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THE DIRECTOR OF CENTRAL INTELLIGENCE

WASHINGTON, D.C. 20505

10 February 1982

National Intelligence Council

MEMORANDUM FOR: Chairman, National Intelligence Council

FROM: Maurice C. Ernst
NIO for Economics

SUBJECT: Some Perspectives on the Pipeline

1. The insistence on precise estimates of how much US sanctions could delay completion of the Yamal pipeline indicates a lack of perspective concerning Soviet capabilities and options in gas pipeline construction. Specific estimates of delays are feasible only when comparing technical options involving specific sources of equipment (for example, producing GE rotors in France instead of the United States). In practice Moscow is likely to use a variety of technical options and Western sources of equipment unless the latter are all shut off. This flexibility would presumably mean smaller delays than would occur if only one technical option were involved.

2. Even if Moscow had no access to Western compressors, there is no question that it would be able to make adjustments in domestic production and in its pipeline construction plans. Consider the following:

o The USSR builds more long distance gas pipelines than the rest of the world put together; the Yamal line is only one of six planned for construction during 1981-85.

o Although the Soviets have found their own compressors to be less satisfactory than some of those built in the West, their compressors do work and may be improving. Since 1978, most Soviet long distance lines have used Soviet-built 10 Megawatt compressors. The existing line to Western Europe uses Soviet as well as some Western compressors of this size.

o Moscow has been developing a 25 Megawatt compressor. It hopes to get Western help, but does not lack technical capability. The USSR is among the world leaders in electric power generation and builds large numbers of effective and reliable, if not efficient, jet engines. There is every reason to believe that the Soviets could develop an adequate large compressor without Western help. It might take more maintenance and use more fuel, but that is characteristic of most Soviet equipment.

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o The GE compressors on which so much is being written are characterized as including "1950's technology." What the Soviets like is their proven track record and reliability, but that doesn't mean something else won't do.

3. Even if they have to go it alone, the Soviets almost certainly will build pipelines to expand gas exports to Western Europe. They realize they badly need the hard currency. If they build the Yamal pipeline with their own compressors, there would be greater gas consumption to run the pipeline, and therefore slightly smaller gas sales to Western Europe. The foregone earnings, however, are not massive except when cumulated over many years. Completion of such a pipeline need not be delayed if Moscow gives it a very high priority. Some domestic pipelines might be delayed, but perhaps not much since it seems reasonable to expect domestic compressor production to be accelerated beyond planned level.

4. Even if there were substantial delays, Moscow could partially bridge the gap using new domestic pipelines for most of the distance to Western markets.

5. If Moscow could not buy Western compressors, it would still be dependent on Western suppliers for a great deal of pipe. However, France and Italy, which are large potential suppliers of compressors but not pipe, might find buying Soviet gas less attractive. The principal potential attraction of Soviet gas for these countries would then shift from larger export sales to low gas prices. There is little question that Soviet gas is potentially the cheapest source of large amounts of new gas for Western Europe. The cost of producing and transporting Algerian gas is probably less, but Algerian reserves are far smaller than Soviet reserves. Norway has the reserves to supply substantial amounts of new gas in the 1990s, but I suspect that much of the new Norwegian gas would be more expensive to transport than Soviet gas. Consequently, if the West Europeans want to ensure long term supplies of gas at prices low enough to compete with oil in widespread industrial uses, they probably must go to the Soviet Union. This key selling point for Soviet gas will remain even if there are no tied exports of equipment. Even so, French and Italian government enthusiasm for the pipeline might weaken considerably, especially in the face of political criticism.

Maurice C. Ernst

Ananalytic Framework

(1) Baseline assessment: Soviet capabilities without sanctions: Best case

-- Baseline against which other assessments are to be measured

-- Need to determine:

-- Can contracted gas be delivered by 1984?

-- When can 1st leg be completed--84? --86?

-- when can full flow be expected?

-- What would be specific bottleneck--

-- construction? turbines?

(2) Worst case: What can Soviets do in "absence" of Western technology

-- Assumes deliveries of pipe

-- Assumes availability of certain components which cannot be effectively controlled such as valves.

