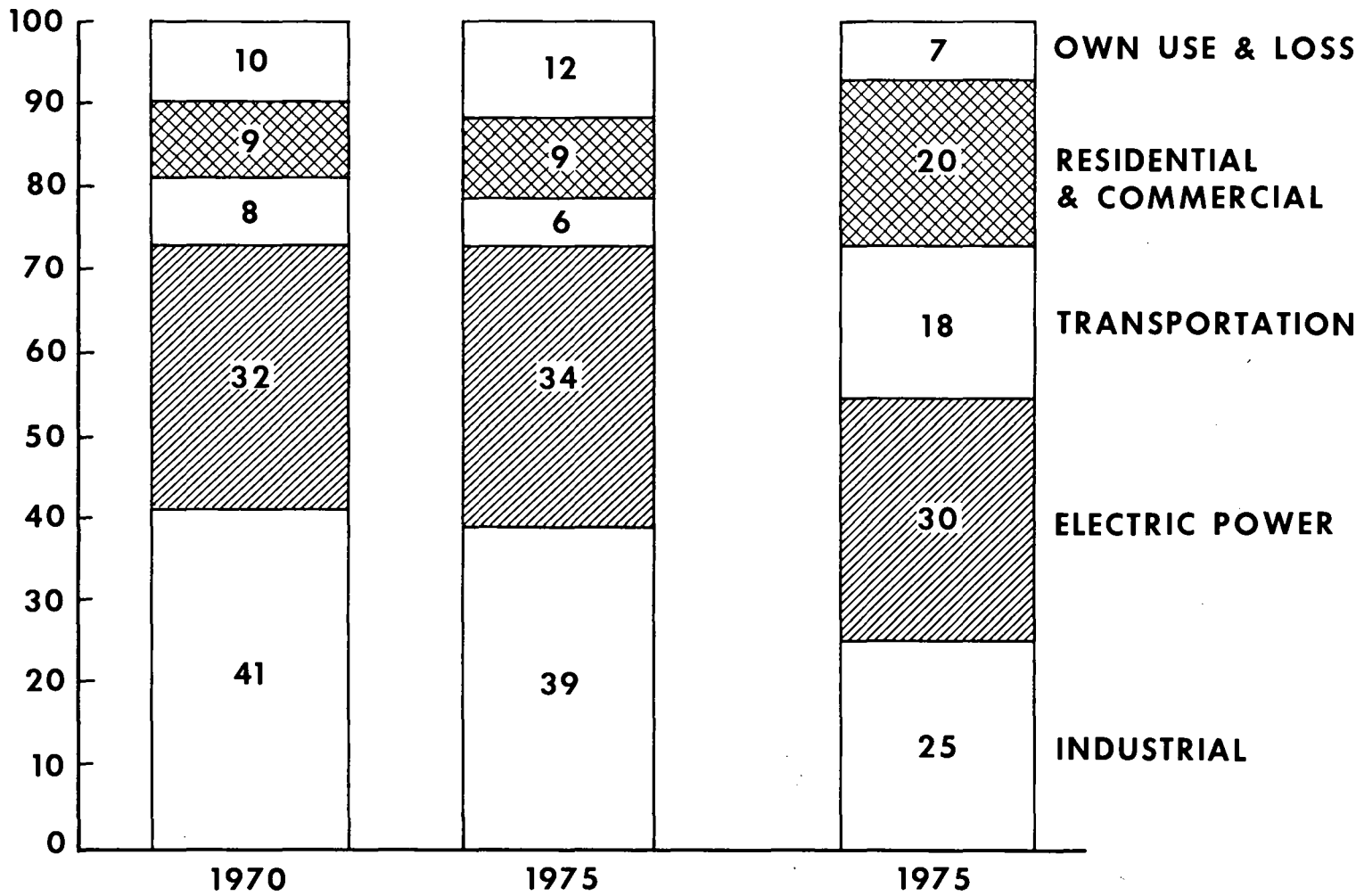
13. Currently estimated at around 440 million tonnes a year, Soviet demand for oil may rise to 483 million tonnes by the middle of the decade and, in the face of probably restricted domestic oil availability, to slightly over 500 million tonnes by 1990(1). Eastern European demand for oil, at present around 100 million tonnes a year, will probably be allowed to rise to no more than 115 million tonnes by 1985 and 120 million tonnes by the end of the decade, depending on the area's foreign exchange position(2). Cuba's oil-run economy is likely to continue to absorb some 10 million tonnes of Soviet oil(3) annually through 1985, if it is available, but may be forced to import up to 15 million tonnes a year from world markets by 1990. Altogether, if Soviet oil production should drop as low as 550 million tonnes by 1985 and 525 million tonnes by 1990, the CMEA nations might, if they can afford it, import around 50 million tonnes of oil annually from world markets by the middle of the decade and slightly over 100 million tonnes by 1990.

