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ECONOMIC COMMITTEE

THE ENERGY SITUATION IN COMECON COUNTRIES IN 1976

Note by the Chairman

Attached for the attention of the members of the Committee is a recent report on the COMECON energy position, based partly on British and various other sources, as well as discussions in the 8th April, 1976 reinforced meeting.

(Signed) J. BILLY

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THE ENERGY SITUATION IN COMECON COUNTRIES IN 1976

I. INTRODUCTION

1. Despite assertions the USSR is not undergoing an energy crisis analogous to that in the West, and that the country has the capability to remain energy self-sufficient, highest government officials informed the recently completed (5th March, 1976) Twenty-Fifth Soviet Party Congress that management of the Soviet fuel-energy supply has become a matter of serious concern.

2. General Secretary Brezhnev and others called for a long-term inter-branch effort, to use oil and gas supplies more efficiently and ensure the power supply to the energy-deficient European part of the USSR; they also urged alternative cheaper resources such as a greater utilization of coal, atomic power and hydro resources. Premier Kosygin was frank in ascribing the problems facing the USSR due to the location of most of the USSR's fuel reserves in Siberia and the Far East and stressed the need to intensify exploration activities throughout the country and to readjust the USSR's fuel-energy balance away from the present course of increased dependence on oil.

3. It would appear that the USSR still has sufficient energy supplies. In 1975 oil output was 491 m tons and gas production reached a record 19.1 b ft³. (The 1975 USA figures were 417 m tons and 20.1 b ft³ respectively). Coal output was 560 m clean tons and the US figure was 537 m; the 1975 electricity output in the Soviet Union was 1038 trillion kwt, or 4070 kwt per capita; the USA figures were 9722 kwt per capita with a total output of 2200 trillion(1) and Table I).

4. In the oil industry a considerable amount of the new Siberian oil is high in sulphur content and much of Soviet production is this crude, less refined oil. Moreover, wastage in both the oil and gas industries can amount to 30% at the wellhead. Technology in both the oil and gas industries is backward and additional output levels are dependent on importation of Western technology and know-how.

5. A more pressing situation in the oil sector is the medium-term problem of Soviet inability to balance energy supply and demand. The demand is increasing yearly due to the increased industrial output. The growing manpower shortage, particularly in those non-Russian areas where resources need to be developed which necessitates greater use of machines, and the growth of the transport sector(2). By 1980 this oil demand in the Tenth Plan is expected to increase 35-39% but petrol supplies are only to grow by 26-31%.

6. Nor is Soviet nuclear power capacity likely to grow. Production is already falling behind because of technological difficulties and will generate only about 10% of all electricity output by 1990 (c.f. USA 1975 nuclear output generates 8.6% of all electricity in 1975). Thus it appears the Soviets in the short term will experience an energy shortfall with significant implications for the domestic investments as well as on the export trade unless some drastic steps are taken.

7. The USSR has already initiated some measures to alleviate its growing energy problem:

- (a) simultaneous cutback of oil exports to her East European allies of up to 33% of the supply wanted by East Europe, together with large price increases for oil shipped; (prices in 1973 were 20.3 roubles (\$28.40 per ton; in 1974, 37.4 roubles (\$50.50) and in 1975, 45.40 roubles (\$60.40));
- (b) a greater effort to increase exports of gas to Western Europe for much needed hard currency;
- (c) an intensive energy saving programme designed to change the domestic energy balance by 1980-1990 by the replacement of expensive and exportable oil fuel with the cheaper alternatives of coal and gas;
- (d) greater emphasis on the expansion of the natural gas industry, both in the domestic and export markets because of greater amounts of natural gas reserves and the relative cheapness of gas production and transportation compared to long distance coal transportation or the desirability to export oil for hard currency;
- (e) several exploration agreements with Britain, Japan and the USA to help develop the sources of Siberia and off-shore oil reserves. In return for Western capital and knowledge, the USSR will pay in oil and gas found in the exploration project.

8. For Eastern Europe the energy situation is even more uncertain. Domestic energy sources are totally inadequate for all but Poland and Romania and total supply, both domestic and imported, is not increasing at the same rate as the demand; by 1980 it is estimated that Eastern Europe will meet domestically only 13% and 50% of its oil and gas needs respectively. The oil energy shortfall which was over 50 m tons in 1975 will rise to a range of 110-135 m tons in 1980. Eastern Europe will try to meet this shortfall by a number of methods:

- (a) importation of as much oil and gas as the USSR will allow, given its own programmes. In the oil sector this is expected to be 60-70 m tons at prices about 20-30% below the world market which will gradually approach world market prices if the latter remain stable over the next five years; the rest will be purchased from OPEC and Third World oil producers at world market prices;
- (b) great effort towards the development of all available cheaper domestic sources of supply: coal and coal gasification plants in Czechoslovakia, Hungary and Poland; oil refineries in Romania, nuclear reactors in Bulgaria, offshore drilling in Poland, GDR, Romania and Bulgaria as well as a shift, especially in Czechoslovakia, from oil to gas or coal as fuel in thermal power stations;
- (c) the COMECON countries are making determined efforts to expand co-operation projects within COMECON that would lead to exchange of energy saving technology and information and also give a greater degree of economic integration. In the past these have included Interetalonpribor (precision equipment), Interelectro (high tension equipment), etc. as well as joint construction projects such as the Orenburg gas pipeline and Adria oil pipeline. One of the most promising ventures is Interatominstrument composed of 15 members from six COMECON countries whose ostensible purpose is to provide research and development for the establishment of nuclear reactors for energy(3).

II. ENERGY SITUATION IN THE SOVIET UNION

A. PRIMARY SOURCES

(i) Coal

9. Sixty per cent of present Soviet coal production is in European USSR but over 90% of potential recoverable coal reserves (or 61.4% of world's total) are in the Asiatic sector. Partially because of oil extraction difficulties, the Tenth Five-Year Plan intends to give coal a greater role, particularly in eastern regions, as heating fuel and for generating electric power. Kosygin's March 1976 report to the 25th CPSU Congress affirmed previously announced 1980 production targets of 790-810 million tons of coal, up 15% above the 1975 output of 701 million tons. At least one-third of the planned 1980 production is to be used in connection with the electricity production.

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10. The efficiency of the Soviet coal industry is low due to a number of reasons:

- (a) there is a constant presence of bad organization and over management, and a lack of concern or inability to rationalize the labour force which hampers modernization of Soviet mines. Indeed, Soviet labour productivity is only 15% that of the USA. On the basis of fairly complete figures for 1972 evidence of over-employment in Soviet mines as 1,056,000 face workers produce 524.2 million clean tons while 159,300 US workers have an output of 537.9 million tons (Table II);
- (b) the productivity of capital equipment is low. Technology lags badly in Soviet mines: poor quality machinery, unavailable spare parts and insufficient modern machinery designed for specific tasks.

11. It is, therefore, doubtful whether the Soviet Union will be able to meet the 1980 Plan goals which include the introduction of more than 120 million tons of new capacity. Coal Industry Minister B. F. Brachenko recently called these goals "complex" due to the slow production of a gigantic coal burning thermal station at Ekibastuz; current Plan directives also do not provide adequate resources for development of new production areas. This lack of funds is not surprising as the coal industry has continually suffered in the last twenty years as the oil and gas industry has enjoyed priority for R and D and expensive Western technological imports.

Coal consumption

12. Industry, including thermal power stations, absorbs 80% of the coal output, with the rest allocated to municipal sources, transport and agriculture and private consumption. This percentage has remained generally the same since 1970 although the overall percentage of coal in the energy balance has fallen from 35.9% in 1970 to under 30% in 1975 due to the increased use of oil in the agricultural, transport and municipal sectors.

(ii) Oil

13. The Soviet Union was the world's second largest oil producer in 1975 with an output of 491 million tons (after the USA) or almost one-third of world production (American output including gas condensate was slightly greater though the position will change in 1976 as the USSR increases its production (Table III).

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14. The current Tenth Five-Year Plan calls for 1980 oil production levels of 620-640 million tons of crude oil, a rise of 40% above the 1975 level of 491 million tons. Almost all of the production increase will come in the Tyumen oblast¹ of West Siberia and Komi ASSR; these areas will produce more than half of the total production of which the largest is now the giant Samotlor field producing an average of over 1,224,000 barrels* (167,600 tons) per day (1974).

15. By the 1990s the USSR anticipates production close to one billion tons a year, of which 600 million tons are to come from Siberia. This will be more than twice the present Saudi Arabian output or a growth rate averaging 4.85% a year. Whether Soviet consumption and export possibilities will rise to meet such an output is another matter.

16. The USSR has a refining capacity that is second to that of the US and a growth rate of 6-7% a year. Almost 90% of the increased production from 1971-1975 was provided by plants built before 1971. The 47 Russian refineries have a capacity of approximately 375 million tons a year, or 7.5 million barrels a day. In contrast, 290 US refineries produce 760 million tons, or 15.2 million barrels a day. Soviet refinery production does not provide extensive specialization for a changing market but relies more on the use of standardized, fairly unsophisticated refining equipment. Construction time of Soviet refineries is 6-7 years (US 2-3 years) and most operate only up to 50% of design capacity.