-- Need to determine:

-- How dates for completion would differ from baseline case

-- How flow would differ

-- Would bottlenecks be the same or different

-- What are Soviet abilities for:

Turbines

Compressors

Pipe layers

Construction & Engineering

-- Impact on domestic plans

(3) Current situation

-- How would current restrictions affect pipeline vis-a-vis baseline case

(4) What if only 10 Megawatt turbines were available from the West -- other factors being equal.

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Figure 1

USSR: Production of Major Fuels

	Natural Gas			Oil		Coal	
	(Billion M^3)	(mtoe)	AARG[1]	(Million tons)	AARG[1]	(Million tons)	AARG[1]
1960	45.3	38.1		147.9		509.6	
			23.0		10.4		2.5
1965	127.7	105.0		242.9		577.7	
			9.2		7.8		1.6
1970	197.9	165.4		353.0		624.1	
			7.9		6.8		2.4
1975	289.3	239.7		603.2		701.3	
			8.5		4.2		0.4
1980	435.2	360.6		603.2		716.4	
			7.7		0.8		1.6
1985 Plan	630.0	522.0		630.0		775.0	

[1] Average annual rate of growth calculated from unrounded numbers. Narkhoz 1980 pp. 156-7.

Figure 2

Soviet Natural Gas Trunklines of 1,420 mm. Diameter
Completed Through 1980:
Total Length 17,050 Kilometers

(See accompanying map)

Northern Route	Length (Km.)
Medvezh'ye-Punga-Ukhta-Torzhok-Minsk	3,100
Central Route	
Urengoy - Punga - Nizhnyaya-Tura - Perm - Kazan	2,100
Urengoy - Punga -Nizhnyaya-Tura - Perm	1,520
Southern Route	
Urengoy-Vyngapur-Chelyabinsk-Petrovsk-Novopskov	3,380
Urengoy-Vyngapur-Chelyabinsk	1,700
"Soyuz"	
Orenburg-Aleksandrov Gay-Novopskov-Uzhgorod	2,750
Central Asia-Center	
Shatlyk-Beyneu-Alexandrov Gay-Ostrogozhsk	2,500
	17,050