14. It is doubtful, however, that the USSR will allow its oil production to fall below its own anticipated domestic needs and the most essential requirements of its CMEA partners. Thus, it will probably invest heavily if necessary to obtain output from new wells, principally in Siberia, to offset declines in older fields. At the same time, it will continue trying to reduce industrial consumption of energy, and oil in particular, which remains relatively high by Western standards(4). The prospects for conservation in industrial energy usage will be limited, however, by entrenched wasteful practices, the age of much of the country's industrial machinery, and the absence of market forces; the amount of energy of all types which can be saved through industrial conservation measures will probably be no more than 5-7% of the USSR's anticipated level of energy consumption in 1990, or the equivalent of around 100 million tonnes of oil.

(1) Assuming an annual rate of real economic growth of 1-2%.
(2) This would allow for an average rate of economic growth of around 2% in the area as a whole over the decade, assuming that an increase in oil consumption of 0.8-0.9% is needed for each percentage increase in total economic output.
(3) In fact, this oil is supplied by Venezuela through the operation of switch deals with the USSR.
(4) See Diagram VI. In line with these efforts, the price of oil to Soviet industrial users will be increased 40-50% beginning 1st January 1982.

(Diagram VI)

SHARE OF CONSUMING SECTORS OF ENERGY USE IN THE U.S.S.R. AND EUROPE



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15. As opposed to the oil projections for the CMEA economies in the 1980's, natural gas should be in abundant supply to meet anticipated demand. Exports of gas to the West will probably take first priority in demand, in order to make up for declining hard-currency receipts from oil(1), and could amount to around 70 billion m^3 by the end of the decade, as opposed to 26 billion m^3 in 1980(2). After exporting a probable minimum of 50 billion m^3 to Eastern Europe and Yugoslavia(3), in 1990 the USSR will thus have some 630 billion m^3 (525 million tonnes oil equivalent) for its own domestic consumption, as opposed to around 375 billion m^3 in 1980. The increase in gas availability, amounting to the energy equivalent of over 200 million tonnes of oil, will give the USSR an effective means of meeting new energy demands, and, to the extent that the cost of equipment changeover is not prohibitive, a substitute for oil as a fuel and as feedstock for the petrochemical industry.

16. Growth in CMEA demand for other types of energy in the 1980's is expected to outpace growth in domestic energy output, in that planned production levels will probably not be met. On the grounds of economic feasibility, it is unlikely that Soviet gas will be substituted to any significant extent to power machinery and electrical generators using coal as their heat source, even in the face of coal production shortfalls. Beyond the 1980's, growth in CMEA energy demand is to be met almost exclusively by increases in coal and nuclear power output.

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(1) The importance of the USSR of gas exports was noted in particular by Jonathan P. Stern at the NATO 1981 Colloquium: "When talking about CMEA gas demand it is therefore important to recognize that, '...exports play a major rôle in the planning balance,... and that any shortfall in production makes itself felt through a reduction in fuel available for domestic needs rather than a decline in exports' (Natural Gas: Resources, Production Possibilities and Demand in the 1980's, quoting David Wilson, Soviet Oil and Gas to 1990, Economist Intelligence Unit Special Report No. 90, 1980).

(2) Forty billion m^3 of this amount might be supplied under an agreement currently being negotiated by the USSR which would provide for deliveries from the Yamburg field in Western Siberia, to commence around 1985, to as many as seven West European countries. If, in fact, the negotiations reach early agreement it is foreseen that deliveries bearing on a part (20 billion m^3) of contracted quantities might start as early as 1984, followed by progressive increases to reach 40 billion m^3 by 1987.

(3) By 1985, Soviet exports of natural gas to Eastern Europe are expected to amount to about 41 billion m^3 (34 million tonnes oil equivalent), up from 31.7 billion m^3 (26 million tonnes oil equivalent) in 1980. (See Table II, Annex.)

