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SOVIET ENERGY POLICY

OUTLOOK FOR THE PERIOD 1975-1980

Note by the French Delegation

The Soviet Union's future membership of the "consumer society" and the possibility of its subsequently becoming a "post industrial nation" hinges essentially on its energy policy.

2. The rising geographical imbalance between the growing requirements of European Russia and the development of resources, the focal point of which is shifting inexorably towards Western and Central Siberia, is forcing the Soviet leader to choose between various options. The relevant decisions concern the weight to be given to each element in the fuel balance with due regard to extraction and transport costs. It is also causing them to set up processing industries in the vicinity of the sources of the Siberian energy despite or because of the under-population of those areas.

3. Paradoxically and notwithstanding the variety and extent of the natural resources now being harnessed and the immense potential which is known to exist, this policy is proving difficult to map out and to apply.

4. The problem of how to tap the vast Siberian resources is making it necessary for the Soviet Authorities to take transitional measures - the purpose of the Ninth Five-Year Plan 1971-1975 - to meet the growing requirements of European Russia as best they can, pending the arrival of the Siberian oil and gas pipelines. Extensive reliance is having to be placed on the technology and finance of the industrialized countries of the West and the Far East in order to obtain the necessary transport equipment and plant.

This document includes: 8 Annexes.

5. It may be assumed that the Soviet Union will be capable, up to at least 1980, of applying an energy policy based for the most part on oil and particularly on natural gas, with little call on any but the most economic coalmines. This policy which affects the whole of the Soviet world will give the Soviet Union during the period 1970-1980:

- self-sufficiency in the field of energy;
- continuing control over the economy of the satellite countries;
- the means of keeping up a substantial flow of energy exports to the free world in exchange for hard currencies and technological aid;
- the means of insidious penetration in the oil producing countries of the Middle East.

6. In all these areas, Soviet energy policy seems to be closely intertwined with transport policy, on which it will depend to a great extent and, in some measure with population and sociological trends in the USSR.

7. It forms part of the Soviet "grand design", the purpose of which is to bring the economy up to the level of the capitalist country economies while keeping a firm grip on the COMECON countries and expanding its rôle as a major world power.

1. Internal and external requirements

1.1 Internal requirements

8. It has become commonplace to recall that four-fifths of Soviet economic requirements are generated in European Russia whereas four-fifths of Soviet workable resources are located in Western and Central Siberia. It is perhaps less so to emphasize that the shift towards the East of the focal point of Soviet energy is an irreversible process and that the harnessing of Siberian resources is essential to the development of the Soviet economy and to its continuing leadership of the European Communist world.

9. Fuel requirements have increased twenty five fold since 1915 and in 1970 totalled 1.2 milliard coal equivalent tons (CET)(1); timber(2) has given way to coal and is being replaced increasingly by oil and natural gas(3) which together will account for almost 70% of the fuel balance in 1975. The requirements in that year will be for 1,550 to 16 hundred million CET, which represents an increase of 29% to 33% by comparison with 1970. Most of this increase in requirements will come from European Russia. After rising by 75% in the years 1966-1970 (Eighth Plan) and by 70% in the period 1971-1975 (Ninth Plan) they will account for 80% of total Soviet requirements in the years 1975-1980.

10. At the same time, the deficit in the fuel balance in Europe will be steadily rising. From 70 million CET in 1965 it rose to over 140 million CET in 1970 and is expected to reach almost 350 million CET in 1975 and even more during the period 1975-1985. In 1975, four-fifths of requirements will be in European Russia, four-fifths of resources will be located East of the Urals and Siberia will produce 40% of the total volume of energy consumed as compared with 22.9% in 1965(4)(5).

11. This trend is irreversible and is due to the relative depletion of deposits in European Russia. Up to 1965-1970, the growing use of oil and gas was due to improved extraction West of the Urals. Over a period of 10 years, i.e. between 1955 and 1965, oil output in the USSR rose by 172.1 million tons of which 150.3 million tons (or 87%) came from Europe. During the same period, natural gas output rose by 118.7 milliard cubic metres of which 84 milliard cubic metres (or 70%) came from Europe.

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(1) 1 ton of conventional fuel (ICF) is equal to 7,000 kilocalories, taking coal as the unit; consequently one ton of coal equals 7,000 kilocalories. Expressed in terms of conventional fuel (coal equivalent tons or CET):
1 kilo oil equals 1.4 kilos CET coal unit;
1 cubic metre gas equals 1.2 kilos CET coal unit;
1 kilo watt hour equals 0.4 kilos CET coal unit.
The energy yield or CET of oil is thus 40% higher than coal, 20% higher than gas and three times higher than electricity.

(2) 1% in 1970; 60% in 1913.

(3) Oil plus gas have accounted for the following percentages of the fuel balance:
25.2% in 1955;
53.2% in 1965;
60.5% in 1970;
67% in 1975 (Plan).

(4) The situation as regards production and consumption areas in 1970 and 1975 respectively is shown on the attached maps.

(5) Production East of the Urals in 1970;
Electricity: 30% of installed power, 26% of output;
Oil: 18.1% of output, i.e. 63.8 million tons;
Natural gas: 29.8% of output, i.e. 59 milliard cubic metres;
Coal: 43.2% of output, i.e. 269.3 million tons.

12. In 1972, the output from "western" oil wells reached its peak particularly in the Volga, Caucasus and even in the Ukraine. By 1975, production in the Urals, in the North West and in Byelorussia will have risen but at a rate representing only 20% of the general rate of growth. The same will be true of natural gas. Output from the Moscow and Urals coalfields will fall while output from the Pechora and the Douetsk, used primarily for coke will, unlike output from the Donbas, go up.

13. Electricity, which ranks third after oil and natural gas in the fuel balance is also affected by the geographical imbalance between Soviet requirements and resources. The tendency towards urbanization and the rise in the standard of living are generating an increase in consumption which is particularly acute in European Russia where there is already a shortage of plant for the production of electrical energy. In European Russia in 1969, requirements were growing at a rate of 11% and output by only 7.8%. The gap will inevitably widen to the detriment of the future population of 200 million(1) which will inhabit the areas West of the Urals in 1990.

14. Production of electricity is due to rise from 507 milliard kilowatt hours in 1965 and 740 milliard kilowatt hours in 1970, to at least 1,000 milliard kilowatt hours in 1975(2). In that year, the energy requirements of industry and building will have risen 1.4 times by comparison with 1970 but their relative share of requirements will fall since the requirements of agriculture will have doubled and the needs of the cities will have risen by 1.6(3).

15. The bulk of the growth in resources can be expected from the thermal power stations the most economic of which are located in Siberia close to the sources of primary energy. There will then be a choice of two solutions: either to carry the electrical energy generated to the consumption areas West of the Urals or else to place this energy at the disposal of the locally located key industries which have enormous consumption requirements. It seems likely in any case that by 1975 output of electrical energy generated in Siberia will have increased by 54%, the highest increase in the whole of the USSR.

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(1) Out of a total of approximately 285 million in the USSR as a whole.
(2) The Plan optimistically provides for 1,030-1,070 milliard kilowatt hours but 740 milliard was obtained under the Eighth Plan as compared with the 840-850 milliard scheduled.
(3) See Table 1 at Annex A.

1.2 External requirements

16. The Soviet Union is striving to bring its internal economy gradually up to the level of the capitalist economies by striking a balance between its requirements and its resources. This will involve the opening up of Siberia and the concommitant need for sophisticated and costly systems of extraction and transportation. At the same time the USSR is constantly aware of its major power status and intends to keep its control over its satellites by a quasi monopoly of the supply of energy. It also wishes to keep up a substantial flow of energy products - oil and gas - to the Western countries which are rich in strong currencies and capable of supplying the technological aid which is essential to the development of Siberia.

17. The USSR has a firm hold over the satellite countries which are members of the COMECON(1): the GDR, Poland, Czechoslovakia, Hungary, Bulgaria and Rumania. In the first four of these countries where large numbers of its troops are stationed, it has had no hesitation in using force to crush all moves towards independence made in the past 20 years.

18. At the same time, it has successfully sought to obtain the monopoly and control within the COMECON of the most up-to-date energy products, namely oil and natural gas. All the satellite countries, other than Rumania, are 90% dependent on oil and natural gas from the USSR which is sent through oil and gas pipelines under Soviet control(2). The MIR international system of electrical interconnections allows the USSR, the main supplier, to keep a firm hold over the distribution of electrical energy in each of the countries referred to. Dependence on the USSR is less great in the case of coal except as regards Hungary, Bulgaria and, to a lesser degree, Czechoslovakia. The nuclear power stations, all of them in early infancy, are closely controlled by the USSR to which the uranium output is sent for enrichment.

19. The preservation of this hold over the satellite countries is one of the main aims of Soviet energy policy. Because of their close and genuine dependence on energy resources, the subordination of the satellite countries to the Soviet Union is far stricter and far more effective than it would be if based on solemn treaties and declarations of undying friendship.

(1) Council for Mutual Economic Assistance
(2) Cf. Note No. 10/092/SGDN/CER/C/CD dated 27th January, 1972, "Logistic dependence of the COMECON countries on the USSR".

The USSR has no intention(1) of relinquishing this powerful instrument of control over satellite policy which enables it to retain its leadership of the Soviet world and leaves it free to act in the rest of the world, particularly as regards China.

20. These ambitious plans are entirely dependent on the early development of Siberian wealth. The magnitude of the task, the extent of the facilities which will be needed to carry it through the financial resources and technical know-how which they imply, leaves the USSR with no option but to put aside its idealogical and national sentiments and to draw without compunction on the resources of the capitalist countries. In exchange for the already substantial aid being provided by Japan, the Federal Republic, Italy and France, and for the even greater aid about to be provided by the United States, the Soviet Union has, practically speaking, only its surplus energy resources to offer.

21. Certain manufactured items, particularly up-to-date civil transport aircraft built in the USSR can be used for barter purposes and the Russians have taken advantage of this in its dealings with Italy and the Federal Republic. However, its best bargaining counters are oil and gas(2) in exchange for wide diameter pipe for oil and gas pipelines, drilling and extraction plant, port facilities, steel rolling mills and motor works.

