

# Pipeline embargo in new jeopardy

## Soviet Union's technology could adapt

President Reagan's ploy to stop or delay the supply of Siberian natural gas to Western Europe may all be in vain — because of two simple technical options open to the Soviets.

Reagan's tactics have been to urge European steel manufacturers — particularly West Germany — to stop supplies of the large-diameter (1.42m) steel pipe needed for the line; and to forbid General Electric and other American suppliers from shipping key parts (for example turbine blades) to Western manufacturers making the gas turbines and compressors needed to pump the gas.

But the Soviet Union is experimenting with increasing the pressure of gas in the line from its nominal 75 atmospheres to 100 or even 120 atmospheres. At 100 atmospheres, the pipeline could be built with only two parallel pipes (the current design has three) and yet carry the same net flow of gas (40,000 million standard m<sup>3</sup> a year). At 120 atmospheres, only one pipe would be needed, according to official reports in the newspaper *Pravda*. This would reduce the steel requirements for the line to within the capacity of Soviet industry (although the higher pressure pipes would have to be reinforced), and it would also drastically reduce the cost.

Another neglected fact is that the design capacity of the line is in excess of the contracts for gas so far signed in Europe. Since the power required to pump gas down a pipeline rises more than linearly with the rate of gas pumped, it would be possible for the Soviets to pump the contracted gas with many fewer than the 125 gas turbines of 25 MW currently on order in Europe. The 125 turbines are only necessary to pump the full design flow rate.

Exactly how many turbines the Soviet Union would need to be in place by 1984 — when the line is supposed to come on stream — depends on the detailed characteristics of the line. However, the plan is to supply just 15,000 million m<sup>3</sup> at that date — under 40 per cent of capacity. It was never envisaged that the line would be pumping its full capacity before 1987.

In fact, according to British pipeline engineers, it would be presumptuous to assume that the Soviets would need as much as 15/40 of design pumping power by 1984, that is 47 or so 25-MW turbine and compressor sets.

It happens that there are parts available in Europe to supply 23 such sets to the Soviet Union, six at John Brown in

Scotland and the rest in France and Italy. That would leave the Soviet Union with at most 24 sets to supply from its own industry in Leningrad, as opposed to the 102 apparent from the design. According to British turbine manufacturers, the General Electric turbines are not particularly sophisticated technology — they are based on 1950s steam turbine design. The obstacle to their manufacture in the Soviet Union is primarily a matter of industrial capacity.

At present, the Soviet Union has no such capacity for 25-MW sets, but West European engineers are convinced that a working prototype is now under test in Leningrad. According to Soviet sources this prototype is "even more efficient" than the General Electric sets it is designed to replace. Whether the Leningrad works could supply 24 of these sets in working order by 1984 is open to question, but the target is a good deal more realistic than the 102 that the Reagan embargo apparently implied.

Another option open to the Soviet Union is to divert 10-MW set production, for which it has capacity, from the six national pipelines under construction. And

## EPA holds out against lead

*Washington*

The US Environmental Protection Agency (EPA) stuck to its guns last week and issued a regulation tightening limits on lead in gasoline, despite pressure from the Office of Management and Budget (OMB) to back off.

The new rule, to take effect on 1 November, limits the lead content of leaded gasoline to 1.1 grammes per gallon. EPA estimates that after eight years, airborne lead concentrations will be 31 per cent lower than they would be without the new rule.

Under current regulations, refiners are allowed to average the lead content of all their gasoline, both leaded and unleaded; that pool average must not exceed 0.5 grammes per gallon. But as a result, refiners have been increasing the lead content of leaded fuel (which cannot be used in new cars with catalytic converters) as demand for it drops off. Adding lead is the cheapest way of increasing octane ratings, and EPA has found refiners using as much as 2 grammes of lead per gallon.

Earlier this year, EPA had proposed relaxing the lead regulations. This was done at the bidding of Vice President George Bush's task force on regulation. But in the face of a storm of protest — and convincing evidence that reductions to date in airborne lead have brought about real reductions in blood-levels — EPA went back to the drawing board.

By the beginning of August, EPA had

in Europe, the French company Alsthom-Atlantique has the capacity to build complete turbines (albeit under licence from General Electric, and so in defiance of the Reagan embargo and so in risk of penalties in America).

Thus it seems entirely conceivable that one way or another the Soviet Union will meet its 1984 deadline — and that it could develop the capacity to bring the line up to full flow by 1987, as Soviet sources continually affirm.

The pipeline design requires three 4,500 km strings to bring the gas from Siberia to the Western border of the Soviet Union. So far, 2,700 km of pipe have been delivered to the pipeline builders, according to the Soviet news agency Tass. Some 500 km of pipe have been welded into a single line, says Tass, and by mid-August 250 km had been laid in place.

Pipe laying equipment which was to have been supplied by the American Caterpillar company is also embargoed, but a new Soviet-designed pipe-layer is now under test, says Tass. The Japanese company Komatsu is also substituting for Caterpillar equipment, according to the news agency.

**Robert Walgate and Vera Rich**

completed its about face, and in an apparent attempt to out-flank OMB, leaked its new, tougher proposal to the *New York Times*. OMB nonetheless responded by requesting EPA to reconsider the proposed 1.1 gramme limit but EPA has held its ground.

OMB did get its way, however, over the issue of the so-called small refiners.



Current regulations grant an exemption for refiners who produce less than 50,000 barrels per day; they are allowed to add from 0.8 to 2.65 grammes of lead per gallon, according to their scale of production. The new rules will narrow the exemption, reserving the "small refiner" designation for producers of less than 10,000 barrels a day who were in business before October 1976. According to EPA, this will leave only 74 companies in this category, about half the current number. They will be allowed to add up to 2.5

grammes per gallon. The losers will be the "blenders", companies that jumped into the business in the past few years to take advantage of the small-refiner loophole. They buy cheap gasoline, add lead to boost the octane, then resell it. That practice should be largely halted by the new rules.