17. In sum, the principal constraint on energy consumption in the CMEA economies in the 1980s is expected to come from Soviet oil supplies, although constraint may be compensated, to a certain extent, by increased supplies of Soviet natural gas. All told, total CMEA energy demand should grow from a position of being somewhat less than total energy supply in 1980, to a position roughly in balance with energy supply in 1990; but since a certain quantity of Soviet gas will be reserved for export to the West for hard-currency earnings, part of CMEA energy demand by 1990 will probably have to be met by oil imports from non-CMEA countries.

IV. IMPLICATIONS FOR THE WEST

18. The CMEA energy situation in the 1980s is of particular interest to the West in four respects: (a) potential impact on global energy supplies; (b) economic effects on Western and CMEA economies; (c) potential Soviet leverage on Western nations through gas exports; (d) possibly heightened CMEA interest in influencing the OPEC nations.

(a) Global Energy Supplies

19. Some projected trends suggest that the CMEA countries will cease to be net oil exporters around 1985 and may become buyers competing with Western nations on world oil markets by the end of the decade. On the other hand, Soviet gas deliveries to the West may add to the availability of Western gas supplies throughout the decade. If the CMEA states purchase around 100 million tonnes of oil from non-CMEA nations by 1990, it could represent around 8% of the oil which might be offered on world markets by that time(1), and perhaps 6% of the amount of oil which might be consumed by the OECD nations; because of hard-currency limitations, however, it is likely that the CMEA area will purchase substantially less than this amount of oil, and so take a smaller portion of world oil supplies.

20. On the other hand, Soviet gas deliveries to the West would enhance the availability of Western supplies throughout the 1980s. Soviet exports of natural gas to the West in 1990 may be approximately treble their current level of 26 billion m^3 annually, and may represent roughly 20% of the amount of gas which may be offered on world markets by that time, or 8% of anticipated gas consumption among the OECD nations. In terms of energy content, CMEA gas exports to the West by 1990 may approximate current levels of CMEA oil exports to the area.

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(1) Assuming that the principal source of supply will be the OPEC countries. Total oil produced by the world as a whole in 1990 will probably be at least twice as much as OPEC output (see Diagram at Annex).

(b) Economic Effects

(i) On World Energy Prices and Trade

21. The effect of CMEA energy on world markets in the 1980s, therefore, is likely to repress, through more abundant supply, increases in natural gas prices, and to give further impetus to forces increasing the price of oil. Counterbalancing this tendency, however, it can be assumed that in their own self-interest the USSR will attempt to set its gas prices as high as the market will bear, and conversely, will probably encourage OPEC nations to exercise restraint on oil price increases. To this end, they may seek to gain economic and political influence in the OPEC nations, through, for example, transporting more of its oil in CMEA tankers, or entering into more gas development projects with them(1).

22. To guarantee gas sales to the West, which may become the single most important source of hard-currency earnings during the decade, the USSR can be expected also to cultivate potential markets in the West. To this end, it will continue to have a high interest in concluding long-term sales agreements with Western nations.

23. In any case, expected CMEA energy trade is not likely to have more than a marginal effect on world oil and gas prices, because of its relatively small volume in comparison to global supplies, and because the CMEA supply situation will lead the CMEA countries to try to counter the price effects of their participation in world markets. Western economies may be marginally stimulated by sales of energy-related technology and equipment to CMEA to facilitate energy development, or by sales of other items generated under long-term Soviet gas supply contracts with the West(2).

(ii) On CMEA Economic Growth

24. The CMEA energy outlook for the 1980s implies constraints on the growth of the East European member-country economies in particular because of reduced oil availability, and large costs associated with supply development and equipment changeovers from oil to gas or coal as energy sources, as well as the time required for such changeovers. As a result, the East European economies will grow more slowly in the 1980s than they would have done if energy had been more readily available(3).

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(1) The cheap gas exploration and development packages which CMEA offers to OPEC countries suffer, however, from lack of advanced technologies; moreover, the OPEC countries, so far, have shown little interest in developing their natural gas deposits.

(2) Under the gas deal currently being negotiated with several West European nations, for example, some of those nations might see significant increases in the output of contributing industrial sectors.

(3) US authorities estimate that Soviet economic growth is likely to be about 2% annually through 1985, not so much because of energy as because of a wide range of obstacles including labour shortages and unfinished capital construction in particular.

