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ECONOMIC COMMITTEE

THE ENERGY SITUATION IN COMECON COUNTRIES
IN THE FIVE-YEAR PLAN PERIOD 1976-1980

Note by the Chairman

At its meetings on 30th June and 14th July, 1977 the Economic Committee briefly reviewed Working Paper AC/127-WP/515 (proposed declassified version of C-M(76)57) on the energy situation in COMECON countries in the Five-Year Plan period 1976-1980.

2. Following a few amendments suggested by a number of Delegations, the Economic Committee agreed that the attached paper be downgraded from "NATO CONFIDENTIAL" to "NATO UNCLASSIFIED".

(Signed) J. BILLY

NATO,
1110 Brussels.

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

TABLE OF CONTENTS

	<u>Paragraphs</u>
<u>PART I - MAIN FINDINGS AND CONCLUSIONS</u>	1 - 16
(i) USSR	1 - 9
(ii) Eastern Europe	10 - 13
(iii) The West and COMECON energy	14 - 16
<u>PART II - GENERAL REPORT</u>	17 - 93
I. <u>Introduction</u>	17 - 24
II. <u>Energy situation in the Soviet Union</u>	25 - 60
A. Primary sources	25 - 55
(i) Coal	25 - 27
(ii) Oil	28 - 43
(iii) Natural gas	44 - 52
(iv) Nuclear power	53 - 55
B. Secondary energy resources	56 - 60
Electricity	56 - 60
III. <u>East Europe</u>	61 - 93
(i) East Germany	62 - 65
(ii) Hungary	66 - 70
(iii) Poland	71 - 79
(iv) Czechoslovakia	80 - 84
(v) Romania	85 - 89
(vi) Bulgaria	90 - 93
IV. <u>Sources for General Report and Annex</u>	
Annex: Tables I to V.	

THE ENERGY SITUATION IN COMECON COUNTRIES(1)
IN THE FIVE-YEAR PLAN PERIOD 1976-1980

PART I: MAIN FINDINGS AND CONCLUSIONS

(1) USSR

1. In 1975, the Soviet Union with a crude oil output of 491 million tons became the world's leading producer, leaving the United States in second place. The efforts which it has exerted to achieve this will no doubt be continued; production is planned to reach 640 million tons in 1980. However, the planned growth 1976-1980 (5.4% yearly or overall 31%) is lower than that achieved during the period of the Ninth Five-Year Plan (38%). The share of oil in total energy consumption will rise slightly from 42.5% in 1975 to 42.7% in 1980.

2. Domestic demand, on the other hand, could rise at an average yearly rate of 7-7.5% to reach some 512 million tons in 1980. This growth rate is well above that of the economy as a whole (an average of around 4% a year under the Tenth Five-Year Plan). This is explained by the many uses to which oil is put in a modern economy, especially in the Soviet Union where automation, the rise in the number of motor vehicles, the expansion of the transport system and the opening up of the areas East of the Urals, call for increased energy inputs.

3. The Soviet Union is the main oil supplier for Eastern Europe, which enables it to consolidate its political hold over an area which is generally poor in energy resources. This domination is strengthened by the fact that Soviet oil is sold to the East European countries at prices which are generally below those obtaining on the world market. In 1975, for example, the Russians were charging their Warsaw Pact allies \$47 a ton, whereas the world f.o.b. price was around \$80 a ton.

4. The Soviet Union needs to maintain exports to its East European customers for economic and political "leverage" as well as to the non-Communist countries, since these sales are a substantial source of convertible currency; in 1976 they may have brought in \$3.5 billion (1975: \$3.1 billion. Oil is, in fact, the Soviet Union's primary export to the Western industrialised countries.

(1) Excluding Cuba and Mongolia

AC/127-D/558

-4-

5. Over the next few years, natural gas(1) can also be expected to become an increasingly important element in the energy pattern and in Soviet foreign trade. The share of this commodity in energy production would reach 23.7% in 1980 from 21% in 1975. Exports, which in 1975 were in the region of 19 billion m³ may, according to certain estimates, reach 65 billion m³ in 1980, of which 24 billion m³ will go to Western Europe and about 40 billion m³ to Eastern Europe. Imports, mainly from Iran and Afganistan, are expected to reach 15 billion m³ from 12.4 billion m³ in 1975.

6. However, the new oil and gas fields are located East of the Urals, further and further from the main consumption centres. Climatic and geological conditions make prospection and production difficult and very costly.

7. As a result, the Soviet Union will be faced with a problem in the fairly near future. The present pace of development of the oil industry is unlikely to enable it to meet simultaneously domestic demand, the growing needs of its COMECON partners and its Western customers. Some recent studies have also shown that Soviet oil production may well peak by 1984-1985 and the country could be faced with the prospect of becoming an oil importer in order to meet domestic oil demands and its export commitments to other COMECON countries and to Western buyers.

8. The Soviet coal industry will receive greater attention as a result of government action to shift dependence upon oil to the alternative cheaper fuels - coal and gas. Coal production, which was 712 million tons (unclean) in 1976, is forecast to rise at about 2-3% a year to 805 million tons in 1980.

9. To speed up the harnessing of new deposits and the movement of hydrocarbons, the Soviet Union will continue to rely on Western equipment and technology. In addition, the Soviets have put the much vaunted COMECON integration plan to the test by strongly encouraging the East European countries to take part in joint energy projects (Orenburg gas line, joint grid system, doubling of the capacity of the "Friendship" pipeline). Nevertheless, it must be stressed that nothing approaching a concerted long-term energy development plan for either East Europe or the Soviet Union has so far been announced.