Oil policy investments

17. Capital investment in the Soviet oil producing industry totalled 14 billion roubles (\$19 billion) in the 1971-1974 period. The value of production in 1974 was 3.1 billion roubles - 30% higher than in 1970 - but Oil Minister Shashin has indicated that while the overall value of industry earnings are likely to grow due to higher output and higher export prices, the return on capital investment may decline "somewhat below" the 1970 rate of 27.8%, the new production merely compensating for lost output at fields nearing depletion(4).

Exploration

18. Continual efforts are being made to locate new oil deposits and an increase of helicopter and photo-reconnaissance surveys has taken place, particularly in eastern Siberia, and a joint Soviet-Japanese exploration off Sakhalin Island costing \$152.5 million(5). Despite enormous expenditure in the last

* 7.30 barrels = 1 metric ton of crude oil (OECD measurements)

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ten years on exploration (over 5,677 million roubles were spent in the period 1966-1970) Ekonomicheskaya gazeta recently stated(6) there is still not enough investment money allocated to meet the requirements nor enough technological expertise and equipment made available to meet demands of thorough scientific explorations. The Volga-Ural region and in the northern Caucasus have entered the late stage of development and greater effort is required to sustain oil production in older areas. As a result, the cost of one ton of oil and gas condensate increased in 1970 by 9.2% on 1965(7).

Oil consumption

19. Domestic oil consumption for 1975 was estimated to be 370-380 million tons a rise of 5% compared with an annual rate of 7-8% in previous years. This is expected to fall to 6.5-7% in the 1976-1980 period due to the peaking of several major oilfields and the inability of the Soviets to master secondary and tertiary oil recovery methods.

20. In the civilian sector, despite the fact that the Tenth Plan calls for a limit to production of motor vehicles (1980 vehicle production is to be 1,400,000, or about 10% higher than 1975 with private passenger car sales to remain roughly the same, oil consumption is planned to increase by about 7% per year due to expanded development of the transport sector: air traffic, merchant shipping and diesel railways, a higher annual growth rate than has been the case in the last Plan(8).

21. It is extremely difficult to ascertain the military consumption of oil and oil products. Given that the USSR has already established fuel dumps - estimated to last 90 days in case of emergency - there should not be an unusual consumption of fuel save for peacetime activities and manoeuvres. The figure given for this consumption is 375,000 barrels per day or 5% of the total Russian output in 1975. The Soviets import 1.5 million tons of lubricants and specialized oils but it is impossible to determine the proportion designated for the military or the civilian sector.

Oil exports

22. In 1974 oil exports represented the USSR's largest single source of foreign exchange - \$3 billion of the total hard currency exports of \$7.5 billion. This export was $3\frac{1}{2}$ times the value in 1972. The exports in 1974 amounted to 116.2 million tons of which East Europe received 59 m tons (51%), other Communist countries 13 m tons (11%) while exports to the West totalled 44 m tons or 38% (Table IV). Crude oil which makes up

70% of total Russian petroleum exports, has traditionally gone to Communist countries with the refined products going to the West (mainly West Germany, Iceland, Italy and Greece(9)).

23. As a result of OPEC's increase in crude oil prices, the Soviet Union benefits from its position as a net exporter of oil to East and West Europe. In 1975, the USSR set oil prices for the COMECON market at 45-46 roubles (ca \$60) per metric ton based on a formula adopted by COMECON in January 1975 which provides that member nations buying oil from other countries in the bloc in the 1970s will pay according to a sliding scale based on average world prices for the preceeding five years. This price therefore reflected the new OPEC prices in 1974 and represented to East Europe a price increase of 150%.

Prospects

24. In a recent Pravda article Shashin has suggested that the only way to effect necessary oil conservation measures in the USSR is to increase the domestic price of oil. This line, which may be the opening round in broader debates on the subject, apparently reflects Shashin's conclusion that oil economy efforts must proceed simultaneously with plans to increase oil production lest increases in domestic consumption reduce amounts available for hard currency exports or other priority objectives. Latest reports state that the USSR has been reasonably successful in holding down domestic consumption in 1975 to 5% compared with an annual rate of 7-8% while increasing production by 7%(10).

25. The overall lines of development for the next five years are consistent with those previously enunciated by Shashin. His strong hint of the need for increase in the domestic price of oil is in keeping with Shashin's previous proposal for price reform to stimulate timely production of new technology but this is his first published statement to the effect that domestic demand must be curbed by increased prices. As Shashin has now implied, even if projected production levels for 1980 can be reached, priorities such as hard currency exports may not be maintained at desired levels unless domestic demand or exports to East Europe can be limited. And when Shashin's earlier public statements dealing with problems in oil drilling and exploration are recalled, a conservation programme would seem even more necessary.

26. The Soviet Union continues to be plagued by relatively low productivity in drilling and a high rouble cost per metre of drilling compared to the average dollar per metre cost in the US (3 : 1). Moreover, the most serious problems, still persist: very high gas losses amounting to some 10 b m³ a year because of poor extraction equipment, inadequate mud technology both in oil

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and gas, and low quality drill pipe and bits(11). Acute problems occur in later stages of production. The Soviets have come to rely almost completely on foreign high capacity submersible pumps to extract large volumes of water in secondary recovery stages of oil and gas deposits and there is some indication that the present record level of production is due entirely to the use of Western technology.

27. Offshore operations are also badly neglected as the Russians have lacked the necessary equipment, although they are now more willing to seek an arrangement with British and Japanese firms for offshore drilling(12). At present talks between the Soviet Union and British Petroleum are at an "advanced stage" for the sale of North Sea oil platform technology at \$120-160 million per platform for use in oil production in the Caspian Sea.

28. Moreover, indigenous Soviet efforts to develop satisfactory equipment for compressor stations have failed and the Soviets have come to rely on the West for these as well as most large diameter seamless pipes.

29. The return on capital investment in the oil industry has decreased from 1971-1974 and this is of great concern to the Soviets. Oil Minister Shashin attributes this to four reasons:

- (1) continued depletion of and consequent low return from Urals-Volga deposits;
- (2) exploitation of small oil fields in European USSR with higher costs per unit of output;
- (3) establishment of new production centres in economically under-developed and difficult climatic areas of eastern Siberia;
- (4) technological problems in extracting and transporting the oil because of variations in viscosity, permafrost conditions and poor quality of Soviet equipment.

30. Like so many enterprises in the USSR there is, as Shashin has stated, an "unjustified number of workers in regional engineering - technical services" and other "non-industrial groups". The elimination of some of this labour force is one basic step that Shashin has suggested to reduce excessive labour costs and, at the same time, there must be a streamlining of management into two-tiered "ministry-production association" to expedite the decision making process.

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31. In another instance, both Pravda and Sotsialisticheskaya Industriya have carried complaints from leading experts that the oil shale programme "has been bureaucratically split into isolated enterprises, each of which operates in the least rational way" and that the country's oil shale industry in Estonia is in serious trouble with mining losses of 30-50%(13). This plus a continuing technological lag in production of shale-based fuels, upon which the Soviets have often waxed enthusiastic, plus unacceptably high pollution levels have created so much concern that the Soviets are now discussing these problems openly.

32. In the course of the Tenth Plan, it is very doubtful whether Shashin will succeed in much greater management efficiency due to the proliferation of the bureaucrat apparatus both within Moscow and the various republics. There simply are too many hands involved in the decision making which has led to numerous bottlenecks. Until Shashin's call for a reform of management decision making is heeded, the energy industries will continue to suffer from decisions made by too many people.

(iii) Natural gas

33. The USSR has rich deposits of natural gas: in 1974 it claimed to possess proved and probable reserves of 28,600 billion m³ with an additional 12,000 billion m³ as "promising". At least 80% lie in Siberia and the East. The Orenburg region alone contains estimated deposits of 1,700 billion m³ with a methane content of 85% plus by-products of 800,000 tons of sulphur and 2 million tons of gas condensate per year. Production has grown steadily in the past five years, up from 198 billion m³ in 1970 to 289 billion m³ in 1975 (7.8% annually)(14).

34. The Tenth Five-Year Plan calls for the natural gas industry to achieve an annual growth rate of 6.7-8.5% to bring the total production to between 400-435 billion m³ in 1980; the greatest increase will be in the Tyumen oblast' where the annual production growth will average 25-30% from the 38 billion m³ in 1975 to 115-145 billion m³ in 1980. In order to achieve this goal gas processing equipment is being purchased in the West for cash or through long-term credit arrangements.

35. The most important Plan target will be the creation of a "large gas production industry" in northern Tyumen and the Yamal fields with an annual output of 130-150 billion cubic metres, accounting for 29-33% of total gas production. Against this optimism is pitted the inability of Soviet industry to adapt to new levels of gas technology which has, in the past, greatly hindered performance in the gas sector. The USSR needs to rely heavily on Western imports of technology throughout the Plan if the target goals are to be approached and has already

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ordered 17 gas turbine compressor stations worth over DM. 1.5 b from West Germany(15).

36. Consumption of natural gas in 1974, according to figures provided by the USSR to the UN Economic Commission for Europe, amounted to 260 billion m³ including addition to stocks: this was a rise of 6.1% over 1973. Most of the gas consumption takes place within the industrial sphere; private and public consumption takes less than 2% of total output.

37. As the Soviets try to reduce their reliance on oil, they will rely more heavily on natural gas to compensate for the diminishing share of oil in total energy supplies.

