Gain in Soviet Oil Reserves Doubted

In the battle among the estimators, the CIA's pessimists are winning ground

Estimating Soviet oil reserves and production rates—once a specialized task among Sovietologists—has been a popular spectator sport since April 1977, when the Central Intelligence Agency (CIA) put out a report predicting trouble in the Russian oil industry within a few years. The CIA was accused of spreading pessimistic propaganda. Other experts put out reports refuting the CIA's work, and then there were refutations of the refutations. Since then, the debate has rumbled along, occasionally breaking to the surface in a new batch of academic papers. A fresh harvest of forecasts appeared this fall.

The prevailing view among American experts is that although the CIA may be wrong on some of its numbers, it is correct in its pessimism about the Soviets' ability to increase oil production before 1985. If correct, this conclusion means that the Soviets, aready sinking into an economic slump, will encounter more severe productivity problems in the next few years. And for oil consumers generally, it means that the Persian Gulf oil fields will acquire greater strategic importance. According to the CIA scenario, a decline in production will compel the Soviets to import oil in order to supply clients in Eastern Europe. In competing with the West as buyers, the Soviets will accelerate price inflation in the world market through the 1980's.

The CIA view gained credibility in late November when Leonid Brezhnev, the Soviet chief of state, gave a gloomy report on the nation's economic performance this year. Oil production failed to meet the planned goal for the third time in 3 years, and the increase in production in 1979 was the smallest in two decades. Next year's goal has been reduced from a level of 12.8 million barrels a day to 12.1 million. (The current level is 11.7 million.) Brezhnev reportedly spoke of the need for "shock work" to improve economic growth and conserve energy in 1980.

Recent papers on this question differ most glaringly on two points: on the correct way to describe the Soviet oil reserves and on the likelihood that these reserves will be developed quickly and exported. The extreme optimists' view is put forward in a report by a group known as Petrostudies, based in Malmö, Sweden. In an updated version of a report issued a year ago, Petrostudies claimed this fall that Soviet reserves are at 150 billion barrels, just a little less than Saudi Arabia's. This is by far the highest figure used anywhere; it contrasts starkly with the CIA's estimate that proved reserves amount to around one-fourth of that figure, or about 30 billion to 35 billion barrels.

The CIA also says that Soviet production will drop from the present level to around 10 million barrels a day or less in 1985, at which time the Soviets will be importing more than 2 million barrels a day. Petrostudies suggests otherwise: "There is no danger at all that the USSR will become a net importer of oil in the next 10 years at least, and compete with other nations for purchase of OPEC oil."

Oil analysts in commerce and academe fall between these two extremes in their forecasts, agreeing with the CIA on production estimates, but challenging the notion that the Soviet Union will be forced to import oil. Two of those who spoke with *Science*, Marshall Goldman of the Russian Research Center at Harvard University and Leslie Dienes of the University of Kansas, have given detailed justifications for their views in a report published in October by the congressional Joint Economic Committee.

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Forecasting of this kind has attracted attention recently for several reasons. The Carter Administration made it important by releasing the CIA's paper on Soviet oil and giving it wide circulation. The President leaned on it himself 2½ years ago when he introduced his first energy program, citing it to bolster his argument that the oil shortage is a worldwide phenomenon demanding quick and radical action by the United States. The decision to publish a paper by America's spy service was controversial in itself, for it put a new political burden on supposedly neutral estimators.

Changes outside the United States also contributed to the interest in oil guesswork. In the late 1970's governments have found it important to know precisely where future petroleum supplies will come from, and in what quantities. Yet at the same time, the Soviet Union, which has always treated reserve data as a state secret, has begun to cut back on the quality and quantity of information it is willing to release. This happened just as the Soviet Union became the world's largest oil producer and second largest exporter. When official data are lacking, guesses become more interesting.