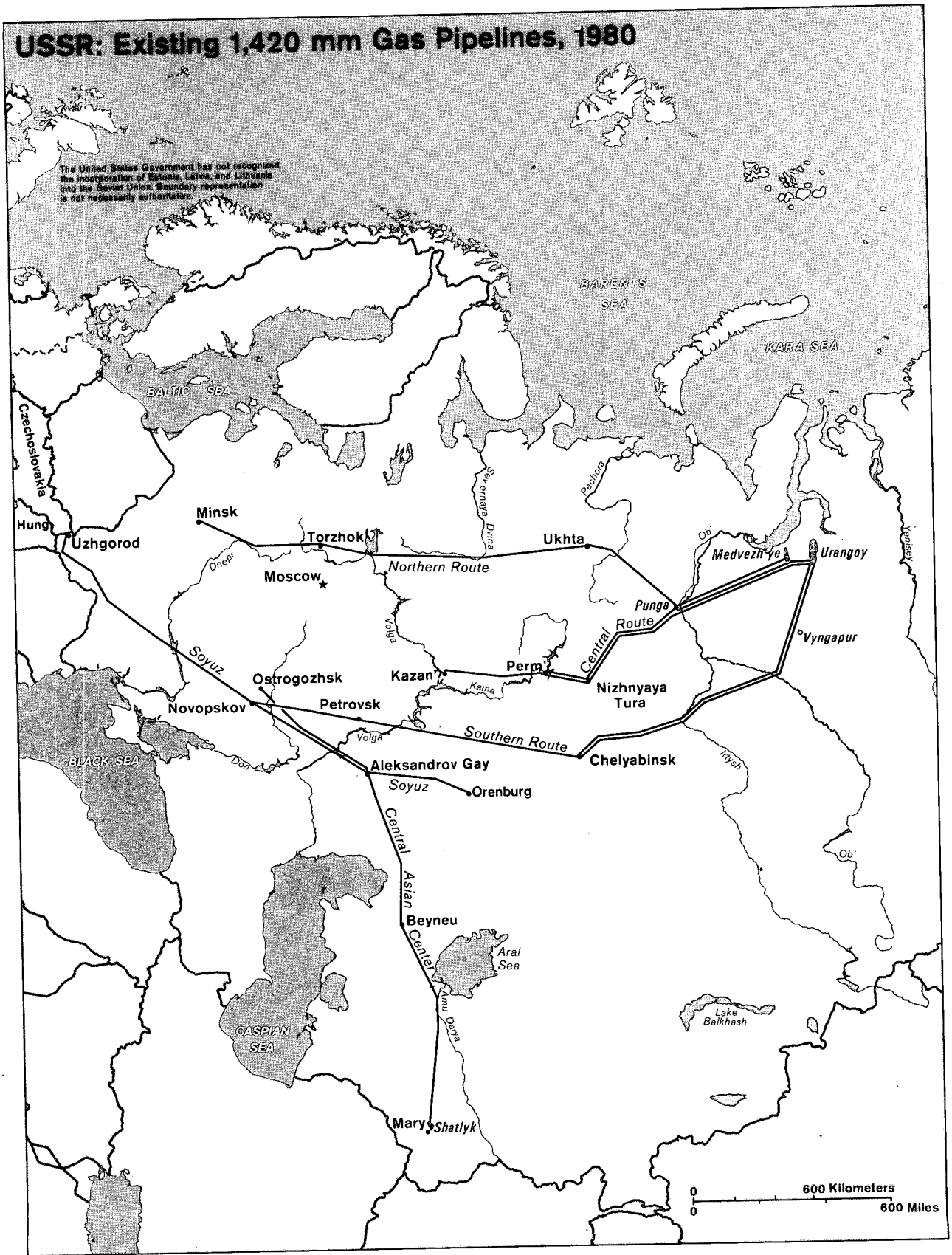

Figure 3

Soviet Natural Gas Trunklines of 1,420 mm. Diameter Included in Plan for 1981-85: Total Length, 20,000 Kilometers*

(See accompanying map)

Northern Route	Length (Km)
Urengoy-Punga-Ukhta-Gryazovets-Moscow**	2,800
Gryazovets-Torzhok-Minsk-Ivatsevichi	1,300
Central Route	
Kazan-Petrovsk-Novopskov	1,100
Perm-Kazan-Petrovsk-Novopskov	1,650
Urengoy - Nizhnyaya-Tura - Yelets - Kursk	3,500
Urengoy - Nizhnyaya-Tura - Petrovsk - Uzhgorod***	4,650
Southern Route	
Chelyabinsk-Petrovsk-Novopskov	1,700
Subtotal	16,700
Plus allowance for terrain adjustments, capital repairs and unspecified construction	3,300
	20,000

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* During the past year, Soviet journals have been inconsistent in their discussion of pipeline routes and distances. The routes shown here must therefore be considered as provisional.

** The Urengoy-Gryazovets-Moscow Ring line was completed in February 1981, and was claimed as the first of seven lines planned for completion in the Eleventh FYP. Subsequent plans refer to the remaining six line.

*** This is the so-called "export pipeline." An alternative alignment discussed in Soviet publications is Urengoy-Chelybinsk-Petrovsk-Uzhgorod along the the Southern Route, some 200 km. longer.