38. The Soviet Union has made a deliberate policy decision to expand natural gas development and use in industry at the expense of oil; gas investment has risen 86% between 1970 and 1975 and, by contrast, oil investment rose only 28% during the period. Already the Ministry of Power and Electrification has ordained that fuel economy in thermal power stations can also be raised by constructing installations in which steam turbines are supplemented by gas turbines. The Soviets also see there the most promising approach for meeting for the first time the growing peak load demands.

39. Exports of natural gas to Western Europe which began in the late 1960s have still to provide substantial amounts of hard currency (\$100 m in 1974 on exports of 5.4 m m³. By 1980-1983 however, gas exports should expand greatly in light of the two projects involving the sale of Russian (and Iranian) gas to West Germany and the start [if approved by the US Congress] on the controversial North Star project in which US companies would bring Siberian gas to the US east coast(16).

40. Two important gas pipelines are now (1976) under construction. The first, in Komi ASSR running 1,000 km from Punga-Torzhok with a diameter of 1,420 mm, will carry 48 million m³ to Central Russia; the second line stretches 3,275 km from Urengoy and Medvezh'ye in northern Tyumen oblast' to Dolina in western USSR. It is claimed that this will be built in a year.

41. The most important is the joint East European-Soviet 2,750 km Orenburg pipeline. The USSR is to supply Eastern Europe with gas. The pipe diameter to be very large - 1,420 mm (4½ feet) and maximum capacity of the line would be 28 billion m³ per year. A total of 22 gas compressor stations purchased in the West would be installed between Orenburg and Uzhgorod.

42. As of March 1976, however, only 290 km of pipe have been installed at an investment cost of 70 million roubles.

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Recent meetings to "raise work tempo" and unwillingness or inability of certain East European countries to fulfil their work section (Czechoslovakia, originally designated to build a 350 km section is now only to provide "workers' housing" for the entire project) indicates that the 1978 target completion date is somewhat optimistic.

(iv) Nuclear power

43. Atomic power stations were to figure prominently in long-range Soviet energy plans in an effort to provide an alternative to Soviet oil and gas resources which may peak by 2000. Of late though, there has been a sharp scaling down of earlier estimates of the percentage of electrical power that will be generated by nuclear reactors.

44. In the reactor field the Soviets have shown some technical independence. The US delegation which visited Soviet installations in 1970 reported that the Soviet water reactors seemed "well within the performance range of similar reactors in the West". A major weakness in the Soviet programme, however, is in actually building the stations, although in 1975 there were over 20 Soviet nuclear reactors generating 3,700 million watts, compared to 60 in the US with a production of 30,425 million watts. It is generally acknowledged on both sides that there appears to be no breakthrough as yet in fast-breeder technology(*) which would permit more efficient generation of electrical power. Until this technology is developed the Soviets are concentrating on building larger conventional reactors; the 1976-1980 Plan calls for reactors of 1 B - 1.5 B kwt size for a total of 13,252 B kwt(17).

45. Further troubles and construction delays have recently been experienced at the Volgodonsk heavy machine building plant which is to use atomic power generating equipment. It is now very doubtful that the plant can contribute to the goal of 13-15 million kwt increase in atomic generating capacity in the current Plan. It would appear that until the technological difficulties are solved Soviet attention and reliance is to be placed on traditional means of power generation; this is emphasized by the fact that atomic power will generate only 2% of all USSR electricity produced in 1980 and about 10% in 1990.

(*) Using as fuel the most common form of uranium, U-238, this type of reactor "breeds" huge amounts of plutonium while heating steam for electrical generation. US experts say this technology will not be available for at least another 20 years although the French have made some recent progress on this front

B. SECONDARY ENERGY RESOURCES

(i) Electricity

46. Of the three main branches of the energy sector, the USSR seems to do best in the electric power industry. Soviet labour productivity is 39% of that in the US, the input ratio for fuel (the heat rate) is better than in the US and the output is produced with a small capital stock(18). Nevertheless, the Soviet utilization of installed generating capacity is inferior to the US performance, due to Soviet difficulties with boiler breakdowns and persistent failure to get new units working at capacity. Soviet steam turbo-generators and boilers are described as inferior in generator cooling, efficiency and reliability. It is not surprising that overloaded generating stations are often unable to meet peak demands and has led to "brown-outs" at various times. These problems are not necessarily an unbridgeable technological gap but more of an inability within the bureaucracy to plan and design appropriate equipment.

Production

47. At the 25th Party Congress in March, Minister of Power and Electrification Neporozhny, revealed that the USSR had an electricity output of 1,038 trillion kwt of which 86% came from thermal plants(19) and that of the Tenth Plan programme to 1980 called for an introduction of 70 million kwt of new generating capacity including "no less than" 15 million kwh of atomic power to assure 1,400 billion kwt of output. This is to double by 1990 as Neporozhny assures the introduction of "no less" than 300 m kwh of new capacity and large scale construction of atomic power plants.

Power lines

48. Neporozhny has called for a greater effort to help form a unified USSR power grid by linking Siberia's cheap electric power with western regions and "experimental use" of the new power control panel of the control centre of the USSR's unified power grid has begun(20).

49. Given progress in this area, one of the problems facing the USSR is the present lack of technology in both the East and West about the building of high voltage (1,500 megawatt) power lines from the point of production in Siberia over long distances to the consumers in European Russia or East Europe. The recent collapse of the Soviet-German plan to build a DM. ½ billion nuclear plant at Königsberg with a high voltage line to run directly to West Berlin has undoubtedly deprived the USSR of some valuable technical information the Germans would have provided(21). It remains to be seen whether the USSR has the

resources and technology and management within the scope of the Tenth Plan to overcome the difficulties of supplying the consumer via high voltage lines from points 3,000-5,000 kilometres away.

50. Soviet electricity exports to East Europe are carried on the "Peace" electrical grid. In 1974 they totalled 10,886 billion kwt, of which the largest customers were Hungary (4,246 billion kwt), Bulgaria (3,645 billion kwt) and Czechoslovakia (1,094 billion kwt). Exports to the West were directed mainly at Finland. Soviet efforts are now mainly in the direction of transporting increased output from thermal units in Siberia to Europe and linking up all of the European and East European power lines in one grid. The technology for this latter development, however, is still several years away, although COMECON representatives met in June 1976 to review a project for a 750 kV 1000 kilometre line between Albertisa (Hungary) and Vinnitsa (Ukraine) which will have a transfer admittance of 2000 MW.

III. EAST EUROPE

Overview

51. Of the East European countries only Poland and Romania have extensive energy sources (coal and oil) which enable them to avoid the worst aspects of energy deficiency that face East Germany, Czechoslovakia, Hungary and Bulgaria (Table V). These latter countries have in fact curtailed their previous long-term projects for a very rapid rise in oil imports. Apart from the introduction of economy measures, they tend to rely to a larger extent on other energy resources, including natural gas as well as coal, lignite and nuclear power. Nevertheless there will be, in general, a substantial further increase in the demand for liquid fuels, especially for petro-chemical purposes. The combined internal oil needs of the six smaller COMECON countries of Eastern Europe in 1980 could add up to at least about 120 million tons, of which close on 20 million tons would be indigenous, some 80 million tons would probably come from the USSR, and the remaining 20 million tons or so would come from OPEC countries. Overseas purchases will have to be paid for at world market prices, often in hard currencies, and intra-COMECON prices are now being gradually raised towards the same high level.

(i) East Germany

52. East Germany is experiencing difficulty in the energy sector. The 1976 Ninth Party Congress mood was determined to modernize its energy sector particularly lignite which calls for use of Western technology, new capital investments totalling

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240-243 billion DDR marks. Special efforts are needed because existing deposits will run out in nearly a third of the existing open-pit lignite mines by 1980. At the same time East Germany is turning more to alternative energy supplies. The 1980 Plan calls for an almost 40% increase in both petroleum and natural gas and the initiation of a nuclear power network.

53. Growing petroleum and natural gas imports are necessary to fuel East German economic growth because of stagnation in output of brown coal and lignite which still accounts for about two-thirds of total energy supplies (Table VI). Brown coal production is scheduled to remain at the 250 million ton level reached in the mid-1960s as deposits have become less accessible. Natural gas production will also remain unchanged in 1976-1980 despite great hopes for the gas processing plant near Magdeburg. Output in 1975 exceeded 8 billion m³ compared with a planned 11.5-14 billion. Supplementary gas will, however, be provided by the Orenburg pipeline(22).

54. East Germany will obtain almost all of its increase in energy supplies in 1976-1980 from imported Soviet oil and natural gas and from limited nuclear power production. Total energy consumption will grow an estimated 2.6% annually. This low growth rate, compared to a GNP growth of 3.7%, means that the East German energy programme is falling behind the demand and severe consumption curtailment will have to be made.

55. By 1980 imports will account for 36% of energy consumption, up from 30% in 1975, with the USSR continuing to provide more than four-fifths of energy imports. The GDR will pay M120 or 35 roubles per ton or about half the price the FRG has to pay(23). Middle Eastern oil shipments will have to increase only from 50,000 barrels per day (7,000 tons) to 60,000 barrels per day (8,500 tons) to meet total requirements. Natural gas deliveries from the USSR will more than triple in 1976-1980 and should reach the oil equivalent of 120,000 barrels per day (16,438 tons) by 1980.