Finally, the forecasters do have something tangible and troublesome to work with: there are signs that the Soviets are experiencing a real oil crisis of some kind. In 1976, the Soviet government clamped down on the publication of certain kinds of data—for example, making secret the previously available figures for oil trade and regional oil production. This is taken to be a sign that the government is embarrassed by poor performance in some areas. It is also agreed that in 1977 the Soviets began a crash development program in the Siberian oil fields because the older oil areas west of the Ural Mountains—near the big cities—are being depleted at an alarmingly rapid pace. Since the Soviets have been silent on this matter, Sovietologists have been working overtime.

Goldman, a moderate among the forecasters, argues that both the CIA and Petrostudies reports are wrong. Although he has not yet read the updated Petrostudies paper, he is scornful of its conclusions. "Nobody seems to know who these people are," he said, and he suggested, as others have, that this forecast had been published as an "answer" to the CIA, either for its propaganda val-

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Carter Backs "Spirit" of Kemeny Report

"I fully agree with the spirit and intent of the Kemeny Commission's recommendations," President Carter said on 7 December, and then proceeded to explain why he would fail to carry out the broadest of them. He will not abolish the Nuclear Regulatory Commission (NRC), but will reorganize it to increase the chairman's executive authority. Carter also used the occasion to set out his position on the future of nuclear power, in what seemed a warm-up for the oratory of the campaign trail.

"Nuclear power is an energy source of last resort," the President said, and then added a clarification: "By this I meant that, as we reach our goals for conservation, direct use of coal, development of solar power and synthetic fuels, and enhanced production of American oil and natural gas, we can minimize our reliance on nuclear power." At the moment, there appears to be no way to reduce the nuclear share of the energy budget. Mentioning that one nuclear plant can "displace" 35,000 barrels of imported oil a day, Carter concluded: "We do not have the luxury of abandoning nuclear power or imposing a lengthy moratorium on its future use. . . . Nuclear power has a future in the United States—it is an option that we must keep open." The chief recommendation of the Kemeny Report (*Science*, 16 November) was that the NRC be done away with and replaced by an independent executive agency, directed by a single administrator who would serve at the pleasure of the President. The primary statutory responsibility of this agency, the Kemeny Commission decided, should be to protect public safety. The Kemeny group also recommended that a new 15-member oversight committee be created to serve as a check on the enhanced power of the government's chief nuclear power official and report periodically on the agency's work.

Instead of following this advice, President Carter has decided to retain the NRC in its present form—that of an independent collegial body run by commissioners with varied and sometimes conflicting policy views. However, the Administration will send legislation to Congress early next year reorganizing the internal structure of the NRC to give the chairman greater control over the staff during normal operation and over the entire agency during an emergency. The reorganization plan is being drafted by the Office of Management and Budget. According to the President's domestic adviser, Stuart Eizenstat, this option was selected over the Kemeny proposal because the White House found no support in Congress for a more radical overhaul of the NRC. The key congressmen involved—particularly the chairmen of the nuclear regulatory oversight subcommittees, Senator Gary Hart (D-Colo.) and Representative Morris Udall (D-Ariz.)—have said that they do not favor giving the chairman of the NRC much more discretionary power than he now has.

Because the collegial governing form is to be retained, the President decided there would be no need for a permanent oversight committee, as called for in the Kemeny report. He will establish instead a five-member "expert advisory committee" to perform the same task.

Recognizing that there is a need for fresh leadership at the NRC, the President relieved Joseph Hendrie, the then-chairman, of his senior position and made him just another commissioner. Commissioner John Ahearne has been made acting chairman, pending the possible early resignation of one of the commissioners or the scheduled retirement of Commissioner Richard Kennedy in June. When a new slot opens on the NRC, the President will name a new full-time chairman "from outside the agency." According to a fact sheet passed out at the President's press conference, "Dr. Ahearne will stress both safety and the prompt implementation of needed reforms."

Without adopting the Kemeny Commission's recommendation that he consider stripping the NRC of responsibilities unrelated to safety, the President "urges the implementation" of certain other reforms, as follows: establishing safety-cost trade-offs, improving licensing procedures, increasing the safety emphasis in control room and plant design, setting higher professional standards for the industry, siting new plants in remote areas, and developing plans for mitigating the damage done by nuclear accidents.