25. Anticipated CMEA energy trade patterns will also have an effect on the CMEA economies in the 1980s. In terms of convertible currency earnings, Soviet gas sales to the West will probably gradually rise to approximately the current volume of oil sales (around $14 billion annually) and so will tend to compensate for the expected decline in oil exports. Eastern Europe, on the other hand, will probably have to spend larger sums of hard-currency for oil imports from OPEC and so may be driven deeper into hard-currency debt. The Soviet Union might import certain amounts of oil on behalf of the other CMEA nations, as it has in the past made other imports on behalf of other CMEA members, in connection with the Orenburg gas project, or it might continue to produce enough oil to supply their minimum needs; in either case, non-Soviet CMEA countries could see additional quantities of potentially hard-currency earning goods go to the USSR to pay the increased prices it will presumably demand for the oil.

(c) Possible CMEA Gas Leverage

26. Views differ as to whether Soviet shipments of natural gas to the West in the 1980s might give the USSR a means of leverage over recipient Western nations through threats to cut off the flow; the prospect is all the more disturbing because gas is still delivered largely by pipeline rather than in liquefied form, and so cannot be readily rerouted from alternative sources if delivery is interrupted. There are a number of considerations which modify the potential impact of this prospect however. First, unlike oil, Western Europe produces 80-90% of the natural gas it uses; and it is anticipated that it will still produce 70% of its natural gas in 1990. A cut-off of Soviet gas deliveries would thus represent only a partial disruption of gas supply. The effects of a gas cut-off would be all the more limited by the fact that gas supplies from all sources constitute less than 20% of all West European energy consumption; except for the gas-producing countries, the West European economies in the 1980s will still be powered preponderantly by oil, and increasingly by coal. Further, the fact that much of West European imported gas is used for electricity production means that a potential shut-off would probably most directly affect electrical output, which could be rapidly remedied by imports of electricity from neighbouring countries which might not have gas deliveries interrupted, or by increasing the load on the already considerable number of nuclear coal and oil-fueled generating facilities in Western Europe. In any case, when temporary interruptions have occurred under delivery contracts currently in force, West European gas companies have successfully been able to deal with them; although the interruption of larger deliveries in the future might cause greater dislocations, nonetheless the gas companies' past experience with the problem should aid them in working to overcome it.

27. Some view, however, the threat of a Soviet gas cut-off to Western Europe in peacetime as not particularly plausible especially, it is argued, as cut-off could not be selective to affect any one particular country; there might be also technical difficulties with supplies to Eastern Europe if a cut-off to the West were applied without preparation. It would not be in Soviet economic interests, which are ostensibly the primary motivation behind the sales, since an intentional gas shut-off or its threat by the USSR would severely erode confidence in the USSR as a dependable trading partner, would motivate potential customers to turn to other energy forms and suppliers, and would put obstacles in the way of the USSR's obtaining products, additional technology, and financing it desires from the West. In time of crisis, a cut-off of Soviet gas might be more conceivable. In wartime, of course, a shut-off would be certain; but it would be done in a situation where a sharp curtailment in the use of many commodities, including energy, would be assumed for broad segments of the population, and where plans for such an emergency would presumably already have been made.

(d) CMEA Involvement in OPEC

28. Another security issue affecting the West related to projected CMEA energy supplies is that the CMEA countries will have a continuing interest in gaining political and economic influence in the oil-rich states of the world. To achieve this end, they probably perceive that the best means is to promote social, economic and political unrest, in the hope of gaining prestige among isolated factions which might one day enjoy full political power. The West, on the other hand, has a long-term interest in promoting stability and preventing outside interference in the oil-producing areas.

V. POTENTIAL WESTERN STRATEGIES

29. The CMEA energy outlook for the 1980s suggests essentially three potential Western strategies: (a) assist CMEA energy development primarily through sales of technology, materials and equipment; (b) attempt to hinder CMEA energy development by blocking such sales; (c) prevent Western vulnerability to dependence on CMEA gas supplies, and from possibly increased CMEA intervention in world oil markets. The first two strategies assume that the CMEA states, and the Soviet Union in particular, will continue to seek to purchase items in the West to make up potential lacks in their energy production programmes. The third assumes that Soviet gas sales to the West or East European purchases of oil from OPEC will be substantial enough to have a perceptible effect on Western economic or strategic considerations. Since approaches (a) and (b) both constitute a sort of leverage, they could be thought of as gradations of a single policy of attempting to influence CMEA energy developments either positively or negatively according to desired Western economic and political objectives. From the viewpoint of potentially promoting energy availability on world markets, however, or at least trying to diminish pressures on those markets, approaches (a) and (b) are mutually incompatible, and so should be considered separately. In addition, policy (a) is linked to policy (c), in that promoting CMEA energy availability might give rise to greater Western dependence on CMEA supplies, if the resultant additional energy were sold to the West; similarly, attempts to hinder CMEA energy development imply eventually lessened Western dependence on CMEA energy supplies.