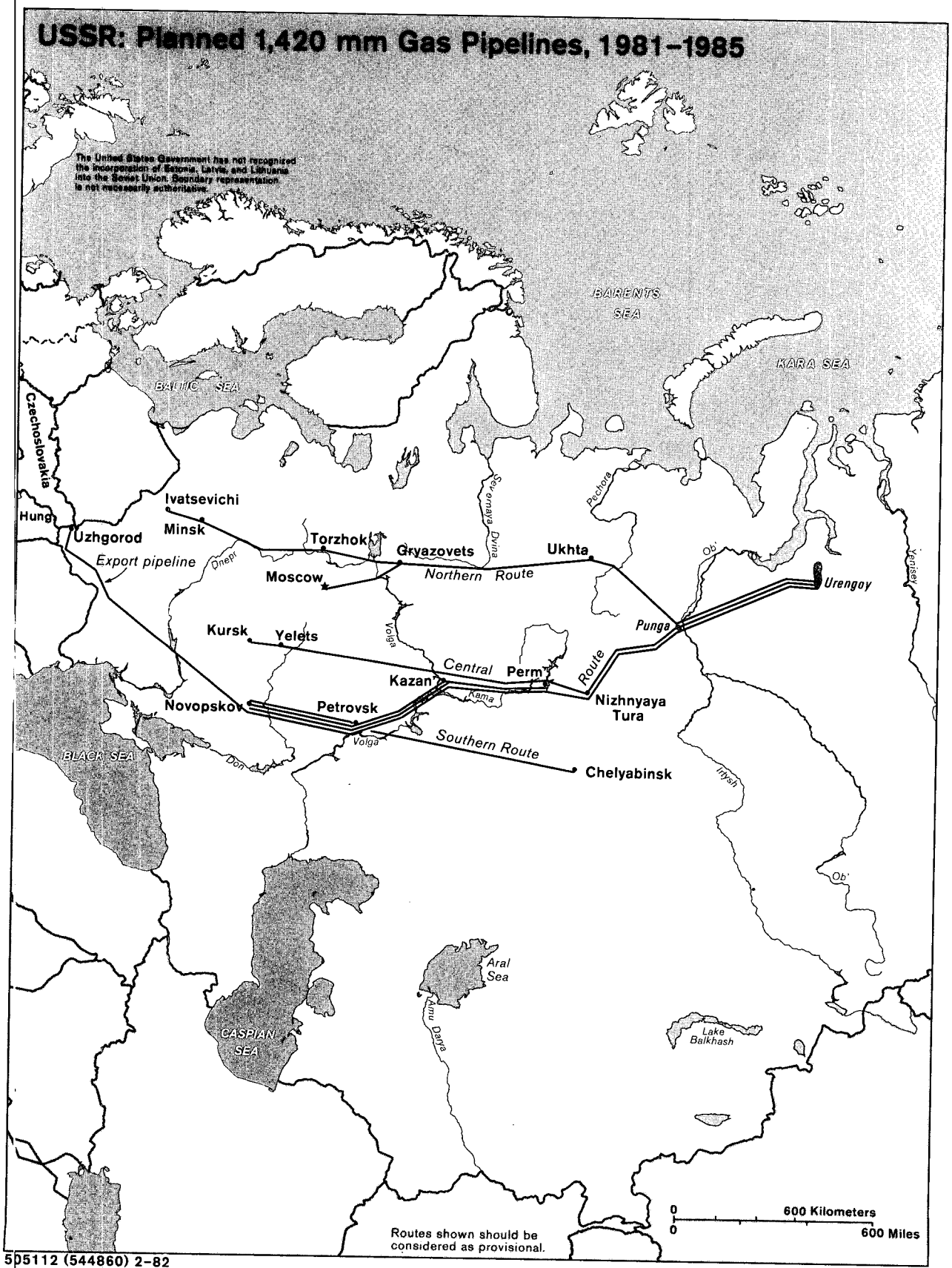


Figure 4

USSR: Progress of the Gas Trunkline System

	Length (1,000 km.)	Compressor Station Power (1,000 MW)
1965	41.8	1.9
1970	67.5	3.4
1975	98.8	8.0
1980	132	17.6
1985 Plan	180	43