(1) 1976 output: 321 billion m³; planned for 1980: 435 billion m³

(ii) EASTERN EUROPE

10. The European COMECON countries will be obliged, by 1980, to import annually at least 33 million tons of crude oil from non-Communist sources in addition to the 75 million tons they will have to purchase from the USSR(1).

11. Traditionally, East European countries, except Romania, have obtained the bulk of their hydrocarbons from the Soviet Union. However, the latter is finding it increasingly difficult to meet all their requirements. These countries will, therefore, have to allocate part of their scant convertible currency resources to purchase the oil which the Russians cannot provide and which they need for their economic growth. For political reasons the Soviet Union cannot completely overlook the new difficulties facing these countries. At the same time the question arises whether given the size of its own convertible currency debt, the Soviet Union will be prepared to provide its East European partners, if necessary, with some of the convertible currency they need for such purchases in the world market.

12. The industrialised Western countries which have neither oil nor natural gas in sufficient quantity for their own requirements are not in a position to help the East European countries to make good their hydrocarbon deficit. The latter are therefore obliged, on the other hand, to spare no effort to develop their home resources and to conserve energy and, at the same time, to turn to the OPEC countries.

13. Eastern Europe may thus be led to co-operate more extensively with the OPEC countries perhaps even with the help of the Soviet Union. Romania has recently concluded agreements with some OPEC countries (Ecuador, Kuwait) providing for oil deliveries in exchange for assistance in prospecting and drilling for oil. Accordingly, COMECON commercial penetration may well increase in the oil producing and exporting countries, particularly Iraq, Algeria, Syria, Libya and Angola.

(iii) THE WEST AND COMECON ENERGY

14. The Soviet Union must find the means of paying for the additional machinery and technology it may seek to obtain from the West. In this respect, the Communist countries already make extensive use of export credits and other forms of external financing to cover the cost of their imports from the

(1) It is worth noting that Romania is the second largest producer in COMECON after the USSR. As its production has passed its peak, Romania now imports 5 or 6 million tons from OPEC countries.

AC/127-D/558

-6-

non-Communist industrialised world. According to certain sources the total debt burden of the Communist countries at end-1976 was around \$43 billion, of which \$14 billion represented the Soviet share. In the case of oil and natural gas prospection and exploitation, the projects may entail a certain degree of risk and take a long time to come to fruition, thereby immobilising substantial capital, without the certainty of adequate returns.

15. Until 1975, Western credits were generally granted to COMECON countries at attractive conditions, but these are now becoming more stringent. Western financial institutions are becoming wary of the credit worthiness of certain Communist countries and may, henceforth, hesitate to lend even when not faced with legal or self-imposed ceilings that are even now imposing some constraints.

16. The share of oil imports from Communist countries (mainly the USSR) in total Allied countries imports is modest: 3.4% in 1975. The percentage is somewhat higher in the case of the European members of the Alliance: 5% (30 million tons imported from the East as against 614.6 million tons procured world-wide). Moreover, these figures are unlikely to grow substantially over the next few years as the Soviet supply position grows tighter and increasing quantities of North Sea oil and gas come on stream.

PART II: GENERAL REPORT

I. INTRODUCTION

17. Despite assertions that in the energy field the USSR is not confronted with problems similar to those of the West, and that the country has the capability to remain energy self-sufficient, highest government officials informed the Twenty-Fifth Soviet Party Congress (completed on 5th March, 1976) that management of the Soviet fuel-energy supply has become a matter of serious concern.

18. General Secretary Brezhnev and Premier Kosygin gave a frank assessment of Soviet energy potential, and called for a long-term inter-branch effort, to use oil and natural gas supplies more efficiently and ensure the power supply to the energy-deficient European part of the USSR; they also urged alternative resources such as a greater utilization of coal,

atomic power and hydro resources. The leaders noted the problems of the location of most of the USSR's fuel reserves in Siberia and the Far East and stressed the need to intensify exploration activities closer to industrial users in European Russia and to readjust the USSR's fuel-energy balance away from the present course of increased dependence on oil.

19. It would appear that the USSR still has sufficient energy supplies. In 1976 crude oil(1) output was 520 million tons (USA: 487 million tons; Saudi Arabia: 428 million tons), while natural gas production reached a record 321 billion cubic metres (USA (1975): 592 billion m³). Coal output was 712 million tons (about 564 million tons clean) while the 1975 US figure was 537 million tons (clean). The 1976 electricity output in the Soviet Union reached 1,111 billion kWh. USA figures for 1975 show a total of 2,200 billion kWh.

20. The USSR, however, faces considerable problems in achieving satisfactory growth rates in the energy industries and these are likely to become even more serious in the 1980s. The geographic shift of production into the remote and physically demanding areas of Eastern Siberia, Central Asia and Kazakhstan has created major problems for the equipment industries. Indeed, while for many years Soviet technology, albeit inferior to that generally found in the West, was adequate for basic domestic needs, this is no longer good enough and future output levels may well be determined by the acquisition of appropriate advanced Western technology and know-how.

21. In the oil industry the USSR must reconcile the conflict of meeting demands of the home market with the need to expand oil exports for much needed hard currency. Domestically the demand for oil products has increased steadily in recent years, spurred on by recent industrial development and the growth of the transport sector, both of which are threatening to run beyond the oil industry's capacity. At the same time, the development of Siberia poses special problems both in terms of quality and quantity of product demanded. Some fields are already jeopardized by poor secondary recovery methods.