(ii) Hungary

56. Faced in the last two years with the rising cost of imported raw materials and energy both from the Soviet Union and the West, a domestic energy demand expected to increase 22-24% by 1980, compounded by a serious worsening of the Hungarian terms of trade with the USSR in 1975, the government is placing greater emphasis on the expansion of domestic production of fuel and power and limiting the growth of imports. While many of the projects outlined in the Plan will not be in full operation by 1980 it is still hoped that domestic energy production will increase its share in total consumption from 45% in 1975 to 56-58% in 1980.

57. Efforts are being made to stop the trend in decline of brown coal production although the labour shortage will not permit any immediate improvement; by 1990 the estimated production will be 36-37 m tons, an increase of 30% over 1975 output of 24,887 m tons(24).

58. The consumption of oil which was 10 m tons in 1975, of which 8 m were imports, will increase in absolute terms but at a reduced rate, and its share in total energy consumption will fall from 43% in 1975 to 37% in 1980 for the first time in many years. Consumption of natural gas in 1975 was over 6 B m³ which will increase by 1980 as a result of the initiation of large scale imports of Soviet gas via the Orenburg pipeline and the expanded Bratstvo pipe system. In the field of electric energy Hungary will produce her first nuclear power in 1980 with a planned capacity of 1760 MW although still relying on COMECON imports (Table VII).

59. Nevertheless, domestic output capacity is limited in the energy sectors. By 1980 the USSR will supply almost 80% of Hungary's natural gas imports of 3,800 mm³ and 7.5 million tonnes of Soviet crude, or 75% of imports. In electric power Hungary has so far imported only 4.2 mwh from the USSR to add to domestic thermal power station output of 24 mwh; by 1980, despite an output of 27.5 million mwh, Soviet imports will be 7.5 million mwh, or 21% of total consumption.

60. Hungary is currently building with Yugoslavia and Czechoslovakia, financed by the World Bank, Kuwait and Libya, the \$500 m Adria oil pipeline to run from the Adriatic to Hungary and to link up with the Druzhba pipeline. This project is putting a considerable strain on Hungarian oil and gas equipment industries as well as on the labour supply and Hungary will have to import supplementary supplies from the West if construction progress is not to be delayed. This new access to Middle East oil will give Hungary some sort of energy flexibility it desperately needed in the last Five-Year Plan.

(iii) Poland

61. The energy situation in Poland in 1976-1980 will alter little from that of the last few years although Poland is in a better position than most of her COMECON allies. The cost of fuel and power imports, soaring from \$575 m in 1974 to \$1,181 m in 1975(25), has forced Poland to reassess her domestic resource base. Premier Jaroszewicz recently laid particular emphasis on the continued development of the rich coal deposits which are to provide almost 80% of Poland's energy requirements. The consumption of oil will continue to grow but the Polish Authorities

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will try to keep such growth to the minimum level required by their plans for development in the economy as a whole.

62. The coal industry provides Poland with her chief source of primary energy, 20% of her major export earnings and a valuable raw material for the chemical industry. Over the last five years, 1971-1975, Polish coal production totalled 978 million tons of which 786 million tons or 80% was hard coal. Poland is the world's fourth largest producer of hard coal and is second only to the USA in terms of exports. Between 1971 and 1975 yearly output rose from 145 million tons to 171.6 million tons, equivalent to an average annual growth rate of 4.3%. Production in the current Plan period however is expected to grow at the slower rate of 3.1% a year, from 177 million tonnes in 1976 to over 200 million tons in 1980. This increase will result from increased extraction at existing fields rather than from the opening up of new mines.

63. Poland exported about 15 million tons of coal to socialist countries in 1975 and 25 million tons to the West. Most of this was steam coal, with total coking coal exports (about 10 million tons) going to non-socialist countries.

64. Poland, like her East European neighbours, is being forced therefore to seek additional fuel energy because the USSR in 1976 can only supply 11.7 million tons of oil out of an estimated Polish requirement of some 16 million tons; by 1980 the proportion represented by Soviet deliveries may fall to 55-60%. The rising cost of oil imports has therefore given added urgency to plans to develop Poland's domestic oil reserves. Despite exploration efforts in Poland and USSR-GDR joint exploration projects in the Baltic, it seems highly unlikely that any major discoveries will be made and Poland may, therefore, be forced to cut back on the planned expansion of her oil processing and petrochemical industries.

65. Natural gas production in 1975 totalled a disappointing 5,963 million cubic metres, substantially lower than the optimistic target of 10,000 million cubic metres set in 1972; the target for 1980 is 8.5 b m³ which may be somewhat optimistic. At present Polish reserves are estimated at around 130,000 million cubic metres, with little prospect for any increase in production over the next few years.

66. Polish consumption of natural gas is currently estimated at around 8 billion cubic metres planned to rise to 13 billion cubic metres in 1980 and thus she is highly dependent on imports which she receives from the USSR(26). Poland is currently taking part in the construction of the Orenburg gas pipeline and will receive an additional 2,800 million cubic

metres and one million tons of oil a year for 20 years in return for providing labour, welding equipment, pipes and insulating material for the project.

67. In the field of electric power, the plan forecasts a major expansion in Poland's electricity generating capacity reaching 132-135,000 million kwh in 1980, 36% higher than the figure of 970,000 million kwh for 1975 and sufficient to confirm Poland's position as a substantial net exporter of electric power. During the plan Poland will construct, with Soviet help, her first nuclear power station at Zarnowiec. The Polish Authorities have stated that by 1990 nuclear power should account for 13% of Poland's total electricity consumption.

68. The development of her energy resources will depend on Poland's ability to overcome problems of labour supply and financing. The Polish mining industry is currently undergoing a fairly severe shortage of labour as well as lower productivity levels than the US or the UK and to overcome this has greatly improved the pay and conditions of the miners (who now rank as the most highly paid workers in the country), introduced incentive payments and re-equipped the older mines with automated mining techniques.

69. The provision of the necessary investment funds for the industry has also posed difficulties in the light of her growing indebtedness to the West of almost \$8 billion. It has been estimated that the 15 year project for the development of the Lublin coal basin will cost some 50,000 million zloties (\$15 billion) and it is expected West German firms will obtain orders worth up to DM. 2.6 b for two coal gasification plants and a plant to extract a variety of other chemicals from coal(27).

(iv) Czechoslovakia

70. Almost completely devoid of indigenous oil supplies, the Soviet decision to raise oil prices at the beginning of 1975 hit the Czechoslovak economy hard. Relative to 1973, the Czechoslovak bill for Soviet oil rose 175% by the end of 1975 - possibly the largest increase to be paid by any COMECON member. Additionally, above-quota deliveries will have to be paid for in hard currency or "world market" exportable goods. The result has been a decision by the authorities to adopt a double fuel system in certain key industries permitting use of both oil and natural gas. Coal reserves will also receive greater attention and investments in energy projects will increase.

71. The Minister of Fuel and Power stated that it might be possible to cover about one-third of the projected rise in

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energy requirements from domestic sources (including nuclear power). Thus, the country produced some 28 million tons of hard coal and 94 million tons of lignite in 1975 while the targets for 1980 are at best marginally higher, at 28-28.5 and 94-97 million tons respectively. There will be a substantial rise in electricity output but by far the larger part of this is to come from conventional thermal stations, based on solid fuels and a growing part from nuclear power which is to receive investment in 1976-1980 equal to "35 times" previous plan outlay. Czechoslovakia has also substantial uranium deposits upon which to draw. Production of crude oil and natural gas, of minor significance anyway, has lately tended to decline and is not even mentioned in the published version of the plan(28).

72. The plan itself also lacks details about energy import but a trade protocol signed last year envisages the delivery from the USSR of over 88 million tons of oil during 1976-1980 which will probably cost 65 transfer roubles a ton, equal to the 1976 world price, compared with barely 70 million tons in 1971-75. Oil imports from overseas, hitherto insignificant, will be facilitated by the forthcoming completion of the 5 million tons/year extension into Czechoslovakia of the new Yugoslav pipeline starting at the Adriatic seaboard. They are expected to cover close on 10% of the country's requirements during the plan period and total oil supplies could reach some 97 million tons during 1976-1980, or about 40% more than in the preceding five years.

73. Concurrent with the rise in oil supplies, it is intended to raise the crude capacity of Czechoslovakia's refineries to 20-21 million tons/year by 1980 - presumably, in the main, by building the long-projected 3 million tons/year plant at Ostrava in Moravia. There will be a sharp increase in motor fuels, chemical feedstocks and in the output of petrochemicals. The production of plastics is to be doubled, and that of chemical fibres is to be raised by 30%.

74. Russian deliveries of natural gas - almost wholly for use in industry - will apparently be raised from about 3,400 million cubic metres last year to 6,000 million cubic metres in 1980. Czechoslovakia will take an active part in enlarging the capacity of the existing Russian export pipeline, and in the construction of the new gasline from the Orenburg area; a substantial part of future gas deliveries to the country will be made by the Russians in payment for services rendered. The plan emphasises the need to provide additional underground storage for gas.

(v) Romania

75. Among the East European economies Romania has the largest energy autonomy; in 1973 Romania imported only 6% of her total energy consumption. Romania is also a substantial exporter of oilfield equipment in the world (worth \$70 m in 1973) and has linked this expertise to many of her trade agreements with Third World countries looking for oil (e.g. Ecuador).