(a) Promote CMEA Energy Development

30. Means by which the West might encourage Soviet energy development include sales of such items as gas lift equipment and submersible pumps for oil production, and rotary drills for oil exploration. Gas lift equipment is needed as an alternative to, and submersible pumps to overcome repair problems associated with, the USSR's practice of extensive water flooding to enhance production from current wells; rotary drills are needed for deeper drilling in connection with oil exploration and exploitation. For gas production, there is a need not so much for advanced Western equipment, as for compressors and large-diameter pipe, for which the USSR has inadequate production capacity: of the 30,000 km of gas pipeline to be laid in the 1981-1985 period, for example, almost all of the large-diameter (56 inch) pipeline is to come from the West. Among potential imports from the West required for improving coal output is equipment that can withstand often indifferent operator handling and the extremely low temperatures of Siberia; also the USSR will probably be increasingly interested in Western strip-mine equipment and techniques.

31. Advantages to the West in promoting CMEA, and particularly Soviet energy development centre basically around improving Western energy supply prospects and export earnings from sales of energy equipment. If Soviet oil-producing capabilities are enhanced there should be less East European bidding on world oil markets because the USSR presumably would use its additional production to supply its East European allies, after meeting its own needs. With less bidding for their oil, there should be less impetus for the OPEC nations to raise oil prices. If Soviet production could be kept at a level enabling exports to both Eastern Europe and the West, OPEC price rises might be further dampened and the West would have additional time for implementing oil substitution programmes, and would have an additional potential source of oil supply, should political turmoil interrupt oil production in OPEC countries.

32. From an economic standpoint, sales of Western energy-related technology and equipment have several beneficial effects. They promote employment in Western nations, and give the selling firms additional means for continuing research and development. The sale of pipeline in particular serves to boost activity in Western steel industries, currently in difficulties. East European economic growth should also be enhanced by technologically improved Soviet production, and indirectly the West would benefit from improved East European capabilities to repay large outstanding hard-currency debts. Finally, Western banks stand to profit both from increased East European solvency and from financing sales of energy technology and equipment to the USSR.

33. There are also strategic reasons why the West might want to improve CMEA energy supplies. By helping remove a potential restraint on improving the East European standards of living, Western nations make Eastern Europe less prone to popular unrest which might encourage Soviet military intervention. At the same time, with improved energy supplies the CMEA nations have fewer economic reasons for intervening in the affairs of the oil-producing nations, although political motivation for intervening might remain. Finally, sales of Western technology and equipment to the East provide the West with a potential economic lever, through the possible threat of a cut-off of further sales, and through the East's subsequent need for spare parts and servicing.

(b) Thwart CMEA Energy Development

34. On the other hand, to the degree that Western nations block sales of energy-related equipment and technology to the CMEA area, they might tend to thwart or delay CMEA energy development. If pursued, such a policy would probably produce noticeable results if done on a unified basis; it might be done selectively for particular energy-related items or for particular economic and political objectives. The most immediate economic effect of a concerted Western blocking of energy-related sales, if practicable, might well be to re-orient CMEA energy investment toward producing items formerly supplied by the West. Considering the large amount of investment funds already allotted to energy development in the USSR, it would probably involve postponing certain energy development projects, and so might slow down development of new energy resources(1).

(1) US authorities believe that Western technology could help Soviet oil development particularly in offshore areas and in some enhanced recovery operations. Moreover, they estimate that a cut-off in Western deliveries of pipe, pipelayers, and compressors could delay Soviet gas programmes for several years.