22. Nor will the expansion of the nuclear power capacity prove an easy solution. During the last Plan the growth in nuclear power capacity fell short of target and by 1975 totalled less than 3% of the total installed capacity of the country, generating 2% of the total electricity output. Even if the 1976-1980 Plan capacity of 19,000-21,000 MW is achieved, which given difficulties in the nuclear engineering industry seems unlikely, nuclear stations will only represent

(1) Figures include natural gas liquids.

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AC/127-D/558

-8-

5-6% planned capacity by 1980. By 1980 the Soviet Union may well be facing a shortfall in energy supplies under planned targets. Given the commitments to the other COMECON members, the need for convertible currency exports to the West and the growing internal demands, such a development will have significant repercussions on the Soviet economy unless steps are taken to conserve energy and improve the rate of exploration of new energy deposits.

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

- (a) simultaneously restricting the export of oil to Eastern Europe and increasing the price for such shipments; (prices in 1973 were 16.0 roubles per ton (\$21.5), in 1974 18.1 roubles per ton (\$23.9) and in 1975 33.9 roubles per ton (\$47.0));
- (b) initiating an intensive energy saving programme(1) 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;
- (c) giving greater emphasis to the expansion of natural gas production for home and export markets. Domestic consumption of gas to increase relative to oil while exports to both Eastern Europe and the West to expand considerably;
- (d) establishing agreements with British, Japanese and US firms on interchange of technology. There have also been co-operation agreements with Japan for exploration off Sakhalin. In return for Western capital and expertise the USSR will pay in oil, gas and various by-products.

24. 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 million tons in 1975, will rise to a range of 110-135 million tons in 1980. Eastern Europe will try to meet this shortfall by a number of methods:

(1) It is not certain that such a programme is already in effect

- (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 about 75 million tons at prices which may gradually approach world market prices if the latter remain relatively stable over the next few 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 domestic sources of supply: coal and coal gasification plants in Czechoslovakia, Hungary and Poland; 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; efforts to curb waste and increase efficiency of energy utilisation in all countries;
- (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 small scale organizations such as Interetalon-pribor (precision equipment), Interelectro (high tension equipment), as well as the massive joint construction project - the Orenburg gas pipeline. One of the promising areas of co-operation is the nuclear power. In 1972 Interatominstrument was set up to promote nuclear precision engineering whilst a later organization, Interatomenergo, was founded to foster co-operation in the design and production of equipment for nuclear power stations.

II. ENERGY SITUATION IN THE SOVIET UNION

A. PRIMARY SOURCES

(1) Goal

25. Sixty per cent of present Soviet coal production is in European USSR but over 90% of potential recoverable coal reserves, established at 6.8 trillion tons, are in the Asiatic sector. Partially because of oil extraction difficulties, the Tenth Five-Year Plan intends to give coal a greater rôle, particularly in eastern regions, as heating fuel and for generating electric power. Reports in Ekonomicheskaya gazeta in January 1977 affirmed previously announced 1980 production targets of 805 million tons of coal, up 13% above the 1976 output of 712 million tons. At least one-third of the planned 1980 production is to be used in connection with the electricity production.

AC/127-D/558

-10-

26. The poor performance of the Soviet coal industry is due to low productivity, bad organization and over management, and a lack of concern or inability to rationalize the labour force which hampers modernization of Soviet mines. 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.

27. 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. In 1980 this percentage is planned to drop to 26.5%.

(ii) Oil

28. The Soviet Union was the world's largest crude oil producer in 1976 with an output of 520 million tons and with a refining capacity (in 1975) of 7.5-8 million barrels per day(1). The volume of proved crude oil reserves has been estimated to be between 10.1 and 11.8 billion tons in 1976. This is slightly less than stated in 1975 (12.4 billion) (USA in 1976: 4.7 billion tons; Saudi Arabia: 21.2 billion tons). It is, however, most difficult to give fully reliable figures since Soviet authorities consider information on oil reserves as secret. Verification is, therefore, impossible. On the other hand, recent USA estimates have put Soviet reserves at 4.5-5 billion tons, roughly the same as those of the USA. This wide range of discrepancy between estimates highlights the continual problem of preciseness in this sector.

29. The current Tenth Five-Year Plan calls for 1980 oil production levels of 640 million tons of crude oil. On the other hand, figures for the oil industry output in the first quarter of 1977, plus recent estimates by the USA and OECD, seem to indicate that this target may not be reached.

Almost all of the projected production increase will come in the Tyumen oblast¹ of West Siberia and in Komi ASSR; these areas will produce more than half of the total production of which the largest is now the giant Samotlor field with 15% of output in 1976.

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

30. By the 1990s the USSR optimistically 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. Certainly the potential does exist, but this would seem to be an unlikely figure unless the Soviet Union continues to import highly expensive Western technology and know-how, especially in the field of off-shore drilling and secondary recovery methods and discovers large new deposits.

Oil policy investments

31. 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 the late Oil Minister Shashin indicated that while the overall value of industry earnings was 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 the decline in output at fields nearing depletion.

Exploration

32. 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 offshore including a joint Soviet-Japanese exploration off Sakhalin Island costing \$152.5 million. Despite enormous expenditure in the last ten years exploration (over 5,677 million roubles were spent in the period 1966-1970), the Ekonomicheskaya gazeta has recently stated there is still not enough investment money allocated to meet the requirements nor enough technological expertise and equipment available to meet demands of thorough scientific explorations. The Volga-Ural region and the northern Caucasus have now entered the last stages of oil exploitation and greater effort is required to sustain oil production in these areas. As a result, the cost of producing one ton of oil and gas condensate increased in 1970 by 9.2% on 1965. Moreover, the cost of transportation of energy from remote areas to European Russia has soared. The shipping of Kusnetsk Basin coal to Moscow is set at 18.5 roubles per ton above the cost of the coal. Oil and gas pipelines involve similar levels of expense.