22. Development needs at home and its rôle as a major Communist power make demands on the USSR which force it to draw extensively on the resources and techniques of Europe, Japan and the United States(3).

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(1) During the period of the Eighth Plan, 1966-1970, the USSR supplied the satellite countries with 135.3 million tons of oil. During the period of the Ninth Plan, 1971-1975, it is to deliver 256 million tons or about twice as much and over 80% of those countries' requirements for the period under review.

(2) In 1970, the USSR exported 90 million tons of oil of which 40 million tons went to the COMECON countries and about 50 million tons to the rest of the world. Since 1966, its deliveries to the Western European countries, Japan and the third world countries have been in the region of 50 million tons. It is planned to keep up this rate during the present decade. Deliveries of natural gas however, will grow steadily: from a level of 10 milliard cubic metres in 1971, they will rise to 14 milliard in 1974 and 30 milliard per annum towards 1975.

(3) Annex B, "Soviet requirements and resources for wide diameter pipe up to 1980" provides an illustration of the barter policy being applied by the USSR in its dealings with the German Federal Republic, Italy, Japan and, more recently, the United States of America.

2. Range of Options

23. To the Russians, the development of the Siberian potential is consequently not a working assumption but "an imperative necessity." The technical and economic solutions adopted for the establishment of the fuel pattern boil down in the main to the quest for the best possible use of energy obtained at the lowest cost, due account being taken of the comparative cost of extraction, capitalization, infrastructure, management and, above all, transport. These technocratic solutions cannot be modified by sociological considerations or by the "claims" of "pressure groups" which must give in to the logic of the figures.

2.1 Extraction costs

24. According to studies by Soviet economists(1) regional energy resources in the USSR can be divided into four main groups(2). For example, extraction costs, in the Moscow and Kirghiz (Group IV) coalfields, expressed in roubles for one CET, are ten times higher than those in Group I which includes the natural gas from Tyumen(3) and Central Asia.

25. On the basis of the extraction cost alone, it would seem uneconomical to increase oil output in Tyumen or Mangishlak (Group II) which costs two and a half times as much as natural gas from Siberia (Group I).

2.2 Transport costs

26. This first factor must be adjusted to take account of the fact that transport costs for oil(4) from Group II are a third to a quarter of those for natural gas(4) and a seventh to a twelfth of those for coal(4).

(1) A. Probst "The problems of energy development in the USSR"
(2) This breakdown is shown at Annex A, Table 2
(3) Tyumen, which contains most of the newly found Siberian resources, covers Western Siberia, bordered to the West by the Ural mountains, to the East by the Yenisey and to the South by Kazakstan and to the North by the Kara Sea
(4) In terms of CET

27. A comparison of the cost of transporting the different fuels taking account of the methods of transport used and the distance covered(1) show that transport for oil and gas by pipeline comes cheapest. In particular, over a distance of 1,000 to 2,000 kilometres, the wider the diameter of the gas pipeline the cheaper it is to transport natural gas(2)(3). Production of wide diameter pipe is still a difficult operation however and the USSR suffers from a shortage in this field. A large proportion of oil is still carried by railway. A total of 665.1 million tons of oil and petroleum products, representing a quarter of all goods traffic, was transported in 1970. Of this total 364 million or 55% went by pipeline and the remainder - 45% - by railway. At any event, transport of oil and gas by pipeline is far cheaper than transmission, by AC or DC of high voltage electricity(4). It should be added that open cast mining is economical provided that the coal does not have to be carried over distances of more than 100 kilometres.

2.3. Combination of extraction and transport costs

28. In deciding their energy policy, the Russians compared the costs involved in the extraction and transport of fuel now going to European Russia (Table 4)(5), including investment costs, with the combined costs of extraction and transport in terms of distance, of all the types of fuel capable of production in Siberia (oil, natural gas, coal) (Table 5)(5).

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(1) This comparison is set out in Table 3, Annex A

(2) The capacity of a 2,520 mm gas pipeline is four times as great as that of a 1,420 mm pipeline

(3) 1 kilometre of 1,220 mm gas pipeline requires 450 tons of pipe
1 kilometre of 1,420 mm gas pipeline requires 600 tons of pipe
1 kilometre of 2,520 mm gas pipeline requires 1,200 tons of pipe
Soviet requirements for wide diameter pipe are set out at Annex B

(4) Transmission of 2,200 KV in DC (by cable employed 6,500 hours per annum) from the Tyumen area to points West of the Urals is five times as costly as transportation by 25-20 mm pipeline of an equivalent amount of gas in energy terms

(5) Shown at Annex A

29. This comparison shows that it is extremely economical to send natural gas and petroleum from Tyumen to European Russia since the cost is half the cost of coal from the Donetz and the Kuznetsk. The best solution would be to bring gas from Tyumen and Central Asia through wide diameter pipes: costs fall by 20% when 1,420 mm pipes are used in place of 1,020 mm pipes. Use of 2,520 mm high pressure pipes gives a saving of one third by comparison with 1,420 mm pipe and of one half by comparison with 1,020 mm pipe. These conclusions must be qualified as follows however:

- a substantial proportion of Siberian oil is used locally, in Siberia, in Kazakhstan and in the Far East;

- facilities for piping oil from Tyumen to European Russia are still not sufficient to make good the energy deficit in that area;

- in some cases, coal extracted at low cost by open-cast mining can compete with natural gas provided that transport distances are short. It has been established in this way that coal from Ekibastuz works out as cheaply as Tyumen natural gas for the electrification of the Urals area. On the other hand, coal from Kansk-Achinsk, if carried over 350 km doubles in price; if carried over 3,000 km, the transport costs are seven to eight times as high as the extraction costs. Local consumption is therefore obviously called for.

2.4. Adjustment factors

30. The technically ideal solutions in which the most economic fuels are carried by the cheapest means of transport have to be adapted to the realities of transport policy, the population of Siberia and administrative red tape.

2.4.1 Transport policy(1)

31. Soviet transport policy continues to rest on the predominance of railways which is traditional and has been maintained out of necessity. The railways are responsible for 68% of all internal traffic, carry all the coal and almost half the oil, the 32,000 km of pipeline notwithstanding(2). The network of gas pipelines which already comprises 65,000 km(3) is

(1) Cf. Note No. 10.575/SGDN/CER/C/CD dated 19th May, 1971
(2) In principle, 69,000 km in 1965
(3) In principle, 95,000 km in 1975

insufficient to make good the deficit in the fuel pattern in European Russia and will not become fully effective until some years after it has been laid.

32. In 1972 there was only one pipeline network bringing oil from Tyumen to Kuibyshev via Omsk and no gas pipeline between the Tyumen fields and the regions West of the Urals.

2.4.2 Population of Siberia(1)

33. The Soviet transport system gives an accurate reflection of the imbalance of the Soviet continent. Relatively dense in European Russia, by the time it gets to the Urals it has become considerably distended. A few lines cross Western Siberia to Omsk and Novosibirsk but between Novosibirsk and Vladivostok - 6,000 km via Lake Baykal - there is only the Trans-Siberian railway to oil the economic wheels of these regions with their huge energy resources which cost so much to transport. It would undoubtedly be economically and socially beneficial to channel these resources into local industries manned by and for the benefit of population groups which this economic development would help to attract and retain. These logical arguments come up against the reluctance of settlers to extend their stay in Siberia which is too often limited to a few years of intensive work rewarded by high bonus payments.

2.4.3 Administrative stumbling blocks

34. Natural gas consumed in European Russia is three to four times more expensive than if used on the spot; coal consumed in Europe is budgeted at 15-20 roubles per CET and at only 2 roubles if used in Eastern Siberia. Consumption of 1 million CET in Eastern Siberia means a saving of 35-40 million roubles in investment costs and of almost 7 million roubles in annual operating costs by comparison with consumption in Europe. Capital invested in the energy basis for the energy consuming industries(2) accounts for 50-100% of the total investments required by those industries. The location of the industries near the Siberian sources would mean a saving of 25-50% in investment costs which would largely offset the higher construction costs due to the rigours of the climate in those regions.

(1) Cf. Note No. 5.661/SGDN/CER/DR dated 23rd November, 1970
(2) Aluminium, rubber and synthetic fibres

35. Various ministries and government departments reply to these arguments by pointing to the inexorable growth of energy consuming industry in European Russia. A number of senior officials who, in too many cases, are unwilling to look beyond their own narrow sector of activity, are in favour of stimulating requirements in Europe and of locating factories West of the Urals. It is, in fact, true that medium and long-term savings achieved by the location of factories close to the Siberian deposits are matched, given the climate, by high initial outlays in the short-term for the construction of the energy base. Temporary budget deviations of this kind are inconceivable in the context of a narrow interpretation of yearly planning.

3. Solutions adopted

36. The Soviet Authorities must not only make good the lack of balance in energy supplies West and East of the Urals but also release sufficient energy resources to follow-up their policy vis-à-vis the COMECON and the Free World, adopt the most cost effective solutions as regards extraction and transport costs and make allowance for geographical, sociological and administrative factors. To do this, they are attempting during a transitional phase (Ninth Plan 1971-1975), and by means of major adjustments to the ideal solutions, to remedy the energy deficit in European Russia as best they can until the effects of the recently established infrastructure for Siberian resources - created largely with the help of the industrialized countries of the West and the Far East - begin to be felt in the years 1975-1980.

3.1 Transitional phase: Ninth Plan 1971-1975

37. Broadly speaking, energy policy under the Ninth Plan is geared to:

- a substantial increase in the oil and gas elements in the fuel pattern, nuclear energy being only sufficient to cover peak electricity consumption;

- increased deliveries of Siberian oil and natural gas to make good the energy shortage in European Russia, even though this solution is not always the most economical;

- expansion of the oil pipeline system which was deliberately held back under the Eighth Plan in favour of gas pipelines and enlargement of the gas pipeline system including the use of high pressures in wide diameter pipe;

- support for the construction of energy consuming industries (chemistry, aluminium) close to the Siberian deposits to amortize development costs and encourage the population of these areas;

- doubling of energy supplies to the COMECON countries to meet requirements and maintain Soviet control;

- development of trade with the industrialized countries of Europe, America and the Far East with a view to obtaining the necessary technological aid.