76. Romania is also pressing forward with diversification in the natural gas industry and increasing production; in 1975 this rose to 27 billion cubic metres or 11.5% over 1974 (Table VIII). In this field as well as in the expanding oil refining industry, Romania is showing more enthusiasm for joint ventures with Western or OPEC countries, especially Kuwait, which would provide the hard currency needed for greater modernization.

77. In the Romanian Five-Year Plan for 1976-1980, guidelines for the longer term show that the share of petrochemicals is to reach as much as three-quarters of the chemical industries' total output by 1990. A substantial part of the country's rising energy requirements will be covered by a sharp expansion in the indigenous production of coal, much of it low-grade. Exploratory drilling for hydrocarbons is to be carried to greater depths than hitherto, and to be extended to the Black Sea continental shelf; but overall crude oil production is expected once again to rise only marginally to 15.5 m tons in 1980, 6% higher than 1975, while the rise in natural gas production will probably come to a standstill. Electricity generating capacity totalling 5,400-5,740 MW is to be installed, of which 3,200 MW coal-based, and 1,700 MW hydro-electric. A start will also be made during the period with the construction of nuclear power plants.

78. Romania's oil refineries produce large quantities of products for export as a means of earning foreign currency, though this policy now depends on costly imports of supplementary crude oil from the Middle East. The plan lays down that total exports from Romania are to rise by 75-80% and that petroleum products as well as chemicals are to take an "ever-increasing" share in the export trade both during the plan period and beyond. Crude oil imports will therefore have to be either increased or, at least, to be kept at a high level, in spite of determined efforts to economise with the domestic consumption of oil and, to some extent, of energy in general. The demand for hydrocarbon fuels in power stations may slightly decline during the five years as their relative share in electricity production is due to be cut from over 50% in 1975 to about 35% in 1980(29).

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79. Romania, until recently, was dependent upon the USSR for coking coal. This is changing as Romania is now looking to Western sources and may shortly agree to buy 6 m tons of US hard coal from Island Creek Co. of New York.

(vi) Bulgaria

80. The Bulgarians are more optimistic about their immediate industrial future than most of the other East European COMECON countries. Their new Five-Year Plan envisages a 48-52% increase in the national income from 1975 to 1980, compared with 46% in 1970-75. The plan also calls for a major effort to use fuel and power more rationally, and total energy consumption will, presumably, advance at a less rapid rate. Output of electricity - which normally rises faster than total energy use - is scheduled to go up from 25,200 million kwh in 1975 to 38,000 million kwh in 1980, or at a slightly lower rate than total national income(30).

81. Increases in energy supplies over the next five years mainly involve a higher consumption of solid fuels, natural gas and nuclear power rather than oil. Local lignite production - the mainstay of solid fuel supplies - is to increase from 27 million tons in 1975 to 38 million in 1980, or by 40%. A Soviet gas pipeline reached Bulgaria in 1974 and its capacity is to be gradually raised from an initial 3,000 million cubic metres/year to an eventual 10,000 million cubic metres/year. The plan contains no firm figures about actual deliveries over the next five years but urges the local steel industry to provide large-diameter pipes for new gaslines (e.g. Orenburg).

82. More than any of the other COMECON countries, Bulgaria is concentrating on the development of nuclear power. The present plan calls for 20% of the total electricity supply in 1980 to be nuclear generated, 40-45% by 1990 and 50% by 2000. To reach these goals the capacity of the reactor at Kozlodouli will be doubled, and a new reactor put into service using uranium from the Soviet Union.

83. There are no indications, either in the plan or elsewhere, of further big increases in oil imports which previously went up from 8.5 million tons (chiefly crude) in 1970 to 12-13 million tons in 1975. Most of the supplies are from the USSR though Bulgaria was one of the first COMECON countries to import substantial supplementary quantities (1-2 million tons/year) from the Middle East. Indigenous production of hydrocarbon fuels is negligible but the search is to be intensified, both onshore and offshore, and there will also be further efforts to utilise local shale resources.

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4. CONCLUSIONS

(i) USSR

84. The USSR cannot afford to reduce its efforts in favour of the oil industry since oil remains a very versatile form of energy and, despite growing costs because of remoteness and difficulties encountered in exploration and exploitation, it is still attractive from a cost efficiency view point. Moreover a surplus of oil is needed to supply Eastern Europe and to sell to the West. The reasons for this export policy are not only commercial (oil in 1975 produced hard currency earnings of over \$3 billion) but also political as it gives leverage to the USSR in Eastern Europe(31).

85. One very significant development is already certain for the end of the decade: the USSR's oil surplus will not be equal to the net deficit of the COMECON area which may be as much as 50 million tons. This substantial oil deficit has compelled the East European countries to accept both a greater degree of integration with the Soviet Union in order to obtain a larger share of Soviet energy resources through joint ventures (Orenburg pipeline, common electric grid, doubling of the "Friendship" pipeline capacity) and the necessity of looking to the West and OPEC countries for oil supplies. In any case the USSR is concentrating on the rapid development of its natural gas industry in order to complement oil exports to Eastern Europe.

86. Although faced with a medium-term problem so far as oil production is concerned, the USSR has only partially utilised her resources of all the major sources of energy; she is in a position to pursue a policy of energy self-sufficiency for herself and her East European partners as she has a potential overall energy independence in the long run. However, the USSR would find it extremely onerous if it were to embark on such an ambitious policy without large inputs of Western equipment and technology. Consequently the Soviet planners are trying to involve the West in the development of their energy projects, since such an immediate involvement would spare the USSR much of the necessary R and D cost in time and roubles.

87. The USSR, for political reasons, cannot ignore entirely the East European energy pleadings and it may even have to finance some of the purchases abroad by granting credits to its partners. However this possibility is not at all a certainty: at the present stage the USSR is running a very large hard currency deficit and increasingly growing indebtedness despite an increase in her oil exports to the West. Unless the deterioration of her foreign trade is stopped

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she may find it difficult to compound her own hard currency deficit with that of her partners in the energy field

(11) EASTERN EUROPE

88. The West can do very little to alleviate the hydrocarbon shortage of Eastern Europe which will become more acute towards the end of the decade. The Western industrialised countries have neither oil nor natural gas nor the political opportunity to spare.

89. The OPEC countries are the only alternative source of hydrocarbons to the USSR, but payment in soft currency or on barter terms has been in the past generally unacceptable to these countries for large delivery contracts. Recently, however, there have been in the case of Romania the tying in of oil exports to exploration and drilling of oil in less important OPEC producers (Ecuador).

90. The USSR has reported plans to increase its total energy exports to Eastern Europe by 43% during 1976-1980 over the previous Plan period. Oil exports, however, are expected to increase by only 4.5-5% annually, far below the 8-9% rate of annual increase during 1971-1975. It is doubtful that East European countries can correspondingly slow the growth in their demand which is estimated to be 135 m tons in 1980 of which less than 25 m tons can be met from indigenous production, through any combination of conservation policies. Various estimates of probable East European oil consumption for 1980 would call for rates of increase in supplies from the Soviet Union in excess of the planned Soviet rate as laid down in 1975. These projections, however, do not take account of any hard currency oil purchases the East Europeans might make.

91. The COMECON energy problems, particularly in East Europe, are exacerbated by either the growing manpower shortage or labour inefficiency which requires each country to turn to labour-saving machines and automatic equipment - all of which require some form of energy to work and put a further burden on energy supply. At the same time many countries, particularly Czechoslovakia, suffer from old plant and machinery which lead to costly and wasteful fuel consumption.

92. To buy the items necessary to increase energy supplies and bolster the economy, the COMECON countries have begun to pile up a large indebtedness to the West over the last three years; it is estimated that in December 1975 COMECON indebtedness to Western banks stood at \$14,249 billion(32). In the case of the USSR, at least 30% of the debt was comprised of imports of petrochemical equipment and large diameter steel pipe.

93. Credit terms, which until 1975 were free and easy, are going to get harsher for COMECON because of several factors:

- (a) capital needs in the West are growing due to increased business optimism;
- (b) the unwillingness of COMECON to impart with what Western bankers and economists regard as "normal information" to back up loans. Obviously if this is not forthcoming the greater risks will have to be taken at a higher interest rate cost to COMECON.

94. Eastern Europe may try to improve co-operation with OPEC and even do this with the assistance of the Soviet Union. There is, therefore, the likelihood that COMECON commercial penetration in the oil producing countries will be stepped up, in particular in such countries as Iraq, Algeria, Syria and Libya. In this connection the success of Romania in procuring a certain amount of oil in Iran and in the Arab countries may inspire the other East European countries.

(iii) THE WEST

95. Deals between the Soviet Union on the one hand and the United States and/or Western European countries on the other, so far as energy is concerned, (particularly in the natural gas sector), could materialise within the next few years. Both sides have something to gain from such deals. The West is trying to diversify and guarantee its sources of supplies; the Soviet Union requires increasing inputs of equipment and technology to overcome the constraints created by her inability to cope with ever growing requirements.

96. Should there be no deterioration in relations between East and West, it seems unlikely that the West would deny some of the technology which the energy industry requires to sustain its rate of growth. The level of indebtedness of the Soviet Union towards the West makes it imperative for Western creditors to ensure that the USSR has access to hard currency in order to service her debt. The sale of oil and natural gas to the West, a product which the West does not have in sufficient quantity, without making substantial energy cutbacks is one means of ensuring that the Soviet Union earns hard currency.