33. The USSR, a comparative latecomer to offshore oil exploration, therefore lacks the expertise and equipment for large scale operations. Shashin himself repeatedly warned that the country may face a serious oil crisis in the 1980s unless

AC/127-D/558

-12-

the authorities are willing to give a much higher priority to off-shore oil exploration. To date, little has been done to exploit Arctic resources and only a start made on developing Black Sea and Sakhalin oil potential. Among equipment currently on order from the West is a French dynamically positioned drill-ship and a Finnish semi-submersible rig. The USSR has also chartered three seismic exploration vessels, one from France and two from Japan and is continuing to negotiate for further equipment with a number of countries.

Oil consumption

34. Domestic oil consumption for 1975 was estimated to be 369 million tons, a rise of 6% compared with an annual rate of 7-8% in previous years. This is expected to average 6.5-7% in the 1976-1980 period, reaching 505-517 million tons by 1980, due in part to hopeful government conservation measures and upward price revisions(1).

35. 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 2,200,000 or about 16% higher than 1975) with private passenger car sales to increase only slightly the same, oil consumption is planned to increase by about 7% a year (though output is set at only a 5% increase) 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.

Oil exports

36. In 1975 oil exports represented the USSR's largest single source of foreign exchange - \$3.1 billion of the total hard currency exports of \$7.8 billion. The exports of crude oil and products in 1975 amounted to 130.2 million tons of which East Europe CMEA countries received 63.3 million tons (49%), other Communist countries 14.4 million tons (11%), while exports to the West totalled 52.6 million tons or 40%. Imports, mainly from Iraq, totalled 7.6 million tons worth \$532.2 million.

37. As a result of OPEC's increase in crude oil prices, the USSR benefited considerably from its position as a net exporter of oil to the hard currency area. In 1975, as part of a general price revision in CMEA, the USSR raised its oil prices to its partners by as much as 100% in some cases. These countries are paying on average in 1977 44 transferable roubles per metric ton of crude oil which will rise to 70.4 transferable roubles in 1980.

(1) The 1980 output target is 640 million tons less exports of 143 million tons (Table IV), leaving available consumption total of 497 million tons or a shortfall of about 1-2%. Some Western estimates put consumption growth at a more modest 5%. If the Soviet output target is met, then there would be no shortfall at all and greater scope for an expansion of oil exports.

Prospects

38. In a recent Pravda article, the late Oil Minister 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 or increased needs of East Europe reduce amounts available for hard currency exports or other priority objectives.

39. 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 billion m³ a year because of poor extraction equipment flaring off, inadequate mud technology both in oil and gas and low quality drill pipe and bits. 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. Moreover, indigenous Soviet efforts to develop satisfactory equipment have failed and the Soviets have also turned to the West for most large diameter seamless pipes (worth \$4.3 billion in 1972-1975 alone), valves, liquid gas plants and compressor stations. An order for 22 such stations, worth \$600 million, has recently been placed with German and Italian firms for the Orenburg gas pipeline now under construction.

40. Other problems facing the oil industry which give greater support to recent statements that the Soviet output is peaking include the low return on capital investment, continued depletion of Urals-Volga fields, exploitation of small oil fields in European USSR with higher costs per unit of output, establishment of new production centres in economically under-developed and difficult climatic areas of eastern Siberia, and technological problems in extracting and transporting the oil because of variations in viscosity, permafrost conditions and poor quality, and use, of Soviet equipment. The Soviets are especially prone to pumping too much water into oil wells in an effort to force oil to the surface. This has caused enormous problems with pumping equipment.

41. Finally, like so many other enterprises in the USSR, there exists an unjustified number of workers in regional engineering - technical services and other non-industrial groups. The elimination of some of this labour force, estimated to be about 800,000 in 1976, is one basic step suggested to reduce excessive labour costs and promote a streamlining of management to expedite the decision-making process.

AC/127-D/558

-14-

42. 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%. 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.

43. In the course of the Tenth Plan, it is very doubtful whether the Soviet Union will succeed in much greater management efficiency due to the proliferation of the bureaucrat apparatus both within Moscow and the various republics. There are simply too many hands involved in the decision making which has led to numerous bottlenecks. Until the 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

44. 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 321 billion m³ in 1976 and 86.6 billion m³ for the first quarter of 1977 for a growth rate of 9% over 1976. Total 1977 output is targeted at 342 billion m³.

45. The Tenth Five-Year Plan calls for the natural gas industry to achieve an annual growth rate of 8.5 % to bring the total production to 435 billion m³ in 1980, with gas exports increasing from 19 billion m³ in 1975 to 65 billion m³ in 1980 (1). By 1985, gas exports are expected to earn the Soviets \$1.5 billion a year. The greatest increase will be in the Urengoy field in the Tyumen oblast' in West Siberia where the annual production growth will average 100 billion m³ in 1980. In addition, the USSR plans to lay 35,800 kilometres of gas pipeline (including town and replacement gas lines) in the 1976-1980 Five-Year Plan. The pipe system will total 137,000 kilometres by 1980.

(1) of which some 40 billion m³ to Eastern Europe and the balance to Western Europe.

46. The most important Plan target will be the creation of a "large gas production industry" in northern Tyumen 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 relies heavily on Western imports of technology throughout the Plan if the target goals are to be approached.

47. Consumption of natural gas in 1974 reached 260 billion m³ including addition to stocks. In 1975 it is estimated that consumption reached 282 billion cubic metres, a rise of 8.5%. Most of the gas consumption takes place within the industrial sphere; private and public consumption takes less than 2% of total output.