35. The principal reason, then, for restricting Western exports of energy-related technology and equipment to CMEA is that such action might hinder more rapid completion of energy development programmes, particularly oil and gas exploitation. The CMEA nations might thus be less able to overcome anticipated oil constraints in the 1980s, and whatever slowing effect such constraints might have on expansion of their economic output. With less economic growth the CMEA countries would have less potential to increase military capabilities and to satisfy increasingly vociferous consumer demand. The situation might give impetus to economic reforms to allow greater local productive autonomy, and the beginnings of a counterpoise to the prevailing strongly centralized political control(1). For these reasons it is argued that Western nations should consider denying sales of energy related technology and equipment to the CMEA states. It is unclear, however, whether Western technology and equipment would have significant impact on CMEA economic growth; in any case, it is difficult to measure the impact of Western technology and equipment on Soviet energy development, and to predict what the quantitative effect would be on economic growth if such items were lacking. It is also difficult to assess what effect lack of such sales might have on CMEA energy trade patterns and potential hard-currency earnings.

(c) Prevent Western Supply Vulnerability

36. CMEA energy prospects suggest that a potential development of possibly great concern to the West in the 1980s may be CMEA competition in OPEC oil markets and Soviet sales of natural gas to the West. The West might therefore effectively consider strategies to minimize the anticipated effects of CMEA energy trade patterns on Western economies. Many of the possible options fall within a larger strategy of attempting to reduce dependence on foreign energy supplies.

37. One way for the West to lessen the potential effects of possible CMEA bidding on world oil markets is for Western nations to reduce their own demand for oil. The most immediate means of doing this is through oil conservation, aided by natural world market price rises and regulated, if necessary, by fiscal measures. In addition, Western governments can give greater encouragement to research and development of alternative forms of energy, and provide funding to make the substitution of these alternative energy forms economically feasible. As oil prices rise, coal, which is generally in plentiful supply in the West but costly to extract, will be substituted for oil without the necessity of government intervention; governments might, however, support measures for promoting international coal trade, such as modernising and expanding port loading and storage facilities.

38. On the other hand, the West can also take steps to try to ensure the availability of oil supplies, regardless of price(2). To this end, Western nations can continue to diversify their sources of oil among as many supplier nations as possible; they can also try to expand storage capacities and the reliability of individual national suppliers by building up economic and political influence, for example, through joint investment projects.

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(1) It can be argued, however, that increasing trade with the West, including energy trade, can also serve as an impetus for economic reform in the CMEA area and that domestic economic difficulties within the CMEA might lead to military adventurism, not economic reform.

(2) Regardless of the strategy, finite supplies in a tight market mean maximum revenues for the producers.

39. To prevent excessive West European dependence on the Soviet Union as a supplier of natural gas, conservation in gas use is again the most immediate step which can be taken. Over the longer term, governments can support research and development for alternative energy forms, and can institute measures encouraging substitution of other types of energy for natural gas use. In the meantime, Western nations can expand storage and surge capacities and diversify to the fullest possible extent their sources of gas supply. In this connection, sub-Mediterranean gas pipelines and development of liquefied natural gas facilities might be further explored. All these options are costly, but from a strategic and defence point of view their cost should be measured not in economic terms alone, but also in terms of the security they can provide from the vagaries of foreign supply and from potential foreign energy blackmail.

40. As a further safeguard from the threat of cut-off of Soviet gas deliveries in particular, West European purchasers could insist on special provisions in gas delivery contracts they might conclude with the USSR. Since the USSR has a strong interest in obtaining the convertible currency and related goods associated with the gas sales, Western companies are in a position to exert pressure in making such demands. Further, as a safeguard against the unlikely event of a crisis-generated cut-off, Western nations should consider appropriate contingency measures, especially those more of an industrial than a military nature.

ANNEX to
C-M(81)60

GLOSSARY

anthracite:	a hard, clean-burning coal
bituminous coal:	a type of coal yielding considerable volatile hydrocarbons when burned
calorific content:	measure of heat-producing potential, by which different forms of energy can be compared
coal:	all types of coal, including anthracite, bituminous coal, and lignite
CMEA:	Council for Mutual Economic Assistance, comprising: Bulgaria, Cuba, Czechoslovakia, the German Democratic Republic, Hungary, Mongolia, Poland, Romania, the Union of Soviet Socialist Republics, and Vietnam
East:	in this paper, CMEA
gas:	natural gas (not gasoline)
GNP:	gross national product, or the total value of all goods and services produced by a nation, including net foreign investment income
lignite (brown coal):	a coal intermediate between bituminous coal and peat
kWh:	kilowatt hour(s), a conventional measure of electricity production - that is, kilowatts generated in one hour
LDC's	less(er) developed countries
MW:	megawatt, or one thousand kilowatts, a conventional measure of electrical generating capacity
m^3:	cubic metres
OECD:	Organization for Economic Co-operation and Development, comprising Australia, Austria, Belgium, Canada, Denmark, the Federal Republic of Germany, Finland, France, Greece, Iceland, the Irish Republic, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain Sweden, Switzerland, Turkey, the United Kingdom and the United States. Yugoslavia participates with a special status.