97. It may also be important from a global energy balance viewpoint that the Soviet Union remains an exporter of energy for, by exporting some 120 million tons of oil a year, it relieves the pressures which might exist on global supplies or maintain some surplus of supplies which help the market to

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avoid undue pressures on prices. From a political point of view, the increased Soviet dependence on the availability of Western equipment may be beneficial to the West, since Western countries might try to obtain some concrete political concessions for their willingness to keep the USSR supplied with technology (better implementation of the CSCE Final Act, greater willingness to negotiate armament limitation and control).

98. The West should show restraint and caution in co-operating with the Soviet Union in the energy field. In this regard mention should be made of the Soviet Union's suggestion at the 31st ECE Plenary session that there should be a Pan-European energy conference as a follow-up to the Helsinki Final Act. This suggestion, which was resisted by the West, probably represents an attempt to involve the West even more deeply in the future developments of the Soviet oil and natural gas industries.

99. A further ramification of this policy is the effect the increased Soviet output is bound to have on COMECON relations. More Soviet oil exports to Eastern Europe could easily lead to that region's greater dependence on Moscow, both economically and militarily. It is precisely this sort of Soviet energy lever that NATO might wish to discourage.

100. It should be stressed that the energy lever is much more in evidence within COMECON than is the case of Communist exports to the West. Nevertheless this aspect is not totally negligible. The percentage of oil imports from Communist countries in relation to overall consumption in NATO countries is rising in Denmark (4.9% in 1970, 8% in 1974), FRG (6.9% in 1970, 7.6% in 1974), the Netherlands (1.6% in 1970, 7.2% in 1974) with a high of 83% in Iceland(33)(see Table IX). The percentage is falling in France and Italy and is very small in Britain.

101. Nevertheless as the Soviet gas industry in particular expands to meet rising energy demands in both East and West, some degree of dependence in certain Western countries upon Soviet energy is bound to arise unless suitable alternatives are found. More important implications, however, are bound up in the whole Western trade policy to the USSR and Eastern Europe.

FOOTNOTES

- (1) Le courrier des pays de l'Est, mars 1976, p.E-4 et Table II.
- (2) Murray Feshbach. "Population and manpower trends and policies" (Washington, D.C.). Paper reviewed at reinforced meeting, 1st June, 1976. See "Introduction".
- (3) SWB, East European Weekly Economic Report, 15th April, 1976 p. 13.
- (4) Oil and Gas Journal, 13th October, 1975, p. 37.
- (5) Oil and Gas Journal, 3rd November, 1975, p. 43.
- (6) Ekonomicheskaya gazeta, February 1976, p. 17.
- (7) Neftyanik, 6/25, p. 6-8 quoted in ABSEES January, 1976, p.48.
- (8) Le Monde, 25th May, 1976.
- (9) AC/127-D/530, p. 6; see also Table IX in Annex.
- (10) International Herald Tribune, 25th May, 1976.
- (11) Neftyanik, op.cit.
- (12) Financial Times, 30th January, 1976.
- (13) Oil and Gas Journal, 6th October, 1975, pp. 42-3. Total oil shale production in 1975 is set at 32 m tons.
- (14) Petroleum Economist, June 1976, p. 205; AC/127-D/530.
- (15) Financial Times, 1st June, 1976. For a description of the new Yamal gasfield believed comparable in size with Tyumen deposits, see Petroleum Economist, June 1976, p. 237.
- (16) Reuters East-West Trade News, 3rd June, 1976, p. 3. The Iranian-USSR-German gas deal is said to be worth over \$1.4 b (Oil and Gas Journal, 8th December, 1975, p. 46).
- (17) Le courrier des pays de l'Est, mars 1976, p. E-11; see map 2 in Annex.
- (18) R. Campbell, "Technological levels in the Soviet energy sector" NATO colloquium "East-West Technological Transfers" March, 1976, pp. 11-12.
- (19) Le courrier des pays de l'Est, mars 1976, p. E-4; also see map 2 in Annex. This represents a 40% increase over the 1970 figure of 741 b kwh or 4,070 kwh per head per year.
- (20) SWB USSR Weekly Economic Report, 30th April, 1976, p. 13.
- (21) Neue Zürcher Zeitung, 2nd April, 1976.
- (22) Petroleum Economist, XLIII, 4th April, 1976, p. 137.
- (23) SWB, East European Weekly Economic Report, 22nd April, 1976 p. 10.
- (24) Petroleum Economist, May 1976, p. 189.
- (25) AC/127-D/535.
- (26) Petroleum Economist, June 1976, p. 206.
- (27) Financial Times, 3rd June, 1976. Der Spiegel, 1st June, 1976, p. 24 which has an interesting article on the Krupp firm and business with Poland.
- (28) Petroleum Economist, June 1976, pp. 235-6.
- (29) Ibid., January 1975, pp. 29-30.
- (30) Ibid., May 1976, p. 189.
- (31) Carl Spielmann, et al., Security implications of alternative Soviet energy policies towards Europe: 1976-1981. (Arlington, Va.) chapter I.

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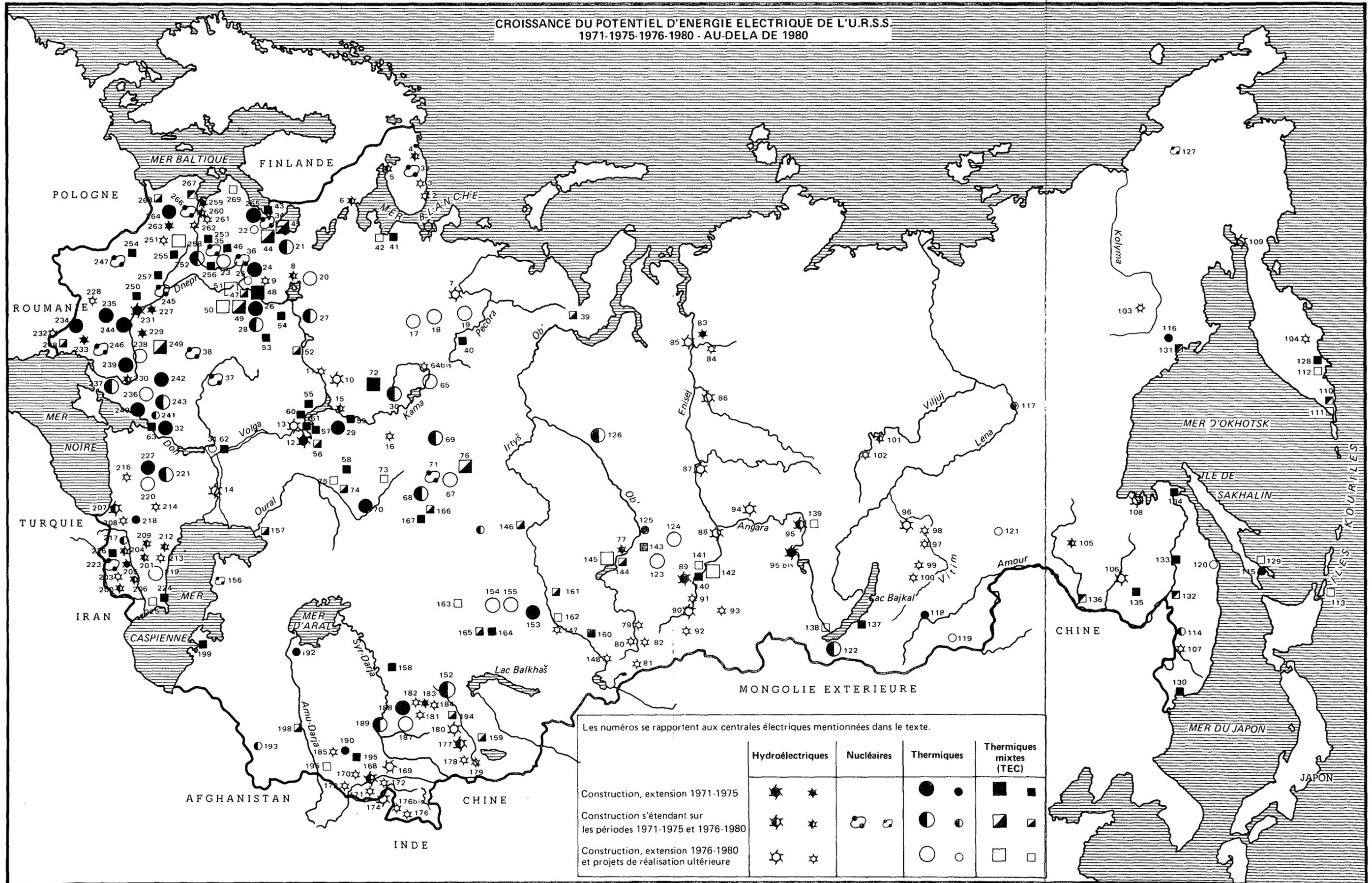
- (32) Eastwest Markets, 5th April, 1976, p. 7. The Dresdner Bank announced in July 1976 it was loaning the International Investment Bank \$600 m to finance part of the Orenburg pipeline cost.
- (33) AC/127-WP/463.