48. As the Soviets try to reduce their reliance on oil, they will rely more heavily on natural gas to compensate for the currently stagnating share of oil in total energy supplies. According to Soviet officials, natural gas will replace oil as the premier source of energy by 1990.

49. The Soviet Union has made a deliberate policy decision to expand natural gas development in the gas industry and use in industry. 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.

50. Exports of natural gas to Western Europe which began in the late 1960s should provide greater amounts of hard currency. In 1975 exports of 8.04 billion cubic metres were worth \$219 million. By 1980-1983 gas exports and hard currency income should expand greatly with increased deliveries to France and West Germany. Two other potential export deals, Yakutia and North Star, are unlikely to be in operation for a considerable time because of the cost of development.

51. Two important gas pipelines are under construction. The first, in Komi ASSR, running 1,000 kilometres from Punga-Torzhok with a diameter of 1,420 mm, will carry 48 million m³ to Central Russia; the second line stretches 3,275 kilometres from Urengoy to Medvezh'ye in northern Tyumen oblast' to Dolina in western USSR.

AC/127-D/558

-16-

52. Another important line is the joint East European-Soviet 2,750 kilometre Orenburg gas pipeline to supply Eastern Europe with Soviet 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 are to be installed between Orenburg and Uzhgorod. About one-half of the construction is now completed (1977) though some of the most difficult terrain has yet to be crossed. It appears the 1978 target completion date is somewhat optimistic.

(iv) Nuclear power

53. 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. 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.

54. 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. In 1975, according to Soviet figures, the capacity of atomic power stations in the USSR totalled 6,000 MW and generated 22,000 million kWh of electric power, representing only 0.4% of total energy production. Whilst it is generally acknowledged on both sides that there appears to be no breakthrough as yet in fast-breeder technology(1) which would permit more efficient generation of electrical power, the USSR plans to install a 600 MW reactor at Belayorsk by 1980. Until this technology is developed the Soviets are concentrating on building larger conventional reactors at the mammoth "Atomash" plant. The 1976-1980 Plan calls for reactors of the 1,000-1,500 MW size for a total production of 1,340-1,350 billion kWh.

(1) 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. The debate over this type of nuclear energy has also spilled into the political arena as the USSR and the U.S.A. have recently taken opposite stands on the wisdom of exporting nuclear plants (and plutonium) to countries willing to buy such technology.

55. Further troubles and construction delays have recently been experienced at the Volgodonsk plant building atomic power generating equipment. It is now very doubtful that the plant can contribute to the goal of 13-15 million kWh 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 emphasised by the fact that atomic power, which in 1977 accounts for about 2% of all electricity, will generate only 6-7% of all USSR electricity produced in 1980 and about 10% in 1990.

B. SECONDARY ENERGY RESOURCES

Electricity

56. Of the three main branches of the energy sector, the USSR seems to do best in the electric power industry. Output/capital ratio is high and output grew 40% in the 1971-1975 period. 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.

(a) Production

57. At the 25th Party Congress in March 1976, Minister of Power and Electrification Neporozhny revealed that the USSR had an electricity output of 1,038 billion kWh, of which 86% came from thermal plants, and that of the Tenth Plan programme to 1980 called for an introduction of 67,000-70,000 MW of new generating capacity including "no less than" 13,000-15,000 MW of atomic power to raise total electricity production to 1,340-1,380 billion kWh. This is to double by 1990 as Neporozhny assures the introduction of "no less" than 300 million kW of new capacity and large-scale construction of atomic power plants.

(b) Power lines

58. 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.

AC/127-D/558

-18-

59. 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) DC 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. half 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. 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.

60. Soviet electricity exports to East Europe are carried on the "Peace" electrical grid. In 1975 they totalled 11.3 billion kWh, of which the largest customers were Hungary (4,244 million kWh), Bulgaria (4,009 million kWh) and Czechoslovakia (1,116 million kWh). 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 lay the groundwork for a 750 kV 1,000 kilometre line between Albertisa (Hungary) and Vinnitsa (Ukraine) which will have a transfer admittance of 2,000 MW.

III. EAST EUROPE

Overview

61. Of the East European countries only Poland and Romania have extensive energy sources (coal and oil respectively) 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 125 million tons, of which less than 20 million tons would be indigenous, some 75 million tons would probably come from the USSR, and the remaining 33 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

62. The East German economy has been hampered significantly by difficulties in the energy sector. Particular attention was paid to these difficulties at the Ninth Party Congress in May 1976. The 1976-1980 Five-Year Plan directives approved at the Party Congress illustrate East Germany's determination to modernize its energy related industries. Special efforts are needed with respect to lignite production, as it has been estimated that reserves will be depleted in nearly one-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 production and the initiation of a nuclear power network.

63. 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. Brown coal production is scheduled to remain at the 250 million tons level reached in the mid-1960s as deposits have become less accessible. Natural gas production during the 1976-1980 period is also scheduled to remain at the level achieved in recent years, despite extensive exploration for domestic sources and considerable reliance on the new gas processing plant near Magdeburg. Output in 1975 exceeded eight billion m3 compared with a planned 11.5-14 billion. Supplementary gas will, however, be provided by the Orenburg pipeline.

64. 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.

65. 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. Middle Eastern oil shipments will be increased to meet total requirements. Natural gas deliveries from the USSR will more than triple between 1976 and 1980 and should reach the oil equivalent of 120,000 barrels per day (16,438 tons) by 1980.

AC/127-D/558

-20-

(ii) Hungary

66. Faced in recent 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. In this regard, the unexpectedly large production capacity of Szegad area fields will enable Hungary to keep gas imports at manageable levels during the next several years.