Figure 5

Gas Pipeline Compression and Throughput

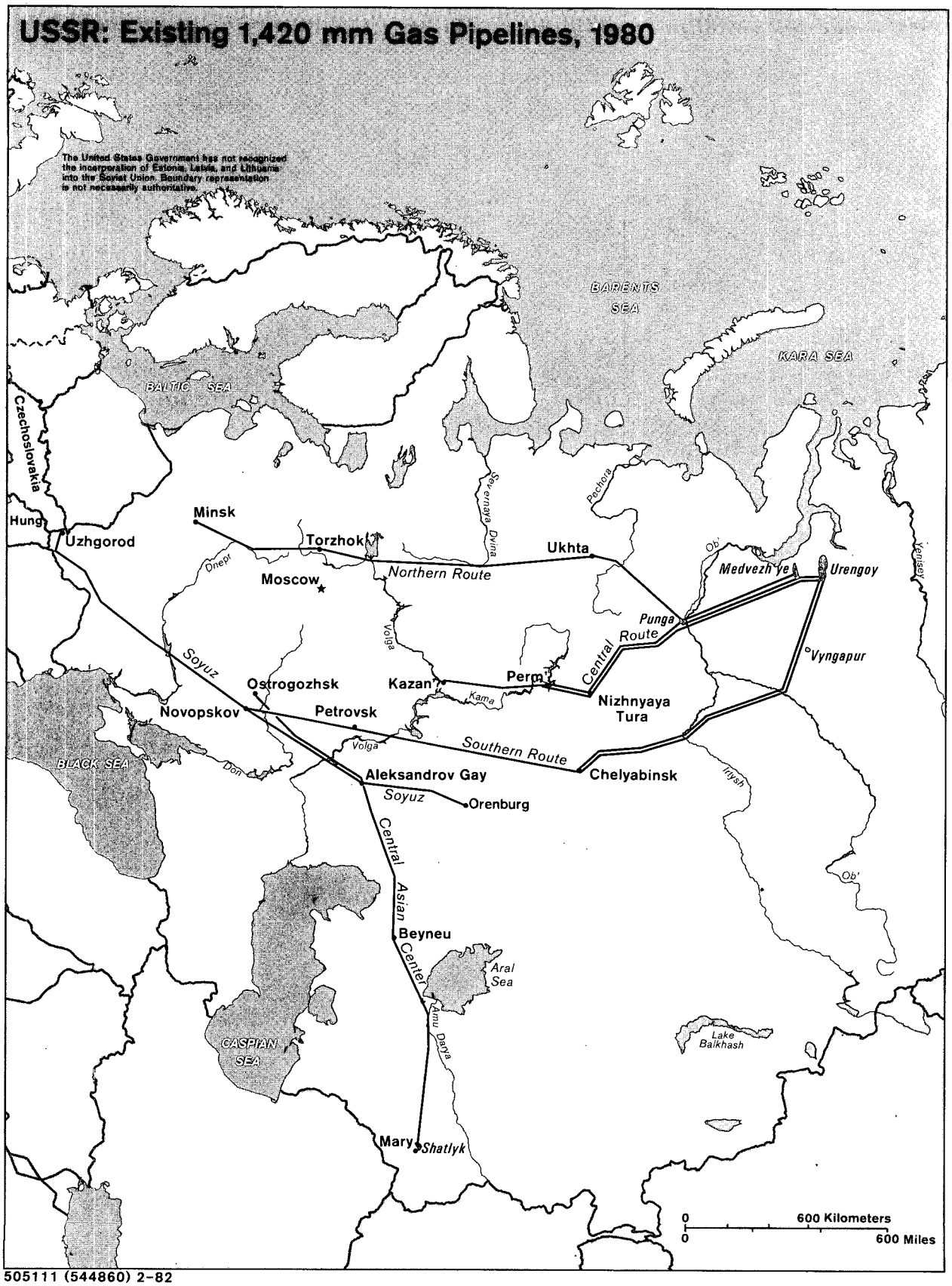
Natural Gas Pipeline Characteristics

Diameter (Millimeters)	Diameter (Inches)	Pressure (Kg/cm^2)[1]	Throughput Capacity (billion m^3/yr)
1020	40	55	8.5
1020	40	75	12.0
1020	40	100	17.0
1220	48	55	13.5
1220	48	75	19.0
1220	48	100	27.0
1420	56	55	20.0
1420	56	75	29.0
1420	56	100	41.0

[1] Kg/cm^2 is roughly equivalent to "atmosphere."