3.11 Fuel pattern

38. Oil and natural gas which together accounted in 1970(1) for 60.5% of the fuel balance will account for 67% of this balance in 1975 when the Ninth Plan ends. Three-quarters of all fuel used in 1970 will consist of oil, gas and open-cast coal.

39. During the period of the Ninth Plan, the natural gas element will increase by 50-60%, the oil element by 36-40% and the coal element by 10-11%. Calculated in terms of CET however, the oil element will be almost twice as great as the gas element and almost five times as great as the coal element. Per capita electricity output will rise from 3,040 kilowatt hours in 1970 to 4,170 kilowatt hours in 1975. Urban requirements for electrical energy will be multiplied by 1.6 and rural requirements, given the increase in the standard of living, will practically double. Electrical energy of nuclear origin which accounted for only 1%(2) of installed electrical power in 1970 will provide a very small addition(3), about 2 or 3%, to the mainly thermal energy generated by high-output power stations(4). It will be used, particularly in European Russia to help meet demand during peak consumption periods.

3.12 Making good the deficit in Europe

40. The rise in oil and gas production will originate mainly in Siberia: One quarter(5) of Soviet oil and gas will come from areas East of the Urals. The growing energy deficit in

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(1) 25.2% in 1955, 53.2% in 1965, 60.5% in 1970, 67% in 1975
(2) 1,565 megawatts (MW), see Annex C "Nuclear Energy"
(3) 5,000-7,000 MW
(4) See Annex D "Electricity under the Ninth Plan"
(5) 125 million tons of oil (out of a total of 480-500) and 75 milliard cubic metres of gas (out of a total of 300-520 in 1975

European Russia will be offset to some extent by the significant injection of natural gas from Tyumen and Central Asia. Efforts will be made to supply more oil to European Russia. These efforts will lead in some cases to the adoption of solutions which, on the face of it, seem illogical. Up to 1970 a large proportion of oil from the lower Volga (the "second Baku") was sent in either crude or refined form to Tyumen, Omsk and Novosibirsk for the development of those areas (refineries, miscellaneous industries); since 1971 refined products have still been sent to Siberia but the flow through one of the pipelines carrying crude oil(1) has been reversed so that the crude oil now runs from Tyumen (the "third Baku") to European Russia(2). The Soviet Authorities have therefore been compelled to reconcile the industrialization of Siberia which they wish to continue with the need for making good the energy deficit in European Russia.

To reduce the shortage of electricity West of the Urals and to curtail transport of energy from Siberia, a number of large power stations, mostly thermal, are to be built in European Russia. Almost all new nuclear powered stations will, as in the past, be located West of the Urals. They will account for 12% of the capacity installed during the course of the Ninth Plan. Plant investment for 1 kilowatt of installed power is higher in a nuclear station than in a condensation thermal station, but lower than in a hydro-plant. The cost price of electrical energy from a nuclear station is lower than from thermal stations. In addition, nuclear generated electricity has other advantages; the geographical criteria are flexible; stations can be sited where the energy requirements are greatest, i.e. in European Russia. They are also special in that they can be operated for long periods at maximum capacity of the nominal, installed power which enables them to meet peak demand(3).

(1) A low-output pipeline is still supplying crude oil to the Irkutsk refineries. For lack of appropriate pipelines, these cannot yet be supplied from Tyumen, at present linked to the lower Volga by the existing Kuibyshev-Omsk pipeline which has been flowing in the opposite direction since 1971. Completion of the big throughput pipes between Tyumen and the Irkutsk area will put an end to the apparently absurd situation in which crude oil from the lower Volga is sent to Central Siberia and received from Western Siberia

(2) The supply of oil to European Russia will be stepped up with the completion of an additional wide diameter pipeline for crude oil (1,420 mm) for the lower Volga

(3) During the winter of 1970, the gap between maximum and minimum consumption was 27 million kilowatts with a reserve of 30 million kilowatts (18 hydro-generated, 13 thermal generated) which in practice means that saturation point was practically reached. In 1975 this gap will grow to 47 million kilowatts, 20 more than in 1970. The large thermal stations now being built are lacking in flexibility and ill-suited to meet peak consumer demand. The structure and development of nuclear energy during the period 1970-1980 is shown at Annex C

41. In the case of coal, output will probably reach 670 million tons in 1975 as compared with 685-695 million tons scheduled (624 million tons in 1970 as opposed to the 665 million scheduled). Coal from the open-cast mines at Kuznetsk has proved more economical than coal from the local mines in the Urals and the Donetz, the Upper and Middle Volga, the central and north western regions of European Russia and the Baltic coast. This explains why open-cast coal from Ekibastuz and Kuznetsk will be sent to the Urals and even to points West of the Urals. Few technical and economic difficulties will be encountered in the actual transport which will be by existing railways and will take less time than the transport of gas from Tyumen which is dependent on the construction of pipelines.

3.13 Expansion of the oil pipeline network

42. The oil pipeline network will expand at a rate of 84.3% during the period of the Ninth Plan as compared with 14.3% during the Eighth Five-Year Plan. In principle, 27,000 kilometres of pipeline (as compared with 4,000 kilometres in the period 1966-1970) will be built between 1971 and 1975, mainly to carry Siberian oil westwards. These plans are undoubtedly ambitious but mark a reversal of policy applied under the Eighth Plan. The latter provided for 12,000 kilometres of oil pipeline of which only one-third were built. In contrast the gas pipeline target was achieved (25,000 kilometres out of the 28,000 scheduled). The Russians themselves have explained that they had had to revise their programme during the course of the Plan. The shortage of pipe compelled them to concentrate on gas pipelines. This means that 45% of oil is still being carried by railway which could take additional traffic but which is not suitable for the carriage of natural gas, a new form of energy. Now that the basic gas pipeline network has been built, it will be possible to expand the oil pipeline system to relieve the burden on the railways.

43. However, the gas pipeline network is to be expanded by a further 44.8% rising from 65,000 kilometres to 90,000 kilometres with the construction of an additional 30,000 kilometres consisting to a large extent of 1,420 mm tube (instead of the 1,020 mm tube used under the Eighth Plan) which will carry gas pressurized at 75 atmospheres. These are ambitious programmes given the state of the Soviet pipe industry and this explains the emphasis which has been placed on oil pipelines; the transport of oil requires a fifth of the pipe needed for the transport of an equivalent quantity of natural gas.

44. As regards the transmission of electricity, lines carrying 35,000 volts (and more) will be increased from the present 441,000 kilometres to 600,000 kilometres. The last figure will include lines carrying 220,000 to 750,000 volts (112,000 to 115,000 kilometres as compared with 78,500 kilometres). The shortage of electricity in European Russia will be offset in part by the erection of very high tension lines (1.5 million volts DC and 1.15 million volts AC) which will carry the electricity generated by the large thermal power stations in Kazakhstan and Siberia.

3.14 Construction of new industries in Siberia

45. The resources of Siberia will lead to the creation by 1975 of new local industries comprising power stations and factories, particularly for chemicals. Apart from the hydro-station(1) at Krasnoyarsk which is the world's most powerful (6,000 MW) and which came on stream in 1971, a new hydro-station generating 6,400 MW and located in the Sayanskiy mountains of Siberia will be operational in 1975. Open-cast coal from Ekibastuz will be used in that year to feed a further four, 4,000 MW thermal stations(1).

46. These new(2) local sources of energy will permit the construction of factories requiring high levels of electricity (chemicals, aluminium)(3). Here, coal from Kansk-Achinsk and the Siberian refineries (at Omsk for example) will have a dominant part to play. Open-cast coal from the Kansk-Achinsk field is the least expensive in the whole of the USSR. Reserves are unlimited (100 milliard tons) and mining costs one-eighth of those in the Donetsk. Output of one-half to one milliard tons per annum could be obtained but no special effort is being made in this direction: production rose from 14 million tons in 1975 to 18 million tons in 1970. So far the coal has been sent

(1) The Siberian hydro and thermal stations are the most economical. In 1969 the cost price per 10 kilowatt hours was 2.17 kopeks at Irkutsk and 10.11 kopeks in the Ukraine
(2) Only the most significant have been mentioned
(3) The low cost of Siberian electricity means a saving per ton of 123 roubles for aluminium, 14 roubles for ferro-silicate, 26 roubles for caustic soda and 10-30 roubles for calcium carbide

to European Russia. Because of the low energy power of this commodity however, transport costs were 12 times as high as mining costs. A large proportion of this coal will now be used locally for the aluminium, titanium, manganese and viscose industries(1).

47. As for refineries, existing plant in Siberia will be expanded under the Ninth Plan and supplemented by large new refineries. Some of the primary refineries will, it is true, be built in European Russia to remedy the serious energy deficit(2) but the greatest emphasis will be placed on the creation of a Siberian energy base with secondary refineries capable of optimum refining and of producing the maximum quantity of hydrocarbons. Total extraction of the products of petro-chemistry (propane, butane, butylene) and employment of the resources of condensates will also be developed in Siberia. The co-existence of these hydrocarbons and the cheapest coal will provide exceptional conditions for the development of a complex of energy consuming industries. The Omsk refinery for example which alone processes as much oil as the whole of Rumania(3) has just had its capacity for primary processing increased by 20%. This increase is 40% in the case of catalytic cracking and 50% in the case of thermal cracking. The same is true at Angarsk (near Irkutsk) where capacity which is already considerable, is to be doubled during the period of the Ninth Plan(4) at Achinsk (near the Kansk-Achinsk coalfields, east of Novosibirsk between the Ob and the Yenisey) where a large refinery is to be built by 1975, at Krasnoyarsk where a large petro-chemical complex is under construction, at Komsomolsk on the Amur, at Pavlodar and Chimkemt in northern Kazakhstan.