67. Efforts are being made to stop the trend in decline of brown coal production but because of chronic labour shortages, improvement will not be immediate; by 1990 the estimated production will be 36-37 million tons, an increase of 30% over 1975 output of 24.9 million tons.

68. The consumption of oil which was 10 million tons in 1975, of which 8 million 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, which in 1975 was over 6 billion m³, increased 20% in 1976 and will increase by 1980 as a result of the initiation of imports of Soviet gas via the Orenburg pipeline. By 1980 the USSR will supply almost 80% of Hungary's natural gas imports of 3.8 billion m³ and 9.1 million tonnes of crude and oil products, or 75% of imports. These new supplies, plus the domestic expansion at Szegad, will allow Hungary to continue its planned expansion of its petrochemical industries.

69. In electric power Hungary has so far imported only 4,200 kWh from the USSR to add to domestic thermal power station output of 24,000 million kWh; by 1980, despite an output of 27,500 million kWh, Soviet deliveries will be 7,500 million kWh, or 21% of total consumption. Hungary will produce her first nuclear power in 1980 with a planned capacity of 1,760 MW.

70. Hungary is currently building with Yugoslavia and Czechoslovakia, financed by the World Bank, Kuwait and Libya, the \$500 million 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, after the initiation of the project in 1980, some sort of energy flexibility it badly needed in the last Five-Year Plan.

(iii) Poland

71. 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 million in 1974 to \$1,181 million in 1975, 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 will try to keep such growth to the minimum level required by their plans for development in the economy as a whole.

72. The coal industry provides Poland with her chief source of primary energy, 14% of her major export earnings partly as a result in coal price increases (in 1974) 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 of hard coal rose from 145 million tons to 171.6 million tons, equivalent to an average annual growth rate of 4.3%. Lignite production in the same period rose almost 20% from 34.5 to 40.5 million tons. Production in the current Plan period, however, is expected to grow at the slower rate of 3.1% a year, from 177 million tons in 1976 to over 200 million tons in 1980. Lignite production is projected to reach 100 million tons in 1980. This increase will result from increased extraction at existing fields rather than from the opening up of new mines.

73. 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.

74. Poland, like her East European neighbours, is being forced 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.

AC/127-D/558

-22-

75. Natural gas production in 1976 totalled 6.7 billion cubic metres, an increase of 12.3% over 1975. The target for 1980 is 8.5 billion m³ which may be somewhat optimistic given that the 1975 target figure had been 10 billion m³.

76. 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 dependent on imports which she receives from the USSR. Poland is currently taking part in the construction of the Orenburg gas pipeline and will receive an additional 2,800 million cubic metres in return for providing labour, welding equipment, pipes and insulating material.

77. In the field of electric power, the Plan forecasts a major expansion in Poland's electricity generating capacity reaching 140,000 million kWh in 1980, the 1976 output was 102,000 million kWh and sufficient to confirm Poland's position as a substantial net exporter of electric power (3.5% of her production in 1974). 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.

78. 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.

79. 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 \$7 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 billion for two coal gasification plants and a plant to extract a variety of other chemicals from coal.

(iv) Czechoslovakia

80. Because Czechoslovakia is almost completely devoid of indigenous oil supplies, the Soviet decision to raise oil prices at the beginning of 1975 hit the Czechoslovak economy hard although the increase to Czechoslovakia, both on a value

and unit cost basis, was the smallest to any East European country. Relative to 1973, the Czechoslovak bill for Soviet oil rose 116% in dollar terms by the end of 1975 while on a unit cost basis the increase was 88%. 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.

81. The country produced some 28 million tons of hard coal and 86 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. The Plan forecasts a substantial rise in electricity output (8.6% planned for 1977) with the largest part of this to come from conventional thermal stations, based on solid fuels. This seems optimistic given that the sector failed to meet consumer demands in 1976 by about 500 MW. Moreover, room for expansion is very limited because of scarce coal resources and desire to use oil/gas supplies in industry and electricity supplies will be strained. 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 Five-Year Plan. Faced with these dim energy prospects, Czechoslovakia is using its substantial uranium deposits to build up a nuclear power plant system. By 1980, capacity will be 880 MW, increasing to about 11,000 MW in 1990 and 30-35,000 MW by the year 2000, or 70% of the country's electric power.

82. The Plan itself also lacks details about energy imports, but a trade protocol signed in 1975 envisages the delivery from the USSR of over 88 million tons of oil during 1976-1980 compared with barely 70 million tons in 1971-1975 costing 65 roubles a ton, equal to the 1976 world price. Oil imports from overseas, hitherto insignificant, will be facilitated by the forthcoming completion of the 5 million tons per 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.

83. Concurrent with the rise in oil supplies, it is intended to raise the crude capacity of Czechoslovakia's refineries to 20-21 million tons per year by 1980 - presumably, in the main, by building the long-projected 3 million tons per 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%.

AC/127-D/558

-24-

84. Russian deliveries of natural gas - almost wholly for use in industry - will apparently be raised from about 3,700 million cubic metres last year to 6,500 million cubic metres in 1980. Czechoslovakia will take part in enlarging the capacity of the existing Russian export pipeline, and in the construction of part of the infrastructure for the Orenburg pipeline; a substantial part of future gas deliveries to the country will be made by the Russians in payment for services rendered. The Plan also emphasizes the need to provide additional underground storage for gas.

(v) Romania

85. 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 million in 1973) and has linked this expertise to many of her trade agreements with Third World countries looking for oil (e.g. Ecuador).