oil:	crude petroleum and petroleum distillates (including gasoline)
oil equivalent:	the amount of energy or fuel having the same calorific content as a given amount of oil
OPEC:	Organization of Petroleum Exporting Countries, comprising: Algeria, Ecuador, Gabon, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, the United Arab Emirates and Venezuela
peat:	partially carbonized vegetable matter formed by partial decomposition in water of various plants, such as moss
tonnes:	metric tons
West:	in this paper, the OECD countries, with special reference to NATO members
world (energy) markets:	in this paper, net exports of oil and gas offered by the OPEC nations

TABLE I

Table of Energy Conversion Equivalents
Used in this Paper (1)

OIL:

1 tonne	= 7.35 barrels
1 barrel/day	= 49.6 tonnes/year
1 million tonnes/year	= 20.1 thousand barrels/day

GAS:

1.2 billion m^3	= 1 million tonnes oil equivalent (mtoe)

COAL:

a) anthracite and bituminous:

1.5 million tonnes	= 1 mtoe

b) lignite:

4.8 million tonnes	= 1 mtoe

ELECTRICITY:

4.4 billion kWh	= 1 mtoe

For USSR, 1 MW installed capacity produces about 4.8 million kWh annually, based on fact that 256 thousand MW of installed capacity produced 1,239 billion kWh in 1979; thus:

0.9 thousand MW	= 1 mtoe

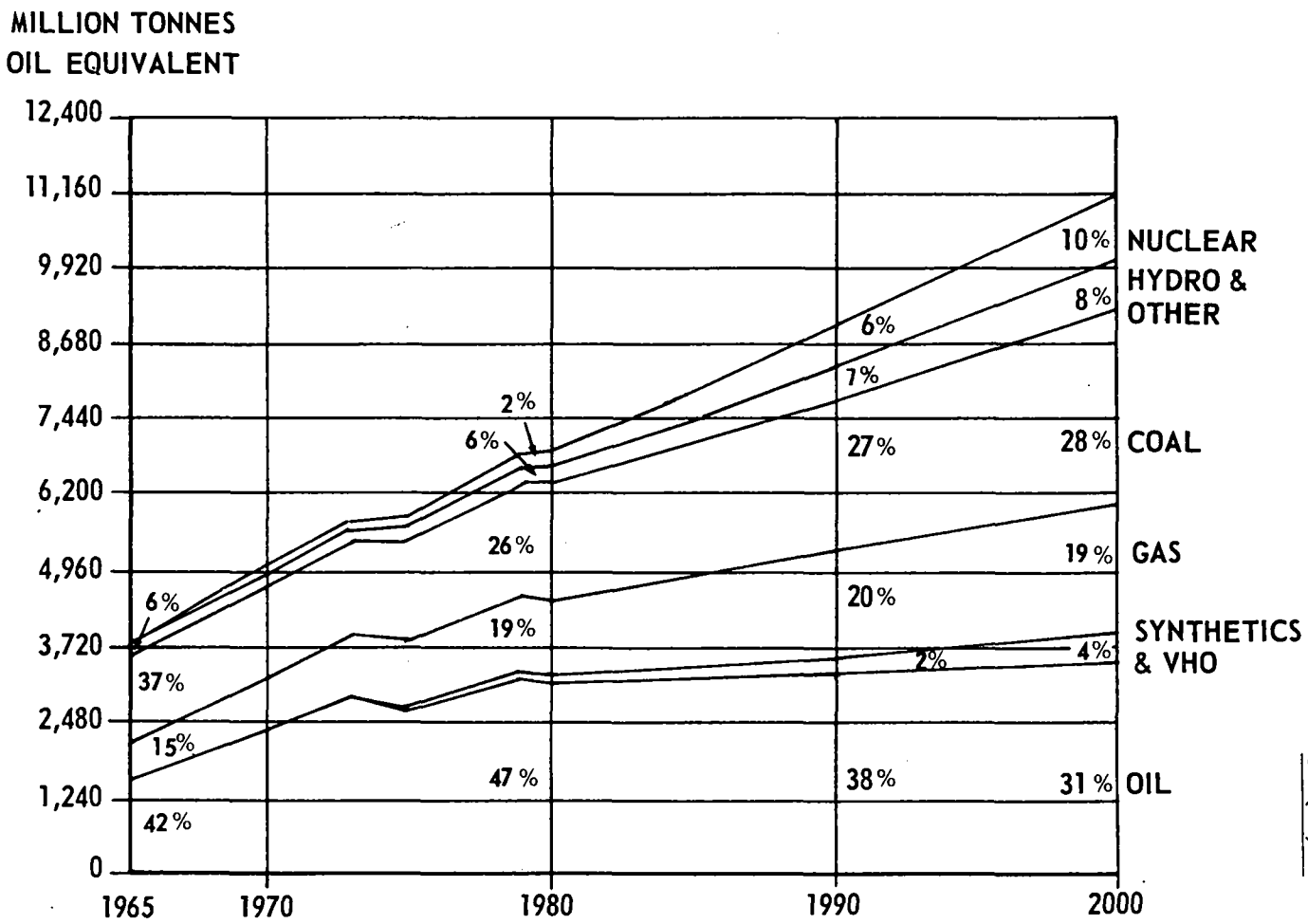
(1) The conversion factors given are intended only as rough guidelines for making broad comparisons, and cannot be used for detailed analyses.