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(1) The expenditure of energy for each ton of aluminium (including the production of the corresponding aluminium) equals 10 tons CET or 20 tons of coal from Kansk. The cost of carrying aluminium produced in Kansk to European Russia is a twentieth of the cost of carrying coal over the same distance and a quarter or a fifth of transport costs in the form of electricity. Production of manganese, titanium, viscose and artificial silk requires 12 to 15 tons CET per ton which is equal to 25 to 30 tons of Tansk coal and the cost of carrying the finished goods which have required consumption of a large quantity of fuel and energy is considerably lower than the cost of carrying the Tansk coal used for their production

(2) The siting of refineries west of the Urals can also be explained by the fact that investment in refineries produces quick results whereas the funds required to sink new coal pits - which take 8-10 years before becoming fully productive - are "frozen" for several decades for a fuel which ultimately will no longer be used

(3) 15 million tons at Omsk and 16 million tons in Rumania (1970 figures)

(4) The refinery will cover 700 hectares as compared with the present 550

3.15 Doubling of energy deliveries to the COMECON countries and barter arrangements with the free world

48. While facing up as best it can to the problem of the balance between fuels and of the shortage of energy West of the Urals, the USSR will keep up its exports of primary energy products to the COMECON countries and to the countries of the free world.

3.15.1 Deliveries to the COMECON countries

49. The Soviet grip on the COMECON countries with respect to energy(1) will not be relaxed during the course of the Ninth Plan. Deliveries of oil will be twice as high as under the Eighth Plan (256 million tons as compared with 135.3 million tons in five years) and will meet 80% of the satellite countries' requirements during the period under review.

50. Supplies of non-Soviet oil will account for 20% of those countries' requirements instead of the 10-15% in 1970. Iraqi oil sent to Hungary and Czechoslovakia through the pipeline now being built across Yugoslavia will however simply represent repayment of Soviet investments in the harnessing of the Iraqi wells. Likewise, oil supplied by the British Petroleum Company to Poland will not be delivered until 1975 and will only represent 15% of Polish requirements. Deliveries of natural gas which, with the pipelines still under construction, were at a low level in 1971 will be increased four fold during the Ninth Plan; 7.5 milliard cubic metres in 1975 as compared with 2 milliard in 1971(2). They will meet 90% of the requirements of the COMECON countries other than Hungary, which in 1980 will still be able to meet half its needs from national output, and Rumania which is self-sufficient(3).

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(1) Cf. Note No: 10092/SGDN/CER/C/CD, dated 27th January, 1972

(2) 1971: 1 milliard cubic metres to Poland; 1 milliard cubic metres to Czechoslovakia - total 2
1972: 1 milliard cubic metres to the GDR; 1.2 milliards to Poland, 1 milliards to Czechoslovakia - total 3.2
1973: ditto - total 3.2
1974: ditto plus 1 milliard to Bulgaria - total 4.2
1975: 1 to GDR; 1.2 to Poland; 1 to Czechoslovakia; 3 to Bulgaria; 1.2 to Hungary - total 7.4 milliard

(3) The degree of reliance of the COMECON countries on the USSR for energy is described at Annex E. Imports of oil from the USSR and the Middle East up to 1975 are shown in percentage terms at Annex F. The volume and nature of Soviet natural gas exports is shown at Annex G.

3.15.2 Deliveries to the non-Communist world

51. Simultaneously, the USSR will keep up its oil exports and develop its exports of natural gas to the free world countries. Deliveries of oil to Europe in the main but also to Japan and a few Third World countries will be kept on a level of 40-45 million tons per annum which has been the case since 1966 and this will enable it to earn hard currency. The USSR will, above all, expand exports of natural gas which will increase four fold by comparison with the Eighth Plan: 35 milliard cubic metres in 1971-1975 as compared with 9 milliard cubic metres in the period 1966-1970. In 1975, deliveries to Western Europe will total 13 milliard cubic metres. It can be estimated that from 1975 onwards (cf. Annex G) the Soviet Union will have a yearly surplus of 30 milliard cubic metres which, taking account of deliveries to the Soviet world, Europe and Japan, will leave a surplus of 10 milliard for which the United States are well placed as potential customers.

52. The Soviet Union has sufficient natural resources(1) to keep up exports of natural gas at this rate and its underlying rationale is perfectly logical: if it is to achieve a balance between fuels in an economical way it must increase its Tyumen gas production to the utmost; and if it is to open up the deposits and transport the gas to where it is needed (mainly European Russia) it will require the technology of the industrialized countries for which it can only pay in natural gas, which is precisely what it is doing. Deliveries of gas hinge on the laying of the pipelines and consequently imports of steel pipe must come before the barter contracts can be put into effect. The market is a vast one for Soviet requirements in wide diameter pipe(2) are immense(3). Suffice it to say that during the Ninth Plan 1971-1975, the USSR will need 12 to 13 million tons of wide diameter steel pipe to implement its oil and gas pipeline programme and that it will only be able to produce a little less than 7 million tons itself. It will, therefore need to import 5 to 6 million tons which is roughly what is provided for under present contracts(3). In contrast however the Soviet Union itself is self-sufficient in the field of very wide diameter pipe (2,520 mm), a key industry in which it leads the world.

(1) 34% of world oil reserves, 45% of gas reserves and 55% of coal reserves are held by the Soviet Union
(2) 1,020 mm, 1,220 mm, 1,420 mm
(3) Details are shown at Annex B

3.2 The outlook for 1980

53. With assured natural energy reserves for a number of years, the USSR seems well set to continue the energy policy outlined under the Ninth Plan until at least 1980. This policy consists of a change of emphasis on the various elements making up the fuel balance, and the elmination of the fuel deficit in Europe through the opening up of Siberia as well as the continuation of its hold over the COMECON fuel supply. However, it is only through the pursuit and development of its barter trade with the free world that it will be able to build up the infrastructure needed for the harnessing of its energy resources in Siberia, the key to its economic, and hence to its political future. In keeping with its system of centralization, the USSR is to build up a "single energy system" covering the areas situated between Lake Baikal and the country's western frontiers. This system will be designed to make the most economic use of all energy resources East and West of the Urals. It would seem however that the sensational appearance of the United States on the huge potential market created by the opening up of Siberia will be a major event of the current decade as far as Soviet energy policy is concerned.

3.31 Outlook for energy resources

54. According to recent estimates (1971) by Soviet experts whose views are shared in this respect by the American experts, the Soviet Union can, on the basis of consumption rates in the years 1975-1980, look forward to sufficient coal for about 1,000 years(1), oil for 200 years(2), natural gas for 70 years(3). However 80-90% of the proven reserves of these three types of energy are located East of the Urals. The real

(1) 6,800 milliard tons broken down as follows:
Lena deposits 30.5%)
Tungusk deposits 20.1%)
Kansk-Achinsk deposits 14.1%)
Kuznetsk deposits 10.5%) i.e. 90% to the East of the
Taymyr deposits 6.7%) Urals
Pechora deposits 4%)
Donetz deposits 2.8%)

(2) 6.8 milliard tons of proven reserves, 300 milliard tons of probable reserves, 80% of which are East of the Urals

(3) 15,700 milliard cubic metres of proven reserves, (85 trillion cubic metres of probable reserves) broken down as follows:
61.1% in Western Siberia
21.3% in European Russia
15.4% in Central Asia and Kazakhstan
2.2% in Eastern Siberia and the Far East

problem which is stressed throughout the study is how to extract the resources in the most economic manner and to get them to where they are required. Ideally, the extraction rate must tally with the consumption rate and it is here that Soviet optimism which does not seem excessive for the period up to 1975 may appear less justified, if not for natural gas then at least for oil in the period 1975-1980. Soviet energy policy rests on the gamble that with the transitional measures provided for under the Ninth Plan, enough time will be won to set up the extraction plant and to organize the transport to carry resources from Siberia to European Russia. This gamble may come off in the case of natural gas from Tyumen and coal from Kansk-Achinsk given the construction of infrastructure in Siberia based on key industries using large amounts of locally produced energy as described above. Where the situation becomes problematic is in the field of oil extraction in Tyumen. The untold difficulties encountered by prospectors, geologists and particularly drillers in these areas with their daunting winters and mosquito-infested summers have caused some trans-Atlantic experts to form the opinion that despite its enormous wealth, the Soviet Union may have a very narrow margin for manoeuvre between production and consumption in the years 1975-1980.

55. Assuming the worst, the USSR might be faced with a slight shortage of oil which it would make up with larger imports from certain Middle Eastern countries to enable it to keep up its exports to the COMECON. A number of western experts do not share this pessimistic view and believe that output of 600 million tons of oil in 1980, which would be in line with Soviet energy policy, is a definite likelihood.

3.22 The contribution of the industrialized countries

56. Under the terms of agreements which have been reached since 1969 between the USSR and certain Western countries (the Federal Republic and Italy) the latter will provide the Soviet Union with the technical means (pipes, technology) of fulfilling the Ninth Plan. Japan is also contributing to no small extent to the enlargement of Soviet port facilities particularly at Nakhodka and Wrangel near Vladivostok. As far as the 1975-1980 period is concerned, it seems doubtful whether the European countries will be able to meet Soviet requirements for plant and transport. These requirements cannot be calculated for the present but the tripling of the "Aurora Borealis" gas pipeline to carry gas from North Tyumen over a distance of 5,000 kilometres to the Moscow area - just to mention one project - gives some idea of the Herculean proportions of the undertaking.

57. The harnessing of the gas deposits of Yakutsk and Sakhalin will likewise call for the laying of gas pipelines over a distance of 3,000 kilometres to which Japan, as a potential customer, will undoubtedly contribute and from which it will benefit. Talks which had been underway for over a year now will undoubtedly end in agreement following the visit that Mr. Gromyko has just made to Tokyo. The United States have also publicly displayed a very lively interest in Soviet natural gas. They have twice indicated their intentions with respect to the enormous potential market represented by the opening up of Siberia. Major negotiations were initiated in Moscow in November 1971 by Mr. Stans, Secretary of State for Commerce. In January 1972, an Agenda was jointly prepared in Washington in anticipation of a visit to be made to that city by Mr. Patolichev, Soviet Minister for Foreign Trade before Mr. Nixon went to Moscow as planned in May 1972. According to unofficial sources, major contracts on the harnessing of the Siberian deposits are being negotiated to counter-balance contracts discussed or signed at the end of 1971; they involve $800 million of which half would go to the Kama complex.