LIST OF MAPS AND TABLES

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CROISSANCE DU POTENTIEL D'ENERGIE ELECTRIQUE DE L'U.R.S.S.
1971-1975-1976-1980 - AU-DELA DE 1980



Les numéros se rapportent aux centrales électriques mentionnées dans le texte.

	Hydroélectriques	Nucléaires	Thermiques	Thermiques mixtes (TEC)
Construction, extension 1971-1975	★ ★		● ●	■ ■
Construction s'étendant sur les périodes 1971-1975 et 1976-1980	★ ★	☉ ☉	◐ ◐	◑ ◑
Construction, extension 1976-1980 et projets de réalisation ultérieure	★ ★		○ ○	□ □

5/0

TABLE I

US AND USSR: .SELECTED ECONOMIC ENERGY INDICATORS

	<u>Unit</u>	<u>USSR</u> <u>1974</u>	<u>US</u> <u>1975</u>	<u>USSR</u> <u>1975</u>	<u>USSR</u> <u>1976</u> <u>Plan</u>	<u>USSR</u> <u>1980</u> <u>Plan</u>
Industrial production index	1970=100	124.7	106.5	132.5	138.2	171.3
Crude oil including gas condensate	thousand barrels per day	9.02	10.0	9.6	10.0	11.6-12
Natural gas	billion cu. feet	9,200	20,100	10,215	11,053	14,125-15,359
Electric power	billion kwt	976	2,200	1,038	1,095	1,340-1,380
Coal	million metric tons	684.5 (un-clean) 540 (clean)	584.8 (clean)	701 (un-clean) 560 (clean)	715 (un-clean)	790-810

Source: Columns 1-4: AC/127-WP/474 and CIA "International Oil Developments, Statistical Survey", 17th June, 1976, p. 1.
Column 5: Based on figures of 620-640 m tons a year in Petroleum Economist, June 1976, p. 206.

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TABLE II

COMPARATIVE US/SOVIET COAL DATA: 1972

<u>Output</u>	<u>USSR</u>	<u>US</u>	<u>US/USSR</u>
Natural tons (metric)	655.2	537.9	.82
Corrected to cleaned basis*	524.2	537.9	1.03
Heat content	459.8	522	1.14
Employment	1,056	159.3	.15

Source: R. Campbell "Technological levels in Soviet energy sector" East-West Technological Co-operation, NATO Colloquium, 1976

Soviet published figures fail to consider "cleaned" basis of coal and hence are much higher than warranted.

In comparison with Western Europe, however, Soviet figures improve although they include only those workers extracting coal and not in auxiliary activities. Average monthly output per man tons in 1970 were: Germany, 51.8; UK, 44.4; Poland, 42.8; Czechoslovakia, 38.4; and the USSR 37.7.

* After removal of rocks, stones etc. usually represents a deduction of 20% of gross figure

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TABLE III

World Crude Oil Production

Thousand b/d

	1975						1976		
	1973	1974	Total	Oct	Nov	Dec	Preliminary		
							Jan	Feb	Mar
World total	55,740	55,885	53,160	51,510	53,280	53,780	52,710	54,050	55,620
Free World total	45,845	45,165	41,510	39,640	41,420	41,880	40,840	42,050	43,420
Western hemisphere	16,145	15,290	14,149	14,010	13,860	13,580	13,290	13,380	13,600
United States ¹	9,210	8,770	8,370	8,320	8,280	8,220	8,240	8,060	8,060
Venezuela	3,365	2,975	2,350	2,250	2,050	1,770	1,730	2,000	2,290
Canada ²	1,800	1,695	1,460	1,440	1,490	1,520	1,260	1,260	1,210
Mexico ³	465	580	720	780	800	820	830	830	800
Ecuador	210	175	160	160	180	190	190	190	200
Other	1,095	1,095	1,080	1,060	1,060	1,060	1,040	1,040	1,040
Eastern hemisphere	29,700	29,875	27,370	25,630	27,560	28,300	27,550	28,670	29,820
Western Europe	370	380	550	680	610	590	700	740	800
Norway	30	35	190	300	230	230	260	280	300
United Kingdom	Negl.	Negl.	20	20	20	20	100	120	170
Other	340	345	340	340	340	340	340	340	330
Middle East	21,210	21,875	19,610	17,490	19,240	19,830	19,150	20,030	21,090
Saudi Arabia ⁴	7,600	8,480	7,080	5,870	6,950	7,590	7,470	7,940	8,370
Iran	5,860	6,020	5,350	4,730	5,000	4,860	4,940	5,020	5,740
Kuwait ⁴	3,020	2,545	2,100	1,580	1,790	2,100	1,810	1,980	1,760
Iraq	2,015	1,975	2,250	2,490	2,130	2,080	1,830	2,010	2,160
United Arab Emirates	1,530	1,680	1,700	1,670	2,040	1,890	1,910	1,910	1,880
Abu Dhabi	1,310	1,410	1,400	1,350	1,750	1,570	1,580	1,580	1,520
Dubai	220	240	260	280	260	280	300	300	310
Sharjah	30	40	40	30	40	30	30	50
Qatar	570	520	440	390	560	610	490	470	500
Oman	295	290	340	380	390	390	390	380	360
Syria	100	135	160	180	180	190	190	200	200
Other	220	230	190	200	200	120	120	120	120
Africa	5,900	5,370	4,990	5,210	5,410	5,560	5,370	5,460	5,430
Nigeria	2,055	2,255	1,790	1,910	1,950	1,980	1,990	2,070	2,000
Libya	2,175	1,520	1,520	1,650	1,840	1,900	1,730	1,730	1,740
Algeria	1,070	960	930	900	950	950	950	960	980
Gabon	150	200	220	200	200	210	210	210	220
Egypt	165	145	250	250	250	320	320	320	320
Angola/Cabinda	160	170	140	160	80	60	20	20	20
Other	125	120	140	140	140	140	150	150	150
Asia-Pacific	2,220	2,250	2,220	2,270	2,320	2,320	2,330	2,440	2,500
Australia	370	390	410	400	400	400	400	450	450
Indonesia	1,340	1,375	1,310	1,370	1,420	1,420	1,420	1,460	1,520
Malaysia-Brunei	320	290	300	300	300	300	300	320	320
Other	190	195	200	200	200	200	210	210	210
Communist countries total	9,895	10,720	11,650	11,870	11,860	11,900	11,870	12,000	12,200
USSR ⁵	8,420	9,020	9,630	9,850	9,840	9,880	9,850	9,980	10,180
China	1,090	1,310	1,620	1,620	1,620	1,620	1,620	1,620	1,620
Romania	275	280	290	290	290	290	290	290	290
Other	110	110	110	110	110	110	110	110	110

¹Excluding an estimated 1.6 million b/d of natural gas liquids in March.

²Excluding an estimated 310,000 b/d of natural gas liquids in March.

³Excluding an estimated 100,000 b/d of natural gas liquids in March.

⁴Including about one-half of Neutral Zone production, which amounted to about 410,000 b/d in March.

⁵Excluding an estimated 270,000 b/d of natural gas liquids in March.

Source : CIA , International oil developments -
Statistical Survey, 17th June, 1976

TABLE IV

SOVIET OIL AND GAS CONDENSATE EXPORTS TO EUROPE

(crude oil and products - million metric tons)

	<u>1960</u>	<u>1965</u>	<u>1971</u>	<u>1974</u>	<u>1975 (est.)</u>
Western Europe	14.5	23.8	38.1	37.5	
Eastern Europe	9.8	23.4	42.9	62.5	
TOTAL	24.2	47.2	80.9	100.0	116.2
<u>Value</u>					4.35 billion roubles or \$5.87 b at October 1975 exchange rates (1)
					<u>Gas (billion m³)</u>
					<u>1980 (est.)</u>
Western Europe	0	0	1.4	5.4	23.3
Eastern Europe	0	0.4	3.1	8.6	28.4
TOTAL to Europe	0	0.4	4.5	14.0	51.7

(1) Source: Oil and Gas Journal, 13th October, 1975, p. 48. Of this figure 66.7 m tons worth 1.21 billion roubles (\$1.63 billion) was bought by other COMECON countries (including Mongolia and Cuba); Petroleum Economist, June 1976, p. 206

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TABLE V

SOVIET BLOC: PRODUCTION OF MAJOR FUELS

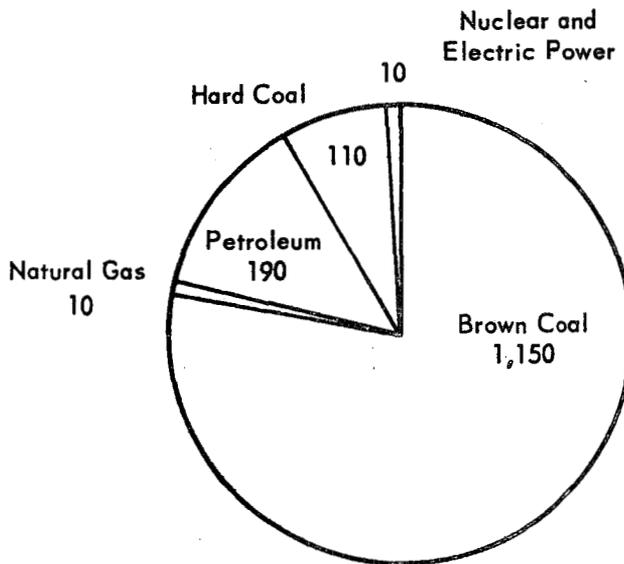
	CRUDE OIL		NATURAL GAS		COAL(a)	
	Million metric tons		Billion cubic metres		Million metric tons	
	1975(b)	1980 (c)	1975(b)	1980 (c)	1975(b)	1980 (c)
USSR	491	620-640	289	400-435	701	790-810
Poland	0.55	(0.55)	5.9	8.5	213	255
Czechoslovakia	0.15	(0.15)	1.0	(1.0)	122	125
East Germany	0.2	(0.2)	8.1	7.8-8.2	245	250-254
Hungary	2.0	2.0	5.2	6.0	25	24
Romania	14.6	15.5	26.8	26.8	30	58
Bulgaria	0.1	(0.1)	0.2	(0.2)	27	38
TOTAL	508.6	648.5(d)	336.2	468.0(d)	1,363	1,547(d)
Total, standardised(e)	727	927	400	557	979	1,111