TABLE II - SOVIET PRIMARY ENERGY PRODUCTION AND TRADE, 1978-1980 AND PLANNED

Year	Energy Source (Unit of Measure)	Production	% of Primary Energy Production (c)	Est. Consumption	Imports	Exports To other CMEA Volume	Exports To other CMEA Value ($ bil)	Exports To OECD Volume	Exports To OECD Value ($ bil)
1978	Oil (mil.t.)(a)	572	44	430	8.7	85(d)	6(e)	60.2	10(e)
	Gas (bcm)	372	24	344	9.3	20(e)	1.4(e)	15 (e)	1(e)
	Coal (mil.t.)(b)	724	28	700	-	6(e)	0.3	7.2	0.4
	Hydro elec.(b.kWh)	170	3	-	-)	11(e)	0.4(e))	(f)	(f)
	Nuclear elec.(b.kWh)	45	1	-	-)		)		
1979	Oil	586	43	440	6(e)	86(d)	9(e)	58.7	12(e)
	Gas	407	25	358	6.3	25(e)	2(e)	20(e)	2(e)
	Coal	719	27	700	10(e)	6(e)	0.3	7.2	0.4
	Hydro	172	4	-	-)	14(e)	0.5(e))	(f)	(f)
	Nuclear	55	1	-	-)		)		
1980	Oil	603	43	450	-	87(d)	11(e)	55(e)	14(e)
	Gas	435	26	380	-	32(e)	-	24(e)	3(e)
	Coal	716	26	-	-	-	-	10(e)	-
	Hydro	184	4	-	-	-	-	-	-
	Nuclear	73	1	-	-	-	-	-	-
1985 (Plan)	Oil	620 - 645	37	500	-	90(d)	-	-	-
	Gas	600 - 640	30	540	-	41(e)	-	26(e)	-
	Coal	770 - 800	25	-	-	-	-	-	-
	Hydro	230 - 235	4	-	-	-	-	-	-
	Nuclear	220 - 225	4	-	-	-	-	-	-
1990 (Official estimate)	Oil	670 - 700	33	540	-	-	-	-	-
	Gas	705 - 820	30	630	50(e)	-	-	70(e)	-
	Coal	1000 -1250	28	-	-	-	-	-	-
	Hydro	350 - 400(e)	4	-	-	-	-	-	-
	Nuclear	440 - 500(e)	5	-	-	-	-	-	-

(a) Including products
(b) Gross output, including lignite
(c) In terms of mtoe
(d) Includes an estimated 10 million tonnes delivered to Cuba
(e) Estimated
(f) In 1978, 0.7 billion kWh, worth $10 million were exported to Western European nations, mainly Finland; in 1979, the same amount of electricity was exported to the West for receipts of $12 million.

WORLD ENERGY SUPPLY



SOURCE : EXXON, WORLD ENERGY OUTLOOK