58. United States investments in the field of prospection and exploitation (laying of gas pipelines, construction of a methane port and methane carriers) could total several milliard dollars, the bulk of which would be paid for in natural gas of an annual value of 800 million dollars which the USSR would supply to the United States over a period of several years.

59. The USSR will apparently have no difficulty in supplying large quantities of natural gas to the United States as from 1975(1) provided that United States aid, which alone can be on a scale equal to the Siberian undertaking is, as statements by the United States Authorities would suggest, up to the required level.

60. The United States would also stand to gain from the boost to their economy offered by the opening up of the Siberian market. Their own domestic gas reserves are not sufficient to meet internal requirements beyond 1985. Imports of Soviet gas would consequently allow them to retain major strategic reserves of natural gas in the same way as for oil. The USSR could, for its part, increase the number of its suppliers of technological aid - Western Europe, Japan and the United States - and turn the competition between those suppliers to its own advantage.

(1) In the region of 10 milliard cubic metres

3.23 Industrialization of Siberia

61. The industrialization of Siberia to which a start has been made under the Ninth Plan with the construction of industries consuming local energy, will be continued well beyond 1975. Pursuing the centralizing policy by which it abides in every field, the Soviet Union will by 1980 have created a "unified energy system" covering the areas between Lake Baykal and the country's western borders. The system, which will be controlled from Moscow will permit optimal distribution of energy. It already extends to European Russia and the Ural mountains and helps to meet peak demand.

62. In application of the same method of centralization and, given the difficulty of preserving or increasing the population of certain inhospitable regions of Siberia, the Russians plan to build up an industrial zone centred round major complexes, such as the existing complex at Novosibirsk, within a 100 kilometre radius of the Trans-Siberian railway(1), the sole economic highway East of the Urals. The first of these complexes which is to be created over the next 20 years will be located in the region of the Angara and Upper Yenisey where three large hydro-stations of the capacity of those at Bratsk and Krasnoyarsk are to be built. By the year 2000 the energy potential of that region should be greater than that of the Volga. Two other industrial complexes, one of which will use oil from Baku III(2) and the other, the rich gas deposits recently discovered in Yakutsk(3) are also scheduled in the Irtysh and Amur basins, in western Siberia and the Far East respectively. This development, which is in line with Soviet energy policy and with the need to populate the Siberian wastes, cannot fail to stiffen the USSR's unbending attitude towards China whose medium-range ballistic missiles might then be capable of reaching this industrialized fringe of southern Siberia whose common frontier with this disturbing neighbour stretches over a distance of nearly 3,000 kilometres.

(1) Cf. Note No. 11.239/SGDN/CER/C/CD, dated 2nd December, 1971
(2) Output from Baku III at the confluence of the Ob and the Irtysh, could total almost 200 million tons in the 'eighties, i.e. one third of output anticipated in the Soviet Union at that time
(3) In the basin of the River Vilyuy, a left bank effluent of the Lena

Conclusion

63. It would seem that the "Soviet gamble" with the stake none other than the country's economic future, may well come off. The potential energy reserves provide the guarantee that the future will be assured for a very long time. In the short and medium terms, it seems likely that the Soviet Union's energy policy will enable it to meet energy requirements at the end of the transitional Ninth Plan period and that the only real difficulties will be with oil. The paramount importance of opening up Siberia and the technological aid from the industrialized countries that this implies will be the major concern of the USSR until at least 1980. The leading part which the United States seems to wish to play on the Siberian market will be decisive.

64. The effects of the intensive working of the Siberian deposits on the general economy of the Soviet Union will not be known before 1985. It seems unlikely that the USSR will cross the threshold into the "consumer civilization" as betokened by private ownership of a motor vehicle, until the end of the century.

65. Some measures of world stability which will enable the USSR to channel its efforts, capital, and material and human resources into the application of its energy policy is a sine qua non for the economic future of this major post-industrial power. The success or otherwise of this policy in conditions of stability will not be seen before 1985.

NATO,
1110 Brussels.

ANNEX A

TABLE 1

TRENDS IN THE PATTERN OF ELECTRICITY REQUIREMENTS

CONSUMER CATEGORY	1970		1975		1975 % in relation to 1970
	Milliard KWH	%	Milliard KWH	%	
Industry and building	452,6	72,3	622,5	69,3	137,5
Transport	55,2	8,8	75,5	8,4	136,5
Agriculture (including the domestic requirements of the rural population)	38,0	6,1	75,0	8,4	197,5
Requirements of towns and their urban population	80,0	12,8	125,0	13,9	156,5
TOTAL	625,8	100 %	898,0	100 %	143 %

ANNEX A to
AC/127-D/421

TABLE 2

COST OF FUEL EXTRACTION

(Project data expressed in roubles per CET)

	Investment Expenditure	Cost Price	Investment Expenditure
GROUP I			
Ekibastuz coal	8,9	1,3	2,7
Kansk-Achinsk coal	6,2	1,0	1,8
Tyumen natural gas	10,0	0,9	2,2
Central Asian natural gas	25,0	1,3	5,4
GROUP II			
Tyumen oil	24,8	2,4	6,2
Mangishlak oil	31,7	3,1	8,3
Kuznetsk coal (open cast)	19,2	3,8	6,6
Minusinsk coal (open cast)	19,7	4,7	7,7
GROUP III			
Kuznetsk coal (deep mined)	30,8	6,8	11,5
Karaganda coal	30,5	7,6	12,3
Donetsk coal	47,5	8,1	15,3
Vargashorsk coal (Peshora basin)	35,3	7,8	13,1
Estonian shale	25,8	7,7	11,6
Peat	39,7	5,7	11,6
GROUP IV			
Moscow coal	62,7	13,8	23,0
Kizyl (Tuva) coal	48,3	12,0	18,5
Lenger (Kazakhstan) coal	47,0	16,4	23,4
Kirghiz coal	53,5	13,0	21,1

TABLE 3

COMPARISON OF TRANSPORT COSTS FOR THE DIFFERENT FUELS

(Project data expressed in roubles per CET)

FUEL	Means of transport (type and specifications)		Transport over 1,000 KM			Transport over 2,000 KM		
			Investment expenditure	Cost Price	Budgeted expenditure	Investment expenditure	Cost Price	Budgeted expenditure
Oil	Pipeline	1020 mm	1,8	0,17	0,44	3,6	0,34	0,88
Natural gas	Gas pipeline	1020 mm	11,9	0,85	2,63	23,9	1,69	5,27
Natural gas	Gas pipeline	1220 mm	10,0	0,80	2,31	20,0	1,58	4,58
Natural gas	Gas pipeline	1420 mm	9,5	0,75	2,18	19,0	1,48	4,33
Natural gas	Gas pipeline	2020 mm	6,7	0,57	1,53	13,5	1,14	3,17
Natural gas	Gas pipeline	2520 mm	5,8	0,53	1,40	11,5	1,05	2,78
Kuznetsk coal	Main line electrified railways		10,4	1,69	3,23	20,4	3,19	6,22
Ekibastuz coal	"	"	13,4	2,21	4,23	26,6	4,18	8,16
Knsk-Achinsk coal	"	"	17,1	2,81	5,37	33,8	5,31	10,37

(1) In equal quantities expressed in CET.

ANNEX A to
AC/127-D/421

TABLE 4

COMPARISON OF EXPENDITURES AS REPRESENTED BY THE EXTRACTION AND TRANSPORT OF DIFFERENT FUELS FOR CONSUMPTION IN EUROPEAN RUSSIA

(In roubles for 1 CET)

Destination areas in European Russia	Donetz coal	Kuznetsk open cast coal	Tyumen gas	Asian gas	Fuel Oil	Peat
Leningrad	20,3	17,3	10,8	–	9,4	–
Moscow	18,4	16,1	10,0	13,3	8,1	11,6
Minsk	18,6	–	11,4	–	9,3	10,2
Gorki	18,8	15,0	10,0	–	7,7	–
Saratov	17,5	15,2	13,3	10,4	7,3	–
Donetsk	15,6	–	–	12,9	10,8	–

TABLE 5

COMBINED EXTRACTION AND TRANSPORTATION COSTS BY TYPE OF FUEL AND DISTANCE COVERED

(In roubles for 1 CET)

Type of fuel	Extraction Costs	For transportation over 1,000 km			For transportation over 2,000 km			For transportation over 3,000 km		
		Trans. exp. (1)	Extrac. and trans. exp.	% Trans. exp.	Trans. exp. (1)	Extrac. and trans. exp.	% trans. exp.	Trans. exp. (1)	Extrac. and trans. exp.	% Trans. exp.
Tyumen gas	2,2	2,2-1,4	4,4-3,6	50-39	4,3-4,8	6,5-5,0	66-56	6,5-4,2	8,7-6,4	75-66
Central Asian gas	5,4	2,2	7,6	29	4,3	9,7	44	6,5	11,9	55
Tyumen oil	6,2	0,4	6,6	6	0,88	7,08	12	1,3	7,5	17
Mangyshlak oil	8,3	0,6	8,9	7	1,1	9,4	12	1,6	9,9	16
Kuznetsk coal (open cast)	6,6	3,2	9,8	33	6,2	12,8	48	9,2	15,8	58
Ekibastuz coal	2,7	4,2	6,9	61	8,2	10,9	75	12,1	14,8	82
Kansk-Achinsk coal	1,8	5,4	7,2	75	10,4	12,2	85	15,4	17,2	90

(1) The first figure of the first line is for transport by 1420 mm gas pipeline
The second figure of the first line is for transport by 2520 mm gas pipeline.