While the President agreed with the Kemeny group's conclusion that no new plant operating or construction licenses should be granted until a thorough review has been completed, he set an early deadline for its completion. The housecleaning should be finished no later than May 1980, Carter said. Frank Press, the President's science adviser and one of the co-chairmen of the President's in-house task force on the Kemeny report, pointed out that the NRC and the industry have already had 6 months to install changes while the Kemeny commissioners were conducting their investigation. Much of the work has been done, Press thinks.

The remainder of the President's statement served as a general endorsement of the Kemeny report, with the addition of a few embellishments:

- The NRC has been instructed to accelerate its program of placing a resident federal inspector at every reactor site and has been asked to consider developing other means of federal surveillance. The NRC may want to install a direct electronic monitoring system, linking all plant control rooms with a central government computer center.
- The Federal Emergency Management Agency (FEMA), an independent arm of the Executive office, has been asked to assume responsibility for handling all "off-site" problems that might arise from a nuclear accident. FEMA will receive a supplemental appropriation of $8.9 million this year to carry out this assignment and finish a review of the states' nuclear emergency plans.
- Additional funding ($49.2 million for the NRC and $7 million for the Department of Energy) is being sought this year to finance an expanded safety program and pay for accelerated research on the accident at Three Mile Island.
- Nuclear plant control rooms, the President said, "must be modernized, standardized, and simplified as much as possible to permit better informed decision-making during an emergency."

Although Congress has not yet had time to mull over the President's statement, the initial reaction in the House and Senate has been favorable, although somewhat muted. This suggests that the President's response to the Kemeny report was tailored to avoid controversy on Capitol Hill.

—ELIOT MARSHALL

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ue or simply to sell optimism (at $735 per copy) to worried, oil-short European governments. The first Petrostudies report reads like "disinformation," Goldman said.

"The CIA is right to say that the Soviets have lots of problems in their oil fields," Goldman explained, "and the Swedes are right to say the Soviets have a huge potential which is not being utilized." But it is wrong to expect any dramatic change in the world oil market because of what is happening in Russia. Goldman expects that the Soviets will continue to have trouble producing oil, and he even agrees with the CIA that production rates may level off in the next few years. However, Goldman thinks the Soviets will deal with shortfalls by imposing conservation measures and substituting other forms of energy—notably gas, which the Soviet Union has in abundance.

Dienes thinks the CIA report contained only minor errors and seems "almost exactly on the nose" now in its forecast of Soviet oil production rates. He believes the peak may have occurred already, or will occur in 1980. However, he does not expect as rapid a decline as does the CIA. He believes the CIA has understated Soviet reserves, but not significantly.

Despite their vast reserves and centralized authority, the Soviets will not be able to respond quickly to the crisis, Dienes argues, because there are few opportunities for conservation or fuel substitution. New oil fields are remote from the centers of population and will require massive investments of equipment and labor before they will yield any fuel. The Soviets lack the machinery and the expertise these sites demand, and Dienes argues that the Soviet government is too cautious to make the decisions that must be made quickly to avert a production slump. When asked about Petrostudies' optimism, he answered, "It's totally idiotic; they can't even read Russian correctly."

Arthur Meyerhoff, a petroleum geologist who serves as a consultant with the Soviet oil ministry, says that the CIA's predictions are working out "perfectly . . . they've been remarkably accurate." Meyerhoff himself has had "a running gun battle" with the authors of the Petrostudies report, for he thinks they have overstated Soviet proved reserves by a factor of 5. The Soviets have vast resources, he says, but they will not be able to tap them rapidly because they lack the drills and pipes necessary for working in deep reservoirs and cold climates.

Decisions Near on Diesels

The Environmental Protection Agency (EPA) will soon make two decisions that could have a major bearing on how fast the "dieselization" of the American automobile fleet proceeds and on the magnitude of the health risks associated with diesel engine emissions.

First, Administrator Douglas M. Costle must act on a request by the auto industry, and by General Motors in particular, for a 4-year waiver of the nitrogen oxides (NO_x) emission standard for 1981-model diesel cars of 1 gram per vehicle mile (down from 2 grams per mile for 1980 models). Then Costle will have to decide what the standard for particulate emissions for diesels shall be, this action to be heavily influenced by the NO_x standard.