- (a) Including high and low-grade coal, on a ton=ton basis. A substantial part of USSR production (44% in 1974) is low grade, mainly lignite. The Polish figures for 1975 and 1980 include, respectively, 173 and 200-210 million tons of hard coal, the balance (partly estimated) being lignite. Czechoslovakia: hard coal 1975, 28; 1980, 28-28.5; lignite 1975, 94; 1980, 94-97; 1980, 94-97. The figures for East Germany and Bulgaria refer to lignite only, hard coal production being insignificant. Hungarian and Romanian production is also mainly lignite but over one-tenth of the former and perhaps one-third of the latter is hard coal.
- (b) Partly estimated.
- (c) The figures (except those in brackets) represent targets shown or indicated in the Five-Year Plans.
- (d) Assuming that the mean figure is reached in all cases where a range of national target figures is shown.
- (e) i.e. in terms of million tons of "standard fuel" of 7,000 kilocalories per kilogramme. Conversion factors (in accordance with normal Soviet statistical practice): 1 ton crude oil = 1.43 ton standard fuel; 1,000 cu m natural gas = 1.19 ton st.f; 1 ton coal = 0.718 ton st. f.

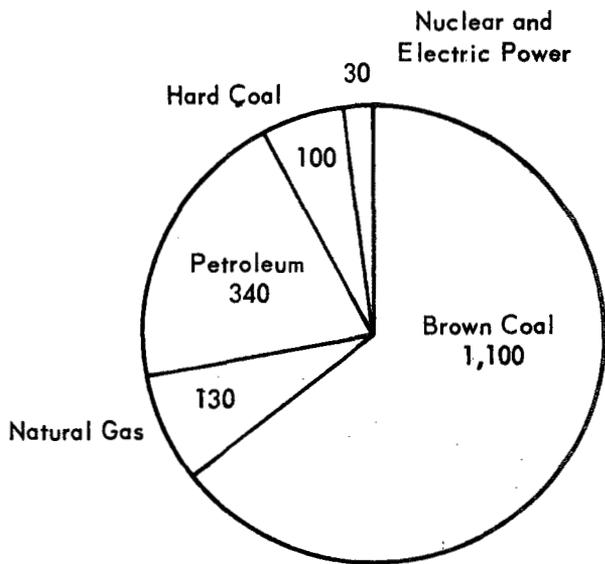
Source: Petroleum Economist, June 1976, p. 206.

TABLE VI
EAST GERMANY : PRIMARY ENERGY SUPPLY

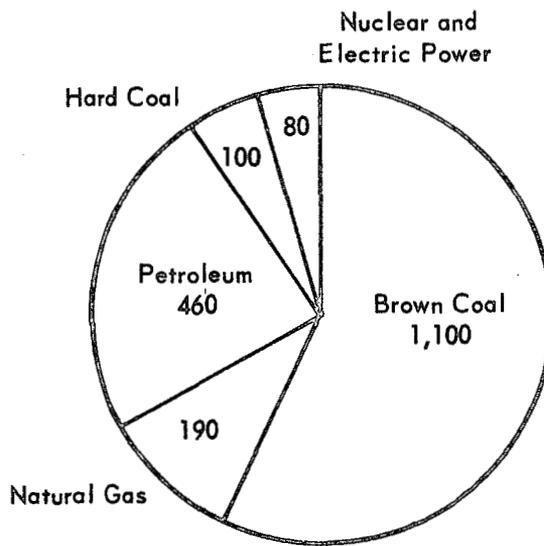
Thousand b/d of oil equivalent



SUPPLY 1,470
1970



SUPPLY 1,700
1975



SUPPLY 1,930
1980 (Plan)

SOURCE : US Delegation, "GDR Energy Supply in the New Five-Year Plan"

March 1976

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TABLE VII
PRIMARY ENERGY OUTPUT AND CONSUMPTION IN HUNGARY
(Tonnes standard fuel equivalent)

	1971		1975		1980 Plan			
	<u>Consump- tion</u>	%	<u>Output</u>	<u>Consump- tion</u>	%	<u>Output</u>	<u>Consump- tion</u>	%
Coal (lignite and brown coal)	15.9	51	24.9 m tons + 1.4 m imports	14	38	23 - 24.5 m tons	16	36
Oil	10.5	34	2 m tons	16	43		17 (12 m tons)	38
Natural gas	4.7	15	5175mm ³ + imports 806 mm ³	7	19		12 (1 b m ³)	27
Hydro- electric + nuclear power	neg. less than 1%	neg.		neg.			neg.	

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TABLE VIII

ROMANIA: SELECTED PRODUCTION TARGETS

	<u>Target for 1980</u> <u>(thous m tons)</u> (a)	<u>Planned %</u> <u>increase</u> <u>1980 over</u> <u>1975</u>
Crude oil	15,500	6
Natural gas	26,800(a)	Nil
C Coal	52-54,000(b)	70-76
Electricity	75-80(a)	30-39
Chemical fertilizers	3,300-3,500	58-68
Feedstocks for plastics	1,000-1,100	85-104
Synthetic rubber	280-300	149-167
Man-made fibres and yarns	310-330	80-92
Steel	17-18,000	64-76
Cement	19-20,000	40-48

- (a) Natural gas in million cubic metres; electricity in thousand million kwh
(b) Of which 82% lignite

Source: Petroleum Economist, January 1975, p. 30, see also AC/127-WP/467, Annex B.1 for 1975 figures

N A T O C O N F I D E N T I A L

TABLE IX

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NATO COUNTRY IMPORTS OF OIL FROM COMMUNIST COUNTRIES (a)
1973 AND 1974 (THOUSANDS OF METRIC TONS)

NATO countries	Crude and Semi-refined oil							Petroleum Products				
	Communist countries					World-wide (including Communist countries)		Communist countries				
	Total		USSR	Rumania	Other Communist countries			Total		USSR	Rumania	Other Communist countries
	1973	1974	1974	1974	1974	1973	1974	1973	1974	1974	1974	1974
(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Belgium	517.0	102.0	102.0	-	-	37,650.0	30,574.0	1,333.0	1,184.0	1,086.0	9.0	89.0
Denmark	-	-	-	-	-	9,799.0	9,363.0	1,157.0	1,204.0	743.0	36.0	425.0
France	3,357.0	226.0	226.0	-	-	134,920.0	129,814.0	1,516.0	1,272.0	949.0	299.0	24.0
F.R. Germany(1)	2,777.0	3,062.0	3,062.0	-	-	112,750.0	104,458.0	5,332.0	6,408.0	3,656.0	808.0	1,944.0
Greece(2)	400.0	500.0	500.0	n.a.	n.a.	12,673.0	n.a.	400.0	500.0	500.0	n.a.	n.a.
Iceland	-	-	-	-	-	-	-	491.0	468.0	468.0	-	-
Italy	7,087.0	4,041.0	3,923.0	72.0	46.0	128,536.0	120,312.0	1,792.0	2,630.0	1,912.0	588.0	130.0
Luxembourg	-	-	-	-	-	-	-	-	-	-	-	-
Netherlands	-	19.0	19.0	-	-	72,161.0	64,585.0	1,252.0	2,221.0	2,085.0	114.0	22.0
Norway	-	-	-	-	-	7,050.0	6,730.0	433.0	338.0	310.0	27.0	1.0
Portugal	-	-	-	-	-	4,348.0	5,758.0	17.0	-	-	-	-
Turkey	90.0	23.0	-	-	23.0	9,306.0	9,962.0	-	-	-	-	-
United Kingdom	180.0	158.0	158.0	-	-	115,465.0	112,817.0	234.0	404.0	395.0	-	9.0
Sub-total I	14,408.0	8,131.0	7,990.0	72.0	69.0	644,658.0	594,373.0(5)	13,957.0	16,629.0	12,104.0	1,881.0	2,644.0
Canada	-	-	-	-	-	45,528.0	40,461.0	32.0	52.0	-	52.0	-
United States	122.0	123.0	40.0	83.0	-	167,587.0	177,020.0	1,529.0	1,337.0	858.0	479.0	-
Sub-total II	122.0	123.0	40.0	83.0	-	213,115.0	217,481.0	1,561.0	1,389.0	858.0	531.0	-
TOTAL - NATO	14,530.0	8,254.0	8,030.0	155.0	69.0	857,773.0	811,854.0(5)	15,518.0	18,018.0	12,962.0	2,412.0	2,644.0

Source: C-M(76)44