ANNEX B to
AC/127-D/421

SOVIET REQUIREMENTS FOR WIDE DIAMETER PIPE (1970-1980)

1. The combined programme for oil and gas pipelines for the period 1966-1970 (Eighth Plan) provided, after a number of cuts and adjustments, for 40,000 kilometres(1) of line requiring imports of 1.5 million tons of pipe or 16% of the 9.3 million tons needed.

2. The Ninth Plan (1971-1975) provides for the completion of 30,000 kilometres gas pipeline of which about one-third will consist of 1,420 mm pipe, withstanding pressures of 75 atmospheres and 27,000 kilometres of oil pipeline (designed primarily to carry Siberian oil to the West). This programme seems fairly ambitious since it implies the laying of 57,000 kilometres of pipe as compared with 29,000 under the Eighth Plan(2). Like the earlier plans it may have to be readjusted(3).

3. In 1971, almost 2,500 kilometres of "main" gas pipelines were built and brought into operation. These gas pipelines are all of a diameter of 1,020 mm or more. Three main lines were built(4).

- Nadym - Oukhta - Torjok (1,500 kilometres in 1,420 mm pipe)
- Nadym - Punga - Sverdlovsk (800 kilometres in 1,220 mm)
- Third section of the Central Asia - Centre gas pipeline (200 kilometres in 1,220 mm pipe)

600 kilometres of oil pipeline were built in the same year.

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(1) According to the results of the Eighth Plan 29,000 kilometres, including 4,000 kilometres of oil pipelines, were in fact laid

(2) Comparative rate of growth under the Eighth and Ninth Plans

	Eighth Plan	Ninth Plan
Oil pipelines	14.3%	84.3%
Gas pipelines	58.7%	44.8%

(3) Eighth Plan:

	Planned	Achieved
Oil pipelines	12,000	4,000
Gas pipelines	28,000	25,000

This Table shows the priority given to gas pipelines under the Eighth Plan

(4) See attached map (Nadym is close to Goubinsk)

4. The chief impediment to the construction of gas and oil pipelines lies in the inadequacy of Soviet output of pipe. Production is currently running at(1) 1 million tons of 1,020 mm (40"), 1,220 mm (48") and 1,420 mm (56") pipe per annum. Output cannot rise by more than 10%(2) per annum. In 1971, the USSR will have produced 1.1 million tons of pipe and for the period 1971-1975 output will be just under 7 million tons. For 1971 alone, however requirements were 1,750,000 tons(3) and for the 1971-1975 Plan will total some 12 to 13 million tons. The Soviet Union will therefore have to import 5 to 6 million tons of wide diameter pipe during this period if it is to carry its programme through.

5. To offset this difficulty it has a surplus of natural gas. Despite rising internal consumption, the simultaneous rise in production will leave a surplus of 10 milliard cubic metres for export up to 1975 (30 milliard cubic metres in the period 1975-1980) including 2 milliard cubic metres (4 in 1975) from Afghanistan and 6 milliard cubic metres (10 in 1974) from Iran(4). A number of Western European countries are interested in Soviet natural gas either because they wish to benefit from this source of energy in return for finished goods or because they want to increase the number of their suppliers as a hedge, should the Groningen strike prove insufficient in the long term. Japan is also in the market for cheap energy in exchange for sophisticated equipment.

6. Since 1963, when NATO placed an embargo on strategic materials, most Soviet imports of pipe have come from Sweden, Czechoslovakia and Rumania. As from 1969, however, West Germany and Italy, followed by Japan, have entered into barter agreements for the supply of pipe in exchange for natural gas.

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(1) Soviet output of wide diameter pipe is shown at Annex
(2) Work was started in January 1971 on the main building of a new factory producing electrically welded 1,420 mm pipe designed to withstand pressures of 75 atmospheres. Scheduled output of this factory, at Khartsizsk (Ukraine) is 2 million tons per annum
(3) 1 kilometre of 1,220 mm gas pipeline equals 450 tons of pipe
1 kilometre of 1,420 mm " " " 600 tons of pipe
1 kilometre of 2,520 mm " " " 1,200 tons of pipe
(4) This policy does not rule out the possibility of doing satisfactory deals: the USSR buys gas from Iran at $6.6 per thousand cubic metres and sells - or hopes to sell - gas to Western Europe for 2 to 2½ times as much

7. The Federal Republic of Germany, with a keen eye for new markets, started talks with the Soviet Government in 1968 with a view to supplying the USSR with plant (foundry) and transport (lorries, pipe) for the opening up of the Siberian deposits. The 20-year agreement signed in December 1969 provides for the delivery by Germany between July 1970 and December 1972 of 1.2 million tons of 1,420 mm steel pipe in exchange for the yearly supply of 2.5 to 3 milliard cubic metres of Soviet natural gas(1), Italy (120 milliard lire worth of supplies in exchange for gas)(2) is following a similar policy which is prompted by its wish to spin out its own national sources and perhaps to avoid becoming too dependent on Libyan gas. Finno-Soviet talks on barter agreements involving gas and pipe have been in progress for the past 18 months (the last meeting was held in January 1972). Sweden and France are also interested in this type of agreement.

8. In the Far East, Japan, no less enterprising than Western Europe, has had its offers of service promptly accepted in a number of areas. A 20-year agreement, reportedly nearing completion(3), provides for the supply of steel pipe for the Sakhalin-Tokyo (1,500 kilometres) and Irkutsk-Magadan (2,400 kilometres) pipelines to be paid for with annual deliveries of Soviet natural gas(4).

9. On the strength of these agreements, the Soviet Union should be able to import 4 to 5 million tons(5) of wide diameter pipe which would enable it to carry out most of its gas pipeline programme for the period up to 1975. For the period beyond that, i.e. 1975-1980 the Russians will need to import at least 1 million tons of wide diameter pipe per annum if they are to build the gas pipelines scheduled for 1980. A point to be noted is that the USSR is itself building 2,520 mm pipes (99") at the Novomoskovsk

(1) This agreement was supplemented in 1971 by a second contract on the same lines providing for Soviet deliveries of 6 to 7 milliard cubic metres in 1975
(2) 1.2 milliard cubic metres in 1973; 2.4 milliard cubic metres in 1974; 4 milliard cubic metres in 1975; 6 milliard cubic metres as from 1976
(3) Talks have been in progress since 1969; suspended in 1970 they were resumed in February and December 1971
(4) 2.4 milliard metres of cubic gas per annum for 20 years
(5) GFR: 1.2 million tons; Italy: 0.8 million tons; Japan: 2 million tons

factory in the Ukraine. The sections, which are 9 metres long and weigh 14 tons, are welded spirally and electrically. A German firm (Thyssen) is building a factory for the same type of production, likewise at Novomoskovsk within the framework of the German/Soviet barter agreement. The aforementioned process which is extremely sparing of raw materials(1) ran into difficulties to start with but the teething troubles now seem to have been ironed out. The commissioning of 6,000 to 7,000 kilometres of 25 mm gas pipeline(2) by 1980 is scheduled in the Plans.

10. Soviet output of 2,520 mm pipe will be adequate up to 1980 but present policy with respect to 1,420 mm pipe will need to be continued at least up to the period 1975-1980.

11. The irreversible eastward drift of their economic potential is forcing the Soviet leaders to undertake the difficult task of opening up Siberia, an old Tzarist and Leninist ambition. Marxist/Leninist principles notwithstanding, they have no option but to turn to aid from the industrialized countries of Europe and the Far East for the supply of steel pipe, specific equipment items and currency as well as for markets for their natural gas surplus.

(1) The throughput of a 2,520 mm gas pipeline is 4 times as great as that of a 1,420 mm pipeline. This means a saving of 500 tons of steel per kilometre

(2) Two gas pipelines linking Western Siberia to the Moscow area and one connecting this same area to Central Asia

APPENDIX

A. Soviet output of electrically welded, wide-diameter pipe (1,020 mm or more). Period 1965-1970, in thousand tons

1965	1966	1967	1968	1969	1970
685	735	877	880	900	1000 (indicative)

B. Growth of pipe requirements for gas pipeline links

Period	Average distance covered by the link	Average Diameter mm	Average Weight 1 km pipe (tons)	Coefficient(1) of pipe requirements	Comments
1956-1960	1,250 km	720	200	1	
1961-1965	2,250 km	1,020	300	2.7	-(2)
1966-1970	2,750 km	1,220	450	5	
1971-1975	3,250 km	1,420	600	8	
Beyond	Unknown	2,500	1,200	20	

(1) This coefficient is proportional to the product of the average weight of 1 kilometre of pipe and of the average length of the gas pipeline to be built. The reference period used is 1955-1960

(2) Comparison of Tables A and B shows that in 1965 when the maximum diameter of pipe manufactured was 1,020 mm, total output of pipe was only sufficient for a single gas pipeline about 2,300 kilometres long

ANNEX C to
AC/127-D/421

NUCLEAR ENERGY

1. In 1970, electricity supplied by nuclear power stations - all of them located in European Russia - totalled 1,565 MW(1). Power stations under construction(2) or expansion will bring the level of installed power in 1972 up to 2,650 MW. This will be achieved by the commissioning of:

440 MW = Kola (under construction)(3)

48 MW = Bilibino = (")

440 MW = Novovoronesh (expansion)

150 MW = Shevchenko (")

2. In 1975, total installed power will reach 5,200 MW through the commissioning of:

600 MW at Beloyarsk (extension)
440 MW at Kola (")
440 MW at Novovronezh (")
200 MW at Shevchenko (")
880 MW at Erevan (under construction)

3. The commissioning of the giant power stations at Leningrad and Chernobyl, north of Kiev, does not seem possible for 1975. These 1,000 MW stations, the first of their kind, can be expected to have teething troubles. Furthermore, work on the Leningrad site did not begin until September 1970; earth levelling work at Chernobyl had yet to begin on 13th March, 1971. These power stations will not come on stream until 1976 and the Soviet Authorities will therefore have to adjust their Ninth Plan forecasts in this area as they have already had to do in several others(4).