The question of NO_x and particulate standards for diesel cars is one of the big issues to confront EPA, and probably is no less important than the SO_2 emission standards for new coal-fired power plants issued last summer.

Given the present state of auto emission control technology, a tightening of the NO_x and particulate standards to the levels now scheduled or proposed could frustrate General Motors' hopes for diesels. GM wants diesel cars to become a steadily growing part of its overall production—the goal is for them to represent at least 17 percent of the cars GM manufactures by the 1985 model year. Less than 5 percent of GM's 1980 cars will be diesels.

Diesels get 25 to 30 percent better gasoline mileage than gasoline-powered cars, and GM is counting on them to help it meet the 1985 fuel economy standard of 27.5 miles per gallon without dropping all of its larger—and more profitable—models in favor of small cars. On the other hand, diesels give rise to public health questions, including the possibility that fine particulates from diesel exhausts cause lung cancer.

According to EPA, light-duty diesel vehicles emit 30 to 100 times more particulates per mile than do catalyst-equipped cars operated on unleaded fuel. Moreover, EPA says that by 1990 diesel engines could be powering 25 percent of the light-duty vehicle fleet, compared to 0.4 percent today.

Conclusive evidence that particulates from diesels cause cancer is lacking, and GM points to a British study that found that the cancer incidence among diesel bus drivers, conductors, and mechanics was not unusually high. But extracts of diesel particulates have been found to be mutagenic in the Ames salmonella/microsome test and to cause changes in vitro in mammalian cells and skin cancer when painted on mice. EPA has under way a sizable research effort on the possible carcinogenicity of diesel particulates.

As the official responsible for establishing the NO_x and particulate standards, Costle must cope with some anomalies in the Clean Air Act that tend to pull him in two different directions. The standards for NO_x and particulates are intimately related because the exhaust gas recirculation system that controls NO_x emissions also increases particulate emissions. But, although the act says that the industry must bear the burden of proof in showing that a partial and temporary waiver of the NO_x standard is safe, it leaves it to EPA to establish a particulate standard that is technically and economically feasible and not governed by speculative health risks.

Consequently, should Costle deny a waiver of the NO_x standard, GM would be in a strong position to attack the proposed particulate standards as infeasible. The Environmental Defense Fund (EDF) is nevertheless calling for a denial. Robert Rauch, an EDF attorney, argues that the validity of strict particulate standards could be defended on the strength of some past court decisions upholding the agency's right to set power plant emissions on a "reasonable extrapolation of technological development." Such a regulatory strategy would—if successful—delay or slow down dieselization pending the development of control technologies capable of reducing both NO_x and particulate emissions to acceptable levels.

The inside word at EPA is that Costle will waive the NO_x standard in favor of a less stringent interim standard but that the waiver will not be for the 4 years requested and may be limited in other ways. According to one well-placed source, Costle believes the shift to diesels is inevitable and will not be stopped on grounds of an unproved cancer hazard.

—LUTHER J. CARTER

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The Soviet Union is 28 years behind the United States in technology, according to Meyerhoff: "To drill a 10,000-foot well, it takes 34 days in the United States and 14 months in the Soviet Union." And he says that pipes made in the Soviet Union are so brittle that, on the coldest days in Siberia, they shatter when kicked. Meyerhoff thinks it will take the Soviets 15 years to develop an indigenous oil industry capable of exploiting the difficult fields—precisely the ones that must be relied on to fill the looming gap in production.

Robert Campbell of Indiana University at Bloomington, another Sovietologist, was skeptical of the Swedish paper: "Some say the Petrostudies people are connected with the Russians. Their extreme evaluation makes you wonder about it." He added that "it is irrelevant to talk about oil reserves [in Russia] in any case. I'm prepared to believe that there's a lot of oil in the Soviet Union and on its continental shelf." But he said it is pointless to stress numbers because the real questions are when and how the Soviets will be able to produce the oil. Campbell expects production to decline. He agrees with the CIA's engineering analysis, which described numerous problems with the pumps and wells in Soviet oil fields, but he does not endorse the CIA's figures for production rates or reserves.