Nonlinear Relation Between Compressor Power and Throughput

Compressor-drive Power (Percent of Maximum)	Throughput (Percent of Designed Capacity)
8	50
15	60
27	70
44	80
67	90
100	100



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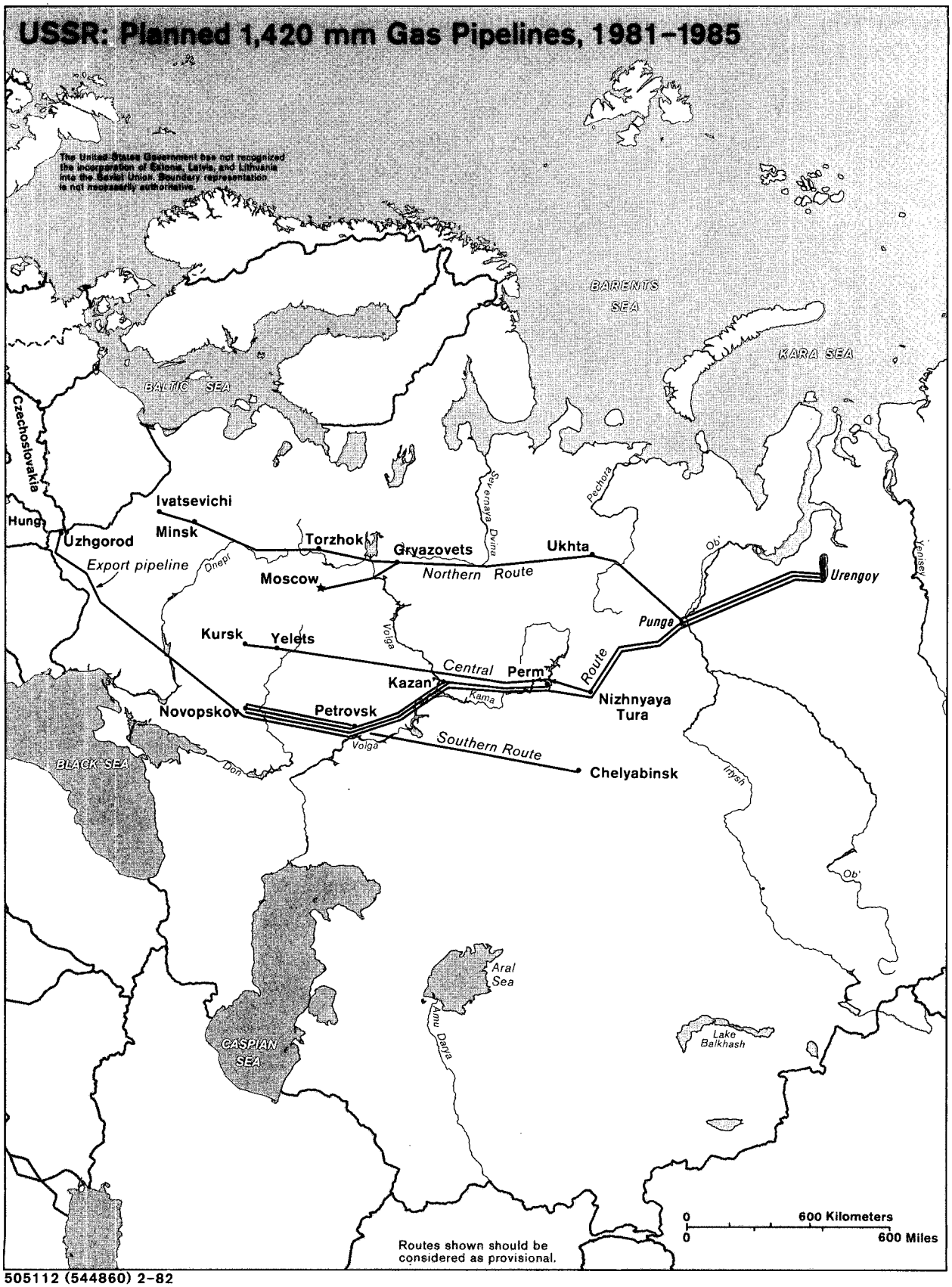

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