(1) A detailed breakdown and a map showing existing or planned Soviet nuclear stations is set out in the Appendix
(2) The average time lag between the starting up of a power station and commercial production of electricity is about six years
(3) The Kola station will be equipped with 220 MW generators brought into service in pairs, making 440 MW at the end of 1971 and 440 MW in 1973-1974
(4) The Plan stipulates that installed power in 1975 will be 6,000-8,000 MW (with a margin of 2,000 MW) which means that contrary to what has been reported in the Western press, output in 1970 has been included

4. No figures are available for the period 1975-1980 (Smolensk and Kursk stations) and forecasts are such that the part played by nuclear generated electricity in the 1980 Soviet fuel balance cannot be assessed. In any event this part will be a very minor one and at best (construction of the Leningrad and Chernobyl stations before 1976) will not exceed(1) 3% of electricity from all sources generated in the USSR(2).

5. Installed electrical power produced by nuclear plant will admittedly increase four fold by 1975 but during the same interval installed power from other sources will have increased by 40% from 166,000 MW to 231,000 MW and total electricity generated will increase by 35%, rising from 740 to over 1,000 milliard kilowatt hours. These rates of increase in the demand for energy explain why rapid expansion notwithstanding energy from nuclear plants, will do no more than supplement Soviet energy resources over the next few years.

6. No nuclear station is scheduled for construction East of the Ural mountains before 1980 (apart from the special case of the small - 48 MW - Bilibino station located at the extreme North Eastern tip of the USSR in the Anadyr region). It would seem therefore that over the next decade at least, the Russians will be relying on stations fired by oil and gas from the very large Siberian deposits located near at hand.

(1) The contribution of nuclear power stations to installed electrical power in the Soviet Union is shown at Appendix 2
(2) Existing and planned nuclear stations in the satellite countries and a map are shown at Annex III

APPENDIX 1 to
ANNEX C to
AC/127-D/421

ELECTRICAL ENERGY (MW) SUPPLIED BY
NUCLEAR STATIONS IN THE USSR

LOCALITY	Start of works	Commission date	Energy generated in 1970	1972	1975
BELOYARSK	9/60	10/63	300	300	900
NOVOVORONEZH	8/59	1964	585	1025	1465
TROICK	?	1963	600	600	600
MELEKESS	1962	1966	75	75	75
SHEVCHENKO	1/65	71-72	--	150	350
MALOYAROSLAVEC	about 1950	1954	5	5	5
BILIBINO	11/66	1972	--	48	48
KOLA	10/67	71-73 (1)	--	440	880
EREVAN	9/69	73-74	--	-	880
LENINGRAD	10/70	75-76	--	-	(1000)
CHERNOBYL	Preparations 3/71	75-76	--	-	(1000)
SMOLENSK	Project				
KURSK	Project				
		TOTALS	1 565	2 643	5 203 (7 203)

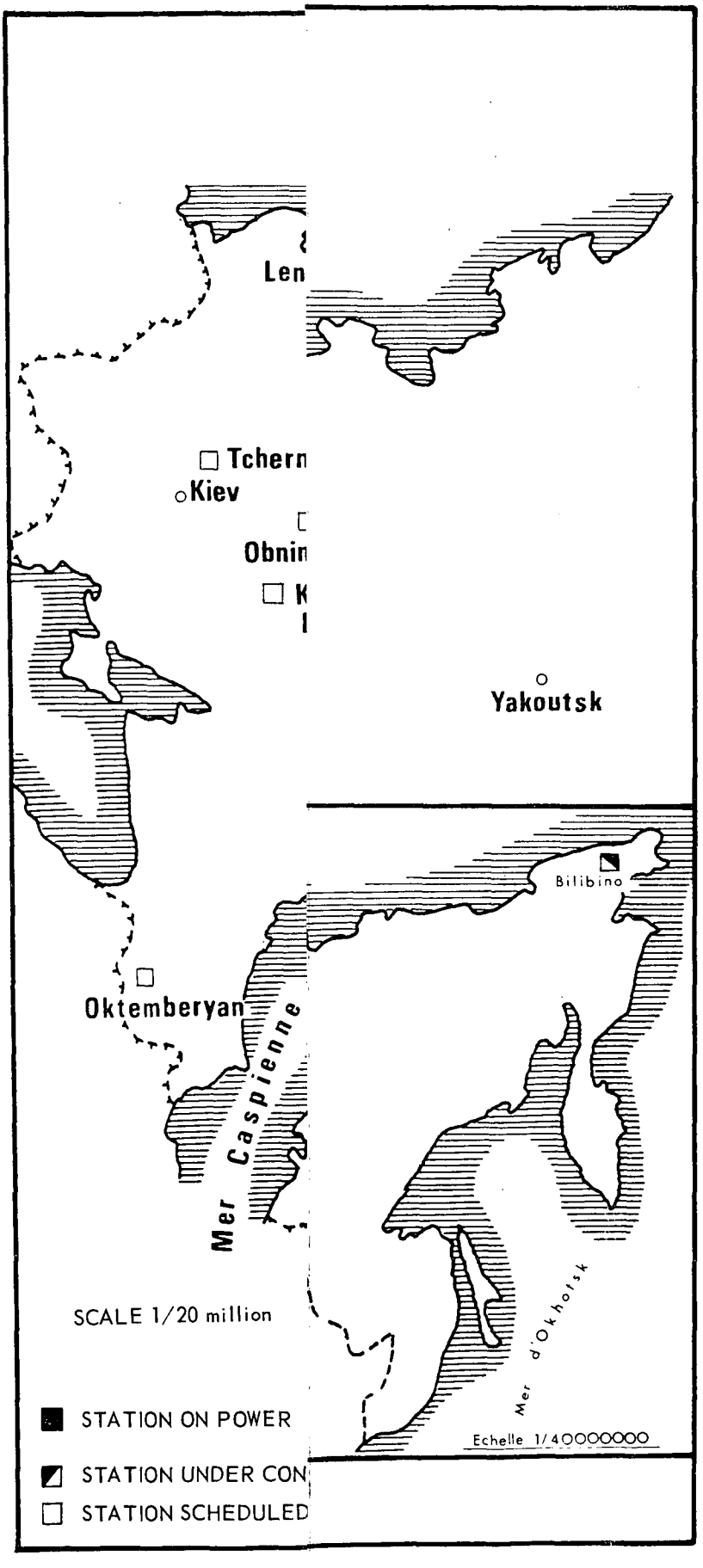
(1) The KOLA station will have 220 MW generators which will be commissioned in pairs, i.e. 440 MW in 1971 and 440 MW in 1973.

APPENDIX 2 to
ANNEX C to
AC/127-D/421

CONTRIBUTION OF NUCLEAR PLANT TO INSTALLED GENERATING CAPACITY IN THE USSR

	1970	1975 (forecasts)	
		Planned	Possible
Aggregate installed power in the USSR, IN MW (1)	166.000	231.000	
Installed power of nuclear plant, in MW	1.565	6.000 à 8.000	5.300
Percentage accounted for by nuclear energy	1 %	3 %	2,3 %

(1) Megawatt



ANNEX D to
AC/127-D/421

ELECTRICAL ENERGY UNDER THE NINTH PLAN

Of the 290-330 milliard kilowatt hours of generating power to be created under the Ninth Plan, 263 will be produced by thermal generation. The 41 milliard kilowatt hours produced by hydro-stations will be generated mainly in Siberia and in Central Asia.

Comparison of output in 1970 and 1975 by type of station

Type of station	1970		1975		% 1975 compared with 1970
	Milliard kwh	%	Milliard kwh	%	
Total	740.0	100	1,065.0	100	143.9
Thermal stations	615.8	83.2	900.0	84.5	146.0
Hydro-stations	124.2	16.8	165.0	15.5	133.1

This Table shows that in 1975, just as in 1970, almost four-fifths of electrical energy will be generated by thermal stations. The increase in installed power (65-67 million kilowatts) will be provided mainly by extremely powerful stations(1). During the period of the Ninth Plan, 19 condensation thermal stations will be built generating 2.4 million kilowatts, 3.6 and 4 million kilowatts (as compared with 2.3 kilowatts-2.4 kilowatts under the Eighth Plan). The Krasnoyarsk hydro-station, commissioned in 1971 has a capacity of 6 million kilowatts (in the USA, where installed power is twice as great as in the USSR, only 3 stations have a capacity of more than 2 million kilowatts). The number of hydro-stations with a capacity in excess of 1 million kilowatts will total 11 in 1971, as compared with 6 in 1970. Thermal stations with the capacity of 1 million kilowatts or more will represent 45% of installed power in 1975. New thermal stations will in toto account for 70% of installed power in 1975 (12% for new nuclear stations; 18.5% for new hydro-stations).