Campbell, like Dienes and other oil specialists, awaits the publication of the next 5-year plan for the Soviet oil fields, due to come out next year. Meanwhile, officials in the Soviet oil ministry are reportedly as bewildered as the CIA by Petrostudies' claims that huge reserves are waiting to be tapped. Pressed already to explain the disappointing record of the last few years, these officials find that Petrostudies is making their task more difficult.

The truth of the matter is that even the Soviets have an imprecise inventory of their petroleum resources. The full extent of these will not be known until prospective fields in Siberia and on the continental shelf have been thoroughly explored.—ELIOT MARSHALL

Much Ado About Soviet Trucks

A festering quarrel within the Department of Commerce over an old and seemingly innocuous decision to export truck technology to the Soviet Union is exciting renewed debate about the adequacy of safeguards against Russian military gain from civilian trade with the United States. The dispute, which pits an export control official against his department, threatens to disrupt implementation of recent changes in the export control law. Because resolution does not seem near, American firms seeking federal approval for high-technology exports to the Communist bloc may be faced with unusual delays in the months ahead, while Congress and Commerce officials sift through the varying claims of culpability.

The center of the dispute is the Kama River truck factory in Siberia, built with the assistance of American companies. For now, the Commerce Department is holding up only an application for export of spare parts to the factory. But an official of the department notes that "with all the tension and discord, everything is not running as smoothly as we would hope, particularly with new licensing procedures to be implemented." And the department is clearly under pressure to scrutinize licenses more carefully in light of the controversy.

Lawrence Brady, the dissident bureaucrat causing headaches for top Commerce officials, says in raising the Kama River case that the entire export control system "has been gradually dismantled to the point where the Soviet Union and other controlled countries are capable of acquiring some of the most sophisticated Western technology and diverting it to military forces." Senator Gordon Humphrey (R-N.H.), who acted as Brady's sponsor during recent hearings of the Senate subcommittee on international finance, says "I am concerned that the Commerce Department has succumbed to too much business pressure to issue licenses for technologies that have potential military utility." Department spokesmen told the committee this is hogwash, and that Brady has been disseminating "false and misleading information" both about Kama River and about the department's vigilance in preventing diversion of civilian trade.

Although the decision to export U.S. technology to the Kama River plant was made 8 years ago, the department's imbroglio did not arise until April, when the Central Intelligence Agency presented evidence that civilian trucks constructed at the plant were being used by military forces in the Soviet Union and Eastern Europe. The evidence left department higher-ups unconcerned, but it clearly upset Brady, then the acting administrator of the export control administration. He insists that this newly discovered use has strategic implications. "What the Soviets need and want most is economy of scale, and we handed it to them; their capability would have been delayed for years if the United States had not participated," he says.

Disclosure of the CIA evidence was made in May before a forum eager for that sort of information, the Senate Armed Services Committee. The senators promptly interrogated Stanley J. Marcuss, then a deputy assistant secretary for trade regulations; Marcuss, a Carter political appointee, is Brady's boss. Marcuss told the senators that, alarming as this truck threat was, no one seemed to be at fault. The export decision had been made knowingly, he said, and no actual violation of the export regulations occurred because the Soviets had never committed themselves as to what use the trucks would ultimately be put.

It was at this point that Brady jumped ship and accused the department of covering up an apparent rules violation, of "an unwillingness to face up to the Soviets' violation." Neither the rules nor the Soviets' promises were in the slightest bit vague, he says; they signed a promise that the exported equipment would produce either "trucks" or "civilian trucks," and never said anything about "military trucks." Brady says that such a pledge is binding, and that the department ought now to punish the Soviets by denying them any additional truck factory exports.

Exactly where this narrow dispute will settle in the broader issue of high-technology civilian trade with the Soviets is uncertain. But it is clear that those who have opposed such trade in the past are delighted to have a new hook on which to hang their claims, even as tiny a hook as the Kama River truck plant.—R. JEFFREY SMITH

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