86. 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. 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.

87. 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 million tons in 1980, 6% higher than 1975, while the rise in natural gas production will probably come to a standstill. Electricity production rose 8.4% in 1976 over 1975 to 58,250 million kWh and generating capacity totalling 5,400-5,740 MW is to be installed in the Plan period, of which 3,200 MW coal-based, and 1,700 MW hydroelectric. A start will also be made during the period with the construction of nuclear power plants.

88. 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.

89. 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 million tons of US hard coal.

(vi) Bulgaria

90. 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 1976 to 1980, compared with 46% in 1971-1975.

91. 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. 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 per year to an eventual 10,000 million cubic metres per year. There are no firm figures published about actual deliveries over the next five years but deliveries in 1980 are expected to reach 6,300 million cubic metres.

92. 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 and almost one-half of the total supply by 2000. To reach these goals the capacity of the reactor at Kozlodouï will be doubled, and a new reactor put into service using uranium from the Soviet Union.

AC/127-D/558

-26-

93. According to the Plan, Bulgaria is to increase her refinery throughput to 18-20 million tons by 1980 which, given the negligible domestic crude production will necessitate a considerable increase in imports from the 1975 level of 12-13 million tons. 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 per year) from the Middle East. Soviet deliveries of oil to Bulgaria in 1980 are expected to total around 17 million tons, thus leaving 1-3 million tons to be purchased elsewhere. 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 utilize local shale resources.

IV. BASIC SOURCES FOR GENERAL REPORT

1. Le courrier des pays de l'Est
2. Summary of World Broadcasts (BBC)- SWB, East European Weekly Economic Report
3. SWB, USSR Weekly Economic Report
4. Oil and Gas Journal
5. Ekonomicheskaya Gazeta
6. Neftyanik
7. International Herald Tribune
8. Petroleum Economist
9. Financial Times
10. R. Campbell, "Technological levels in the Soviet energy sector" NATO March 1976 colloquium, published as East-West Technological Transfers, (Brussels 1976)
11. Neue Zürcher Zeitung
12. Joint Economic Committee ed., Soviet Economy in a New Perspective, Washington, 1976
13. US Government, A Discussion Paper on Soviet Petroleum Production, Washington, 1977

LIST OF TABLES

- Table I US and USSR selected economic energy indicators
- Table II Comparative US/Soviet coal data, 1972
- Table III World crude oil production and world NGL production
- Table IV Soviet oil and gas condensate exports to Europe, Soviet natural gas exports to Europe
- Table V Soviet bloc: production of major fuels

ANNEX to
AC/127-D/558

-2-

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>1976</u>	<u>USSR</u> <u>1980</u> <u>Plan</u>
Crude oil including gas condensate	million(a) barrels per day	9.18(1)	10.0(2)	10.4(3)	12.8
Natural gas	billion(b) cu. feet	9,135	20,272	11,235	15,225
Electric power	billion kWh	975	2,200	1,111	1,380
Coal	million metric tons	684.5 (un-clean) 540 (clean)	584.8 (clean)	712 (un-clean) 564 (clean)	805

Source: "International Oil Developments, Statistical Survey", 26th August, 1976, pages 1 and 2

- (a) Converted from million tons per annum at rate one m bpd = 50 m tpa
- (b) Converted from cubic metres at rate 35 cubic feet = one m³
- (1) Of which natural gas liquids: 230,000 b/d
- (2) Of which natural gas liquids: 1,635,000 b/d
- (3) Of which natural gas liquids: 270,000 b/d

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

-3-

ANNEX to
AC/127-D/558TABLE IICOMPARATIVE US/SOVIET COAL DATA: 1972

Output	USSR	US	US/USSR
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.

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

-3-

TABLE III

	World Crude Oil Production					
	Thousand b/d					
	1973	1974	1975	1976	1977	
Preliminary						
					Jan	Feb
World Total	55,745	55,865	52,990	57,170	56,140	59,620
Free World Total	45,850	45,145	41,470	44,930	43,610	47,050
Western hemisphere	16,145	15,290	14,135	13,800	13,830	13,870
United States ¹	9,210	8,770	8,370	8,120	8,000	7,950
Venezuela	3,365	2,975	2,345	2,290	2,370	2,330
Canada ²	1,800	1,695	1,460	1,300	1,260	1,350
Mexico ³	465	580	720	830	900	950
Ecuador	210	175	160	190	220	210
Other	1,095	1,095	1,080	1,070	1,080	1,080
Eastern hemisphere	29,705	29,855	27,335	31,130	29,780	33,180
Western Europe	370	380	550	870	1,200	1,300
Norway	30	35	190	290	360	360
United Kingdom	Negl.	Negl.	20	250	500	600
Other	340	345	340	330	340	340
Middle East	21,215	21,855	19,590	21,970	19,850	23,070
Saudi Arabia ⁴	7,595	8,480	7,075	8,580	8,420	9,620
Iran	5,860	6,020	5,350	5,880	5,060	6,050
Kuwait ⁴	3,020	2,545	2,085	2,150	1,430	1,940
Iraq	2,020	1,970	2,260	2,250	1,900	2,300
United Arab Emirates	1,535	1,680	1,665	1,940	1,940	2,050
Abu Dhabi	1,305	1,410	1,370	1,590	1,630	1,700
Dubai	230	240	255	310	270	320
Sharjah	.....	30	40	40	40	30
Qatar	570	520	440	490	420	440
Oman	295	290	340	370	370	360
Syria	100	120	185	180	180	180
Other	220	230	190	130	130	130
Africa	5,900	5,370	4,980	5,820	6,120	6,170
Nigeria	2,055	2,255	1,785	2,070	2,200	2,200
Libya	2,175	1,520	1,480	1,960	2,070	2,120
Algeria	1,070	960	960	990	1,000	1,000
Gabon	150	200	225	220	220	220
Egypt	165	145	250	330	340	340
Angola/Cabinda	160	170	140	110	160	160
Other	125	120	140	140	130	130
Asia-Pacific	2,220	2,250	2,215	2,470	2,610	2,640
Australia	370	390	410	420	390	400
Indonesia	1,340	1,375	1,305	1,500	1,630	1,650
Malaysia-Brunei	320	290	300	330	370	370
Other	190	195	200	220	220	220
Communist Countries Total	9,895	10,720	11,520	12,240	12,530	12,570
USSR ⁵	8,420	9,020	9,630	10,170	10,430	10,470
China	1,090	1,310	1,490	1,670	1,700	1,700
Romania	275	280	290	290	290	290
Other	110	110	110	110	110	110