(1) The use of 500 MW generators instead of 300 MW generators will mean a 5% saving in investment costs and a 9% saving in plant costs. With 800 MW generators savings can reach 7% and 9-10% respectively

VOLUME AND PERCENTAGE OF SATELLITE COUNTRIES' FUEL IMPORTS FROM THE USSR AND THE MIDDLE EAST

COUNTRY	OIL			NATURAL GAS		ELECTRICITY		COAL		NUCLEAR ENERGY
USSR : Production '70 Production '75 (plan)	350 Mons T 480 - 500			200 Milliard cu,m. 300 - 320		740 Milliard KWH 1030 - 1070		624 Million T 685 - 695		1,565 MW 5,300 MW
	Annual output	Imp. USSR 66-70 (a)	Imp. USSR 71-75 (b)	Annual output (c)	Imp. USSR	Annual output (c)	Annual imports (c)	Annual output (c)	Annual imports (c)	1971 75 MW 1975 (?) 515 MW
G D R	Nil	38 Mons T	64.5	0.1 Mrd	1 Mrd (in 1972 ?)	65 Mrd KVH	1.3 (MIR)	1.3 Mons T 255 Mons T lignite	6.7 Mons T Coal from Poland	
POLAND	430,000 T	26 Mons T	48.5	4.4 Mrd	1 Mrd (6 to 7 between '71 & '75)	64.5 Mrd KVH	350 Mons (MIR, USSR)	140 Mons T coal	800,000 T from USSR (coking)	1,000 MW in 1975 (?)
CZECHOSLOVAKIA	210,000 T	39 Mons T	66.5	0,5 Mrd (no reserves)	1 Mrd (5 between '71 & '75)	45 Mrd KVH	3 Mrd (MIR, Rumania)	28 Mons T coal 77.5 Mons T lignite	4.6 Mons T coal including 2.7 from USSR	150 MW in '71 - '72
BULGARIA	334,000 T	15.7 Mons T	38.5	Nil	1 Mrd in '74 3 Mrd in '75	19.5 Mrd	0.5 (MIR)	400,000 T coal coal - 29 Mons lignite	2 Mons T coal from USSR	880 MW in 1974-1975
HUNGARY	2 Mons T	16.8 Mons T	38.0	3.4 Mrd	1.2 Mrd in '75 3 Mrd in '80	14.3 Mrd	4 Mrd (MIR, including 2.8 from USSR	4 Mons T coal 23 Mons lignite	3.2 Mons T coal, half being from the USSR	800 MW in '75
RUMANIA	13.5 Mons T	16 Mons T refined (19 end '72) 8 M consumed 5 M imported from Iran (3 M in '72)		20.2 Mrd cu.m.		3 Mrd exported 1 Mrd imported	MIR (CZECH) (MIR)	Self-sufficient		600 or 800 MW in 1980 ?
YUGOSLAVIA (1)	3 Mons T	Imp. from USSR 1.3 Imp. from other countries 4 consumed 7 (12 in 1975)		977 Million cu.m. (no imports)		26 Mrd	0.5 (MIR)	643,000 T coal 28.7 Mons T lignite & brown coal	1.15 Mons T from USSR	600 MW in 1975 ?

(1) pro mem. (a) for the 5 year period '66 - '70 (b) for the 5 year period '71 - '75 (c) 1970 figures

ANNEX F to
AC/127-D/421

VOLUME AND PERCENTAGE OF OIL IMPORTS BY SATELLITE COUNTRIES FROM THE USSR AND THE MIDDLE EAST

	Output in 1970 Output in 1975	Total Imports in 1970 in 1975	Imports from USSR in 1970 in 1975	Percentage of total imports	Imports from the Middle East 1970 1975	Percentage of total imports
G.D.R.	Nil	11,2 Mion T	10 Mion T	90 %	Iraq, Egypt 1.5	10 %
	"	22 "	17 - 18 Mion T	80 %	Iraq, Egypt Saudi-Arabia 5	20 %
POLAND	430.000 T	8 "	7 "	90 %	Syria, U.A.R. 1	10 %
	2,5 Mion T	17 "	13 "	80 %	idem + Brit. Petr. 1 + 3	20 %
CZECHOSLOVAKIA	210.000 T	12 "	10 "	88 %	Iran 2	12 %
	"	23 "	18 "	80 %	Iran, Iraq Venezuela (a) 5	20 %
BULGARIA	400.000 T	6,5 "	5,5 "	90 %	Algeria, U.A.R. 1	10 %
	"	12 "	10 "	90 %	idem + Iracq, Iran Libya 2 (?)	10 %
HUNGARY	2 Mion T	5 "	4 "	80 %	Iran, Syria 1	20 %
	"	13 "	10 "	80 %	Iran, Syria 3	20 %
RUMANIA	13,6 Mion T	Refined 19 Mion T, Consumed 8 Mion T, Imported 5 Mion T from Iran (3 in '72) via Israel, Suez, Alexandria				
YUGOSLAVIA	3. Mion T (7 Mion T consumed '70 12 Mion T consumed '75)	1970 5,3 Mion T	1970 1,3	20 %	1970 4 Mion T	80 %

(a) Supplied by the Middle East to Hungary and Czechoslovakia through the "ADRIA" pipeline which runs across Yugoslavia. This pipeline will probably be completed in 1975.

ANNEX G to
AC/127-D/421

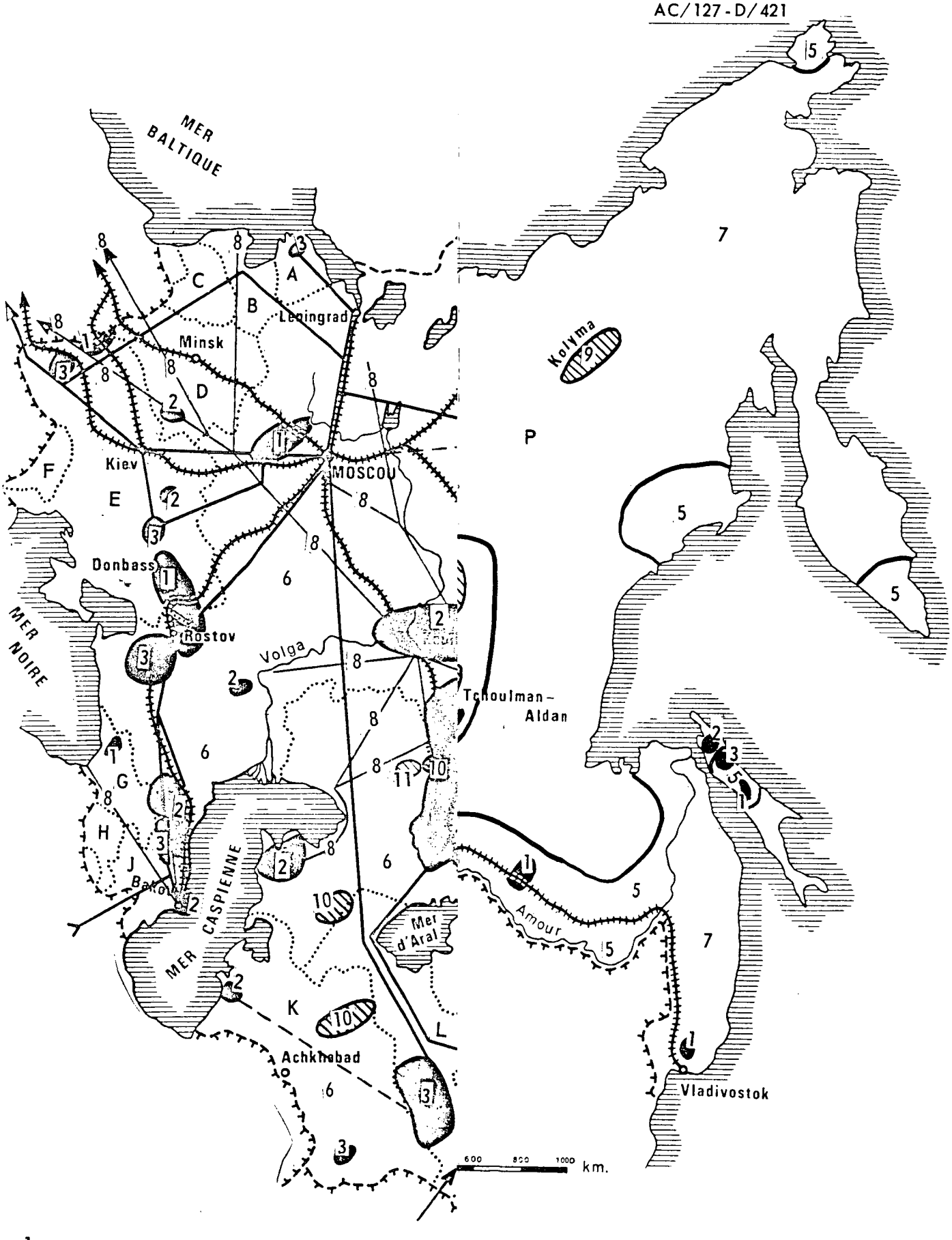
SOVIET PRODUCTION - IMPORTS - EXPORTS - NATURAL GAS

(in milliards of m3) 1970 - 1980

Production		Imports		Surplus available
		IRAN	AFGHANISTAN	
1971	214	6	2,5	10
1972 (plan)	229	6	2,5	10
1973 "	250	6	2,5	10
1974 "	280	10	2,5	20
1975 "	300/320	10	4	30 and more
1980 "	600/700	more than 10	more than 4	(1)

Exports	1971	1972	1973	1974	1975	1976	1980
COMECON							
Pologne	1	1,2	1,2	1,2	1,2		
Czechoslovakia	1	1	1	1	1		
Hungary	0	0	0	0	1,2	?	?
Bulgaria	0	0	0	1	3		
G.D.R.	0	1 (?)	1	1	1		
Rumania	0	0	0	0	0		
TOTAL COMECON	2	3,2 (?)	3,2	4,2	7,4	(1)	(1)
Yugoslavia	0	0	0	?	?		
FREE WORLD							
Austria	1,5	1,5	1,5	4,5	4,5	?	?
G.F.R.	0	0	0,5	3	3	3	5 to 6 in '78
Sweden	0	0	0	?	?	?	?
Finland	0	0	0	0,5	1	1	1.4 in '79
Italy	0	0	1,2	2,4	4	6	more than 6
France	methane	methane	methane	methane	methane	2,5 (?)	2.5 (?) up to 1996
Switzerland	under negociations						
Japan	under negociations					2.4 for 20 years (?)	
United States	under negociations					10 (estimate)	
TOTAL FREE WORLD	1,5	1,5	3,2	11 (?)	13 (?)	(1)	(1)
GRAND TOTAL	3,5	4,7	6,4	15,2(?)	20,4(?)	(1)	(1)

(1) Comparison of surpluses and deliveries foreseeable for the present show a margin of approximatively 10 milliard cu.m per annum (30 minus 20.4) which could meet United States requirements towards the end of the 70's when there will also be an increase in the estimated availabilities. A yearly supply of 10 milliard cu.m of gas would be roughly in line with the dollar repayments announced by the United States.



1 Main coals fields being worked
2 Main oil fields being worked
3 Main gas fields being worked
4 Main gas pipelines under construction
5 Low reserves of coal
6 High reserves of gas
7 Near reserves of oil

National boundaries
Boundaries of Soviet Republics
Boundaries of Tyumen