Environmental groups are generally pleased with the new rules. The lead industry, predictably, is not. In a letter to the *New York Times* last week, Dr Jerome Cole, vice-president of the International Lead Zinc Research Organization argued that the new regulations will cost the public "millions of barrels of crude oil that lead in gasoline saves while adding billions of dollars to the US balance of payments deficit." **Stephen Budiansky**

### Affirmative action employer

The launch of the Soyuz-T, with a three person crew including female cosmonaut Svetlana Savitskaya, coincided neatly with the closing of Unispace-82 in Vienna and upstaged the US contribution to equal opportunities in space, the visit to the conference of Dr Anna Fisher, astronaut in training. Miss Savitskaya's visit to Salyut-7, however, should not be viewed simply as a publicity gimmick, nor an attempt to scoop the launch of Dr Sally Ride aboard the Shuttle next spring. The fact that there were female candidates training at the Gagarin space centre was announced some weeks ago. It would seem that, as far as the space planners were concerned, the launching of a woman was the next routine step.

Soviet space policy is strongly committed to the construction of large space stations,



Savitskaya and crew-mates

aboard which women would serve as scientists. ("And, of course, stewardesses", Andrian Nikolaev, the husband of the first Soviet woman cosmonaut Valentina Tereshkova, once added.) Studies of the effect of spaceflight on the female organism are an obvious prerequisite of such a programme. Yet, since Tereshkova's solo flight in 1963, no woman has been placed in orbit. The reason appears to be partly one of what a Soviet space official delicately called "the amenities". Moreover, the 1961 Soyuz-11 disaster, in which three cosmonauts died due to loss of cabin pressure during re-entry, led to a change in procedure; cosmonauts were to wear spacesuits during the re-entry, which meant that crew size had to be reduced from three to two. It was the introduction of the roomier Soyuz-T transport craft and Salyut-7, that made it possible for the multi-crew spacecraft to have a female visitor.

### Israeli science politics

## Physicist made Science Minister

Rehovot

Professor Yuval Ne'eman, a well known theoretical physicist and former president of Tel Aviv University has become Israel's first Minister of Science, just five years after turning down the post because he preferred to stay out of politics. Since then, though, Ne'eman has become a fully-fledged politician and now represents the nationalist Tehiya Party in the Knesset. When Tehiya joined the Begin-led coalition government, Ne'eman accepted the position of Minister of Science and Development.

Not all of Ne'eman's academic colleagues are enthusiastic about the notion of a ministry with overall responsibility for science. For one thing, they fear that it might mean an undesirable degree of government control. Ne'eman discounts such fears and claims that there are overwhelming benefits in having science represented at cabinet level. Other ministries already have their own chief scientists and research budgets and Ne'eman sees one of his chief tasks as introducing strong central coordination over these separate activities.

Professor Ne'eman is pleased with what has been achieved by Israeli scientists and technologists, but looks forward to a "quantum leap" in these achievements, in particular supporting the idea of creating "science cities". And he has set a target of \$5,000 million dollars a year for the annual income from exports based on local research — the current level being only \$1,000 million.

Although Ne'eman is clearly putting the emphasis on applied research, he says he will also be fighting to see that pure research gets the funds it deserves. He is particularly interested in creating more national experimental facilities like the Weizmann Institute's nuclear accelerator and the 40-inch telescope at Tel Aviv University. He also hopes to explore the possibility of Israel's becoming involved in further multi-national research bodies. Already Israel is a member of the European Molecular Biology Organization, and other candidates are the European Southern Observatory and the European Space Agency.

Only in the past 15 years, says Ne'eman, has advanced science and technology begun to have a serious impact on Israeli industry. Ne'eman himself can claim much of the credit — during the sixties he was amongst those who persuaded the government to back skill-intensive science-based industry at the expense of the labour-intensive textile industry and in the mid-seventies, as Chief Scientist in the Ministry of Defence, he had a significant impact on the country's military science.

Some Israeli scientists are sceptical about one of Ne'eman's pet projects, how-

ever. He is committed to the plan to build a canal from the Mediterranean to the Dead Sea, which among other things will provide hydroelectric power by utilizing water from the hills around the Dead Sea. Some question the value of spending an estimated \$1,000 million on a project that would only provide a few per cent of Israel's energy requirements. Ne'eman, for long a moving spirit behind the plan, maintains that the energy would be available at crucial times and that the canal



Ne'eman takes science to the cabinet

would provide much-needed cooling water for additional thermal power stations along the route.

Looking forward to his new task, the new minister says he will do his best "not to disconnect" from "real science". "I was serving as a military attaché with the Israeli Embassy in London," he recalls, "when I worked with Murray Gell-Mann on 'The Eightfold Way', the theory that led to the prediction of quarks. And if I was able to combine the purchasing of submarines with the charting of elementary particles then, I don't see why I can't maintain the same duality now." **Nechemia Meyers**

### US degrees

## Doctoral decline

Washington

The number of US citizens who received doctorates in the "hard" science fields in the United States declined steadily during the 1970s (see chart). Some see in this trend a dangerous drift away from basic research as a career priority for young US scientists. David A. Shirley, director of the Lawrence Berkeley Laboratory, considers the figures "poignant" evidence of that US society is steering its young people away from basic science.

Another explanation is the changing environment in US university science departments, and the steady upward trend in salaries offered by industry to graduates who have made the initial four-year invest-