¹ Excluding natural gas liquids, which amounted to an estimated 1.6 million b/d in Feb.

² Excluding natural gas liquids, which amounted to an estimated 310,000 b/d in Feb.

³ Excluding natural gas liquids, which amounted to an estimated 100,000 b/d in Feb.

⁴ Including about one-half of Neutral Zone crude oil production, which amounted to about 350,000 b/d in Feb.

⁵ Excluding natural gas liquids.

Source: US Government, Office of Economic Research,
International Oil Developments, Statistical Survey, April 1977

TABLE III (cont'd)

World Natural Gas Liquids (NGL) Production				
	Thousand b/d			
	1973	1974	1975	1976 ¹
World Total	2,735	2,815	2,815	2,965
Free World Total	2,525	2,585	2,575	2,695
Western Hemisphere	2,230	2,185	2,170	2,100
United States	1,740	1,690	1,635	1,560
Venezuela	90	95	115	100
Canada	320	310	310	310
Mexico	50	60	80	100
Other	30	30	30	30
Eastern Hemisphere	295	400	405	595
Western Europe	20	20	30	90
Norway	....	....	5	40
United Kingdom	....	....	5	20
Other	20	20	20	30
Middle East	185	260	255	310
Saudi Arabia	90	150	140	190
Iran	35	35	35	50
Kuwait	60	70	70	60
Qatar	....	5	10	10
Africa	60	90	90	140
Libya	35	40	40	40
Algeria	25	50	50	100
Asia-Pacific	30	30	30	55
Australia	30	30	30	35
Indonesia	....	....	....	20
Communist Countries Total	210	230	240	270
USSR	210	230	240	270
China	N.A.	N.A.	N.A.	N.A.

¹ Estimated.

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TABLE IV

SOVIET PETROLEUM EXPORTS* TO EUROPE
(CRUDE + PRODUCTS)

million tonnes

	1960	1965	1971	1974	1975	1980 esti- mated
Western Europe(1)	14.13	23.62	41.86	38.30	45.54	45
Eastern Europe(2)	9.66	23.45	47.63	62.49	67.72	75
Total to Europe	23.79	47.07	89.49	100.79	113.26	120
Other Communist(3)	3.30	5.48	7.79	9.23	9.94	15
Other non-Communist	6.11	11.85	7.82	6.18	7.15	8
GRAND TOTAL	33.2	64.4	105.1	116.2	130.35 **	143

* Exports include re-exports of imported petroleum

** Worth \$3.2 billion

SOVIET NATURAL GAS EXPORTS*

(billion cubic metres)

	1960	1965	1971	1974	1975	1980 esti- mated
Western Europe(4)	-	-	1.4	5.4	8.04	24
Eastern Europe	-	0.4	3.1	8.6	11.09	40
TOTAL	-	0.4	4.5	14.0	19.13	64

* Exports are gross and do not include imports

(1) Including Turkey

(2) Including Yugoslavia and Albania

(3) i.e. Mongolia, Cuba, China, North Korea, North Vietnam

(4) Excluding shipments of LPG to France

Source: USSR Trade Handbooks

ANNEX to
AC/127-5/552

-7-

TABLE IV (cont'd)

SOVIET COAL EXPORTS

(million tons)

	1965	1970	1974	1975
Western Europe	5.5	4.6	5.9	5.5
Eastern Europe	13.6	13	14.8	14.8
TOTAL (including Japan)	22.4	24.5	26.2	26.1
TOTAL HARD CURRENCY EARNINGS (\$ million)	\$74m	\$92m	\$238 m	\$385 m

Source: JEC, Soviet Economy (1976), p. 477

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	640	289	435	701	805
Poland	0.55	0.3	5.8	8.5	212	245
Czechoslovakia	0.15	0.1	1.0	1.0	114	123
East Germany	0.2	0.2	8.0	7.0	247	250-254
Hungary	2.0	2.2	5.2	6.0	25	24
Romania	14.6	15.5	27.0	26.8	29	56
Bulgaria	0.1	0.1	0.1	0.2	27	38
COMECON	508.6	648.4	336.1	484.5	1355	1541-1545

(a) Hard and soft coal is calculated on ton for ton basis which will give a slightly misleading picture of the hard coal situation

(b) Partly estimated

(c) Plan targets or assumed targets

	<u>1975</u>		<u>1980</u>	
	Hard	Soft	Hard	Soft
Poland	172	40	200	45
Czechoslovakia	28	86	28	95
East Germany	0.5	247	0.5	250-254
Hungary	3.0	22	2.5	22
Romania	-	-	9	47
Bulgaria	0.3	27	0.3	38

Source: COMECON Handbooks

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